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The Precautionary Savings Motive in China: Evidence from a Dynamic Panel Model

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Chinese savings rates are high and it is often proposed that this is because of the need for high levels of precautionary savings. According to the buffer-stock model, the target precautionary wealth ratio should be related to expenditure uncertainty. It is hypothesised in this paper that there are three categories of household expenditure that are especially important in China: medical care, housing and education. Provincial level data are used to explore this relationship in a dynamic panel model. Rising health expenditure is found to lead to an increase in the target wealth ratio, while rising income levels have decreased the target wealth ratio.

Keywords: buffer-stock, precautionary savings, Chinese development.
JEL classifications: O10, O16, O53.

1. INTRODUCTION

China initiated an ongoing series of economic reforms from the end of the Cultural Revolution (1966–78), starting with an emphasis on agricultural reforms in the period 1979–84. The second reform phase, from 1985 to 1991, focused on using market-based mechanisms to determine prices in the context of an overall planned socialist economy. From 1992, the ultimate goal of policy has been a market economy (Demurger *et al*. 2002). The spectacular growth performance of the Chinese economy since the initiation of these market-based reforms is well known. Average real per capita income rose over the period 1978–99 by a factor of more than five (Luo 2005). This development has been export-led and has gone together with increases in savings rates. This is also true of those unfortunately few market-based less developed economies, mainly in Asia,[1] which took off into sustained growth in the last two decades of the 20th century.

It follows from the permanent income hypothesis (PIH) that the saving rate depends on the long-term rate of income growth and this tends to be confirmed by the experience of all countries (developed and less developed) since the 1980s. The growth–saving linkage, however, is almost tautological if the PIH holds. Therefore, it is proposed in this paper that the major explanation for increased household savings in China has been policy-driven changes that have created uncertainty for households and forced them increasingly to rely on their own resourcefulness and to build up more and more financial wealth to hedge against this uncertainty. Thus, it is economic reform

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1 They are Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan, Thailand, as well as Botswana and Mauritius in Africa and Chile in Latin America (Schmidt-Hebbel & Servén 1999).

that is the driving factor behind both improved growth rates and higher savings rates and it is the uncertainty that reform has created that is the key to understanding why household financial wealth has accumulated.

Consistent with a buffer-stock model of savings, it is noteworthy that the variable this study seeks to explain is the stock of household wealth relative to income, or target wealth ratio, rather than the flow variable savings. In fact, the focus of the study is on the stock of wealth quickly realisable in the form of cash, namely bank deposits, to pay for unexpected expenses. Although interest rates on bank deposits are so low that real returns are likely negative, bank deposits are viewed as both safe and readily available to meet urgent contingencies. Holdings of wealth in the form of equities or property are more likely to satisfy a speculative than a precautionary motive.

Of the eight categories of household consumption spending surveyed by the Chinese National Bureau of Statistics, three, namely health care and medical services, education and cultural services, and housing, have been affected by the reform process to a much greater degree than the others (food, clothing, household appliances and services, transport and communications, and miscellaneous), as state provision of these items has declined. Changes in spending in these categories are the manifestation of increasing levels of expenditure uncertainty. The study is unable to access survey data at the household level, but provincial level data are published; so that it is possible to examine the relationship between the target wealth ratio and these three important expenditure categories using combined time-series and cross-sectional (panel) data. On the variables of interest the study uses annual data for 29 Chinese provinces from 1991, just prior to the third phase of the economic reform process.

In summary, the hypothesis proposed here is that increasing expenditure uncertainty for households as a result of economic reform has been the key driver of the increase in the target wealth ratio. By breaking expenditures down according to the major components of health, education and housing, it is also hoped to identify which component is the principal influence. This finding has an important implication for the continued strong growth of the Chinese economy. Although a major transition, based on export-led growth, has already taken place, this phase has to come to an end to rebalance the western debtor economies following the Global Financial Crisis. To move from export-led to consumption-led growth, the degree of expenditure uncertainty for households will have to be reduced.

The outline of the remainder of this paper is as follows. In section 2 there is a discussion of some of the features of the reform process in China, especially as they relate to shifting the burden of certain categories of spending from the state to individuals and the consequent uncertainty regarding expenditures that this has created. Section 3 looks at some previous literature relevant to this topic. Section 4 describes the theory behind the hypothesis put here and section 5 describes the data used in this study. In section 6 there is an explanation of the particular econometric technique used in estimating a dynamic equation to test the hypothesis. Section 7 sets out the paper's findings and section 8 is the conclusion.

2. REFORM, UNCERTAINTY AND SAVINGS

The picture of savings in China is not at all typical of the rest of the world. In fact, Schmidt-Hebbel and Servén (1999) note that world savings peaked at 25% in 1973 before declining to 19% in 1994. In countries of both the Organisation for Economic Co-operation and Development (OECD) and the group of less developed countries (LDCs) that have failed to take-off, savings rates have been declining, although the average saving rate in the OECD is still twice that in the non–take-off LDCs. The savings rates of the 11 formerly poorer countries (10 market economies and China) that have experienced sustained growth in the 1980s and 1990s have increased strongly, with China the 'world record saver at 40% in the early 1990s' (Schmidt-Hebbel & Servén 1999: 9). Indeed, the re-balancing of the persistent over-consumption of the leading developed economies and the under-consumption of China and other emerging economies is one of the major challenges of the current world-wide financial crisis.

Kraay (2000) notes that since 1978, when China began its first round of economic reforms in agriculture, gross national savings have averaged 39% of Gross National Product (GNP). Although China's national savings rates were also quite high (averaging 27% of GNP) before 1978, most of this was accounted for by government and state enterprise saving, with household savings rates relatively low. Kraay claims that, post-reform, state savings have been eroded by strong competition from private enterprise, while at the same time household savings have risen.

Modigliani and Cao (2004) document the very high household savings rates in China from about 1979 onwards. They calculate annual economy-wide

measures of increases in both intangible and tangible assets to derive a series for total household savings for China from 1953 to 2000. Before 1979, the household saving ratio based on this measure ranged from –0.01 to 0.08, with 3% to 4% being a typical value. In 1979 the household saving ratio jumped to over 9% and climbed fairly steadily to peak at 0.34 in 1994 and still remained above 0.23 in 2000.

He and Cao (2007: 5) point out that household savings, based on flow of funds data rather than survey data, in fact declined as a percentage of national savings from 52.3% in 1992 to 41.6% in 2001. They attribute this to accelerating urbanisation, with urban residents reducing their propensity to save.[2] He and Cao view the steady increase in both the government's and non-financial corporations' shares of national disposable income at the expense of households' disposable income to be behind rising national savings rather than any changed household behaviour with respect to precautionary savings. They point out that rural economic reform and the increasing number of peasants coming to the cities to find jobs (and remitting earnings home) resulted in a strong rise in rural incomes while rural consumption remained low. They do concede, however, that the precautionary saving explanation is possibly applicable to urban households.

In urban areas, many workers are no longer as secure in employment in state enterprises, as the private sector has taken on a greater share of employment while threatening the profitability of the state sector. This lack of security as well as the increasing need to pay for services such as housing, education and health, has given households a much greater incentive to save. At the same time, strong growth in household income has placed a much greater proportion of households above subsistence level and, thus, in a position to save. Although the expansion of the cities has caused some farmers to lose their land, the central government has been taking active steps to constrain this situation in order to improve living standards in rural areas and make property rights more secure. This should encourage higher savings in rural areas in the form of investment in land, buildings and equipment.

The spectacular rise in average real per capita income over the provinces of China hides great regional differences. For example, in the poorest province, Guizhou, real per capita income (in 1978 RMB) rose from RMB174 in 1978 to stand at RMB765 in 1999, while in Beijing and Shanghai the comparable figures are RMB1249 to RMB6222 and RMB2484 to RMB14065, respectively (Luo 2005). According to Demurger *et al*. (2002), over the period 1992–98, the national mean growth rate was 11.2% p.a. but the gap between the highest (the metropolises of Beijing, Shanghai and Tianjin) and lowest (the Northwest provinces) performing regions was 5.1 percentage points. These differences are, in part, attributable to both preferential government policies and geographical factors. As early as the 1980s, preferential policy in the coastal provinces led to an inflow of foreign direct investment and the rapid development of a modern industrial sector in these provinces; while their geographic advantages include a higher percentage of arable land than the inland provinces and easy access to the sea (Demurger *et al*. 2002).

Prior to the market reform period, most social security benefits were provided for by state-owned enterprises via their own internal systems. Moreover, urban residents typically were guaranteed lifetime employment (Meng 2000). Housing reform, which began with increases in state-owned housing rentals, has now got to the stage that the majority of urban households expect to purchase their own property. Medical care, previously 100% state-provided, has moved increasingly to a system of part charges. According to a household survey conducted in 2000 by the Institute of Economics of the Chinese Academy of Social Sciences, less than 30% of medical expenses were covered by the state (Meng 2003). There have also been very substantial reductions in health insurance coverage. By 2003, 80% of China's rural population had no health insurance and coverage in the cities had also fallen, although not to the same extent (Wagstaff & Lindelow 2005). Over time, education at all levels from pre-school to tertiary has required greater proportional contributions to costs from parents.

3. LITERATURE REVIEW

There are a number of recent studies of saving behaviour specific to China, some of which are based on household level data and some of which take an aggregate perspective.

Chamon and Prasad (2010) had access to the household level data for 10 provinces from the Urban Household Surveys conducted by the National Bureau of Statistics (NBS). Through a co-operative arrangement with the NBS, these authors were able to check that this restricted sample was representative of the full national sample, both with respect to the savings rates and the final regression results that they report. They focus, as does this study, on the hypothesis that 'the breaking of the "iron rice bowl"' (Chamon & Prasad 2010: 95) is what has held back consumption growth.

2 He and Cao (2007: 5) claim that this reduction 'is witnessed in daily life' but 'cannot be seen from the statistics, because the rural saving rate is much higher than the urban counterpart'.

Having demographic information on each individual household allows Chamon and Prasad to explore how both age and household composition affect savings in relation to expected expenditures on education, housing and health. They find that households with younger children save more in anticipation of future education spending, while those with older children save less as they are actually making those educational expenditures. Data availability posed some problems in determining the drivers of housing-related savings, but it did appear that households owning a high-quality dwelling needed to save less, all other things being equal, than households who lived in a poor-quality dwelling or rented. There is evidence that households with an older head, subject to increasing ageing-related health risks, save more for that reason. This latter result concerning health expenditures is the one most closely related to the increased level of uncertainty imposed by economic reforms, as the revealed patterns of savings with respect to education and housing are consistent with fairly well-anticipated patterns of expenditure related to life-cycle factors.

Meng (2003) uses household level data from the 1999 Urban Household, Income, Expenditure and Employment Survey to estimate a consumption function with independent variables: permanent income, transitory income, uncertainty and a number of household characteristics. Permanent income is measured as a weighted average of past incomes; which is possible because, although the survey was done only once, information was collected on the past five years' income. This permanent income measure was also adjusted for the probability of being unemployed. Income uncertainty was measured in two different ways: as the variance of past incomes; and the predicted probability of the worker in the household becoming unemployed in the survey year. Since the unemployment probability was calculated using data from the 1995 Urban Household Income Distribution Survey, neither of the measures of uncertainty is forward-looking. Both measures reflect each household's recent past experience. As well as modelling with total consumption as the dependent variable, Meng also estimates regressions for food consumption and educational expenditures, arguing that shocks and uncertainties faced in these two areas have important policy implications. In the case of food consumption, households near subsistence level may have little ability to smooth consumption; while, in the case of educational expenditures, low-income households' inability to fund education in the face of other shocks to spending, impacts seriously on intergenerational social mobility. Interestingly, Meng finds a strong precautionary motive for saving but that households find smoothing of educational expenditures particularly difficult. Perhaps his concluding claim, that Chinese households are in general able to protect themselves from transitory income shocks, would be attenuated further had he considered sub-classes of expenditure other than education, especially housing and medical expenses.

Modigliani and Cao (2004) set out to test the life-cycle hypothesis (LCH) versus the more traditional Keynesian explanation, using annual aggregate data from 1953 to 2000. It is often suggested that a simple Keynesian consumption function is adequate to explain consumption/savings in the context of poorer countries, but Modigliani and Cao are interested in whether the LCH has broader applicability. According to the LCH the level of income ought not to affect savings; but rather the relevant variable, at least in the long-run steady-state, is the growth rate of income. Also, when population growth has not been stable for a long time, population structure should be an important determinant of savings. In the case of China, which has experienced quite active population intervention in the form of the one child policy, the ratio of employed people to minors crucially affects savings as children consume but do not save. Modigliani and Cao find evidence that the rate of economic growth and the ratio of employed to minors are both associated strongly with the savings ratio, while the level of income is not. They do not consider the effect of uncertainty; and this is, perhaps, scarcely surprising, given their use of annual national data.

Zhang and Wan (2004) set out very clearly the Euler relation inherent in the basic version of the LCH. They then extend this to a more general case, incorporating both liquidity constraints and precautionary savings, based on the seminal works of Campbell and Mankiw (1989) and Carroll (1992), respectively. In spite of having only aggregate level data available to them, they try to construct a measure of uncertainty, as squared forecast errors of income growth. This procedure involves first running separate instrumental variables regressions for the endogenous variables: income growth and the interest rate. With annual data from 1961 to 1998, allowing for a structural break determined by the data at 1983–84, Zhang and Wan report that uncertainty is highly statistically significant after 1983 but not at all in the earlier period, and that the proportion of liquidity-constrained consumers is also higher post-reform. While these results appear consistent with the hypothesis that economic reform has changed saving behaviour, Zhang and Wan caution that it may be more appropriate to consider the data at a more disaggregated level to reflect, at least, the rural/urban differences.

Kraay (2000) is led to a focus on the forward-looking behaviour of households by an initial careful consideration of the stylised facts apparent in the data on savings, income per capita and its growth rate. He notes the reasonably high time-series correlation between the growth of income per capita and savings; while the level of income per capita rises over time together with savings only in urban and not in rural areas, the savings rates themselves are much higher in rural than urban areas. He also points out the considerable provincial variation in all three of these variables. Cross-sectional correlations turn out to be much more modest than the time-series ones. In Kraay's view, these stylised facts are suggestive of the hypothesis that households facing high expected future income growth will save less (consume more now) in anticipation of better times in the future. In a similar way, higher future income uncertainty will raise current saving. To test these predictions, Kraay constructs a panel data set of three six-year averages for the 30 Chinese provinces. Only two of these six-year periods are used in his regression analysis because of the need to measure 'future' variables. In addition to proxies for future income growth and future income uncertainty, Kraay controls for the share of food in consumption expenditure and the dependency ratio. He finds that expected future income growth is negatively associated with saving for rural but not for urban households, but that uncertainty of future income growth is not in general associated with saving and sometimes even enters the model with the wrong sign. It may be that the six-year averaging employed in Kraay's paper has removed the information evident in the stylised facts or that the measure of income uncertainty used does not capture accurately the true variable of interest.

Chen (2002) examines the causal relationships at a national level over the period 1952–99 amongst the following variables: interest rates, savings and income. He finds a stable long-run relationship using the multivariate co-integration testing method of Johansen; and then uses Granger causality tests to examine the long-run connections between pairs of variables. He notes no definite connection between interest rates and savings, perhaps reflecting offsetting income and substitution effects. He does find unidirectional causality running from savings to income.

Qin (2003) models consumption directly in an effort to derive 'savings potential', which is, of course, not measurable from data for savings. Using quarterly time-series data for average per capita consumption of urban and rural households separately, he adopts Hendry's general-to-specific modelling framework (Campos, Ericsson & Hendry 2005), testing down from a model with the following explanatory variables (and their lags): income per capita; savings per capita; the interest rate on current savings accounts; the inflation rate; as well as a measure of income uncertainty. This last variable is constructed from cross-sectional data from the 30 provinces on household income and average wages and the ratios of provincial to total populations; and it is defined as the standard deviation of provincial household income net of the regional income disparity. It should be noted that this variable appears to be more a measure of income inequality than of income uncertainty, as Qin himself seems to acknowledge (Qin 2003: 518). Whatever it does actually capture, the results suggest that it has a significant effect on consumption and, therefore, savings.

Horioka and Wan (2006) set out an optimisation model in which the representative household maximises utility from consumption over two periods. From this framework they derive an aggregate savings rate and show that it depends positively on the working age population, income growth and the strengthening of habits. They then use this model to guide their choice of explanatory variables for an estimating equation to explain the household saving rate (the ratio of household saving to household disposable income). The lagged saving rate is used in view of the likely presence of persistence or inertia; the growth rate of income, and youth, elderly and total dependency ratios are also included, in line with the theoretical model. Although not present in the theoretical model, the real interest rate, the inflation rate and a rural dummy are included as explanatory variables to allow for the impact of financial variables, price uncertainty and differing urban and rural circumstances, respectively. The data employed by Horioka and Wan (2006) are annually observed panel data for the Chinese provinces over the period 1995–2004. Most variables are available separately for rural and urban households in each province; the exceptions being real growth of per capita provincial product (the income measure), which is only available for provinces as a whole; and the nominal interest rate (used in calculating the real interest rate), which does not vary across provinces. The estimating method used is a generalised-method-of-moments (GMM) estimator applied to a dynamic panel data model. This approach is arguably superior to a static panel model, not least because of the habitual nature (persistence) of saving behaviour.[3] Across a number of specifications and data samples, Horioka and Wan's most consistent findings are that the savings rate exhibits persistence and is driven mainly by income

3 It is intended to use the same econometric technique in the present study and it is outlined in detail in section 6.

growth. Dependency ratios are hardly ever found to be significant and other findings depend on whether all households or just rural or just urban households are considered.

4. THEORY

The basic hypothesis of this paper is that increasing uncertainty is a very important factor in explaining the recent evolution of savings behaviour in China. The standard textbook approach to consumption and savings, as exemplified in the leading graduate macroeconomics text (Romer 2006), begins with a presentation of the life-cycle (or permanent income) hypothesis under certainty. Relaxation of the assumption of certainty entails the use of a quadratic utility function to ensure analytical tractability. Once allowance is made for the possibility of a positive third derivative of the utility function, precautionary saving has an important effect on consumption. Zeldes (1989), Deaton (1991) and Carroll (1992) all posit models of precautionary savings.

Zeldes (1989) is, in the first instance, interested to find out how much precautionary savings is optimal to hedge against future labour income uncertainty. Faced with an analytically intractable model, he uses numerical methods to consider current consumption as a function of financial wealth and current income. Calibration of his model shows that the level of precautionary saving is high when the certain component of future resources is small compared to the risky component. Reversing this argument, one would then expect a drop in savings in the presence of 'the growth of unemployment and other forms of insurance' (Zeldes 1989: 295).

Deaton (1991) imposes liquidity constraints on consumers in an otherwise standard utility maximisation framework. Although noting that not all consumers are likely to be liquidity constrained, he shows that, for such consumers, financial assets are desired to act as a buffer against fluctuations in income.

Carroll (1992) sees his approach as broadly similar to Zeldes (1989) and especially to Deaton (1991). He considers a standard inter-temporal consumption model with impatient[4] consumers and shows that there is a negative relationship between the gross wealth ratio and expected income and consumption growth. Moreover, there is a target, or equilibrium, gross wealth ratio (gross wealth: permanent income) that is stable, in the sense that when the target is exceeded, the growth rate of consumption will rise, reducing savings and pushing the wealth ratio back to target. Similarly, when the target has not been reached; the growth rate of consumption will fall until the target is attained. Once on target, the growth rates of consumption and income will be approximately equal.

Carroll and Samwick (1998) show that if households behave according to a buffer-stock model of saving, then there are at least two simple measures of uncertainty that are highly correlated with a target amount of precautionary wealth. They go on to test the relationship between this target and measures of uncertainty individually; and then, with the addition of demographic controls, using household level data from the Panel Study on Income Dynamics in the US. It turns out that an atheoretical measure of uncertainty, namely the variance of the log of income, correlates as highly with target wealth as a theoretical measure based on the intensity of the precautionary savings motive at the point of zero precautionary savings.

Carroll (1992) and Carroll and Samwick (1998) provide the theoretical framework that motivates the usage in this study of both a measure of target wealth as the variable to be explained and measures of uncertainty based on expenditure as the explanatory variables, as is explained below following an outline of the data sources.

5. DATA

The type of precautionary saving behaviour that this study is interested in investigating relates more closely to city dwellers. Most of the rich are in cities and, in general, city dwellers are better off financially and have better access to banking services, modern medical services and education. Moreover, the arguments that have been made about increasing uncertainty as a result of economic reform apply mainly to urban households. As pointed out by He and Cao (2007: 4), there is evidence to show that the consumption behaviour of rural households follows the PIH. The savings of rural dwellers are also not as likely to be held in readily measurable and liquid form as bank deposits. Thus, this study's attention is restricted to data on urban households.

The source of the data is various issues of the *China Statistical Yearbook*. The China National Bureau of Statistics (NBS) has overall responsibility for the collection and production of official data. Data on the livelihood of urban residents are collected through sample surveys on the urban households conducted by the Urban Socio-economic Survey

4 Consumers are impatient in the sense that, if they faced no uncertainty in income, then they would want to borrow in order to bring forward some consumption.

Organization, NBS. The main content of the survey covers household composition; cash income and expenditure of the household; employment of household members; housing conditions; and the possession of durable consumer goods. Consumption expenditures are classified into nine categories: food; clothing; household appliances and services; health care and medical services; transport and communications; recreation; education and cultural services; housing; and miscellaneous goods and services.

It is clear from the discussion of the literature in section 3 that one could proceed to explain savings in either a cross-sectional (household level) context or in an aggregate (national level) time-series framework. Access to data at the household level, while perhaps ideal for the construction of measures of uncertainty, is currently not available for this study. As noted earlier, the use of time-series data at national level misses considerable regional variation. Thus, it is proposed to use annual provincial level data, starting in 1991, just prior to the third and final reform period, covering 29 mainland provinces (including the three municipalities of Beijing, Shanghai and Tianjin). Tibet is omitted because of incomplete data coverage. Chongqing (which was granted similar status to Beijing in 1996) is combined with the province of Sichuan because its data is only separately reported from 1997.[5]

There are a number of possible ways household savings could be measured, dependent on the range of assets considered. Consistent with the buffer-stock model of savings, it is noted that the variable this paper seeks to explain is the stock of household wealth, rather than the flow variable savings. The focus is on the total stock of wealth that is potentially realisable in the form of cash to pay for unexpected expenses. In reality, both real (tangible) assets and financial assets are available to pay for such expenditures. Apart from cash already on hand, however, bank deposits represent the most liquid financial asset readily available to households to meet unforeseen expenditures. Long and Zhou (2000) note that 75% of Chinese residential wealth is held in the form of financial assets and, furthermore, that 60–70% of financial assets are in the form of bank deposits. There are much more accurate statistical records on bank deposits than other assets and Long and Zhou (2000: 11) argue that bank deposits reflect the key features of China's unusual growth rate of savings.[6] In the light of these facts, the household target wealth ratio (*Wealth*) is measured by real bank deposits per capita to the real average wage.[7] The real average wage acts as a proxy for permanent income.

Motivated by the policy changes considered above that have impinged most on household expenditure on housing, education and medical expenses, three measures of expenditure are constructed. For example, *Health* is defined as the ratio of real health and medical expenditure per capita to the real average wage. *Eductn* and *Housng* are similarly defined for education and housing. Although these three variables are in levels, it will be seen later, when discussing the econometric method, that they will appear in differenced form in the estimating equation. In this way, they are measures of the rates of change of various elements of consumption and, therefore, consistent with Carroll's (1992) modelling approach outlined above. An additional control variable is added to these measures of expenditure, namely the real wage per capita, *Wagepc*, designed to account for changes in saving behaviour due to generally improving economic conditions for consumers.[8] Allowance is also made for persistence, or habitual behaviour, by including the lagged dependent variable as an explanatory variable.

In the econometric specifications, all variables are in logs, i indexes the provinces and t indexes time, so that the starting point for deriving an estimating equation will be equation (1):

5 Other omissions are Hong Kong, Macau and Taiwan, which are outliers because of their different administrative statuses.

6 They also note that interest rates have only a very weak effect on bank deposits, which have continued to grow strongly in spite of the Central Bank's lowering of rates seven times from 1996 to 2000. This is highly suggestive of the hypothesis that households must have a strong precautionary savings motive, as interest rate cuts fail to stimulate consumption. In fact, in spite of falling interest income over this period, and the early years of the present century, bank deposits have continued to grow.

7 Bank deposits are available only for each province as a whole. So, the saving per person includes rural residents although the expenditure uncertainty measures actually relate to urban residents only. Millions of officially rural residents, however, actually stay in or around major cities, taking on casual work and supporting their rural families in this way. In a very real sense, these households face the same expenditure uncertainty as urban dwellers, particularly with respect to education and health expenses. Tertiary education and sophisticated medical care are, of course, only available in the cities.

8 Another way to look at this variable is that it allows for some consumers to behave according to the strict predictions of the PIH.

$$Wealth_{it} = a_0 + a_1 Wealth_{it-1} + a_2 Wagepc_{it} + a_3 Health_{it} + a_4 Eductn_{it} + a_5 Housing_{it} + \mu_i + v_{it} \quad (1)$$

Table 1 (p. 25) contains the mean annual value over the period 1991–2004 of each of the variables in equation (1), before their logs are taken, for each of the 29 provinces. It can be seen that the wealth ratios vary enormously, from an average of over 100% in Beijing and Shanghai, to as low as 22% in Guizhou and even 18% in Yunnan. Beijing and Shanghai top the values for the real wage with a figure over double that of eight of the other provinces.

The three expenditure variables, which are all ratios of real per capita spending to the real wage, may seem at first glance to be quite small. It must be remembered, however, that the total population and the number of wage earners is far from the same so that the scaling of this variable is not a simple one. In fact, each of the expenditure variables in some sense incorporates the dependency ratio, since each is a ratio of spending *per capita* to spending *per worker*, and

$$\frac{\text{spending per capita}}{\text{wage per worker}} = \frac{\text{spending}}{\text{wage}} \times \frac{\text{workers}}{\text{population}}$$

The final term is the labour force participation rate, or 1 minus the labour force *non*-participation rate. The non-participation rate is, of course, closely linked to the dependency ratio.

Table 1 (p. 25) also reproduces the classification of the State Council in 2000 of each province as Central (C), Eastern (E) or Western (W). This official classification provides one obvious way of splitting the panel into sub-panels at the sacrifice of the key advantage of panel data, degrees of freedom. Indeed, since the Central region is comprised of only eight provinces, it may be preferable to combine them with the Western provinces, in that the Eastern (or coastal) provinces not only have obvious geographical advantages but also have been the beneficiaries of early policy reforms. Tan and Khor (2006) modify this East–West split by taking the two Central provinces of Jilin and Heilongjiang, which were prior to World War II heavily developed by the Japanese occupiers, and including them amongst the Eastern provinces in their analysis. Apart from considering the panel as a whole, this study tries out Tan and Khor's 13–16 East–West classification as well as an 11–18 split, preserving the State Council definition of East; and, finally, the State Council's three-way 11–8–10, East–Central–West split.

6. METHOD

Haque, Pesaran and Sharma (1999: 3) note that many of the hypotheses raised by the theoretical literature on savings have usually been addressed in the empirical literature on multi-country panel studies with the econometric technique of 'pooled OLS or static fixed-effects regressions'. Given the dynamic nature of the saving decision with respect to its effects on wealth accumulation and economic growth, such a static specification seems especially inappropriate. Since the present study's data are aggregated at the provincial level and are for a relatively short time span, the same point would hold and a dynamic panel data framework would be appropriate. The only previous paper the present authors could find using this approach is that of Horioka and Wan (2006).

The simplest way to understand the method used is in the context of the specific estimating equation that is proposed. Consider, again, equation (1):

$$Wealth_{it} = a_0 + a_1 Wealth_{it-1} + a_2 Wagepc_{it} + a_3 Health_{it} + a_4 Eductn_{it} + a_5 Housing_{it} + \mu_i + v_{it} \quad (1)$$

In the context of the current discussion of both theory and data above, equation (1) shows the dependent variable $Wealth_{it}$; the wealth ratio in province i at time t, as a function of its first lag, $Wealth_{it-1}$; $Wagepc_{it}$, the real average wage per capita in province i at time t; $Health_{it}$, real average per capita spending on health services as a proportion of the wage in province i at time t; $Eductn_{it}$, real average per capita spending on education as a proportion of the wage in province i at time t; and $Housng_{it}$, real average per capita spending on housing as a proportion of the wage in province i at time t. The error term is composed of a cross-section (province) specific effect, μ_i, and a general error term, v_{it}, which represents the effects of omitted variables that are peculiar to both the individual cross-sections and time periods. The v_{it} are independently identically distributed with mean 0 and constant variance.

Now, by taking first differences of equation (1), this gives equation (2):

$$\begin{aligned} Wealth_{it} - Wealth_{it-1} = {} & a_1 (Wealth_{it-1} - Wealth)_{it-2} \\ & + a_2 (Wagepc_{it} - Wagepc_{it-1}) \\ & + a_3 (Health_{it} - Health_{it-1}) \\ & + a_4 (Eductn_{it} - Eductn_{it-1}) \\ & + a_5 (Housing_{it} - Housing_{it-1}) \\ & + v_{it} \end{aligned} \quad (2)$$

The advantage of equation (2) over (1) is that the province-specific error term has now dropped out; yet, by estimating (2), all of the coefficients of (1)

TABLE 1. Average value of variables in equation (1) for each province, 1991–2004

Province or Municipality		*Wealth*	*Wagepc*	*Health*	*Eductn*	*Housng*
Anhui	C*	0.2816221	5748.811	0.0195527	0.039283	0.0151418
Jiangxi	C	0.3852057	5550.644	0.0178788	0.0353512	0.0291022
Henan	C	0.4151687	5616.943	0.0304442	0.0284862	0.0261871
Mtxi (Shanxi)	C	0.662042	5746.35	0.029096	0.0392366	0.0151191
Hubei	C	0.3878088	5864.136	0.026613	0.0489128	0.0242353
Hunan	C	0.3144529	6336.246	0.0276484	0.0509137	0.0271872
Jilin	C	0.652818	6064.07	0.030297	0.0326876	0.0155798
Heilongjiang	C	0.7303891	5446.242	0.035163	0.0327891	0.0127259
Jiangsu	E	0.5298596	8067.024	0.0199299	0.0298286	0.018338
Zhejiang	E	0.536972	10181.93	0.0321197	0.0336009	0.0220853
Beijing	E	1.296366	12207.25	0.028385	0.0314847	0.0164167
Tianjin	E	0.9017804	9515.742	0.0246676	0.0300635	0.0188198
Shanghai	E	1.010916	13541.49	0.0189285	0.0264737	0.0156262
Fujian	E	0.4691454	7910.964	0.0177123	0.0282944	0.0177774
Shandong	E	0.5182678	6741.366	0.0269336	0.0372989	0.0154154
Hainan	E	0.7103276	6074.091	0.0263288	0.0403785	0.0155175
Hebei	E	0.652406	6150.359	0.0350689	0.034677	0.0168424
Guangdong	E	0.7186185	10793.2	0.0257855	0.036493	0.0327752
Liaoning	E	0.9227836	6854.941	0.0299361	0.0342072	0.01281
Sichuan/Chongqing	W	0.3541712	6412.591	0.0265058	0.0375851	0.0209675
Guizhou	W	0.2211564	5834.408	0.022499	0.0310248	0.0150974
Yunnan	W	0.1893111	7462.452	0.0314651	0.0299711	0.0207632
Inner Mongolia	W	0.4526569	5737.759	0.0298364	0.035876	0.0178846
Guangxi	W	0.328247	6358.188	0.0228183	0.0468262	0.0306977
Ningxai	W	0.778606	6789.091	0.0330218	0.0256341	0.0096465
Qinghai	W	0.3251592	7953.652	0.0281957	0.0269369	0.0091425
Xinjiang	W	0.5562487	6871.206	0.0261673	0.0330565	0.0127313
Shaanxi	W	0.44327	6043.714	0.0339183	0.0391834	0.0252936
Gansu	W	0.2531163	6687.548	0.0266086	0.0279934	0.0108355

* C, E and W correspond to the State Council's 2000 classification of provinces as Central, Eastern and Western; Tan and Khor (2006) include Jilin and Heilongjiang as Eastern.
Note: The variables correspond to those in equation (1) in the text, before logs are taken.

TABLE 2. Estimations across all 29 provinces in data set, using equation (2) and the Arellano-Bond method (dependent variable: *Wealth*)

Variable	Coefficient	S.E.	*z*	*P*>*z*
Wealth (lagged)	0.5665032	0.050908	11.13	0.000
Wagepc	–0.4697009	0.2414074	–1.95	0.052
Health	0.4570517	0.1639546	2.79	0.005
Eductn	0.016461	0.165878	0.10	0.921
Housng	–0.0146909	0.064996	–0.23	0.821
Constant	0.0523463	0.0371835	1.41	0.159
Sargan test of over-identifying restrictions:				
Two-step: $\chi^2(65) = 28.15$ $Pr > \chi^2 = 1.0000$				
Arellano-Bond test that average auto-covariance in residuals of order 1 is 0:				
Two-step: $z = -1.49$ $Pr > z = 0.1359$				
Arellano-Bond test that average auto-covariance in residuals of order 2 is 0:				
Two-step: $z = 1.45$ $Pr > z = 0.1483$				
Notes: No. observations: 318; one-step estimates of coefficients.				

are recovered except the constant term. If a constant term were included in estimating equation (2), it would represent a common time trend across all provinces.[9]

Note, however, that, in equation (2), the coefficient on the lagged dependent variable is biased because of the correlation between it and the unobserved fixed effects in the residual. An instrumental variable technique is thus appropriate. Here, the study adopts the approach of Arellano and Bond (1991), which is to use lags of the endogenous variables as instruments, thereby obtaining unbiased and consistent estimates. For this procedure to work, it is necessary that equation (2) not exhibit second or higher order autocorrelation. The validity of the instrument set should also be checked by examining the correlation between the instruments and the residuals.

The Arellano-Bond technique proceeds in two stages. First, a one-step GMM estimator is calculated. The coefficients and standard errors from this stage are used for inference on the coefficients of the model. Then, a two-step GMM estimator is calculated and the results from this stage are used to test for the validity of the instruments (with the Sargan test) and the existence of second-order correlation (with the Arellano-Bond test). The one-step results are recommended by Arellano and Bond (1991) for inference because, in small samples, the standard errors of the coefficients using the two-step method tend to be biased downwards.[10]

7. RESULTS

As a first step in the study's empirical analysis, equation (2) was estimated, augmented by a constant term, across all 29 provinces in the data set, using the Arellano-Bond method (Arellano & Bond 1991).The results are shown in Table 2. As will be the case throughout this paper's results, the coefficient estimates reported are those from the application of the one-step method, while the diagnostic tests are those from the two-step method.

The appropriate diagnostic tests, from the two-step estimation method, appear to indicate that the identifying restrictions are valid for this model and that there is no problem with auto-covariance of the residuals. The Sargan test has a null that the

9 It turns out in the empirical work that the constant term is never statistically significant.

10 Indeed, the standard errors from every two-step estimation that was run (results not reported) were generally found to be much smaller, with the *t*-stats correspondingly very large.

TABLE 3. Estimations across all 29 provinces in data set, using equation (3) (dependent variable: *Wealth*)

Variable	Coefficient (s.e.)	*z* (*P*>*z*)		Coefficient (s.e.)	*z* (*P*>*z*)
		All provinces (29); no. observations: 318			
Wealth (lagged)	0.5549	11.14		0.5422	11.12
	(0.04980)	(0.000)		(0.04875)	(0.000)
Wagepc	–0.1504	–1.99		–0.1785	–2.13
	(0.0754)	(0.046)		(0.08370)	(0.033)
Health	0.4555	3.06	*HL*	0.5020	3.02
	(0.1487)	(0.002)	(*endog*)	(0.1662)	(0.003)
Sargan	$\chi^2(65) = 28.64$	$P > \chi^2 = 1.000$		$\chi^2(119) = 28.59$	$P > \chi^2 = 1.000$
A–B order 1	$z = -1.50$	$P > z = 0.1344$		$z = -1.50$	$P > z = 0.1327$
A–B order 2	$z = 1.43$	$P > z = 0.1531$		$z = 1.43$	$P > z = 0.1522$
Notes: One-step estimates of coefficients; two-step diagnostics.					

over-identifying restrictions are valid. In this case, there is insufficient evidence to reject the null. The null hypothesis of the Arellano-Bond test is that the average auto-covariance in residuals is 0. Again, there is insufficient evidence to reject the null.

The income (wage) variable and health expenditure variable both exert strong, if opposite, influences and there is considerable evidence from the estimated coefficient of the lagged dependent variable of a persistence effect. A joint test of the null hypothesis that the coefficients of *Wagepc*, *Health* and the lagged dependent variable are zero gave $\chi^2(3) = 141.73$ with an associated *p*-value of less than 0.00005.

The constant term and the education and housing expenditure variables, however, exert no statistically significant influence on the target wealth ratio. A joint test of the null hypothesis that the coefficients of *Eductn* and *Housng*, as well as the constant term, are zero gave $\chi^2(3) = 2.25$ with an associated *p*-value of 0.5228.

In the light of these results, the simpler equation (3) was adopted as the basis for the rest of the analysis. The results of estimating equation (3) across the full sample appear in Table 3.

$$\begin{aligned} Wealth_{it} - Wealth_{it-1} &= a_1(Wealth_{it-1} - Wealth_{it-2}) \\ &+ a_2(Wagepc_{it} - Wagepc_{it-1}) \\ &+ a_3(Health_{it} - Health_{it-1}) + v_{it} \end{aligned} \quad (3)$$

The two right-hand columns of Table 3 report the results of a model that allows the variable *Health* to be endogenous, given the possibility that a higher wealth ratio may feed back onto the capacity of households to spend on health services. Whether *Health* is considered exogenous or endogenous, the results are broadly similar. In both cases, the diagnostic tests suggest no problem with either the identifying restrictions or auto-covariance of the residuals. Also, in both cases (*Health* variable as exogenous or endogenous), all independent variables are significantly associated with the wealth ratio, with the highest *p*-value being 0.046. To one significant figure, the coefficients of the variables *Wagepc* and *Health* agree across the two estimating methods and are –0.2 and 0.5, respectively. The coefficient on *Wealth* (lagged) is 0.55 when *Health* is assumed to be exogenous and is very much of the same order, 0.54, when *Health* is allowed to be endogenous. Since all variables are in logs, these estimates have straightforward interpretations. *Ceteris paribus*, a 1% increase in the real wage per capita leads to about a 0.2% drop in the target wealth ratio. This tends to support the view of He and Cao (2007) that urban households have been increasing their consumption in the face of rising incomes. A 1% increase, however, in the proportion of income spent on health services (or an increase in the real cost of health services) leads to about a 0.5% increase in the target wealth ratio. The implication is that the rising uncertainty caused by high health costs drives up the need to save.

Of course, the quantitative effects uncovered are necessarily average effects across all provinces and cannot be presumed to apply exactly in every case. To investigate this problem further, the study began by re-running the regression reported in Table 3, dropping one province at a time. The detailed results,

TABLE 4. Estimations using Tan and Khor's (2006) 13–16 East–West provincial split, with Jilin and Heilongjiang classified as Eastern provinces (dependent variable: *Wealth*)

Variable	Coefficient (s.e.)	*z* (*P*>*z*)		Coefficient (s.e.)	*z* (*P*>*z*)
		Eastern provinces (13); no. observations: 143			
Wealth (lagged)	0.7703	15.10		0.7632	15.40
	(0.05101)	(0.000)		(0.04954)	(0.000)
Wagepc	–0.06327	–2.25		–0.04740	–1.81
	(0.02811)	(0.024)		(0.02617)	(0.070)
Health	0.1178	2.36	*HL*	0.09255	2.07
	(0.049970)	(0.018)	(*endog*)	(0.04462)	(0.038)
Sargan	$\chi^2(65) = 12.80$	$P > \chi^2 = 1.000$		$\chi^2(119) = 12.95$	$P > \chi^2 = 1.000$
A–B order 1	$z = -1.62$	$P > z = 0.1061$		$z = -1.60$	$P > z = 0.1105$
A–B order 2	$z = -0.48$	$P > z = 0.6328$		$z = -0.60$	$P > z = 0.5468$
		Central and Western provinces (16); no. observations: 175			
Wealth (lagged)	0.5112	7.61		0.4638	7.60
	(0.06715)	(0.000)		(0.06105)	(0.000)
Wagepc	–0.2432	–1.98		–0.2803	–2.39
	(0.1227)	(0.047)		(0.1173)	(0.017)
Health	0.7584	2.93	*HL*	0.8465	3.46
	(0.2588)	(0.003)	(*endog*)	(0.2444)	(0.001)
Sargan	$\chi^2(65) = 14.03$	$P > \chi^2 = 1.000$		$\chi^2(119) = 13.55$	$P > \chi^2 = 1.000$
A–B order 1	$z = -1.49$	$P > z = 0.1363$		$z = -1.50$	$P > z = 0.1336$
A–B order 2	$z = 1.40$	$P > z = 0.1617$		$z = 1.40$	$P > z = 0.1623$

Notes: One-step estimates of coefficients; two-step diagnostics.

not reported here, were surprisingly robust to this process. The *p*-value for the coefficient on the lagged value of the dependent variable never reached 0.05; and moreover, for 28 of the 29 cases, the coefficient remained in the range of 0.54 to 0.56. The sole exception to this was on dropping the province of Yunnan, when it was 0.75. In the case of the wage variable, the coefficient remained in the band –0.17 to –0.14 with the exception of the regressions omitting Yunnan and Ningxia. The coefficient of *Wagepc* was not significant, with *p*-values of 0.098 for Yunnan and 0.121 for Ningxia. For eight other provinces the *p*-values did marginally exceed 0.05, but in five of these it would round down to 0.05. The other three cases were Anhui ($p = 0.055$), Liaoning ($p = 0.058$) and Heilongjiang ($p = 0.070$). Of most interest in the context of expenditure uncertainty is the fact that the coefficient of *Health* was always significant with all *p*-values below 0.05 and with the estimate always in the range of 0.44 to 0.50 except for the two cases already mentioned. On omitting Yunnan from the regression, the point estimate of the coefficient on *Health* was 0.21; and, on omitting Ningxia, was 0.38. Both Yunnan and Ningxia are Western provinces and, therefore, have only more recently been exposed to more vigorous reform efforts. They also have a relatively high ratio of ethnic minorities to total population.

In addition to their geographic and political advantages, no coastal province ranks highly on ratio of minorities to total population. To retain the advantages of panel estimation, while allowing for some degree of regional variation, the sample was therefore split into coastal provinces and inland provinces. Table 4 reports the results of using a 13–16 East–West split in the

TABLE 5. Estimations using provincial split according to State Council's demarcation of Eastern provinces (dependent variable: *Wealth*)

Variable	Coefficient (s.e.)	z (*P*>z)		Coefficient (s.e.)	*z* (*P*>z)
		Eastern provinces (11); no. observations: 121			
Wealth (lagged)	0.7731	14.05		0.7681	14.33
	(0.05504)	(0.000)		(0.05359)	(0.000)
Wagepc	–0.05034	–1.57		–0.03930	–1.31
	(0.03212)	(0.117)		(0.02995)	(0.189)
Health	0.09170	1.67	*HL*	0.07641	1.56
	(0.05504)	(0.096)	(*endog*)	(0.04903)	(0.119)
Sargan	$\chi^2(65) = 10.12$	$P > \chi^2 = 1.000$		$\chi^2(119) = 10.78$	$P > \chi^2 = 1.000$
A–B order 1	z = –1.43	$P > z = 0.1530$		$z = -1.43$	$P > z = 0.1518$
A–B order 2	z = –0.52	$P > z = 0.6065$		$z = -0.77$	$P > z = 0.4408$
		Central and Western provinces (18); no. observations: 197			
Wealth (lagged)	0.5142	8.11		0.4628	7.94
	(0.06339)	(0.000)		(0.05826)	(0.000)
Wagepc	–0.2502	–2.24		–0.3058	–2.77
	(0.1227)	(0.025)		(0.1103)	(0.006)
Health	0.7564	3.21	*HL*	0.8828	3.83
	(0.2358)	(0.001)	(*endog*)	(0.2305)	(0.000)
Sargan	$\chi^2(65) = 15.76$	$P > \chi^2 = 1.00$		$\chi^2(119) = 15.83$	$P > \chi^2 = 1.000$
A–B order 1	z = –1.50	$P > z = 0.1344$		$z = -1.51$	$P > z = 0.1316$
A–B order 2	z = 1.41	$P > z = 0.1578$		$z = 1.41$	$P > z = 0.1599$

Notes: One-step estimates of coefficients; two-step diagnostics.

panel, classifying Jilin and Heilongjiang along with the Eastern provinces. In Table 5, Jilin and Heilongjiang are placed alongside the Western provinces; and, finally, in Table 6 (p. 30) the results that were obtained for a three-way East–Central–Western split are shown.

Without exception, the diagnostic tests confirm, in all sub-panels, that the over-identifying restrictions are valid and there is no evidence of auto-covariance in the residuals.

In Table 4 (p. 28), at the conventional 5% level, all but one of the reported estimates are statistically significant. The exception is the coefficient of *Wagepc* for the Eastern provinces when the variable *Health* is modelled as endogenous. In this case the *p*-value is 0.07 and so is of little concern in terms of interpreting the results. The coefficient on $Wealth_{-1}$ now takes on a noticeably higher value of 0.8, to one significant figure, in the Eastern provinces than the 0.5 in the Western and Central provinces, indicating a greater degree of persistence in the target wealth ratio in the East over the period under consideration. The effect of real wage growth on reducing the wealth ratio is weaker in the East, at around –0.05% to –0.06% for a 1% increase in the real wage, compared to –0.24% to –0.28% elsewhere. For the Eastern provinces, the estimated coefficient of *Health* is about 0.1, whereas for the other provinces the estimate is 0.8, so that households in the Centre and West respond much more to the uncertainty surrounding increasing health expenditures than do those in the more developed East. The general picture that emerges is that, although the coastal regions are considerably more developed than

TABLE 6. Estimations using a three-way Eastern–Central–Western provincial split (dependent variable: *Wealth*)

Variable	Coefficient (s.e.)	*z* (*P*>*z*)		Coefficient (s.e.)	*z* (*P*>*z*)
Eastern provinces (11); no. observations: 121 See Table 5 (p. 29)					
Central provinces (8); no. observations: 88					
Wealth (lagged)	0.6822 (0.0831)	8.21 (0.000)		0.6506 (0.07992)	8.14 (0.000)
Wagepc	–0.03385 (0.0284)	–1.19 (0.025)		–0.04356 (0.02722)	–1.60 (0.110)
Health	0.1485 (0.05245)	2.83 (0.005)	*HL* (*endog*)	0.1866 (0.05196)	3.59 (0.000)
Sargan	$\chi^2(65) = 7.50$	$P > \chi^2 = 1.000$		$\chi^2(119) = 7.64$	$P > \chi^2 = 1.000$
A–B order 1	$z = -1.56$	$P > z = 0.1184$		$z = -1.61$	$P > z = 0.1078$
A–B order 2	$z = -0.08$	$P > z = 0.9365$		$z = 0.02$	$P > z = 0.9818$
Western provinces (10); no. observations: 109					
Wealth (lagged)	0.5130 (0.08149)	6.17 (0.000)		0.5179 (0.0754)	6.87 (0.000)
Wagepc	–0.2962 (0.1632)	–1.81 (0.070)		–0.2737 (0.1607)	–1.70 (0.089)
Health	1.018 (0.3948)	2.58 (0.010)	*HL* (*endog*)	0.9329 (0.3864)	2.41 (0.016)
Sargan	$\chi^2(65) = 7.77$	$P > \chi^2 = 1.000$		$\chi^2(119) = 6.84$	$P > \chi^2 = 1.000$
A–B order 1	$z = -1.48$	$P > z = 0.1399$		$z = -1.64$	$P > z = 0.1000$
A–B order 2	$z = 1.40$	$P > z = 0.1612$		$z = 1.40$	$P > z = 0.1630$
Notes: One-step estimates of coefficients; two-step diagnostics.					

the inland areas, there has been a much greater change in behaviour in the Centre and West than in the East. Given the latter's head-start in the reform process, behaviour had probably already changed significantly there before 1991.

The sub-panels presented in Table 5 (p. 29) only differ from those in Table 4 (p. 28) in that Jilin and Heilongjiang are shifted out of the Eastern panel. It turns out that this has little effect on the results for the Central and Western provinces, with the estimated coefficients being very similar and all being statistically significant, the highest *p*-value being 2.5%. By contrast, the results for the remaining 11 Eastern provinces are subject to greater change. The lagged dependent variable is the only one to retain statistical significance at conventional levels. This is strongly suggestive that it is mainly an already established habit that drives saving in the East post-1991. There is, however, some weak evidence that health expenditure increases savings with *p*-values around the 10% mark.

Table 6 splits up the Central and Western provinces in an attempt to refine further the regional estimates. There is a problem with lack of statistical significance of the coefficient of the wage variable, with *p*-values of over 5% (although less than 10%) in the Western provinces and over 5% for one of the estimating techniques in the Central provinces.

Otherwise, the coefficients of the explanatory variables are significant at better than the 2% level (often better than 0.05%). Persistence in behaviour is stronger in the Centre than in the West. Also, in the West, health expenditures lead to roughly 1:1 increases in the savings ratio, while the response in the Central provinces is an order of magnitude lower.

With respect to this study's basic hypothesis, the response of households to increasing uncertainty, inasmuch as it relates to higher health expenditures, is to raise the target savings ratio more as one moves from East to West. There has been little change in behaviour since 1991 in the more developed East, a small but significant response in the Central provinces, and a large response in the least developed Western provinces.

8. CONCLUSION

In the recent literature on Chinese savings the precautionary motive has often been put forward as an important factor behind the high savings rate, although He and Cao (2007) have challenged this view. If a reasonable proportion of consumers do, indeed, behave according to buffer-stock models (Deaton 1991; Carroll 1992), then one ought to be able to detect a connection between uncertainty regarding expenditures and savings behaviour. Measuring uncertainty, however, does prove challenging. In the context of economic reform in China, beginning with the coastal regions but more recently extending to the interior, those aspects of consumer spending most affected by increasing uncertainty have been those formerly provided in large measure by the state, such as health, education and housing. This study has set out here to explore, in a dynamic panel framework, the connection between the target wealth ratio and consumer spending in these three important areas.

A strong link is found between health expenditures and the target wealth ratio but nothing in the case of either education or housing. This result is consistent with the well-established one-child policy and the certainty of the need for housing, so that true uncertainty in expenditure is most likely to revolve around the unknowable future state of one's health. In this respect, it is reassuring that the findings of this study are consistent with the recent results from the micro-level study of Chamon and Prasad (2010). The elasticity of the wealth ratio with respect to spending per capita on health services is estimated to be much higher in the Western provinces than in the Central provinces; where it is, in turn, much higher than in the East, reflecting the more recent exposure of the interior to market reforms.

Although the primary focus here has been on expenditure uncertainty, the model adopted reveals two other points worth noting. First, the elasticity of the wealth ratio with respect to the real wage per capita is negative across all provinces and of a greater magnitude in the interior. Second, persistence in behaviour becomes stronger moving from West to East. These results, too, suggest that the effects of reform have been more strongly felt over recent years in those parts of China that, at present, still lag behind the Eastern provinces in terms of income and wealth.

The results of this study have a very definite policy implication. To date, China's impressive development performance has been export-driven rather than consumption-driven. As the developed economies, in particular the United States, inevitably move to correct their lack of domestic savings, continued strong growth in China will depend more and more on domestic consumption. Given that uncertainty around health expenditures has been shown to be a strong motivator of precautionary savings, policy to reduce such uncertainty will allow domestic consumption demand to substitute for export demand. Such policy could take the form of improved state provision of health services and/or encouragement of the development of more complete markets for private health insurance.

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