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Urban and Rural Household Savings in China

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Abstract

Household savings behavior in China during the past 30 years has been studied by using econometric models with the time-varying-parameter technique. The rural sector and the urban sector are investigated separately. In comparison to previous studies on the same subject, the estimated models of the current study are more robust, and the results of the models are much more in line with results of similar studies of other countries.

JEL Classification
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Summary

This paper investigates both theoretically and empirically household savings behavior in China. Starting with a critical review of previous studies of the subject, it analyzes factors shaping the contemporary Chinese economy and influencing Chinese household savings behavior. Different motives are presented for saving in the rural sector and in the urban sector, and a separate investigation of the two sectors is carried out.

Unlike previous studies, models using urban time-series data in this paper explicitly incorporate possible regime shifts within the 30-year period under consideration. Theoretical justifications for the regime shifts are provided, and empirical results are robust, showing strong evidence to support the specification.

Panel data on rural income and savings are used to estimate the rural savings functions, which consistently show much larger responses of savings to changes in current income, most of which reflect a high marginal propensity to save out of transitory income. Though very rough and tentative, international comparisons show that China's household-savings propensity has increased from the lower end to the higher end of the international spectrum since the start of economic reforms in the late 1970s.

The results in this paper indicate that one cannot reject through econometrics the hypothesis that recent increases in household savings have been voluntary rather than forced by shortages of consumer goods. A more sophisticated model incorporating both regime shifts and repressed inflation is needed to test these hypotheses--which have potentially different implications for future savings behavior--directly against each other.

Urban and Rural Household Savings in China

I. Introduction

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 her savings rate at the high level of the past few years?

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

By the domestic savings rate, we mean total domestic savings as a percent of gross domestic product (GDP). According to the sources of the savings, total domestic savings constitute government savings, business savings, and household savings. The structure of the saving is then the proportion of these three parts in the total savings. 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. Household savings rates (total household savings as a percent 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 country. 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.

Secondly, the structure of savings 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 enterprises, local government extra-budgetary, and, especially, household savings. The high figure of household savings in 1984 does not appear representative because of the unusual increase in bonus income in the last quarter of that year. However, household savings in 1983 still accounted for one third of total domestic savings. This figure is close to those of market economies such as Korea and the United States.

Thirdly, in recent years, household savings in China increased not only as a share of total saving, but relative to household income, as

Table 1. China: International Comparisons of the Domestic Savings Rate, 1980-84 1/

(In percent of GDP)

	1980	1981	1982	1983	1984
OECD countries	22	22	20	20	19
Developing Countries	24	23	22	22	23
Korea	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: (1) China, author's estimates based on the Yearbooks;
(2) Others, from the World Bank, World Development Report, various issues.

1/ It should be noted that the term "country" used in this paper does not in all cases refer to a territorial entity that is a state as understood by international law and practice. The term also covers some territorial entities that are not states but for which statistical data are maintained and provided internationally on a separate and independent basis.

Table 2. China: International Comparisons of the Structure of Domestic Savings, 1976-84

(In percent of total)

	Government	Enterprises	Household
United States (1976-80)	7	58	35
Japan (1976-80)	9	37	54
Korea (1976-80)	26	35	38
India (1976-80)	13	22	65
China (1978) 1/	51	34	15
(1982) 1/	18	57	25
(1983) 1/	19	48	33
(1984) 1/	20	34	46

Sources: (1) China, 1982-84, author's estimates based on the Yearbooks;
(2) Others, Table 9.1 of Lim and Wood (1985).

Notes: (1) For China's data, government savings include only budgetary saving. Enterprise savings include state and collectively owned enterprise savings and local government extrabudgetary savings (mainly depreciation funds and after-tax profits handed over to local governments).

Table 3. China: Household Savings Rates

(In percent 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				
	1957	1982	1983	1984
Average	5.3	20.0	21.5	24.7
Urban	5.7	4.8	3.8	7.9
Rural	4.9	26.8	28.8	32.0

Sources: (1) Data for countries other than China are from Table 1 of Horioka (1986);
(2) Data on China are from urban and rural household sample surveys in the Yearbooks and calculated by the formula:

$$\text{Urban savings rate} = 1 - \frac{\text{living expenditure}}{\text{income available}}$$

$$\text{Rural savings rate} = 1 - \frac{\text{living expenditure} - \text{housing expenditure}}{\text{net income}}$$

$$\text{Average savings rate} = 1 - \frac{0.8 \times \text{rural savings} + 0.2 \times \text{urban savings}}{0.8 \times \text{rural income} + 0.2 \times \text{urban income}}$$

Notes: (1) China's urban savings rate is biased downward owing to the omission of consumer durables from total savings.
(2) China's rural savings rate is biased upward; see Section VI about rural data.

developing market economies, as seen in the surveys by Mikesell and Zinser (1973) and Snyder (1974).

Since the late 1970s, there have been quite a number of studies of savings 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 (e.g. Pickersgill, (1976, 1980)), ignoring potential disequilibrium concerning the intention and realization of current household consumption and saving, which is believed by many authors to persist in such economies. Another approach takes potential disequilibrium directly into account (e.g. Portes and Winter, (1980)). The latter approach is seen as theoretically more appealing, but technically more difficult.

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 has been singled out, while Hayashi (1986) drew special attention to the role of bequests.

Empirical studies on household savings behavior in China--a developing, centrally planned economy -- did not start until 1982. To our knowledge, four studies have been done prior to the present paper: De Wulf and Goldstein (1983, 1985), Naughton (1986), Feltenstein, Lebow, and van Wijnbergen (1986), and Armitage (1986).

The studies by De Wulf and Goldstein and Naughton shared common methods in estimating savings functions of China, namely applying time series data to the traditional linear models cited above. Naughton (1986) used aggregate nominal data while 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 (D-W) statistics in the estimation indicating misspecification, and that the estimated marginal propensity to save (MPS) varies, depending on the time period selected. However, in neither study was the model respecified for further testing. Although the results were not fully satisfactory, the studies contributed in identifying the problems, in constructing the time series data, and in providing preliminary results.

To avoid the misspecification problems arising with time series data, Armitage 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 to 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 savings behavior between the rural and urban sectors, a result that is consis-

tent with the common observation. Her estimation favors 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. Though the separation of the rural and urban sectors is justifiable, the results may not be reliable, especially because the urban sector data cover only one year.

Stressing the potential disequilibrium in the Chinese economy, Feltenstein, et al. 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 is $p/P = (M/PR)^a$ 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 (1) only two out of five specifications give very low D-W statistics and for the permanent-income model, D-W increased from 0.8 to 1.86; and (2) by defining "real virtual interest rate" as $1 + r = (1 + i) \times p/P_{+1}$, 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 savings behavior, as long as potential disequilibrium is allowed.

Although the theoretical derivation of the model itself is correct, 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 D-W was reduced from 1.86 to 1.27. The reasons for this are obvious: by including $p = P\ (M/PR)^a$ into the regression, we expect to have a higher D-W, because M/PR is correlated to the rapid increase in savings and the correlation is stronger if M includes savings itself as we take M2. Secondly, 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 $1 + r = (1 + i) \times p/P_{+1}$). We doubt, however, that this kind of expectation could survive every year for more than 30 years. If consumers expect rationing to continue in the coming year, then $1 + r = (1 + i) \times p/p_{+1}\ (1 + i)$, and the estimated results may not hold.

In their model, Feltenstein et al. assume no regime shift affecting household savings behavior, but allow a possible change of degree of disequilibrium, which can be summarized, in their view, by p. By choosing the monetary aggregate properly (in this case, M2), most variances can be explained by the virtual price model. The implication of their model is: the higher saving of recent years is the reflection of

the excessive monetary expansion and the increased degree of repressed inflation in the economy, and hence represents forced saving.

In what follows, we will go to the other extreme: assume no change in the degree of disequilibrium (or no disequilibrium at all), but allow a possible change of regime affecting household savings behavior. It is not our belief that it is a more realistic assumption than the other extreme. Instead, it is one important factor that can be used to explain the recent increase in the savings rate in China; the simple forced savings theory is not complete. It is worthwhile to see how successfully the data would fit the model under this alternative assumption. Generally speaking, our approach and Feltenstein et al.'s approach are complementary. However, it should be noted that, since the two hypotheses, "no regime shift" made by Feltenstein et al., and "no disequilibrium" made by us, are not nested in either model, even the perfect fitting of one model cannot reject the hypothesis made by the other model.

III. Factors Shaping the Chinese Economy and Influencing Household Behavior

We consider that the following factors are important in shaping the contemporary Chinese economy and in influencing household behavior--in the present case, household savings behavior.

(1) China is a low-income developing country, with the majority of its population living in rural areas. At the persistently low-income level, as well as low-asset level, 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 $100 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 30-year period (1955-85), during much of which most households were concerned with meeting their basic needs.

(2) China is a centrally planned economy, with most enterprises owned and controlled by the Government. Prior to 1979, China followed a development path similar to that of other centrally planned economies--that is, one of 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 wish 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 would lead to either inflation or forced saving if the price level is controlled. This view is very similar to the quantity theory of money, but in a quite different context. The counterpart of the monetarist's statement "inflation is a monetary phenomenon" is the one "the excess savings is a monetary phenomenon." Prior to 1979, the authorities were generally 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 prior to 1979, other things being equal, is the consequence of the institutional arrangement.

(3) Since 1979, economic reform has been under way in China. 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 marginal propensity to save (MPS) higher than ever before, especially in the rural sector, where per capita income nearly tripled during the past eight years. Many other results of reform are less visible. The emergence of household farms in rural areas and free and parallel markets in urban areas has increased the demand for money, as the economy has become more monetized. In the rural sector, as the household has been transformed into a production unit and investment opportunities have arisen, farmers have been encouraged to save money for investment. 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 reforms is not insignificant.

(4) China's economy is also shaped by a number of unique factors, among which are its huge size, immense population, and its history. Traditional ideas regarding saving and the virtues of thrift, and the past 30 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 behavior in China. To be specific, we postulate the following identity, $vM/PQ = s$, which can be viewed 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 equilibium velocity of money. In the traditional theory of money, s is always set equal to 1, so that v is

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 to some market economies. We will see later that this is mainly due to the high savings rate in the rural sector of China.

Economists are not satisfied by fragmentary observations; they want a systematic explanation--from both theoretical and empirical aspects--of the observed phenomena. In particular, they are interested in the nature of the household savings function, and further, the reasons for the recent high savings rate: Does it reflect the underlying structural shift and behavioral change, or is it merely a monetary phenomenon, a result of repressed inflation, for example? The answer to this question concerns predictions for the future performance as the Chinese economy moves toward further liberalization, as well as the macroeconomic policies the Chinese Government may choose.

The topic of household savings behavior in China is particularly interesting, not only because of the important role of household savings in total domestic savings, but also because of the nature of the decision-making process vis-a-vis household savings. In an economy that is still very centralized in many aspects, the autonomous decisions of several hundred million households on the amount of their individual savings has important macroeconomic policy implications. Furthermore, in China, household savings may directly relate to the Government's monetary policy--if price controls remain important, savings could be an important channel to balance overall liquidity.

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

II. Review of Previous Studies on Household Savings in China

The intellectual background of studies on Chinese household savings can be traced back to the literature of studies of savings for other countries. Like many other economic subjects, modern savings/consumption theories and models originated from the studies of savings behavior in the Western, developed, market economies. Among well-known savings models 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

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, it is the index of shortage or repressed inflation. In the traditional theory with s =1, v and Q fixed, the increase in M will lead to an increase in P, that is, 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, keeping P 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 exactly the assumption made by Feltenstein, et al., where, by choosing M2 as the monetary aggregate, they claimed to be able to explain the increased savings, maintaining the consistency of household saving behavior, especially, the MPS, over time. However, there is also another possibility. Assuming s constant over time, the money equation is still valid if v decreases as M/PQ increases. This situation is quite possible given the recent monetization process in China. Hence, another hypothesis is emerging: with s fixed, the increase in M/PQ is balanced by the decrease of v, which is considered as a signal of a regime shift and it synchronizes the shift of household savings behavior, in particular, the measured MPS. This paper shows, among other things, that increased savings in recent years can be equally well explained under the latter hypothesis.

The difficulty involving the interpretation of "disequilibrium" or "forced saving," is more intricate than it appears, as illustrated in the following simple example. There are two kinds of television sets in the consumer market. One is a well-known brand of good quality, called A, and the other a lesser-known brand of inferior quality, called B. At the given price differential, A is still in short supply, and B is overstocked. In the given time period, some consumers bought A (by rationing), some bought B, and some saved the money (maybe waiting for A in the future). This appears to be a typical situation in China. The controversy arises in the interpretation and modeling of consumer behavior. Person 1 would argue that, because some consumers are waiting for A, which is in short supply, the saving is forced. Person 2 would argue that, since B is a close substitute for A, and always available, it constitutes a parallel market, and the consumers' saving is therefore totally voluntary. Person 1 may reply that, for the Chinese, A and B are not close substitutes--the service of a television set can be substitutable, but the brand name, "the ownership premium," cannot. Yet Person 3 would say that, since a shortage in A causes forced substitute for B, there is a shortage (for A) and a surplus (for B) in individual markets, but there could be no overall involuntary savings. Person 4 notices that a television set is a consumer durable and argues that whether it is in short supply or not, the total savings (as opposed to financial savings) should be the same, only the composition of the total savings would be different. With the exception of person 4's argument,

with which we believe most people will agree, the arguments involve philosophical questions of the meaning of "demand," and "voluntary or forced choice" or "preference," which cannot easily be dealt with in applied economics. Hence, one virtue of the present approach is in avoiding the difficulty by maintaining the conventional neoclassical interpretation of "preference."

IV. Motives for Saving: Urban vs. Rural Sector

To examine the savings behavior in China, it is essential to separate the rural and urban sectors, because as it will be seen below, different institutions and motives would apply in each case. According to the definition prior to 1984, the rural population is about 80 percent of the total population, with the remaining 20 percent urban residents. Unlike other developing countries, population movement from the countryside to cities has been strictly controlled in China, so that per capita income of urban residents was kept two times higher than that of rural residents for nearly 30 years. Farmers in rural areas and wage earners in urban areas are subject to 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, as a retired worker will receive a pension of between 60-80 percent (in some cases, e.g., a model worker, up to 100 percent) of his or her final wages. Precautionary motives are strong, owing to the traditional doctrine. The argument of "no particular use at present" may or may not reflect the shortage of consumer goods. Nobody in urban areas is saving for housing as houses are provided by the "employing unit" at very low rent. But there is a strong motive to save for consumer durables (such as television sets, washing machines, and refrigerators). In addition, saving for children's marriages is not uncommon.

In the rural sector, in contrast, incomes (especially since the reforms) are less stable, depending on the weather, the market, and management of production. Housing as well as pension funds are provided by the farmers themselves. As mentioned earlier, farmers are facing investment opportunities too, which are not available for urban residents. Many of the motives common to savings 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 recent years. These two savings 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.

V. Alternative Savings Models

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

1. The absolute-income model

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

$$S_t = a + b\, Y_t$$

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 relates only to current income, hence, the short-run and long-run responses of savings to current income are identical.

2. The 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 and in the future. The linear version of the model that has been widely used in empirical studies is:

$$S_t = c + a\, Y_t^p + b\, Y_t^t$$

where Y_t^p and Y_t^t are permanent income and transitory income in year t, respectively. To determine the permanent income, in this paper we follow the method used by Williamson (1968) which uses as a proxy for permanent income a three-year moving average of actual income, that is, $Y_t^p = 1/3\,(Y_t + Y_{t-1} + Y_{t-2})$. Other methods of specifying permanent income involve hypotheses on the formation of expectations about future income; examples include the adaptive and rational expectations models (see Model 4 below).

3. 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 analyze savings explores the relation between savings, wealth, and income. The general reduced form of the model is

<1> $$S_t = a\, S_{t-1} + b\,(Y_t - Y_{t-1})$$

however, the parameters of the model have different interpretations, depending 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 savings is viewed as the acquisition of nondepreciating assets. The behavior equations they formulated are:

$$S_t = A + B\, W_t + C\, Y_t$$

<2> $$S_t = \Delta\, W_t$$

where W_t: wealth at time t
B: MPS of assets
C: MPS of income

This is a continuous-time formulation, whereas, S_t is the savings accumulated in a discrete time period, the year t. Equation <1> can be derived from equation <2> with

$$a = \frac{1 + 1/2\ B}{1 - 1/2\ B} \qquad b = \frac{C}{1 - 1/2\ B}$$

$$B = \frac{2\ (a - 1)}{a + 1} \qquad C = \frac{2b}{a + 1}$$

With a constant income growth rate, g, the long-run (i.e., at steady state) savings ratio is $S/Y = C\ g/(g - B)$.

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, $r = W^*/Y = \Delta W^*/\Delta Y = S^*/\Delta Y$ and we thus have:

$$S_t = k(S_t^* - S_{t-1}), \text{ where } 0 < k < 1$$

<3> $$S_t^* = r \Delta Y_t$$

From equation <3> we get $S_t = (1-k) S_{t-1} + krA Y$. Under this formulation, the long-run savings ratio consistent with the constant growth rate of income, g, is $S/Y = krg/(g + k)$.

4. Consumption model

An alternative approach to analyzing the behavior of savings is to examine consumption. By using the income identity, Y = C + S, for each savings model specified above, we could derive a corresponding consumption model, but in this way we add no information. What we can do is to add to the savings model a consumption equation and an identity Y = C + S, forming a simultaneous equation model. In this way, we explicitly recognize the problem of simultaneity of the single equation formulation, that is, the original single equation model is only a submodel of the whole system. Two-stage least square or general instrumental variable techniques can be employed for the estimation of the structural equations.

In this connection, Hall's hypothesis of consumption is examined. According to Hall (1978), the stochastic implication of the life-cycle permanent income hypothesis is that consumption should follow a random walk, in the sense that lagged consumption contains all relevant information in predicting current consumption. To test Hall's hypothesis, we estimate 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, and then test the hypothesis that it is actually not a function of X_{t-1}.

VI. Empirical Results of Urban Household Savings

1. Data

Ideally, total disposable income (including income in kind) and total savings (including acquisition of consumer durables) should be used in the empirical analysis. Owing to 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

household financial savings
= change of household cash holdings
+ change of household savings deposits
+ change of household bond holdings

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

Urban income and savings are then expressed in real per capita terms 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).

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 the 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.

2. Empirical results

It is worthwhile to plot savings/consumption against income before making any estimations. In Chart 2, figures 1 and 3 show real financial savings and real consumption in relation to real income. By taking permanent income as the past three years' average income and transitory income as the difference between current and permanent income, Figures 2 and 4 show the relation between savings and the permanent and transitory income, respectively. Figures 1 and 2 show clearly the nonlinearity of the plotted functions, suggesting that any attempt to fit a linear equation to these data will not yield satisfactory results. On the other hand, Figures 3 and 4 show possible linear relationships in underlying variables.

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

To capture the idea of regime shifts discussed in Section III, switching regression models are employed where 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. Our 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, as they were insignificant in all cases.

For the absolute-income model, the likelihood ratio (LR) test decisively rejects the hypothesis of no regime shift, where LR $\equiv$ 52.58 for 1955-85 (LR = 43.28 for 1955-83), when the 0.99 value of χ^2_1 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 Durbin-Watson statistic is increased from 0.398 to 1.67, indicating no serious autocorrelation (from 0.489 to 1.125 though for 1955-83). $\bar{R}^2$ 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 regimes: (from 1955-85 equation)

$$S_t = -6.0 + 0.04\ Y_t \qquad \text{when } t < 1979$$

$$S_t = -61.7 + 0.26\ Y_t \qquad \text{when } t \geq 1979$$

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

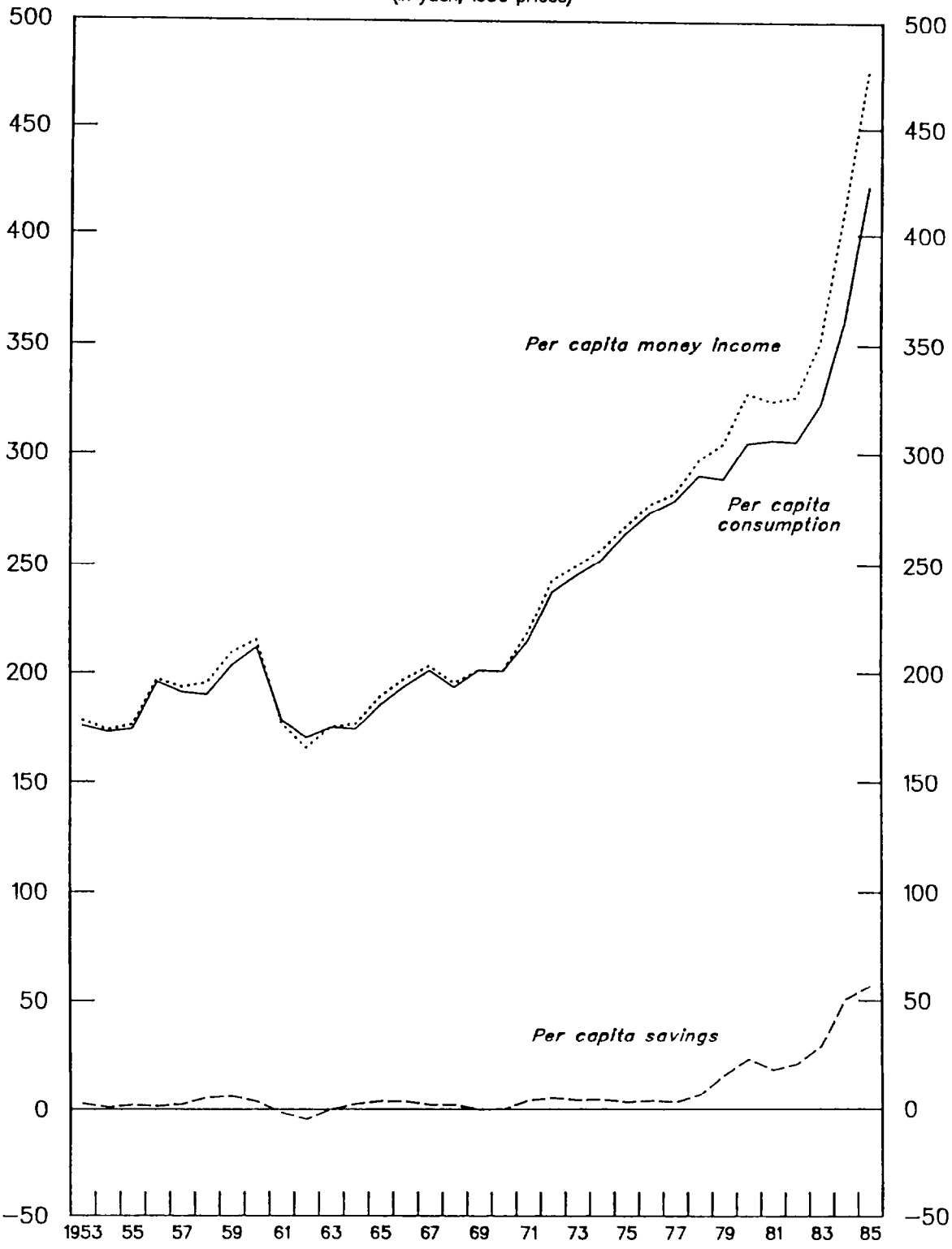
In estimating the permanent-income model, we first test the hypothesis of no shift in MPS out of permanent income, under two alternative assumptions: (A) there is no shift in MPS of transitory income; and (B) there is a shift in MPS of transitory income. Log-likelihood ratios are presented below:

	Assumption A	Assumption B
1955-83	47.76	16.28
1955-85	44.16	13.14

CHART 1
CHINA

URBAN PER CAPITA HOUSEHOLD INCOME, CONSUMPTION, AND SAVINGS, 1953–85

(In yuan, 1950 prices)

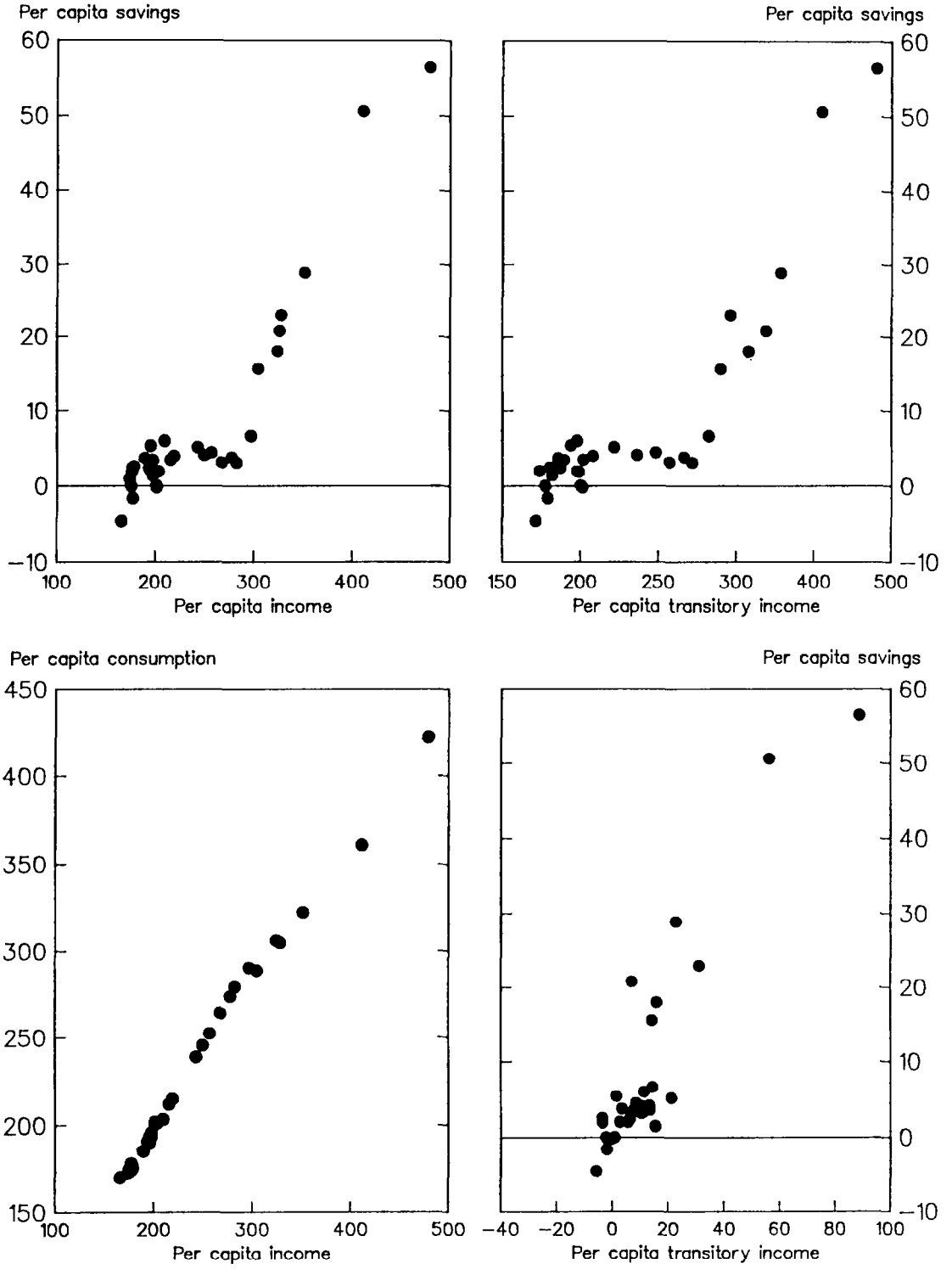


Source: Statistical Yearbook of China, various issues.

CHART 2
CHINA

URBAN HOUSEHOLD PER CAPITA SAVINGS/CONSUMPTION VS. INCOME

(In yuan at 1950 prices)



Source: Statistical Yearbook of China, various issues.

Table 4. China: Absolute-Income Model (Urban)

Time Period	c	d	a	a_1	a_2	DW	$\bar{R}^2$	RSS	LLF
1955-83									
(1)	-74.2	68.2		0.29	0.04				
	(-3.7)	(3.4)		(4.8)	(3.6)	1.125	0.931	103.8	-59.64
(2)	-22.1		0.12			0.489	0.716	461.6	-81.28
	(-6.5)		(8.5)						
1955-85									
(1)	-61.7	55.7		0.256	0.04				
	(-10.12)	(8.2)		(15.3)	(2.9)	1.67	0.967	176.2	-70.92
(2)	-33.4		0.17			0.398	0.833	961.0	-97.21
	(-9.3)		(12.3)						

(1) $S = c + d\,D + a_1\,Y\,(1 - D)\,a_2\,Y\,D$

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

(2) $S = c + aY$

Table 5. China: Permanent-Income Model (Urban)

Time period	c	d	a	a_1	a_2	b	b_1	b_2	DW	$\bar{R}^2$	RSS	LLF
1955-83												
(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)						
(2)	-20.2		0.11			0.21			0.48	0.71	451.9	-80.97
	(-4.7)		(5.0)			(1.7)						
(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)				
(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												
(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)						
(2)	-19.5		0.10			0.44			0.76	0.88	654.6	-91.26
	(-4.0)		(4.2)			(5.8)						
(3)	-59.1	57.1		0.25	0.02		0.27	0.20	1.93	0.97	1.554	-68.97
	(-3.3)	(3.2)		(4.1)	(0.9)		(3.6)	(2.3)				
(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)				

(1) $S = c + d\,D + a\,Y_1^p\,(1 - D) + a\,Y_2^p\,D + b\,Y$

(2) $S = c + a\,Y^p + b\,Y^t$

(3) $S = c + d\,D + a_1 Y^p\,(1 - D) + a_2 Y^p\,D + b_1 Y^t\,(1 - D) + b_2 Y^t\,D$

(4) $S = c + d\,D + a\,Y^p + b_1 Y^t\,(1 - D) + b_2 Y^t\,D$

when D = 1 when $t < 1979$
0 when $t \geq 1979$

Table 6. China: Assets Adjustment Model (Urban)

Time Period	a	a_1	a_2	b	b_1	b_2	T	DW/H	$\bar{R}^2$	RSS	LLF
1955-83											
(1)		0.86	0.51		0.31	0.14	1978	2.00	0.91	134.9	-63.4
		(10.1)	(2.7)		(5.2)	(2.3)					
(2)		0.95	0.34	0.22			1977	2.02	0.90	155.0	-65.45
		(12.2)	(1.9)	(4.8)							
(3)	0.81				0.34	0.08	1978	1.97	0.90	151.2	-65.1
	(9.8)				(5.4)	(1.5)					
(4)	0.92			0.17				1.53/1.25	0.86	231.8	-71.3
	(9.9)			(3.2)							
1955-85											
(1)		0.79	0.53		0.26	0.14	1978	1.81	0.93	352.0	-81.65
		(6.1)	(1.8)		(3.8)	(1.4)					
(2)		0.86	0.35	0.22			1977	1.97	0.94	363.5	-82.2
		(7.7)	(1.4)	(3.8)							
(3)	0.75				0.28	0.09	1978	1.77	0.94	360.9	-82.0
	(6.2)				(4.3)	(1.2)					
(4)	0.86			0.21				1.83/0.33	0.93	627.4	-84.7
	(7.2)			(3.4)							

(1) $S = a_1 S_{-1} (1 - D) + a_2 S_{-1} D + b_1 \Delta Y (1 - D) + b_2 \Delta Y D$

(2) $S = a_1 S_{-1} (1 - D) + a_2 S_{-1} D + b \Delta Y$

(3) $S = a S_{-1} + b_{-1} \Delta Y (1 - D) + b_2 \Delta Y D$

(4) $S = a S_{-1} + b \Delta Y$

when $D = 1$ when $t < T$

0 when $t \geq T$

Table 7. China: Consumption Model (Urban)

Time period			DW	$\bar{R}^2$	RSS
1955-83	(1)	$C_t = -0.73 + 1.03\ C_{t-1}$ (-0.07) (22.98)	1.95	0.95	3,265
1957-83	(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	(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	(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	(5)	$C_t = 5.1 + 0.75\ C_{t-1} + 0.24\ Y_t$ (0.46) (1.96) (4.7)	1.92	0.97	1,754
		(instruments: C_{t-1}, S_{t-1})			
1955-85	(1)	$C_t = -23.5 + 1.14\ C_{t-1}$ (-2.19) (24.0)	1.36	0.95	5,709
1957-85	(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	(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	(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	(5)	$C_t = 10.1 + 0.42\ C_{t-1} + 0.53\ Y_t$ (1.7) (4.8) (8.3)	1.6	0.99	742
		(Instruments = C_{t-1}, S_{t-1})			

The original hypothesis is decisively rejected under either assumption as the 0.99 value of χ^2_1 is 6.63. We conclude that there is a shift in MPS of the permanent income. Next, we want to test the hypothesis that there is no shift in MPS out of transitory income, 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^2_1 is 2.71.

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

$$S_t = -1.2 + 0.01\ Y^P_t + 0.24\ Y^t_t \qquad \text{when } t < 1979$$

and

$$S_t = -64.8 + 0.27\ Y^P_t + 0.24\ Y^t_t \qquad \text{when } t \geq 1979$$

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

We have one interesting finding from the estimation. Prior to 1979, saving propensities vis-a-vis permanent income and transitory income differed greatly, with almost all savings being in response to the increase in transitory income. Since 1979, saving propensities from permanent income and from transitory income were 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 of transitory income here. We may interpret this result in the following way: before 1979, households' income was so low that they saved almost nothing out of permanent income, hence only transitory increments of income were saved. Since reforms began, as discussed in Section III, urban households have been saving such a significant amount from permanent income that they behave like Keynesian consumers.

Turning to the asset adjustment model, four versions of the model, depending on the assumptions of shift in different parameters, were estimated:

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

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

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

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

where $D = 1$ when $t < T$
0 when $t \geq T$

the log-likelihood ratios are given below for possible nested hypothesis:

	(D) vs. (B)	(D) vs. (C)	(B) vs. (A)	(C) vs. (A)
1955-83	11.68	12.40	4.02	3.30
1955-85	5.0	5.24	1.0	0.76

Since the 0.99 value of χ_1^2 is 6.63 and the 0.95 value of χ_1^2 is 3.84, we may want to reject specifications of (D) and (B), and choose in favor of (C), that is, there is a shift in the saving 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:

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

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

Using the formula presented in Section V, we are able 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, the MPS out of assets is

$$B = 2 \times (0.75 - 1)/(0.75 + 1) = -0.29$$

and MPS out of income is

$$C = 2 \times 0.28/(0.75 + 1) = 0.32$$

The long-run savings rate consistent with the constant growth rate of income of 4 percent is S/Y = 0.32 x 0.04/(0.04 + 0.29) = 3.88 percent. Under the interpretation of Leff and Sato, the adjustment parameter relating actual to desired savings, k = 1 - 0.75 = 0.25 and the desired asset-income ratio, 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 = 0.28 x 0.04/(0.04 + 0.25) = 3.86 percent, which is very close to the figure according to Houthakker and Taylor.

We next try to estimate the structural equations of consumption. We estimated equations $C_t = a + b\ C_{t-1} + d\ Y_t$ 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:

$$C_t = a + b\ C_{t-1} + d\ Y_t$$

$$S_t = e\ S_{t-1} + f\ (Y_t - Y_{t-1})$$

$$Y_t = C_t + S_t$$

In contrast to Chow (1985), our estimates of the coefficient of current income (d's) are all significant, but this does not contradict the principal stochastic implications of the life cycle-permanent income hypothesis of Hall mentioned in Section V (i.e., the lagged income should not have predictive power for the 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}, while the strong version would include lagged income or any other lagged variables. It should be noted that what is estimated is the conditional expectation, not the true structural relation between consumption and its determinants.

In Table 7, where equation (2) includes C_{t-2}, C_{t-3} and C_{t-4} in addition to C_{t-1} as in equation (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, we add no additional information. Hence the weak version of the hypothesis is supported.

We then test the predictive power of the lagged levels of disposable income. Equation (3) incorporated a single lagged value of income and equation (4) tried a four-year long lag. For data up to 1983, F-statistics are 0.29 and 1.08, respectively. Therefore, the strong version of the hypothesis can not 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, though not decisively.

VII. Empirical Results of Rural Household Savings

1. Data

In 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 are drawn from the Yearbooks and based on sample surveys conducted in 28 provinces. 1/ Data for 1980 are drawn from the State Statistical Bureau (1985;2). Household expenditure for 1981 is also available from the Yearbook; but household income for that year is missing. Fourteen out of twenty-eight observations are collected from the State Statistical Bureau (1985;3), and others are estimated by simple extrapolation.

It should be noted that 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, etc., 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 (1986;1 and 2)). This implies that, in the case of Hubei, the rural household savings rate is overestimated by 5-6 percent if unadjusted data are used.

2. Empirical results

Per capita savings and income of rural households in 28 provinces during 1980-84 are plotted in Chart 3, in which savings are unadjusted. We first estimated savings equations by using the unadjusted data, the main results of which are presented in Tables 8-10. Later, we re-estimated the same equations by adjusting total savings downward by 5 percent of income uniformly across provinces. Note that the re-estimation will not change anything except causing MPS to decrease by 0.05 in the absolute-income and permanent-income models. Therefore, corresponding results will not be reported here. For the assets

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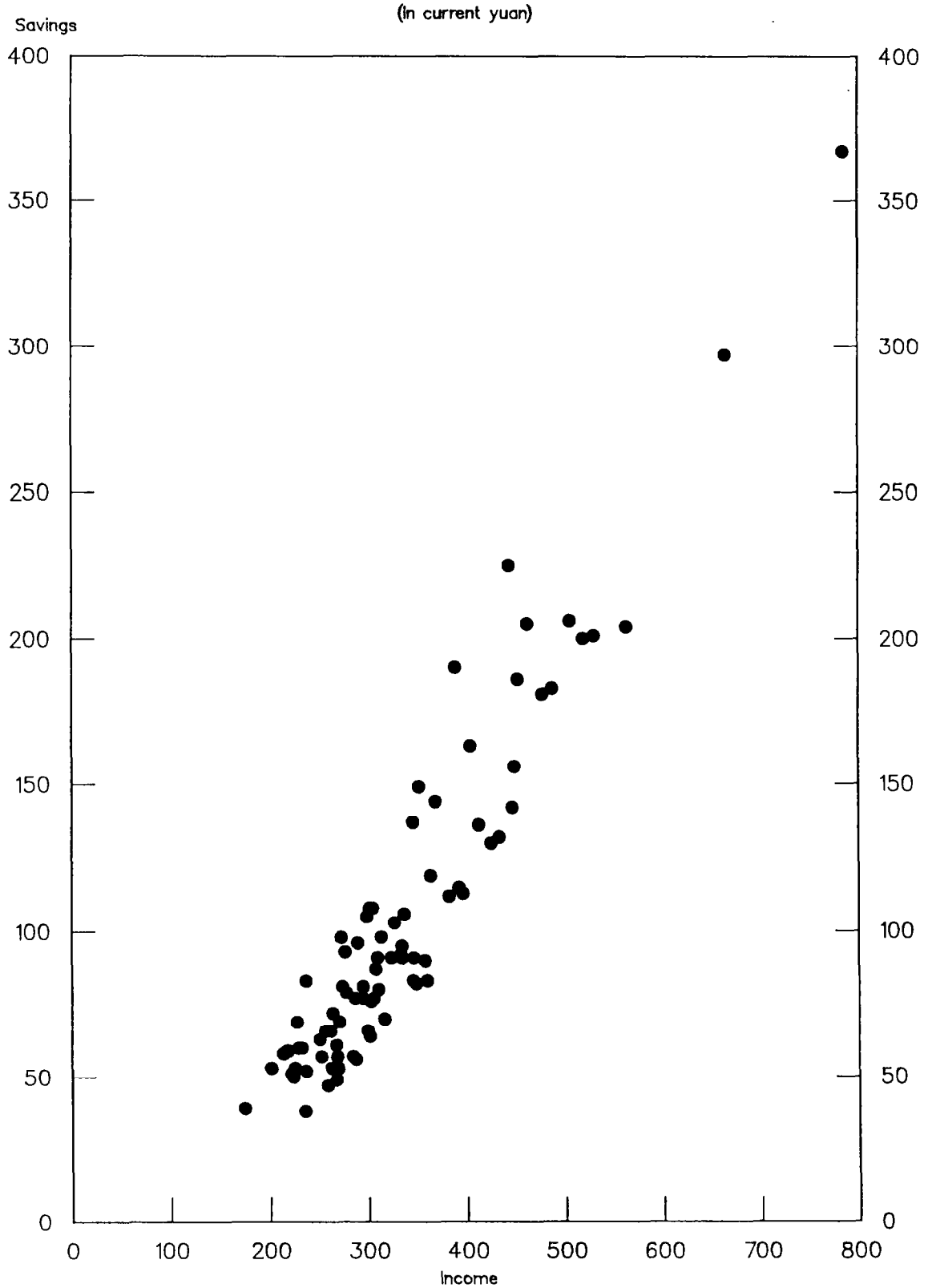
1/ Excluding the Tibetan Autonomous Region of China.

CHART 3
CHINA
RURAL HOUSEHOLD PER CAPITA SAVINGS VS. INCOME, 1980–84
(In current yuan)



Source: Collected surveys on farmers' income and consumption by provinces, 1985.

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

Time 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

$S = c + a\ Y$

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

Time Period	c	a	a_1	a_2	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1982											
(1)	-38.0	0.42			0.38			3,898	-108.8	1.12	0.86
	(-4.0)	(8.3)			(1.9)						
1983											
(1)	-55.8	0.34			1.34			4,618	-111.2	2.04	0.93
	(-5.3)	(8.2)			(10.6)						
1984											
(1)	-52.9	0.36			1.23			8,025	-118.9	1.76	0.94
	(-3.3)	(5.07)			(6.04)						
1982-84											
(1)	-56.9	0.38			1.15			20,790	-350.7	1.4	0.93
	(-8.9)	(12.9)			(11.6)						
1982-84											
(2)	-49.6	0.35				0.99	1.21	19,120	-347.2	1.46	0.93
	(-7.4)	(11.8)				(8.7)	(12.3)				
1982-84											
(3)	-50.0		0.46	0.34		0.38	1.31	17,340	-343.0	1.6	0.94
	(-7.7)		(9.6)	(11.5)		(1.6)	(13.1)				

(1) $S = c + a\ Y^p + b\ Y^t$

(2) $S = c + a\ Y^p + b_1\ Y^t\ D + b_2\ Y^t\ (1 - D)$

(3) $S = c + a_1\ Y^p\ D + a_2\ Y^p\ (1 - D) + b_1\ Y^t\ D + b_2\ Y^t\ (1 - D)$

where D = 1 when t = 1982
0 when t = 1983-84

Table 10. China: Assets Adjustment Model (Rural), 1981-84

Time Period	a	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1981								
(1)	0.85	0.50			1,477	-95.24	1.95	0.85
	(14.1)	(8.5)						
1982								
(1)	0.84	0.57			3,569	-107.6	1.57	0.84
	(8.7)	(4.8)						
1983								
(1)	0.74	0.85			4,693	-111.4	1.67	0.92
	(12.96)	(12.5)						
1984								
(1)	0.86	0.77			1,911	-98.9	1.65	0.98
	(29.7)	(19.0)						
1981-84								
(1)	0.83	0.71			16,430	-438.3	1.27	0.94
	(28.8)	(19.6)						
1981-84								
(2)	0.82		0.56	0.79	12,410	-422.5	1.60	0.96
	(32.7)		(13.6)	(22.9)				

(1) $S = a\, S_{-1} + b\, \Delta\, Y$

(2) $S = a\, S_{-1} + b_1\, \Delta\, Y\, D + b\, \Delta\, Y_2(1 - D)$

where D = 1 when t = 1981-82
0 when t = 1983-84

adjustment models, new results are shown in Table 11. In what follows, we will only discuss estimation with the unadjusted data.

For the absolute-income model, the likelihood ratio test decisively rejects the hypothesis that data from 1980 to 1984 are from the same population at the 1 percent level ($LR = 63.877 > \chi^2_8 = 20.1$). However, in trying to determine whether the MPS in each year are identical, results from the likelihood ratio test were rather weak. Since the LR test is an asymptotic test, we then turn to the exact test, F-test, which rejects at the 1 percent level the hypothesis that all MPSs from 1980 to 1984 are equal ($8.2 > F_{8,130} = 3.48$). 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:

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

(or $S_t = -72.8 + 0.48\ Y_t$ if adjusted savings data are used)

We are able to estimate permanent-income models 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 ($0.9 < F_{4,75} = 2.50$):

$$Y_t = -50 + 0.46\ Y^p_t\ D + 0.38\ Y^t_t\ D + 0.34\ Y^p_t\ (1 - D) + 1.31\ Y^t_t\ (1 - D)$$

(or $Y_t = -50 + 0.41\ Y^p_t\ D + 0.33\ Y^t_t\ D + 0.29\ Y^p_t\ (1 - D) + 1.26\ Y^t_t\ (1 - D)$ 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 marginal propensities to save out of transitory income of the two sectors is more than 1, reflecting unusually high savings in rural areas.

We now turn to the asset adjustment model. Again, the F-test 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

Table 11. China: Assets Adjustment Model (Rural), 1981-84

Time Period	a	b	b_1	b_2	RSS	LLF	DW	$\bar{R}^2$
1981 (1)	0.87 (16.5)	0.57 (8.8)			1,488	-95.35	1.94	0.88
1982 (1)	0.87 (10.5)	0.62 (5.0)			3,577	-107.6	1.58	0.87
1983 (1)	0.78 (16.4)	0.91 (13.3)			4,591	-111.1	1.69	0.93
1984 (1)	0.87 (35.5)	0.83 (20.6)			1,807	-98.07	1.7	0.99
1981-84 (1)	0.85 (34.5)	0.78 (21.1)			15,900	-436.4	1.3	0.95
1981-84 (2)	0.84 (39.2)		0.62 (15.0)	0.85 (24.5)	12,150	-421.4	1.64	0.96

(1) $S = a\, S_{-1} + b\, \Delta\, Y$

(2) $S = a\, S_{-1} + b_1\, \Delta\, Y\, D + b\, \Delta\, Y_2(1 - D)$

where D = 1 when t = 1981-82
0 when t = 1983-84

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 ($1.2 < F_{5,104} = 2.35$).

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

$$(\text{or } S_t = 0.82\ S_{t-1} + 0.56\ \Delta\ Y\ D + 0.79\ \Delta\ Y\ (1 - D)$$

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.

Houthakker-Taylor: $B = \frac{2 \times (0.82 - 1)}{0.82 + 1} = -0.20$

$$C = \frac{2 \times 0.79}{0.82 + 1} = 0.87$$

$$\frac{S}{Y} = \frac{0.868 \times 0.04}{0.04 + 0.198} = 14.6 \text{ percent (at } g = 4 \text{ percent)}$$

Leff and Sato: $k = 1 - 0.82 = 0.18$

$$r = \frac{0.79}{0.18} = 4.4$$

$$\frac{S}{Y} = \frac{0.79 \times 0.04}{0.04 + 0.18} = 14.4 \text{ percent (at } g = 4 \text{ percent)}$$

As calculated in the previous section, the long-run savings rate in urban areas was 4 percent. We should 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 the rural savings.

VIII. Conclusions

We have attempted to explain China's household savings behavior in general and the rapid increase in household savings since 1979 in particular. We argued the necessity of separating the rural sector from the urban sector for the time period considered, since wage earners in urban areas and farmers in rural areas are subject to different institutional environments and their savings motives are quite different. We then estimated some common savings functions, which consistently showed a substantial difference in savings behavior between the two sectors in recent years, with a higher propensity to save in the rural sector. This analysis should shed light on the sources of the increased savings in China. In future, the distinctions between urban and rural sectors are expected to become blurred, as the rural sector becomes more urbanized and the urban sector becomes more market oriented. It is quite possible, therefore, that the savings rate of urban households will increase, while 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: (i) for China, our estimates in this paper seem more "reasonable" than estimates by other authors; and (ii) 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. However, an international comparison of the long-run savings rate is not conclusive.

In this paper, we systematically examined the factors shaping the Chinese economy, many of which have been neglected by other studies, before we estimated savings functions. Theoretically, the rapid increase in the household savings rate in recent years could be explained by the arguments of (i) the increase in the magnitude of repressed inflation in the consumer goods market or (ii) the shifts in the economic structure and household behavior. Two alternative hypotheses were proposed, which have quite different macroeconomic policy implications. Under (i), 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. The high savings rate of the past few years may not be maintained, when the economy returns to "market equilibrium" in future. In contrast, (ii) 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 shows, among other things, that, econometrically one cannot reject this hypothesis, implying that the recent high savings rate in China could be maintained in future.

For future research in this area, a more sophisticated model that incorporates both regime shifts and the 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.

Table 12. China: International Comparisons

(1) MPS out of current income

Time Period	MPS	Country	Author
1950-64	0.203	Asian countries 1/	Williamson
1955-71	0.066	U.S.S.R.	Pickersgill
1955-73	0.077	Poland	Portes and Winter
1956-83	0.072	China	De Wulf and Goldstein
1955-83	0.044	China	Feltenstein et. al.
1984 (rural)	0.580	China	Armitage
1955-78 (urban)	0.040	China	Qian 2/
1979-85 (urban)	0.270	China	Qian 2/
1982-84 (rural)	0.480	China	Qian 2/

(2) MPS out of permanent income

Time Period	MPS	Country	Author
1950-64	0.205	Asian countries 1/	Williamson
1955-71	0.058	U.S.S.R.	Pickersgill
1956-83	0.048	China	De Wulf and Goldstein
1955-83	0.009	China	Feltenstein et al.
1984 (rural)	0.360	China	Armitage
1955-78 (urban)	0.010	China	Qian 2/
1979-85 (urban)	0.270	China	Qian 2/
1983-84 (rural)	0.290	China	Qian 2/

(3) MPS out of transitory income

Time Period	MPS	Country	Author
1950-64	0.32	Asian countries 1/	Williamson
1955-71	0.34	U.S.S.R.	Pickersgill
1956-83	0.17	China	De Wulf and Goldstein
1955-83	0.08	China	Feltenstein et. al.
1984 (rural)	1.23	China	Armitage
1955-85 (urban)	0.24	China	Qian 2/
1983-84 (rural)	1.26	China	Qian 2/

Table 12. China: International Comparisons (concluded)

(4) Dynamic model

Time Period	S_{t-1}	Y	S/Y 3/	Country	Author
1950-64	0.78	0.20	3 percent	6 LDCs	Swamy
1950-64	0.94	0.37	14.8 percent	13 DCs	Swamy
1952-69	0.77	0.78	11.6 percent	Taiwan Province of China	Leff and Sato
1952-69	0.86	0.60	13.3 percent	Brazil	Leff and Sato
1956-83	1.083	0.05	-4.9 percent	China	De Wulf and Goldstein
1955-83	0.56	0.03	0.3 percent	China	Feltenstein et. al.
1957-83	0.47	0.51	3.6 percent	China	Naughton
1955-77 (urban)	0.75	0.09	1.2 percent	China	Qian 2/
1978-85 (urban)	0.75	0.28	3.9 percent	China	Qian 2/
1983-84 (rural)	0.82	0.79	14.4 percent	China	Qian 2/

1/ Selected Asian countries excluding China.
2/ Refers to the present study.
3/ At constant income growth rate of 4 percent and according to formula of Leff and Sato (1975).

APPENDIX

The Construction of Chinese Urban Household Income and Savings Data

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

1. Urban household financial savings

Urban household financial savings are composed of cash, savings deposits, and government bonds, which were the only financial instruments available to households until 1985. (Recently, corporate bonds and even "stocks" have become available). "Urban savings deposits" 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 towns because trading activities are mostly concentrated in the towns and they may also wish to diversify their deposits. Based on Naughton's estimation (1986, p. 45), we assumed true urban savings to be about 65 percent of gross urban savings. Figures from 1978 to 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. We simply disregarded this factor.

2. Urban household money income

Figures of total retail sales given in the Yearbooks include sales to institutions. Based on scattered data in the Yearbooks sales to urban institutions are about 7.5 percent of total retail sales (urban and rural). On the other hand, the proportion of retail sales for urban and rural areas has remained stable over the 30-year period, about 45 percent and 55 percent, respectively. We therefore calculate that sales to urban institutions are about 16.7 percent of urban retail sales, while urban household expenditure on commodities is 83.3 percent of urban retail sales.

Considering that until recently, most services were provided and heavily subsidized by the Government at low and stable prices, we simply extended 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 upon request.

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