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Urban and Rural Household Saving in China

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Abstract

Household saving behavior in China during the past thirty years is studied by using econometric models. The urban sector and the rural sector are investigated separately: the time-varying-parameter technique is applied to urban time-series data, and panel data are used for estimation of the rural sector. The estimated results of the models are robust and in line with those of similar studies of other countries.

Recent economic reforms and developments in China have drawn great attention from economists. One of the most important factors in both the theory of, and policy prescription for, economic development is the domestic savings rate. As the reform moves the economy in a more decentralized direction, can China maintain its savings rate at the high level of the past few years?

With the annual publication of the *Statistical Yearbook of China* (China (1981 and various issues); hereinafter referred to as the *Yearbook*) since 1981, a systematic study of saving in China has become possible. Such a study serves to improve understanding about the effects of the recent economic liberalization in China and to provide preliminary results for future studies as well.

The domestic savings rate is taken here to mean total domestic savings as a percent of gross domestic product (GDP). By source, total domestic savings constitute government savings, business

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savings, and household savings. The structure of the savings is then the proportion of these three parts in the total. Tables 1 and 2 present data on the domestic savings rate and the structure of domestic savings in China and selected countries for the period 1976-84. Comparative household savings rates (total household savings as a percentage of household disposable income) are shown in Table 3. An examination of these tables yields the following observations.

First, China's domestic savings rate, at about 30 percent, is higher than the rate of either the "average" developed country or the "average" developing county (Table 1). China's savings rate is, however, less exceptional in comparison with the rates for some Eastern European countries or some Asian countries, such as Japan and Singapore.

Second, the structure of savings (Table 2) varies from country to country and over time. In most market economies, the share of household savings is substantial; in general it exceeds one third of the total savings. The structure of domestic savings in China has changed dramatically since the start of liberalization in 1979 and has been characterized by a shift from government savings to enterprise, local government extra-budgetary, and, especially, household savings. The high figure for household savings in 1984 does not appear representative because of the unusual increase in bonus income in the last quarter of that year. Household savings in 1983, however, still accounted for one third of total domestic savings. This figure is close to those of market economies such as the Republic of Korea and the United States.

Third, in recent years, household savings in China increased not only as a share of total saving, but relative to household income as well. Unfortunately, data for deriving the household savings rate are incomplete. Only a rough estimate can be made from the sample survey, which shows a quite high level, even compared with some market economies. It will be seen later that this level is mainly due to the high savings rate in the rural sector of China.

Economists are interested in the nature of the household savings function and, further, in the reasons for the recent high savings rate: Does it reflect an underlying structural shift and behavioral change, or is it merely a monetary phenomenon -- a result, for example, of repressed inflation? The answer to this question concerns predictions of future performance as the Chinese economy moves toward further

liberalization. In an economy that is still quite centralized in many aspects, moreover, the autonomous decisions of several hundred million households on the amount of their individual savings have important macroeconomic policy implications.

The paper is organized as follows. Section I contains a review of previous studies of household savings in China. Section II provides a background of the Chinese economy and singles out the most important factors influencing household savings. Section III analyzes motives for saving in the urban and rural sectors, and Section IV presents alternative savings models. Section V and VI present empirical results for the urban sector and rural sector, respectively. Section VII offers the study's conclusions.

I. Review of Previous Studies of Household Savings in China

Like many other economic subject, modern theories and models of saving and consumption originated in studies of saving behavior in the Western, developed, market economies. Among well-known models of saving in this context are the Keynesian absolute-income hypothesis; Duesenberry's relative-income hypothesis; Friedman's permanent-income hypothesis; the Modigliani-Brumberg life-cycle hypothesis; and the asset-adjustment models associated with, among others, Houthakker and Taylor and Leff and Sato. Later on, these models have been applied to the developing market economies, as seen in the surveys by Mikesell and Zinser (1973) and Snyder (1974). More recently, some studies of the exceptionally high savings rate in Japan have focused on aspects not included in traditional theories. In Horioka (1985) the role of target savings for housing and education was singled out, while Hayashi (1986) drew special attention to the role of bequests.

Since the late 1970s, there have been quite a few studies of saving behavior in centrally planned economies, mainly of Eastern European countries and the U.S.S.R. One approach is to apply the above-cited models directly to those economies (for example, Pickersgill (1976, 1980)), ignoring the potential disequilibrium between the intention and realization of current household consumption and saving, which is believed by many authors to persist in such economies. Another approach takes this potential

disequilibrium directly into account (for example, Portes and Winter (1980)).

Empirical studies on household saving behavior in China -- a developing, centrally planned economy -- did not start until 1982. Four studies prior to the present paper are noteworthy: De Wulf and Goldstein (1983, 1985); Naughton (1986); Feltenstein, Lebow, and van Wijinbergen (1986); and Armitage (1986).

The studies by De Wulf and Goldstein and Naughton shared common methods in estimating savings functions for China by applying time-series data to the traditional linear models cited above. Naughton (1986) used aggregate nominal data, whereas De Wulf and Goldstein (1983) applied per capita, real data, and they further separated the rural sector from the urban sector in their later paper (1985). Both studies found very low Durbin-Watson (DW) statistics in the estimation, indicating misspecification, and that the estimated marginal propensity to save (MPS) varies, depending on the time period selected. In neither study, however, was the model respecified for further testing.

To avoid the misspecification problems arising with time-series data, Armitage (1986) instead used rural and urban household sample survey data of recent years to estimate separately the savings function in each sector. Constrained by the availability of data (for the rural sector, 1982-84 data from 28 provinces; for the urban sector, 1983 data from 29 cities), Armitage was only able to estimate a Keynesian savings model for each year from 1982 through 1984 for the rural sector and for 1983 for the urban sector, and Friedman's permanent-income model for the rural sector in 1984. She found a substantial difference in household saving behavior between the rural and urban sectors, a result that is consistent with the common observation. Her estimation favored the permanent-income model over the absolute-income model for the rural sector in 1984, which is the only year for which the comparison can be made. Although the separation of the rural and urban sectors is justifiable, the results may not the reliable, especially because the urban sector data cover only one year.

Stressing the potential disequilibrium in the Chinese economy, Feltenstein, Lebow, and van Wijinbergen (1986) approached the problem quite differently. Instead of using the official price index as a deflator, they adopted what they called the "virtual price," defined as that price level which would induce

the observed quantity of consumption and savings in the absence of rationing. The approximation of the virtual price, p, in terms of observables was defined as $p/P = (M/PR)^a$, where P is the official price index, M is the money supply, PR is total retail sales, and a is a parameter, a constant. By using p instead of P as a deflator (where money supply is defined as M2), they found that only two out of five specifications give very low DW statistics and, for the permanent-income model, that the DW increased from 0.8 to 1.86; and that, by defining "real virtual interest rate" as $1 + r + (1+i)p/P_{+1}$, where i is the official nominal interest rate, they were able to estimate a significant value of the elasticity of consumption with respect to the real virtual interest rate, on the order of about -0.20. They concluded that there was no regime shift in household saving behavior, as long as potential disequilibrium is allowed. The implication of their model is that the higher savings in recent years reflect the excessive monetary expansion and the increased degree of repressed inflation in the economy, and hence represent forced saving.

Although the theoretical derivation of the Feltenstein-Lebow-van Wijinbergen model itself is interesting, the selection and interpretation of the data in the time period remain a problem. First, their results are sensitive to the monetary aggregate selected: when they used M1 (defined as total cash in circulation) instead of M2 (total cash plus total savings deposits), the DW statistics was reduced from 1.96 to 1.27. The reasons for this are obvious: by including $p = P(M/PR)^a$ in the regression, one expects to have a higher DW because M/PR is correlated with the rapid increase in savings, and the correlation is stronger if M includes savings itself, as when M2 is used. Second, their significant estimation of interest elasticity depends crucially on their assumption about expectations: consumers face rationing in a given year and expect rationing to be eliminated in the next year (remember that $1 + r = (1 + i)p/P_{+1}$). It is doubtful, however, that this kind of expectation could survive every year for more than thirty years. If consumers expect rationing to continue in the coming year, then $1 + r = (1 + i)p/p_{+} = 1 + i$, and the estimated results may not hold.

II. Factors Shaping the Chinese Economy and Influencing Household Behavior

The following factors are considered important in shaping the contemporary Chinese economy and in influencing household behavior -- in the present case, household saving behavior.

First, China is a low-income developing country, with the majority of its population living in rural areas. At the persistently low level of incomes and of assets, for many years households were essentially struggling to meet basic needs. Saving was then considered a kind of "luxury good," and not a realistic option when income was below a certain level. Borrowing in general was constrained either by the lack of a credit market or by traditional conservative attitudes toward borrowing. Under these circumstances, one cannot imagine that a consumer with a yearly disposable income of US100 would have the same marginal propensity to save as one with $1,000 a year. This basic and simple notion leads us to suspect the application of a linear savings function to China in the thirty-year period (1955-85), during much of which most households were concerned with meeting their basic needs.

Second, China is a centrally planned economy, with most enterprises owned and controlled by the government. Before 1979, China followed a development path similar to that of other centrally planned economies -- that is, one in which government policy actions were directed toward high accumulation, stable and low wages, full employment, and a high standard of social welfare (at least in the urban areas). On the one hand, with economic uncertainty reduced and the income flow smoothed, for a given level of income a household's motives to save were considerably reduced: housing, education, pension, nursery, and medical services were all provided by the government. On the other hand, the persistent shortage of consumer goods may have forced such households to save the amount that they otherwise may have wished to spend in the absence of shortages. During this period, neither the government nor most economists viewed household savings as being a part of accumulation; rather they thought currency and savings deposits held by households were unrealized purchasing power and were potential destabilizing influences for the consumer-goods market. Other things being equal, excess monetary expansion relative to the real growth of consumer goods output lead to either inflation or forced saving if the price level is controlled. The counterpart of the monetarist's statement that "inflation is a monetary phenomenon" in the present context is that "excess savings are a monetary phenomenon." Before 1979, the authorities were able, with

some exceptions, to control monetary expansion in order to avoid either inflation or the rapid accumulation of household savings. Hence, the low and stable savings rate of the household sector before 1979, other things being equal, is the consequence of the institutional arrangement.

Third, economic reform has been under way in China since 1979. The main feature of the reform has been the decentralization of decision making to enterprises (in the case of urban reform), and to households (in the case of rural reform). One of the results of economic reform has been the sharp increase in both household disposable income and savings, with the measured MPS higher than ever before, especially in the rural sector, where per capita income nearly tripled during the past eight years. The emergence of household farms in rural areas and free and parallel markets in urban areas has increased the demand for money, since the economy has come more monetized. In the urban sector, income -- now consisting of wages and bonuses, and possible extra money from various sources -- is more volatile than before, and most consumers feel less certain about future income. In addition, reform itself increases uncertainty. For example, the impact on uncertainty of prospective price reform is not insignificant.

Finally, China's economy is also shaped by a number of unique factors -- among them its huge size, immense population, and history. Traditional ideas about savings and the virtues of thrift, and the past thirty years' experience of low income, may now contribute to a strong motive to save as a precautionary measure.

The above four factors are important in explaining recent high household savings in China. Specifically, the identity $vM/PQ = s$ is postulated as a generalized form of money equation, where M is the money supply, P is the price level, Q is real output, and v is the equilibrium velocity of money. In the traditional theory of money, s is always set equal to unity, so that v is the observed velocity of money. As interpreted here, s is an index of the degree of disequilibrium in the economy; in particular, when $s > 1$, s is the index of shortage or repressed inflation. In the traditional theory with $s = 1$ and with v and Q fixed, the increase in M will lead to an increase in P; that is, to inflation. Now, as the possibility of disequilibrium is explicitly introduced, the increase in M, other things being equal, will result either in an increase in P or, most often in a centrally planned economy, in an increase in s, with P kept constant.

What happened in China during the past few years was the simultaneous increase in M, P, Q, and M/PQ. This leads to one possible hypothesis of the increase in s, assuming that v is constant. This is the assumption implicitly made by Feltenstein, Lebow, and van Wijinbergen (1986), under which they were able to explain the increased savings, maintaining the constancy of household saving behavior, especially the MPS, over time. This paper makes an alternative assumption. If s is assumed to be constant over time, the money equation is still valid if v decreases as M/PQ increases. This situation is quite possible, given the recent process of monetization in China. Hence, another hypothesis emerges: with s fixed, the increase in M/PQ is balanced by the decrease of v; that is, an increase in the demand for money. This paper shows, among other things, that the increased savings in recent years can be equally well explained under the latter hypothesis, if the possible shift of household saving behavior -- especially the MPS -- over time is allowed.

III. Motives for Saving: Urban versus Rural

To examine saving behavior in China, it is essential to separate the rural and urban sectors because, as it will be seen below, different institutional and motives apply in each case. According to the definition before 1984, the rural population is about 80 percent of the total population, with the remaining 20 percent urban residents. Unlike other developing countries, in China population movement from the countryside to cities has been strictly controlled, so that the per capita income of urban residents was kept two times higher than that of rural residents for nearly thirty years. Farmers in rural areas and wage earners in urban areas experience different institutional environments. It is also evident that the two sectors experienced quite different economic development paths during the recent years of reform.

Urban wage earners have stable incomes and are extensively covered by the state or enterprise welfare plan. Saving for retirement is not necessary, since a retired worker will receive a pension of between 60 percent and 80 percent (in the case of a "model worker," up to 100 percent) of his or her final wages. Nobody in urban areas saves for housing because houses are provided by the "employing unit" at very low rent. But there is a strong motive to save for consumer durables (television sets, washing

machines, refrigerators, and the like). In addition, saving for children's marriages is not uncommon.

In the rural sector, in contrast, incomes (especially since the reform) are less stable, depending on the weather, the market, and management of production. Housing and pension funds are provided by the farmers themselves. As mentioned earlier, farmers face investment opportunities too, which are not available for urban residents. Many of the motives common to saving behavior in market economies have become relevant for Chinese farmers in recent years.

Consumer durables in urban areas and housing in rural areas have accounted for the bulk of the increase in Chinese household savings in recently. These two motives for saving can be attributed to (1) very low initial stocks, (2) the absence of rental markets, and probably most important, (3) the ownership premium. One policy implication from this analysis is the effectiveness of introducing housing as a potential savings instrument in the urban areas for maintaining the household savings rate.

IV. Alternative Savings Models

This section describes in general terms the four models of saving that are used to obtain estimation results in Sections V and VI. In what follows, S is real per capita household savings and Y is real per capita disposable income.

Absolute-Income Model

This model, based on Keynesian theory, postulates a linear relationship between current savings and current income:

$$S_t = a + bY_t.$$

Under the assumptions $a < 0$ and $0 < b < 1$, the MPS exceeds the average propensity to save (APS), and the APS increases with the level of income. The particular feature of the model is that savings relate only to current income; hence, the short-run and long-run responses of savings to current income are identical.

Permanent-Income Model

As opposed to the absolute-income hypothesis, this model relates current savings to permanent income, which can be thought of as the steady rate of consumption a person could maintain for the rest of his life, given the present level of wealth and income earned now and in the future. The linear version of the model that has been widely used in the empirical studies is

$$S_t = \mathrm{c} + aY_t^p + bY_t^t,$$

where Y_t^p and Y_t^t are permanent income and transitory income in year t, respectively. To determine the permanent income, this paper follows the method used by Williamson (1968) which uses as a proxy for permanent income a three-year moving average of actual income; that is, $Y_t^p = (Y_t + Y_{t-1} + Y_{t-2})/3$. Other methods of specifying permanent income involve hypotheses concerning the formation of expectations about future income; examples include the adaptive and rational expectations models (see the consumption model below).

Asset-Adjustment Model

In a dynamic perspective, saving may be viewed as a means of accumulating assets that perform specific functions for the saver. The asset-adjustment approach to analyzing saving behavior explores the relation between savings, wealth, and income. The general reduced form of the model is

$$S_t = aS_{t-1} + b\Delta Y_t. \tag{1}$$

The parameters of the model, however, have different interpretations that depend on the precise form of the underlying behavioral equations.

Houthakker and Taylor (1966) derived the model by applying their general dynamic demand model to the case where saving is viewed as the acquisition of nondepreciating assets. The continuous-time behavioral equations they formulated are

$$S(t) = A + BW(t) + CY(t) \tag{2}$$

$$S(t) = \dot{W}(t), \tag{3}$$

where $W(t)$ is wealth at time t; $Y(t)$ is income at time t; $S(t)$ is savings at time t; B is the MPS of assets; and

C is the MPS of income. Since S_t is the savings accumulated in a discrete time period, equation (1) can therefore be derived from equations (2) and (3), with

$a = (1 + B/2)/[1 - B/2]$; $b = C/[1 - B/2]$;

$B = 2(a - 1)/[a + 1]$; $C = 2b/[a + 1]$.

With a constant income growth rate, g, the long-run (that is, steady state) savings ratio is $S/Y = Cg/(g - B)$.

Leff and Sato (1975) obtained equation (1) in a different way. Let S^* be desired savings, k be the adjustment parameter relating actual savings S to desired savings S^*, and r be the desired ratio of assets W to income Y; that is, $r = W^*/Y = \Delta W^*/\Delta Y = S^*/\Delta Y$. Thus one has

$$S_t = k(S^*_t - S_t),\ 0 < k < 1 \tag{4}$$

$$S^*_t = r\Delta Y_t \tag{5}$$

From equations (4) and (5) one gets $S_t = (1-k)S_{t-1} + kr\Delta Y$. Under this formulation, the long-run savings ratio consistent with the constant growth rate of income, g, is $S/Y = krg/(g + k)$.

Consumption Model

An alternative approach to analyzing the behavior of savings is to examine consumption. By using the income identity, $Y_t = C_t + S_t$, for each savings model specified above, one could derive a corresponding consumption model, but in this way one adds no information. What can be done is to add to the savings model a consumption equation and an identity, $Y_t = C_t + S_t$, to form a simultaneous-equation model. In this way, the problem of simultaneity of the single equation formulation is explicitly recognized; that is, the original single-equation model is only a submodel of the whole system. Two-stage least-squares or general instrumental-variables techniques can be employed for the estimation of the structural equations.

In this connection, Hall's (1978) hypothesis of consumption is examined. According to Hall, the stochastic implication of the life-cycle permanent-income hypothesis is that consumption should follow a random walk, in the sense that the lagged consumption contains all relevant information in predicting current consumption. To test Hall's hypothesis, a conditional expectation, $E(C_t|C_{t-1}, X_{t-1})$, where X_{t-1} is a vector of data known in period t - 1, is estimated and then the hypothesis tested that the expectation is

actually not a function of X_{t-1}.

V. Empirical Results for Urban Household Savings

This section describes the data used, and the results obtained, for the urban sector.

Data

Ideally, total disposable income (including income in kind) and total savings (including acquisition of consumer durables) should be used in the empirical analysis. Because of limited data, money income (excluding income in kind) and financial savings (excluding consumer durables) are used instead. The construction of time-series data is based on the following identity (household borrowing is negligible):[1]

household money income = household expenditure + household financial savings,

where

household expenditure = household expenditure on commodities

+ household expenditure on services

and

household financial savings = change of household cash holdings

+ change of household savings deposits + change of household bond holdings.

Figure 1 plots the time series of urban household per capita real money income, financial savings, and consumption expenditure.

Urban income and savings are then expressed in real per capita terms by using data on the general retail price index and urban population. Data up to 1983 on urban population are cited directly from the *Yearbook*; estimates for 1984 and 1985 are derived by extrapolation using trend growth rates (the rapid increase in urban population on the basis of the official series reflects a redefinition of urban areas).

[1] Details of the construction of time-series data on urban household financial savings and money income are given in the Appendix.

Two final remarks are in order about the data for 1984 and 1985. Savings in 1984 were exceptionally high, reflecting an unusual increase in wage bonuses in the last quarter of that year, and it would be inappropriate to select 1984 as the last year of observation. Data for 1985 were estimated by the author on the basis of partial information.

Estimated Results

It is worthwhile to plot savings/consumption against income before making any estimations. In Figure 2, panels A and C show real financial savings and real consumption in relation to real income. With permanent income taken as the past three years' average income and transitory income as the difference between current and permanent income, panels B and D show the relation between savings and permanent and transitory incomes, respectively. Panel A and B show clearly the non-linearity of the plotted functions, suggesting that any attempt to fit a linear equation to these data will not yield satisfactory results. Panels C and D, in contrast, show possible linear relationships in the underlying variables.

To capture the idea of regime shifts in household saving behavior over time discussed in Section II, switching regression models are used in which two distinct regimes are explicitly recognized and the switching date between the two regimes will be estimated, not predetermined. The switching regression model, which is a special case of a more general time-varying parameter model, allows a simple discrete switch on the values of parameters, with the switching date determined according to the criterion of maximum likelihood. The results of least squares estimation of the switching regression models as well as the ordinary linear regression models are presented in Tables 4-7. Interest rates were first included in the regressions but were later dropped because they were insignificant in all cases.

For the absolute-income model (Table 4), the likelihood ratio (LR) test decisively rejects the hypothesis of no regime shift, where LR = 52.58 for 1955-85 (LR = 43.28 for 1955-83), when the 0.99 value of χ_1^2 is 6.63. The estimated year in which the shift occurs is 1979, coinciding with the beginning of reforms. When the shift is included, the DW statistic is increased from 0.398 to 1.67, indicating no serious autocorrelation (from 0.489 to 1.125, though, for 1955-83). The adjusted coefficient of determination ($\bar{R}^2$)

is also improved significantly. All of the indicators show strong support for the switching specification.

With regard to the parameters estimated, MPS now depends on the following regimes (from 1955-85 equation):

$S_t = -6.0 + 0.04Y_t$, when $t < 1979$;

$S_t = -61.7 + 0.26Y_t$, when $t \geq 1979$.

However, the estimation from the simple linear regression (from 1955-85 equation) is $S_t = -33.4 + 0.17Y_t$. Hence, the estimated MPS before (after) 1979 is lower (higher) than the estimate from the simple linear regression.

In estimating the permanent-income model (Table 5), the hypothesis of no shift in MPS out of permanent income is tested under two alternative assumptions: (A1) there is no shift in MPS of transitory income, and (A2) there is a shift in MPS of transitory income. Log-likelihood ratios are presented below:

	Assumption A1	Assumption A2
1955-83	47.76	16.28
1955-85	44.16	13.14

The original hypothesis is decisively rejected under either assumption because the 0.99 value of χ_1^2 is 6.63. One may conclude that there is a shift in MPS of the permanent income. Next, the hypothesis that there is no shift in MPS out of transitory income is tested, given the shift in MPS out of permanent income. The log-likelihood ratio is 0.42 (or 2.16 for 1955-83). The hypothesis cannot be rejected, since the 0.90 value of χ_1^2 is 2.71.

As in the absolute-income model, the estimated shifting year is 1979. Parameters estimated are:

$S_t = -1.2 + 0.01Y_t^p + 0.24Y_t^t$, when $t < 1979$;

$S_t = -64.8 + 0.27Y_t^p + 0.24Y_t^t$, when $t \geq 1979$.

The corresponding DW statistic is 1.996 (or 1.64 for 1955-83); the $\bar{R}^2$ is 0.970 (or 0.940 for 1955-83).

There is one interesting finding from the estimation. Before 1979, propensities to save in relation

to permanent income and transitory income differed greatly, with almost all savings being in response to the increase in transitory income. Since 1979, propensities to save from permanent income and from transitory income have been nearly identical. This contradicts Friedman's permanent-income hypothesis, and at the same time, supports the Keynesian absolute-income model estimated previously, where MPS out of current income is 0.256, which is about the average of MPS out of permanent income and out of transitory income here. This result may be interpreted in the following way. Before 1979, household incomes were so low that households save almost nothing out of permanent income: hence only transitory increments of income were saved. Since reforms began, as discussed in Section II, urban households have been saving such a significant amount from permanent income that they behave like Keynesian consumers.

Turning to the asset-adjustment model (Table 6), four versions of the model, depending on the assumptions of shift in different parameters, were estimated (equation numbers refer to the table):

$$S_t = a_1 S_{t-1}(1 - D) + a_2 S_{t-1} D + b_1 \Delta Y_t (1 - D) + b_2 \Delta Y_t D \quad (6.1)$$

$$S_t = a_1 S_{t-1}(1 - D) + a_2 S_{t-1} D + b_1 \Delta Y_t \quad (6.2)$$

$$S_t = a S_{t-1} + b_1 \Delta Y_t (1 - D) + b_2 \Delta Y_t D \quad (6.3)$$

$$S_t = a S_{t-1} + b \Delta Y_t \quad (6.4)$$

where $D = 1$ when $t < T$ and $D = 0$ when $t \geq T$. The log-likelihood ratios are given below for possible nested hypotheses:

	(6.4) vs. (6.2)	(6.4) vs. (6.3)	(6.2) vs. (6.1)	(6.3) vs. (6.1)
1955-83	11.68	12.40	4.02	3.30
1955-85	5.0	5.24	1.0	0.76

Because the 0.99 value of χ_1^2 is 6.63 and the 0.95 value of χ_1^2 is 3.84, one may want to reject specifications (6.4) and (6.2) and choose (6.3); that is, there is a shift in the savings response to the change in income, without a shift in the current savings response to the lagged savings. The estimated time of shifting is 1978 in this model:

$S_t = 0.75S_{t-1} + 0.09\Delta Y_t$, when $t < 1978$;

$S_t = 0.75S_{t-1} + 0.28\Delta Y_t$, when $t \geq 1978$.

Using the formula presented in Section IV allows one to calculate structural parameters -- in particular, the long-run savings-income ratio S/Y -- under alternative interpretations. After 1978, according to the methodology of Houthakker and Taylor (1966), the MPS out of assets is

$B = 2x(0.75 - 1)/(0.75 + 1) = -0.29$,

and the MPS out of income is

$C = 2x0.28/(0.75 + 1) = 0.32$.

The long-run savings rate consistent with the constant growth rate of income of 4 percent is $S/Y = 0.32x0.04/(0.04 + 0.29) = 3.88$ percent. Under the interpretation of Leff and Sato (1975), the adjustment parameter relating actual to desired savings is $k = 1 - 0.75 = 0.25$, and the desired asset-income ratio is $r = 0.28/0.25 = 1.12$. With the constant income growth at 4 percent, the long-run savings rate under this interpretation is $S/Y = 0.28x0.04/(0.04 + 0.25) = 3.86$ percent, which is very close to the figure obtained by Houthakker and Taylor.

The analysis next attempts to estimate the structural equations of consumption (Table 7). The equations $C_t = a + bC_{t-1} + dY_t$ were estimated using C_{t-1} and S_{t-1} as instruments. This is equivalent to applying the method of two-stage least squares to simultaneous equations:

$C_t = a + bC_{t-1} + dY_t$

$S_t = eS_{t-1} + f(Y_t - Y_{t-1})$

$Y_t = C_t + S_t$.

In contrast to Chow (1985), estimates of the coefficient of *current income*, d, are all significant, but this does not contradict the principal stochastic implications of the life-cycle permanent-income hypothesis of Hall (1978) mentioned in Section IV (that is, lagged income should not have predictive power for current consumption).

Hall's random-walk hypothesis is formally tested by estimating a conditional expectation, $E(C_t/C_{t-1}, X_{t-1})$, and showing it is not a function of X_{t-1}. The weak version of the hypothesis takes X_{t-1} as lagged

consumption beyond C_{t-1}, whereas the strong version would include lagged income or any other lagged variables. Note that what is estimated is the conditional expectation, not the true structural relation between consumption and its determinants.

In Table 7, where equation (7.2) includes C_{t-2}, C_{t-3}, and C_{t-4} in addition to C_{t-1} as in equation (7.1), the F-statistic for the hypothesis that the coefficients of C_{t-2}, C_{t-3}, and C_{t-4} are all zero is 1.37 for 1955-83 (or 1.63 for 1955-85), well under the critical value of 2.96 at the 5 percent level. This implies that, by adding C_{t-2}, C_{t-3}, and C_{t-4} into the regression, one adds no additional information. Hence the weak version of the hypothesis is supported.

The predictive power of the lagged levels of the disposable income is tested next. Equation (7.3) of Table 7 incorporated a single lagged value of income, and equation (7.4) tried a four-year lag. For data up to 1983, F-statistics are 0.29 and 1.08, respectively. Therefore, the strong version of the hypothesis cannot be rejected at the 5 percent level. But for data extended to 1985, the values are 12.9 and 4.26, respectively, and the hypothesis can be rejected, although not decisively.

VI. Empirical Results of Rural Household Savings

This section describes data used, and results obtained, for the rural sector.

Data

For estimating rural household savings functions, cross-sectional data were used because time-series data of rural income and savings are difficult to construct. Income in kind for rural households is substantial and cannot be neglected; therefore money income is no longer a good proxy. Furthermore, unlike the case in urban areas, a dramatic increase in housing investment is an important part of rural household savings (accounting for nearly 10 percent of total income, or about 30 percent of total savings, in 1984).

Data on rural income and savings from 1982 to 1984 were drawn from the *Yearbooks* and were

based on sample surveys conducted in 28 provinces (China (1985a, 1985b)).[2] Data for 1980 were drawn from the State Statistical Bureau. Household expenditure for 1981 is also available from the *Yearbook*, but household income for that year is missing. Fourteen of the 28 observations were collected from the State Statistical Bureau; the others were estimated by simple extrapolation.

Note that the figures for rural household savings obtained here are biased upward because savings are calculated as a residual between income and expenditure, which includes only expenditure on commodities, cultural activities, and services. Other expenditure -- including outward remittances, gifts, fixed investment, and the like -- is not reported. Detailed survey data are available for Hubei Province, from which it is estimated that other expenditure excluding fixed assets was 5.9 percent of total income in 1981 and 5.4 percent in 1982 (King (1986a, 1986b)). This implies that, in the case of Hubei Province, the rural household savings rate is overestimated by 5-6 percent if unadjusted data are used.

Empirical Results

The per capita savings and incomes of rural households in 28 provinces during 1980-84 are plotted in Figure 3, in which savings are unadjusted. First the savings equation were estimated by using the unadjusted data; the main results are presented in Tables 8-10. Later, the same equations were re-estimated by adjusting total savings downward by 5 percent of income uniformly across provinces. Note that the re-estimation changes nothing, with the exception of causing the MPS to decrease by 0.05 in the absolute-income and permanent-income models. Therefore, corresponding results will not be reported here. For the asset-adjustment models, new results are reported in Table 11. In what follows, only estimation with the unadjusted data is discussed.

For the absolute-income model (Table 8),, the likelihood ratio test decisively rejects the hypothesis that data from 1980 through 1984 are from the same population at the 1 percent level (LR = 63.877 > χ_8^2 = 20.1). Results from the likelihood ratio test were rather weak, however, to determine whether the MPSs for each year are identical. Because the LR test is an asymptotic test, the exact F-text was used, which

[2] Excluding the Tibetan Autonomous Region of China.

rejects at the 1 percent level the hypothesis that all MPSs from 1980 through 1984 are equal ($8.2 > F_{8, 130} = 3.84$). If observations for 1980-81 are dropped because of uncertainties about the quality of the data, then the F-test cannot reject the pooling specification at the 5 percent level ($2.23 < F_{2, 78} = 2.54$). The fitted equation is

$$S_t = -72.8 + 0.53Y_t,$$

or

$$S_t = -72.8 + 0.48Y_t,$$

if adjusted savings data are used.

Permanent-income models (Table 9) can be estimated using data for the three years, 1982-84. The F-test rejects the pooled specifications at the 1 percent level, although not decisively ($3.2 > F_{6, 75} = 3.1$). When a dummy variable was introduced for 1982, for which annual data were considered more problematic (owing to data of 1980-81), the F-test cannot reject the new specification at the 5 percent level ($0.9 < F_{4, 75} = 2.50$):

$$S_t = -50 + 0.46Y_t^pD + 0.38Y_t^tD + 0.34Y_t^p (1 - D) + 1.31Y_t^t (1 - D),$$

or,

$$S_t = -50 + 0.41Y_t^pD + 0.33Y_t^tD + 0.29Y_t^p (1 - D) + 1.26Y_t^t (1 - D),$$

if the adjusted savings data are used, where $D = 1$ when $t = 1982$. In comparison, the estimation of an urban savings model, where MPS out of permanent income is 0.27, is slightly lower than 0.29 in the case of a rural model. However, the difference between the MPSs out of transitory income of the two sectors is more than unity, reflecting unusually high savings in rural areas.

For the asset-adjustment model (Table 10), the F-test again rejects the pooling specification at the 1 percent level ($6.7 > F_{6, 104} = 3.0$). As with the permanent-income model, if a dummy variable is introduced for 1981 and 1982 in the coefficient of the change in income, the F-test fails to reject the new specification at the 5 percent level ($1.2 < F_{5, 104} = 2.35$):

$$S_t = 0.84S_{t-1} + 0.62\Delta Y_tD + 0.85\Delta Y_t(1 - D),$$

or

$S_t = 0.82S_{t-1} + 0.56\Delta Y_t D + 0.79\Delta Y_t(1 - D)$,

if adjusted savings data are used, where D is the dummy for 1981 and 1982.

The structural parameters are now calculated using estimates from the adjusted savings data: from Houthakker and Taylor (1966),

$B = 2x(0.82 - 1)/(0.82 + 1) = -0.20$

$C = 2x0.79/(0.82 + 1) = 0.87$

$S/Y = (0.868x0.04)/(0.04 + 0.198) = 14.6$ percent (at g = 4.0 percent);

from Leff and Sato (1975):

$k = 1 - 0.82 = 0.18$,

$r = 0.79/0.18 = 4.4$,

$S/Y = (0.79x0.04)/(0.04 + 0.18) = 14.1$ percent (at g = 4.0 percent).

As calculated in the previous section, the long-run savings rate in urban areas was 4 percent. Remember that savings, as defined in this paper, excludes consumer durables, which are believed to be a substantial part of total savings in urban areas but can be neglected in determining rural savings.

VII. Conclusions

Estimations of household savings functions in this paper have shown a substantial difference in saving behavior between the urban and rural sectors in recent years, with a higher propensity to save in the rural sector. This analysis should shed light on the sources of the increase in savings in China. In future, the distinctions between urban and rural sectors are expected to become blurred as the rural sector becomes more and more urbanized and the urban sector becomes more market-oriented. It is quite possible, therefore, that the saving rate of urban households will increase, and the savings rate of rural households will decrease.

In Table 12, estimations by various authors for selected countries are shown. Two observations are obtained from the table. First, the estimates for China in this paper seem more "reasonable" than

estimates by other authors; second, from an international perspective, China's propensity to save has increased from a rather low level to a very high level during the period of economic reform. An international comparison of the long-run savings rate, however, is not conclusive.

Theoretically, the rapid increase in the household savings rate in recent years could be explained by the arguments of, first, the increase in the magnitude of repressed inflation in the consumer-goods market, or, second, the shifts in the economic structure and household behavior. Two alternative hypotheses were proposed, which have quite different macroeconomic policy implications. Under the first, household savings are forced; the higher savings rate in recent years has been a result of a monetary overhang and an increasing shortage of consumer goods; and the high savings rate of the past few years may not be sustained when the economy returns to "market equilibrium" in future. In contrast, the second hypothesis is consistent with the theory of voluntary savings: there is no excess disequilibrium in the consumer-goods market during the recent years of the higher savings rate, in comparison with those years of the lower savings rate. This paper has shown, among other things, that one cannot reject this hypothesis econometrically, implying that the recent high savings rate in China could be maintained in the future.

The approach taken here also has its limitations: it did not incorporate the possibility of disequilibrium in the market for consumer goods. Therefore, the approach in this paper and that taken by Feltenstein, Lebow, and van Wijinbergen (1986) are complementary. For future research in this area, a more sophisticated model that incorporates both regime shifts in household savings behavior and repressed inflation is called for. Only in this generalized model can the two hypotheses developed in this paper be nested within one another and be directly tested against each other.

APPENDIX

Construction of Chinese Urban Household Income and Savings Data

As mentioned in the text, time-series data for Chinese urban per capita money income and financial savings are not readily available in the *Yearbooks*. The construction of these data is based on the following identity: household money income = household expenditure on commodities + household expenditure on services + change in household cash holdings + change in household savings deposits + change in household bond holdings.

Urban Household Financial Savings

Urban household financial savings comprise cash, savings deposits, and government bonds (the only financial instruments available to households until 1985; recently, corporate bonds and even "stocks" have become available). "Urban savings deposits," as given in the *Yearbooks*, unfortunately include deposits from both urban and rural residents with the Agricultural Bank of China and the People's Bank of China in urban areas. Farmers may have an incentive to keep a bank account in town because trading activities are mostly concentrated in the towns, and they may also wish to diversify their deposits. On the basis of Naughton's estimation (1986, p.45), true urban savings are assumed to be about 65 percent of gross urban savings. Figures from 1978 through 1980 show about 16 percent of total currency in circulation held by urban residents (Naughton (1986, p.37)), a ratio that was applied in this paper throughout the entire period. There were two periods (1950-58 and 1982-85) when government bonds were issued, but no detailed information is available about household purchases of such bonds. This factor was therefore disregarded.

Urban Household Money Income

Figure for total retail sales given in the *Yearbooks* include sales to institutions. On the basis of scattered data in the *Yearbooks*, sales to urban institutions appear to be about 7.5 percent of total retail

sales (urban and rural). The proportion of retail sales for urban and rural areas, however, has remained stable over the thirty-year period, about 45 percent and 55 percent, respectively. Sales to urban institutions are therefore calculated at about 16.7 percent of urban retail sales, whereas urban household expenditure on commodities is 83.3 percent of urban retail sales.

Because until recently most services were provided and heavily subsidized by the government at low and stable prices, one can simply extend the scattered data on household outlays of services from the sample surveys in 1957, 1964, and from 1981 on in the *Yearbooks* to the entire period.

The data constructed as above and used in this paper are available from the author on request.

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Table 1. Comparative Domestic Savings Rates, 1980-84
(In percentage of GDP)

Country or Area	1980	1981	1982	1983	1984
Organization for Economic Cooperation and Development countries	22	22	20	20	19
Developing countries	24	23	22	22	23
Korea, Rep. of	23	22	24	26	30
Hong Kong	24	24	25	25	29
Singapore	30	33	41	42	43
Japan	31	32	31	30	31
Yugoslavia	32	29	33	37	30
Hungary	22	29	29	29	28
China	31	30	32	32	33

Sources: For China, *Yearbook* (various issues) and author's estimates; for other countries, World Bank (*World Development Report*, various issues).

Table 2. Comparative Structure of Domestic Savings, 1976-84
(In percentage of total savings)

Country	Government	Enterprise	Household
United States (1976-80)	7	58	35
Japan (1976-80)	9	37	54
Korea, Rep. of (1976-80)	26	35	38
India (1976-80)	13	22	65
China[a]			
1978	51	34	15
1982	18	57	25
1983	19	48	33
1984	20	34	46

Sources: For China, *Yearbook* (1982-84) and author's estimates; for other countries, Lim and Wood (1985, Table 9.1).

[a] Government savings include only budgetary savings. Enterprise savings include state and collectively owned enterprise savings and local government extra-budgetary savings (mainly depreciation funds and after-tax profits handed over to local governments).

Table 3. Comparative Household Savings Rates

Country	Percentage of Household Income
United States (1976-82)	8.1
Germany, Fed. Rep. Of (1976-81)	12.8
Belgium (1976-82)	16.1
Japan (1976-82)	21.2
China[a]	
1957 (average)	5.3
Urban	5.7
Rural	4.9
1982 (average)	20.0
Urban	4.8
Rural	26.8
1983 (average)	21.5
Urban	3.8
Rural	28.8
1984 (average)	24.7
Urban	7.9
Rural	32.0

Sources: For other countries, data are from Horioka (1986, Table 1); for China, data are from urban and rural household surveys in the *Yearbooks*, calculated by the following formulas:

urban savings rate = 1 - living expenditure/available income
rural savings rate = 1 - (living expenditure - housing expenditure)/net income
average savings rate =
1 - (0.8 rural savings + 0.2 urban savings)/(0.8 rural income + 0.2 urban income)

[a] The urban savings rate is biased downward because of the omission of consumer durables from total savings (see Section V and the Appendix); the rural savings rate is biased upward (see Section VI).

Table 4. Absolute-Income Model (Urban)

Period and Equation	c	d	a	a_1	a_2	DW	$\bar{R}^2$	RSS	LLF
1955-83									
(4.1)	-74.2 (-3.7)	68.2 (3.4)		0.29 (4.8)	0.04 (3.6)	1.125	0.931	103.8	-59.64
(4.2)	-22.1 (-6.5)		0.12 (8.5)			0.489	0.716	461.6	-81.28
1955-85									
(4.1)	-61.7 (-10.12)	55.7 (8.2)		0.256 (15.3)	0.04 (2.9)	1.67	0.967	176.2	-70.92
(4.2)	-33.4 (-9.3)		0.17 (12.3)			0.398	0.833	961.0	-97.21

Note: Equations are as follows:

$$S_t = c + dD + a_1 Y_t(1 - D) + a_2 Y_t D, \quad (4.1)$$

where $D = 1$ when $t < 1979$ and $D = 0$ when $t \geq 1979$, and

$$S_t = c + aY_t. \quad (4.2)$$

DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 5. Permanent-Income Model (Urban)

Period and Equation	c	d	a	a_1	a_2	b	b_1	b_2	DW	$\bar{R}^2$	RSS	LLF
1955-83												
(5.1)	-63.7	62.6		0.26	0.011	0.25			1.64	0.94	87.1	-57.09
	(-3.4)	(3.3)		(4.3)	(0.75)	(4.34)						
(5.2)	-20.2		0.11			0.21			0.48	0.71	451.9	-80.97
	(-4.7)		(5.0)			(1.7)						
(5.3)	-70.0	68.0		0.27	0.02		0.36	0.20	1.47	0.94	80.8	-56.01
	(-3.7)	(3.5)		(4.5)	(1.1)		(3.5)	(3.0)				
(5.4)	7.0	-11.6	0.03				0.28	0.16	1.12	0.90	14.7	-64.15
	(1.1)	(-3.3)	(1.7)				(2.1)	(1.9)				
1955-85												
(5.1)	-64.8	63.6		0.27	0.01	0.24			2.00	0.97	157.5	-69.18
	(-4.4)	(4.5)		(5.4)	(0.67)	(4.28)						
(5.2)	-19.5		0.10			0.44			0.76	0.88	654.6	-91.26
	(-4.0)		(4.2)			(5.8)						
(5.3)	-59.1	57.1		0.25	0.02		0.27	0.20	1.93	0.97	155.4	-68.97
	(-3.3)	(3.2)		(4.1)	(0.9)		(3.6)	(2.3)				
(5.4)	1.97	-7.9	0.04				0.49	0.14	1.30	0.95	237.3	-75.54
	(0.3)	(-2.7)	(1.7)				(10.1)	(1.4)				

Note: Equations are as follows:

$$S_t = c + dD + a_1 Y_t^p (1 - D) + a_2 Y_t^p D + b Y_t^t \quad (5.1)$$

$$S_t = c + a Y_t^p + b Y_t^t \quad (5.2)$$

$$S_t = c + dD + a_1 Y_t^p (1 - D) + a_2 Y_t^p D + b_1 Y_t^t (1 - D) + b_2 Y_t^t D \quad (5.3)$$

$$S_t = c + dD + a Y_t^p + b_1 Y_t^t (1 - D) + b_2 Y_t^t D, \quad (5.4)$$

where $D = 1$ when $t < 1979$ and $D = 0$ when $t \geq 1979$. DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 6. Asset-Adjustment Model (Urban)

Period and Equation	a	a_1	a_2	b	b_1	b_2	T	H	$\bar{R}^2$	RSS	LLF
1955-83											
(6.1)		0.86 (10.1)	0.51 (2.7)		0.31 (5.2)	0.14 (2.3)	1978	2.00	0.91	134.9	-63.4
(6.2)		0.95 (12.2)	0.34 (1.9)	0.22 (4.8)			1977	2.02	0.90	155.0	-65.45
(6.3)	0.81 (9.8)				0.34 (5.4)	0.08 (1.5)	1978	1.97	0.90	151.2	-65.1
(6.4)	0.92 (9.9)			0.17 (3.2)				1.53/1.25	0.86	231.8	-71.3
1955-85											
(6.1)		0.79 (6.1)	0.53 (1.8)		0.26 (3.8)	0.14 (1.4)	1978	1.81	0.93	352.0	-81.65
(6.2)		0.86 (7.7)	0.35 (1.4)	0.22 (3.8)			1977	1.97	0.94	363.5	-82.2
(6.3)	0.75 (6.2)				0.28 (4.3)	0.09 (1.2)	1978	1.77	0.94	360.9	-82.0
(6.4)	0.86 (7.2)			0.21 (3.4)				1.83/0.33	0.93	627.4	-84.7

Note: Equations are as follows:

$$S_t = a_1 S_{t-1}(1 - D) + a_2 S_{t-1} D + b_1 \Delta Y_t (1 - D) + b_2 \Delta Y_t D \quad (6.1)$$

$$S_t = a_1 S_{t-1}(1 - D) + a_2 S_{t-1} D + b \Delta Y_t \quad (6.2)$$

$$S_t = a S_{t-1} + b_1 \Delta Y_t (1 - D) + b_2 \Delta Y_t D \quad (6.3)$$

$$S_t = a S_{t-1} + b \Delta Y_t, \quad (6.4)$$

where $D = 1$ when $t < \mathrm{T}$ and $D = 0$ when $t \geq \mathrm{T}$. H is the Durbin-Watson H-statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 7. Consumption Model (Urban)

Period	Equation	DW	$\bar{R}^2$	RSS
1955-83 (7.1)	C_t = -0.73 + 1.03 C_{t-1} (-0.07) (22.98)	1.95	0.95	3,265
1957-83 (7.2)	C_t = -4.6 + 1.09 C_{t-1} - 0.24 C_{t-2} (-0.38) (5.4) (-0.82) + 0.35 C_{t-3} - 0.15 C_{t-4} (1.17) (-0.68)	1.83	0.95	2,751
1955-83 (7.3)	C_t = 4.7 + 0.71 C_{t-1} + 0.29 Y_{t-1} (0.3) (1.21) (0.54)	1.90	0.95	3,229
1957-83 (7.4)	C_t = 0.08 + 0.84 C_{t-1} + 0.32 Y_{t-1} (0.005) (1.38) (0.57) -0.34 Y_{t-2} + 0.31 Y_{t-3} - 0.12 Y_{t-4} (-1.19) (1.09) (-0.56)	1.98	0.95	2,706
1955-83 (7.5)	C_t = 5.1 + 0.75 C_{t-1} + 0.24 Y_t (0.46) (1.96) (4.7) (Instruments: C_{t-1}, S_{t-1})	1.92	0.97	1,754
1955-85 (7.1)	C_t = -23.5 + 1.14 C_{t-1} (-2.19) (24.0)	1.36	0.95	5,709
1957-85 (7.2)	C_t = 25.6 + 1.42 C_{t-1} - 0.53 C_{t-2} (1.9) (6.2) (-1.48) + 0.23 C_{t-3} + 0.02 C_{t-4} (0.62) (0.08)	1.67	0.95	4,742
1955-85 (7.3)	C_t = 15.1 - 0.29 C_{t-1} + 1.2 Y_{t-1} (1.05) (-0.7) (3.6)	1.54	0.96	3,905
1957-85 (7.4)	C_t = 8.3 - 0.03 C_{t-1} + 1.2 Y_{t-1} (0.5) (-0.07) (3.3) -0.45 Y_{t-2} + 0.27 Y_{t-3} - 0.05 Y_{t-4} (-1.5) (0.91) (-0.21)	1.82	0.96	3,280
1955-85 (7.5)	C_t = 10.1 + 0.42 C_{t-1} + 0.53 Y_t (1.7) (4.8) (8.3) (Instruments = C_{t-1}, S_{t-1})	1.60	0.99	742

Note: DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 8. Absolute-Income Model (Rural), 1980-84

Period	*c*	*a*	RSS	LLF	DW	$\bar{R}^2$
1980	-31.7 (-4.3)	0.38 (10.8)	2,805	-104.2	1.6	0.81
1981	-12.9 (-1.4)	0.31 (8.8)	3,378	-106.8	1.0	0.74
1982	-37.7 (-4.1)	0.41 (13.1)	3,902	-108.8	1.1	0.86
1983	-73.3 (-4.4)	0.53 (10.9)	12,630	-125.3	1.2	0.82
1984	-90.7 (-6.9)	0.58 (17.6)	11,390	-123.8	1.4	0.92
1980-84	-55.8 (-12.6)	0.49 (33.6)	43,750	-600.8	1.1	0.89
1980-84	Four time dummies	0.50 (27.1)	42,750	-559.2	1.1	0.89
1982-84	-72.8 (-10.2)	0.53 (26.0)	31,120	-367.6	1.1	0.89

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Note: The equation is

$$S_t = c + aY_t.$$

DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 9. Permanent-Income Model (Rural), 1982-84

Period and Equation	c	a	a_1	a_2	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1982	-38.0	0.42			0.38			3,898	-108.8	1.12	0.86
(9.1)	(-4.0)	(8.3)			(1.9)						
1983	-55.8	0.34			1.34			4,618	-111.2	2.04	0.93
(9.1)	(-5.3)	(8.2)			(10.6)						
1984	-52.9	0.36			1.23			8,025	-118.9	1.76	0.94
(9.1)	(-3.3)	(5.07)			(6.04)						
1982-84	-56.9	0.38			1.15			20,790	-350.7	1.40	0.93
(9.1)	(-8.9)	(12.9)			(11.6)						
1982-84	-49.6	0.35				0.99	1.21	19,120	-347.2	1.46	0.93
(9.2)	(-7.4)	(11.8)				(8.7)	(12.3)				
1982-84	-50.0		0.46	0.34		0.38	1.31	17,340	-343.0	1.60	0.94
(9.3)	(-7.7)		(9.6)	(11.5)		(1.6)	(13.1)				

Note: Equations are as follows:

$$S_t = c + aY_t^p + bY_t^t \quad (9.1)$$

$$S_t = c + aY_t^p + b_1Y_t^tD + b_2Y_t^t(1 - D), \quad (9.2)$$

$$S_t = c + a_1Y_t^pD + a_2Y_t^p(1 - D) + b_1Y_t^tD + b_2Y_t^t(1 - D) \quad (9.3)$$

where $D = 1$ when $t = 1982$ and $D = 0$ when $t = 1983\text{-}84$. DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 10. Asset-Adjustment Model (Rural), 1981-84

Period and Equation	a	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1981	0.87	0.57			1,488	-95.35	1.94	0.88
(10.1)	(16.5)	(8.8)						
1982	0.87	0.62			3,577	-107.6	1.58	0.87
(10.1)	(10.5)	(5.0)						
1983	0.78	0.91			4,591	-111.1	1.69	0.93
(10.1)	(16.4)	(13.3)						
1984	0.87	0.83			1,807	-98.07	1.70	0.99
(10.1)	(35.5)	(20.6)						
1981-84	0.85	0.78			15,900	-436.4	1.30	0.95
(10.1)	(34.5)	(21.1)						
1981-84	0.84		0.62	0.85	12,150	-421.4	1.64	0.96
(10.2)	(39.2)		(15.0)	(24.5)				

Note: Equations are as follows:

$$S_t = aS_{t-1} + b\Delta Y_t, \quad (10.1)$$

$$S_t = aS_{t-1} + b_1\Delta Y_t D + b_2\Delta Y_t(1 - D), \quad (10.2)$$

where $D = 1$ when t = 1981-82 and $D = 0$ when t = 1983-84. DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 11. Asset-Adjustment Model (Rural, Adjusted Savings Data), 1981-84

Period and Equation	a	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1981	0.85	0.50			1,477	-95.24	1.95	0.85
(11.1)	(14.1)	(8.5)						
1982	0.84	0.57			3,569	-107.6	1.57	0.84
(11.1)	(8.7)	(4.8)						
1983	0.74	0.85			4,693	-111.4	1.67	0.92
(11.1)	(12.96)	(12.5)						
1984	0.86	0.77			1,911	-98.9	1.65	0.98
(11.1)	(29.70)	(19.0)						
1981-84	0.83	0.71			16,430	-438.3	1.27	0.94
(11.1)	(28.8)	(19.6)						
1981-84	0.82		0.56	0.79	12,410	-422.5	1.60	0.96
(11.2)	(32.7)		(13.6)	(22.9)				

Note: Equations are as follows:

$$S_t = aS_{t-1} + b\Delta Y_t, \quad (11.1)$$

$$S_t = aS_{t-1} + b_1\Delta Y_t D + b_2\Delta Y_t(1 - D) \quad (11.2)$$

where $D = 1$ when t = 1981-82 and $D = 0$ when t = 1983-84. DW is the Durbin-Watson statistic; $\bar{R}^2$ is the adjusted coefficient of determination; RSS is the residual sum of squares; LLF is the log-likelihood function. Numbers in parentheses are t-statistics. See the text for definitions of variables.

Table 12. Comparative Estimation Results, Selected Countries

Period	Variables	Country	Study
	MPS out of current income		
	MPS		
1950-64	0.203	Asian countries[a]	Williamson (1968)
1955-71	0.066	U.S.S.R.	Pickersgill (1980)
1955-73	0.077	Poland	Portes and Winter (1980)
1956-83	0.072	China	De Wulf and Goldstein (1985)
1955-83	0.044	China	Feltenstein, Lebow, van Wijinbergen (1986)
1984 (rural)	0.580	China	Armitage (1986)
1955-78 (urban)	0.040	China	Qian (1988)[b]
1979-85 (urban)	0.270	China	Qian (1988)[b]
1982-84 (rural)	0.480	China	Qian (1988)[b]
	MPS out of permanent income		
1950-64	0.205	Asian countries[a]	Williamson (1968)
1955-71	0.058	U.S.S.R.	Pickersgill (1980)
1956-83	0.048	China	De Wulf and Goldstein (1985)
1955-83	0.009	China	Feltenstein, Lebow, van Wijinbergen (1986)
1984 (rural)	0.360	China	Armitage (1986)
1955-78 (urban)	0.010	China	Qian (1988)[b]
1979-85 (urban)	0.270	China	Qian (1988)[b]
1982-84 (rural)	0.290	China	Qian (1988)[b]

MPS out of transitory income

1950-64		0.32	Asian countries[a]	Williamson (1968)
1955-71		0.34	U.S.S.R.	Pickersgill (1980)
1956-83		0.17	China	De Wulf and Goldstein (1985)
1955-83		0.08	China	Feltenstein, Lebow, van Wijinbergen (1986)
1984 (rural)		1.23	China	Armitage (1986)
1955-85 (urban)		0.24	China	Qian (1988)[b]
1983-84 (rural)		1.26	China	Qian (1988)[b]

Dynamic model

	S_{t-1}	Y	S/Y[c]		
1950-64	0.78	0.20	3 percent	6 LDCs	Swamy (1968)
1950-64	0.94	0.37	14.8 percent	13 DCs	Swamy (1968)
1952-69	0.77	0.78	11.6 percent	Taiwan province of China	Leff and Sato (1975)
1952-69	0.86	0.60	13.3 percent	Brazil	Leff and Sato (1975)
1956-83	1.083	0.05	-4.9 percent	China	De Wulf and Goldstein (1985)
1955-83	0.56	0.03	0.3 percent	China	Feltenstein, Lebow, van Wijinbergen (1986)
1957-83	0.47	0.51	3.6 percent	China	Naughton (1986)
1955-77 (urban)	0.75	0.09	1.2 percent	China	Qian (1988)[b]
1978-85 (urban)	0.75	0.28	3.9 percent	China	Qian (1988)[b]
1983-84 (rural)	0.82	0.79	14.4 percent	China	Qian (1988)[b]

Note: MPS is the marginal propensity to save; S is per capita household savings; Y is per capita disposable income.

[a] Selected Asian countries excluding China.
[b] The present study.
[c] At constant income growth rate of 4 percent and according to the formula of Leff and Sato (1975).

Figures 1-3 are available from the author on request: yqian@leland.stanford.edu