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Market reforms and consumption puzzles in China

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ABSTRACT

China exhibits above average savings and below average consumption as shares of total economic activity when compared with other countries. At the same time, to create more balanced growth at home and rebalance key bilateral trade and capital flow relationships, China's leadership is trying to increase domestic demand. To complement studies that investigate the high rate of savings in China, this study focuses on the variation in consumption as a share of GDP across provinces between 1979 and 2004. Drawing on well-established consumption theories and work done on savings behavior in China, this paper develops an empirical investigation of the variables hypothesized to influence the pattern of consumption across regions.

We find that the normal, economic variables have a small explanatory power if significant at all, while the key variables influencing the macro consumption share are structural, and mostly related to government behavior. For example, local government expenditure on health and education is significant and has a relatively large effect on consumption. Consistent with this we also find a positive relationship between consumption shares and the size of the state sector and the share of tax revenue in GDP. We also find some evidence that financial development has a positive effect on consumption shares. Our results suggest that in order for domestic consumption to be increased in the future, new public and private options to replace the declining security and responsibility of the prior state-dominated system will be needed.

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1. Introduction

As economies transition from planning to markets, numerous structural changes are expected to occur. In a command economy, government allocates resources directly via the plan or indirectly via state enterprises. With transition, resource allocation would increasingly be determined by households. In the case of China, in particular, overall savings was kept high during the planned period, with consumption given a lower priority. With reforms, then, private consumption would be expected to rise.

Looking at gross domestic product (GDP) accounting from the expenditure side, consumption as a share of GDP has not increased with market reforms. Government consumption has remained stable but household consumption has fallen (see Fig. 1). Households report that they consume more and better quality goods under the reform system. Retail sales and new shopping malls have grown tremendously along with incomes. However, as a share of economy-wide activity, household consumption has fallen substantially (Mukherjee, 2007). In addition, when compared to other economies such as India, China's share of national consumption in GDP is substantially lower. In the last two decades, China's consumption share in GDP averaged 57% compared with India's 75%, and China's household consumption averaged only 43% compared with India's 64% (see Fig. 2).[2]
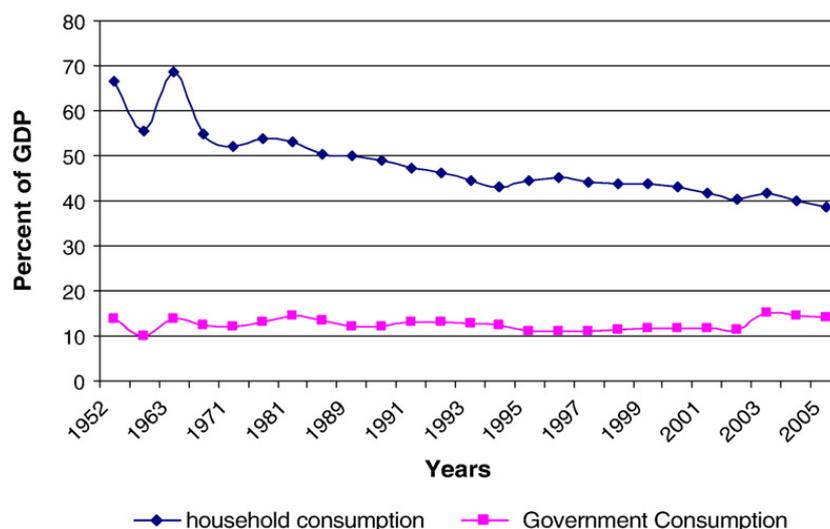
Fig. 1. China's Government and Household Consumption as a Percentage of GDP, 1952-2005. Sources: Household and government final consumption and GDP (expenditure approach) data for China are obtained from the University of Michigan China Center Database website, http://chinadatacenter.org.

China's policy makers themselves have declared that domestic market development that would allow increased consumption would be helpful for long-run, sustained growth (He & Kuijs, 2007; Lardy, 2007). Policies to promote the domestic economy as the engine of growth, which include consumption as well as better efficiency and innovation, are a centerpiece of President Hu Jintao's "balanced growth" strategy (Hu, 2004). External demand has been the primary engine of growth for China with exports as a share of GDP approaching 30%. However, the challenges to shift demand from exports to domestic consumption are formidable. For example, when savings are high, consumption will be low, and China has some of the highest saving rates in the world (Kuijs, 2005; He & Kuijs, 2007). While impressively high already, exports continue to grow. Moves to appreciate the yuan, encourage domestic sales, and lower export incentives have had little effect.

Analysts of China's current market development stage often make an analogy between the U.S. in the late 19th century and China today. The U.S. economy after the Civil War increasingly brought regions together with the completion of coast to coast railways, the emergence of national media, and the beginnings of large corporations that viewed their market as national in scale from their inception. *The Incorporation of America*, by Alan Trachtenberg (1982), eloquently captures this period of national market development and the effect on American business and culture. Today, China's leaders are building national highways, improving rail and air travel, and encouraging investment in the western part of the country on a large scale. Provincial and local level "self-reliance" of the past is giving way to these new forces and policies. This progress would be expected to generate more domestic demand for all kinds of goods and services, and serve as an important source of economic growth. Detailed research by sector across countries conducted by the Global Institute of McKinsey concludes that domestic competition in product markets is second only to macro stability in helping to promote economic growth and productivity (Lewis, 2004). Establishing an integrated national market and breaking local segmentation is vital for stimulating competition and domestic demand to propel long-term growth in China.

There is debate about how successful national market development has actually been in China. Local protectionism is not dead. For example, Young (2000) and Poncet (2003, 2005) argue that China's domestic market continues to be highly fragmented. However, Bai, Du, Tao, and Tong (2004) find that although local government protection is strong for industries with high profit margins, the overall time trend of regional specialization of China's industries has reversed an early drop in the mid-1980s, registering a significant increase in later years. Through examinations on industrial market concentration ratios and their relationship to industry-level profit margins and share of the state sector output, Qi (2008) finds that protectionism associated with fiscal reforms seems to be much stronger in the early stage of reforms than the later stage. Park and Du (2005) also demonstrate that regional specialization increased beginning in the early 1980s.

In addition to the ongoing debate over market integration on the commodity and industry side, recent studies have examined capital market integration. Boyreau-Debray and Wei (2002) study China's provincial savings and investment rates at the aggregate level and argue that, contrary to expectations, reforms have not made capital more mobile across provincial borders. Other work, however, points to more normal market flows when the private sector is accounted for. For example, after stripping out foreign funds, government appropriations and officially influenced funds, Qi (2006) finds that the behavior of capital flows in China's commercial sector moves toward that of interstate flows in the U.S. and other advanced nations, suggesting a more integrated capital market than previously thought.

The mixed evidence notwithstanding, promoting a national market that will allow domestic demand to be a leading stimulant for growth is now high on the central leadership's agenda. Blanchard and Giavazzi (2006) put forward a combination of policies they believe will work best in China to achieve balanced growth, including a decrease in savings, an increase in service provision, and a reevaluation of the Chinese currency. He and Kuijs (2007) also suggest that policy changes are required to rebalance China's economy. The bias towards infrastructure investment, for example, has meant under-provision of health and education. Looking at where China is today in terms of the rebalancing and domestic demand policies, Lardy (2007) concludes that while the direction makes sense, progress has been uneven.
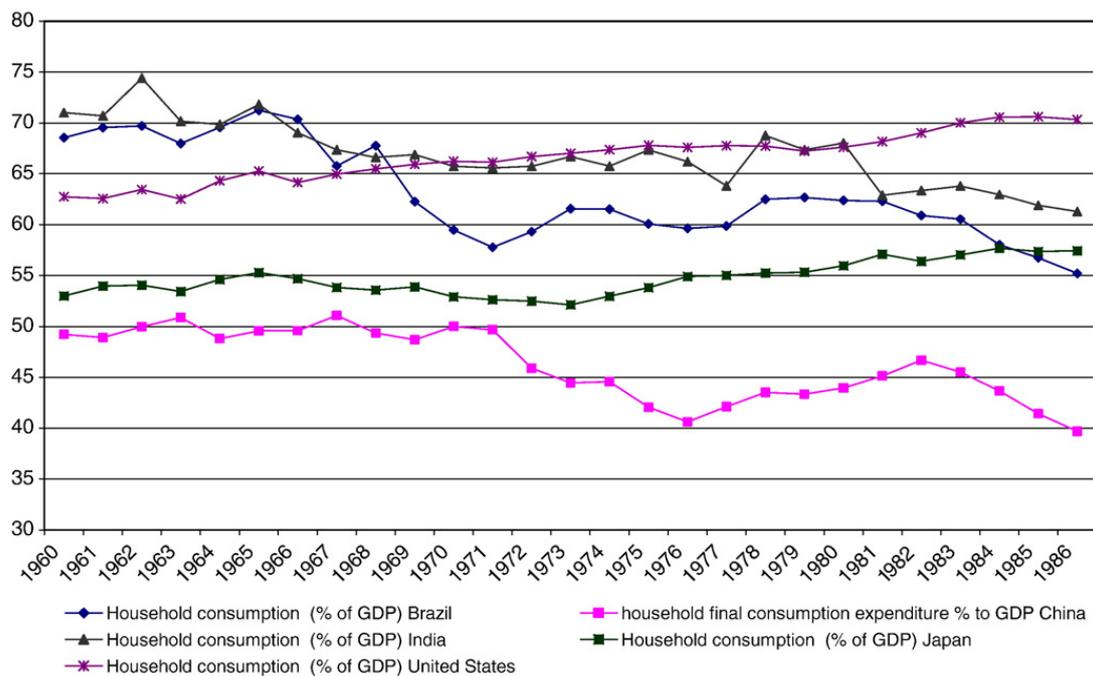
Fig. 2. Comparison of household consumption to GDP. Source: World Bank, World development indicators.

China's high savings rate is at the root of the problems, but explanations for high savings rates in China are so far incomplete. Based on a thorough analysis of China's national and sectoral flow of funds, Lin and Schramm (forthcoming) argue that a substantial portion of domestic savings ends up in the informal sector and cannot be accounted for. They conclude there are serious structural challenges within China's financial system that are preventing a more balanced distribution of resources.

Taking a complementary but different tack, in this paper we explore the state of domestic consumption in China by examining variations in consumption patterns to see what factors influence consumption rates, and in particular household consumption rates. We hope that this will indirectly shed light on why consumption appears to be low in China's macro economy despite its move to a market system. Most aspects of household consumption behavior in China on a micro level seem to be fairly in line with other countries at similar development levels (Clements & Qiang, 2003; Wu, 1999). Our focus, therefore, is on a macroeconomic and institutional level of analysis, using cross-sectional and time-series data at the provincial level. Our dependent variable is household consumption expenditure as a share of total economic activity measured by gross domestic product by province. The data we use is collected by the China statistical system and reported as the private consumption element of GDP, rather than micro level, household survey data. The average consumption share of GDP in the reform period is between .4 and .5 (see Fig. 1), while the average consumption share of disposable income on the micro level is over .8 (see Fig. 3). Hence, these two data sets are capturing different phenomena. By looking at variations across provinces, we explore variables from the literature that we have reason to believe could explain why consumption as a share of overall activity is so low. By focusing on consumption, our goal is to complement the work that has been done on savings behavior in China.

The next section reviews the literature on savings and consumption behavior, which leads us to identify key, measurable variables to examine empirically in Section 3. The fourth section reports our empirical results, followed by a conclusion.

2. Literature review: savings and consumption in China

Figures for savings rates in China range from 30% of GDP (Modigliani & Cao, 2004) to 43% (Kuijs, 2005) and even as high as 50% (Horioka & Wan, 2007), depending on definitions and time periods. One line of inquiry into these savings rates has followed Modigliani's work (1966) on the life-cycle hypothesis. Using time series macro data for China from 1953 to 2000, Modigliani and Cao (2004) found that higher than average private savings in China during the reform period can be explained by the high growth rate of the economy and the one-child policy. The theory implies that high income growth rates would result in higher savings because incomes of the working age population would rise relative to those who are not working. In addition, with only one child, household dependency rates would be relatively low, which is associated with higher savings rates. Likewise, if there are more people consuming but not earning income (the definition of a dependent), then the average consumption share would be higher. Consistent with the life cycle hypothesis, they did not find evidence that income per capita was an important factor. Additional support for this result was found by Masson et al. (1998). Looking at pooled international cross-country data over time, they found that lower dependency ratios and higher growth rates were associated with higher savings. They also found, however, that growth rates raised savings more in developing countries as compared with richer, developed countries, while the dependency ratio did not vary much by development level.

In another application of the life-cycle hypothesis, Horioka and Wan (2007) test for factors influencing household savings in China using a provincial data set for 1995–2004 based on household surveys. Their estimation includes income growth, the interest
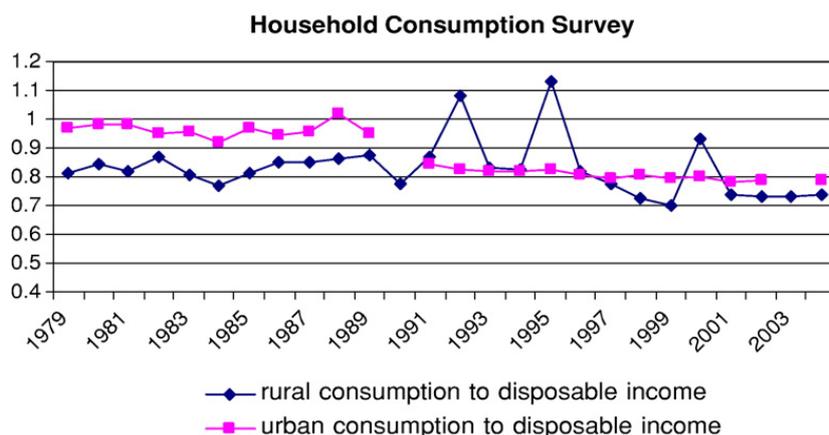
Household Consumption Survey

Fig. 3. Source: Historical statistical almanac for China's provinces, autonomous regions and cities, 1949–1989 and various years of the China statistical yearbooks for more recent years.

rate, the inflation rate, lagged savings and the age structure of the population. They find that lagged savings and income growth are the most important determinants of high savings in their estimations, while the interest rate and inflation rate have mixed results, and the demographic variables were not significant for the most part. They conclude their work provides partial evidence of a life cycle explanation, and that if growth rates continue to be high, it is likely that savings rates will also remain high.

Another approach suggests that people are saving in China in order to deal with unusually high uncertainty due to the lack of ability to insure for health, retirement and other contingencies especially as state subsidies for these items have declined without private options to take their place (Wong & Yu, 2002). Yoo and Giles (2002) also find precautionary behavior due to uncertainty that is specific to rural households in China.

Research on consumption–the flip side of savings–in China has looked at differences in consumer behavior across time, geographies, urban–rural lifestyles and income groups. Song, Liu, and Romilly (1996) use a permanent income hypothesis framework and a time varying parameter approach to model consumer behavior in China comparing pre and post reform periods covering annual data from 1952–1993. They find changes in consumer behavior over time consistent with central planning in the early period and with market reforms later. For example, they find a low marginal propensity to consume during the planned period that is consistent with shortages, controlled prices and rationing. With market reforms they find a substantial rise in the marginal propensity to consume in reaction to suppressed demand in the early years, with a fall later. Overall, then, consumer behavior was as expected, and their model was able to capture the social and economic changes in China over time.

Another study using national level annual data from 1961 to 1998 focuses on uncertainty and liquidity (Zhang & Wan, 2004). This study finds that there is a major behavioral shift after 1983, and that liquidity constraints and uncertainty reinforce each other resulting in very low consumption and high savings under the market reforms.

A few studies utilize cross-sectional data. Wong and Yu (2002) examine data from 1991 to 1998 to find increasing income differentials have affected people's consumption habits. This is consistent with varying consumption behavior between rich and poor countries more generally (Seale & Regmi, 2006). In the case of China, Wong and Yu point out, however, that some rural families have done well, so that a simple rural–poor versus urban–rich characterization is not accurate. Nonetheless, on average, rural households seem to exhibit different consumption behavior as compared with urban households (Wu, 1999, 2004), as well as different savings behavior as reported by Horioka and Wan (2007).

3. Investigation of China's aggregate consumption patterns under market reforms

Based on this body of literature and the significant economic system changes China has experienced in the post-Mao reform period, we develop an empirical model that includes both standard economic variables and a set of structural factors that have shifted along with the changes in the economic system. Our study adds to the current literature by utilizing pooled time series and provincial cross-sectional data over a longer period than the household survey data cover. In addition, since the micro survey data show that Chinese households behave in familiar ways in terms of consumption and savings behavior, we are looking for other explanations for the low consumption share puzzle in our approach.

The equation to be estimated for (i) provinces and (t) time periods is as follows:

$$\left(\frac{C}{Y}\right)_{it} = \beta_0 + \beta_1 \hat{Y}_{it} + \beta_2 \Pi_{it} + \beta_3 r_{it} + \gamma_1 P_1 + ... + \gamma_{i-1} P_{i-1} + \lambda_1 D_1 + ... + \lambda_{t-1} D_{t-1} + \sum \sigma_i Z_{it} + \mu_{it} \tag{1}$$

where:

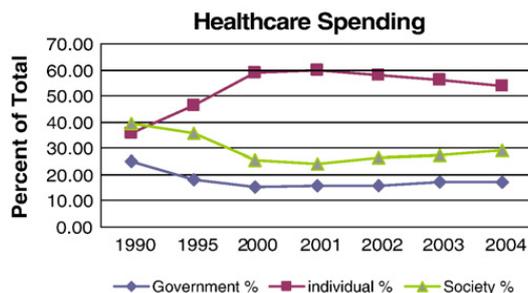|	
$\left(\frac{C}{Y}\right)_{it}$	household consumption as a share of provincial domestic product
$\hat{Y}_{it}$	the annual growth in provincial domestic product
Π_{it}	inflation rate

Fig. 4. Shares of healthcare spending in China by individuals, government and society, 1990–2004.

r_{it}	real interest rate (nominal interest rate minus inflation)
P_i, D_i	provincial and time dummies

Z is a vector of economic system variables:

S_{it}	the state share of industrial gross output value;
G_{it}	local government expenditure on education, health and culture as a share of total local government expenditure;
F_{it}	the share of loans plus deposits in provincial domestic product;
U_{it}	the share of urban employment in total provincial employment;
d_{it}	dependency ratios;
y_{it}	provincial domestic product per capita;
T_{it}	local tax revenue as a share of GDP.

The empirical model used here combines standard consumption determinants relating to income, price levels and income growth with a set of economic system characteristics expected to influence or constrain households' consumption decisions. We use the share of household consumption in gross domestic product $\left(\frac{C}{Y}\right)_{it}$ as our dependent variable, where consumption includes durable and non-durable goods. This is the share that appears to behave differently in China compared to other countries. Our panel data set includes provincial data for 31 provinces between 1979 and 2004.[3] The variation across provinces allows us to explore possible factors relating to differences in income levels and reform progress, in addition to the standard consumption variables.

To test the life cycle model's prediction that faster growth in income will lead to an increase in savings and therefore a decrease in consumption shares, we use growth in provincial GDP. Inflation is included with the expectation that higher inflation can cause households to save less and thus consume more.

In theory, interest rates would also be expected to influence savings, and therefore consumption, with lower rates leading to increased consumption. Nominal interest rates, however, are available for China's national economy but not by province, and only for more recent years. We calculated real interest rates by subtracting inflation from nominal interest rates. So far the reforms in China may not have progressed to a stage where interest rates influence either consumers or savers–investors very much partly because the rates are set very low (Economist, 2007). Indeed, the market interest rates are actually often negative when inflation is taken into account. So the normal relationship between consumption and interest rates cannot be expected. For these reasons, we do not include interest rates in most of our estimations.

For the system variables in the Z vector, we include a number of factors raised by the literature. One is the hypothesis of precautionary savings. To the extent that the state sector was no longer going to assure households' employment with the package of "iron rice bowl" perks that went along with state sector employment, a reasonable hypothesis is that households would adapt to this new environment of uncertainty. In this study we use the state share in total industrial output value as a proxy for uncertainty, expecting that with a lower state sector, families would opt for more precautionary savings and therefore consume less.

Another interpretation of the effect of the size of the state share is that provinces with more state companies are able to obtain relative more funding from state banks since the banks lend primarily to the large SOEs and not to the private sector (Boyreau-Debray & Wei, 2002).[4] Having access to financing would help reduce uncertainty for those working at these companies. It is much less likely, for example, that SOEs receiving state financial backing would go bankrupt as compared with private firms. It is also more likely that they would be able to fund higher wages and benefits than non-state companies. Further, while small and marginal SOEs were being sold and closed in the earlier years, since the mid-1990s, stronger companies and those in priority sectors have done quite well (Li & Putterman, 2008).

A second, related factor that might influence household consumption is that of government expenditure. If the government is taking care of certain needs, such as allocating grain, supplying education and healthcare, etc., then households would not need to save for these possible expenditures in the future. With reform, local government provision of services has varied greatly across

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[3] Please see the Appendix for sources of all data used in our model.
[4] We thank an anonymous reviewer for pointing out this alternative interpretation.

areas, and for some services, has declined. For example, if we look at healthcare spending depicted in Fig. 4, we can see that the share spent by individuals has increased steadily from 1990 to 2000 while the government's share has fallen. The third category, "society's share", captures contributions by companies and other institutions and entities. The data that are available at the provincial level, and that we use in our estimation, represent the share of local government expenditure that is used for health, education and culture.

A third system factor we would expect to influence household consumption is the ability of households to use the newly marketized financial system to smooth consumption over time. In principle, with market development, liquidity options should expand and therefore not pose a constraint to consumption. Commonly used financial development indicators are the percentage of total financial assets to GDP (Goldsmith, 1969) or money supply measures such as M2 as a share of GDP. However, we do not have access to financial assets data for all provinces for the period of time we study, and money supply measures are appropriate for cross-country analyses but will not vary by province. Therefore, we follow other scholars and use the total deposits and loans issued by all financial institutions as a percent of GDP reported by each province as a proxy for financial development (Zhou, 2004). We would expect this coefficient to be positive if more financial development lessened liquidity constraints.

The fourth variable we use to capture changes due to reforms is the degree of urbanization measured as the percent of urban employment in the total labor force. Other work has shown that rural and urban households exhibit different consumption patterns (Wu, 2004). Household survey data for China show that the average propensity to consume in urban areas is near .9 while in rural areas it is nearer to .8, and that the difference between the two has varied over time (see Fig. 5). Since provinces vary in their relative importance of rural activity to urban, this difference could affect consumption patterns in the aggregate. Reforms have led to rapid urbanization and significant job transfers out of agriculture into industry and services, and therefore we expect this to affect consumption patterns over time as well. Hence we would expect this coefficient to be positive, with higher urbanization explaining higher consumption shares.

Our fifth variable is provincial output per capita. Cross-country studies have shown that consumption patterns in rich countries differ from those in poor countries (Clements & Qiang, 2003). In particular, consistent with Engel's law, expenditure shares on food in rich countries were lower than poorer countries. Also, reforms have benefited some provinces more than others, as reflected in varying growth rates and average incomes. We hypothesize that consumption patterns would differ across provinces as well. But due to possible multiple influences, the relationship could go in either direction. For example, as households become richer they spend a smaller proportion of income on food, but it may be that richer families have a choice to spend relatively more on housing.

To account for the dependency burden for households on consumption from the life-cycle model, we use the dependency ratio as our sixth variable. This ratio is defined as the proportion of the population that is either under 14 or over 65. We expect a positive relationship here, as more dependents would mean more consumer expenditure on average.

Finally, our seventh variable is the overall provincial tax burden. Since our dependent variable uses provincial gross output in the denominator rather than a disposable income measure, we add this tax variable to see what effect it has on overall consumption. For provinces where the tax burden is higher, we would expect the consumption share to be lower. The measure is the share of tax revenue in provincial GDP.

4. Estimation and results

We begin our estimation with a pooled, cross-provincial fixed effect model. One of the advantages of this approach is that it controls for omitted variables that vary across provinces but do not change over time. For example, people's life styles differ depending on what part of the country they live in, and this may affect household consumption behavior. In addition, vast differences in economic, industrial and fiscal structures across provinces are likely to influence household consumption. The intercepts generated for each province in this model should absorb the influences of these omitted variables that differ for each province but are constant over time.
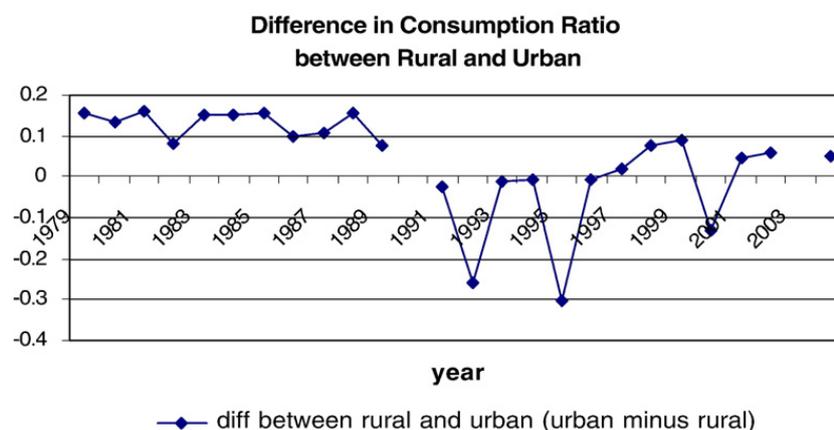

Fig. 5. Source: Historical statistical almanac for China's provinces, autonomous regions and cities, 1949–1989 and various years of the China statistical yearbooks for more recent years.

Table 1
Descriptive statistics.

Variable		Mean	Std. dev.	Min	Max	Observations
Household consumption as a % of GDP	Overall	0.49	0.11	0.20	0.86	$N = 771$
	Between		0.08	0.30	0.64	$n = 31$
	Within		0.08	0.27	0.80	
Inflation	Overall	6.74	7.42	−3.60	29.70	$N = 749$
	Between		0.63	5.41	8.10	$n = 31$
	Within		7.40	−4.96	28.75	
State sector size	Overall	0.57	0.24	0.04	0.94	$N = 786$
	Between		0.13	0.27	0.79	$n = 31$
	Within		0.20	−0.09	0.94	
Government expenditure on health, education & culture	Overall	0.25	0.04	0.13	0.43	$N = 781$
	Between		0.03	0.19	0.29	$n = 31$
	Within		0.04	0.13	0.43	
Financial development	Overall	1.86	3.14	0.27	8.10	$N = 769$
	Between		0.80	1.02	5.13	$n = 31$
	Within		3.03	−2.77	82.07	
Share of urban employment	Overall	0.31	0.16	0.11	0.81	$N = 766$
	Between		0.16	0.15	0.72	$n = 31$
	Within		0.03	0.16	0.42	
Dependency ratio	Overall	46.97	9.24	25.59	69.66	$N = 496$
	Between		7.37	31.55	60.11	$n = 31$
	Within		5.71	24.16	57.66	
GDP per capita	Overall	4298.26	5825.77	204.00	55307.00	$N = 806$
	Between		3115.08	1440.01	16506.18	$n = 31$
	Within		4953.50	−9639.92	43099.08	
Real interest rate	Overall	−0.73	5.33	−19.62	8.19	$N = 434$
	Between		0.60	−2.29	0.21	$n = 31$
	Within		5.30	−18.91	8.90	
Tax burden	Overall	0.09	0.04	0.03	0.22	$N = 718$
	Between		0.03	0.04	0.15	$n = 31$
	Within		0.03	0.01	0.16	
Share of SOE employment	Overall	0.75	0.10	0.34	1.04	$N = 799$
	Between		0.08	0.55	0.93	$n = 31$
	Within		0.05	0.43	1.06	
Share of state sector fixed investment	Overall	62.91	20.44	0.00	100.00	$N = 792$
	Between		14.28	19.72	91.70	$n = 31$
	Within		15.15	−9.45	113.87	
GDP per capita variance	Overall	4043.65	3024.44	1180.80	15934.93	$N = 806$
	Between		3072.53	1180.80	15934.93	$n = 31$
	Within		0.00	4043.65	4043.65	
Normalized GDP per capita variance	Overall	0.69	0.52	0.20	2.74	$N = 806$
	Between		0.53	0.20	2.74	$n = 31$
	Within		0.00	0.69	0.69	
Micro rural consumption ratio	Overall	0.83	0.48	0.1	9.62	$N = 765$
	Between		0.11	0.67	1.21	$n = 31$
	Within		0.47	0.08	9.24	
Micro urban consumption ratio	Overall	0.88	0.09	0.08	1.15	$N = 676$
	Between		0.02	0.81	0.91	$n = 31$
	Within		0.09	0.098	1.14	
Micro rural income variance (normalized)	Overall	0.81	0.38	0.24	1.95	$N = 806$
	Between		0.39	0.24	1.95	$n = 31$
	Within		0	0.81	0.81	
Micro urban income variance (normalized)	Overall	0.77	0.58	0.51	3.80	$N = 806$
	Between		0.59	0.51	3.80	$n = 31$
	Within		0	0.77	0.77	

We then add time-fixed effects to control for variables that are constant across provinces but evolve over time. For example, we see the growth of private industry, elimination of the "iron rice bowl," shrinking influence of state sectors, introduction of new healthcare regimes, changes in employment benefits, etc., nationwide as economic reforms deepen in China.

Table 1 reports our descriptive statistics as well as the between-province standard deviation and within-province standard deviation (over the entire time period) of each variable in our model. This table confirms the considerable variations of the dependent and independent variables of interest in our data set.

Model 1 reported in Table 2 includes the standard growth and inflation variables and the economic system variables using the full data set from 1979–2004 with provincial fixed effects. This model is estimated with ordinary least squares. The F-statistics of the test on the significance of provincial fixed effects show that there are significant variations among provinces. The growth rate of provincial income is significant and negative, reflecting that consumption tends to lag behind growth as suggested by the life cycle model; however inflation is insignificant.

Table 2
Estimation results of base models 1979–2004 (dependent variable: household consumption to GDP).

Regressors (symbol)	Regressors	Model 1	Model 2 (GMM)	Model 3	Model 4 (GMM)
$\hat{Y}$	GDP growth rate	−0.001***	−0.001***	−0.001***	−0.001***
		(.0004)	(.0004)	(.0003)	(.0003)
$\prod_{it}$	Inflation	0.0007	0.0001	.0003	−0.000
		(.28)	(.0006)	(.0005)	(.0006)
S_{it}	State sector size	.07***	.09***	.004	.03
		(.17)	(.03)	(.02)	(.03)
G_{it}	Gov't spending on health etc.	0.67***	1.17***	.34***	0.9***
		(.14)	(.16)	(.12)	(.19)
F_{it}	Financial dev. indicator	−.002	.006	.02***	.02***
		(.007)	(.007)	(.005)	(.005)
U_{it}	Share of urban employment	.09	−.02	.05	−.04
		(.08)	(.09)	(.07)	(.08)
d_{it}	Dependency ratio	−0.001**	−0.001**	−0.0005	−0.0005
		(.0005)	(.0005)	(.0005)	(.0005)
y_{it}	GDP per capita	6.03E-06	1.66E-06	8.78E-07	1.44E-06
		(1.04E-06)	(1.10E-06)	(1.01E-06)	(1.09E-06)
T_{it}	Tax rev. to GDP	.68***	.74*	.19	.42***
		(.11)	(.11)	(.13)	(.13)
Dummy90_94				−.1***	−.07***
				(.02)	(.02)
Dummy95_99				−.14***	−.09***
				(.02)	(.02)
Dummy00_04				−.17***	−.12***
				(.02)	(.02)
Prov. effects		Yes	Yes	Yes	Yes
Time effects		No	No	Yes	Yes
Instruments			S_{it} lag1, G_{it} lag1, G_{it} lag2		S_{it} lag1, G_{it} lag1, G_{it} lag2
DWH test			.000		.000
First-stage F			41.37, 3		27.71, 3
Stat & degrees freedom			14.52, 3		13.35, 3
Over-identifying J stat			.41		.63
Time range		79–04	79–04	79–04	79–04
# of obs.		428	423	428	423
Adj. R-square		.81	.39	.85	.51
F-stat		54.98	25.72	70.61	32.56

Note: *denotes 10% significance level, **5% significance level, ***1% significance level.

Our two main economic system variables, the size of the state sector and local government spending on health and education, are both significant and positive as expected with government spending resulting in a substantially larger coefficient (.67 compared with .07). The strong effects from these two factors are consistent with how the economic system in China has changed during the reform period. While the state sector has declined with reforms, when it still exists it provides more employment security and corporate responsibility to cover an individual's healthcare and housing costs as well as better retirement security than the non-state sector. These benefits help reduce the uncertainty brought by economic reforms pushing toward a market system, therefore reducing the need for precautionary savings. Similar reasons apply to the governments' efforts to provide more health care and education services to the residents, which will also reduce precautionary savings for possible medical needs or education cost for children.

The next two variables, financial development and urbanization, were not significant in this specification. Financial development does become significant in later models but the degree of urbanization does not explain consumption shares in our study.

The dependency variable was significant but was negative, implying higher savings when there were more children and elderly. This is the opposite of what the life cycle theory predicts. The Horioka and Wan (2007) study based on Chinese household survey data also could not establish an expected pattern or significance for their demographic variables. They cite another study (Chamon & Prasad, 2006) using the same data set that found savings increased with age and was the highest for the elderly. Since in pre-reform China saving for retirement was not a household or individual responsibility or even an option, it may be that the uncertainties around the many changes in Chinese society during this more recent period have influenced decision making in unexpected ways. Perhaps, for example, instead of households having a higher consumption share because they are caring for children and older family members, they try to save more in order to insure that the children will be able to attend school and later college. We know, for example, that the tuition for schools at all levels has increased rapidly–perhaps 25 fold for college tuition– and that this could affect household savings and consumption behavior.[5] According to a survey implemented by the People's Bank

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[5] http://www.bzpi.gov.cn/Body.asp?Id=330.

of China, the fast and steep increase in tuition and schooling fees has become the primary motive for household savings.[6] In terms of retirement, for centuries people in China relied on their children to take care of them in old age. The one child policy may cause people to save more because they are less assured of this safety net.

Provincial output per capita was insignificant. One factor that might lessen the effect of different levels of development is that many people from poor provinces work elsewhere. To the extent that they send home their earnings, then consumption would be higher than expected for poor provinces.[7]

The tax variable was significant but positive, which is the opposite sign from expectations. Here, a higher tax burden results in higher consumption shares. As this measure is not actually related to disposable income, but instead is the tax revenue as a share of provincial GDP, it may in fact be measuring the importance of government instead of the tax burden.

Although model 1 provides reasonable estimates with useful implications for understanding consumption patterns in China, the standard ordinary least squares estimation is not correct if consumption is determined simultaneously with some of the other variables in our models. For example, GDP data enter both sides of the estimated equation a number of times, and macroeconomic variables in the same system may generate reverse causality issues, which also might produce endogeneity.

We resolve these issues by using instrumental variables and employing generalized method of moments (GMM) estimators. We implemented the Durbin–Wu–Hausman (DWH) test to examine whether any of our suspected endogenous variables can be treated as exogenous and reported the DWH test results (with the exogeneity hypothesis) in all subsequent tables. We find that the GDP growth rate and GDP per capita can be treated as exogenous variables based on the DWH test results. However, our state sector size and government expenditure variables are endogenous. These endogenous variables by definition must be related to the residual terms of the regression. We suspect that this correlation with the residual terms may be caused by other omitted variables that affect household consumption ratios. For example, as mentioned earlier, the pace of tuition increases for schools at all levels certainly affects household savings and consumption behavior. These types of factors as well as government policies on social security issues and varying health benefits for rural and urban residents are likely to influence household consumption behavior. However, our data set does not include direct measures of all these influences as regressors. Further, all of these issues (or potentially omitted variables) are closely related to government behavior, thus causing the state sector size and government expenditure variables to be endogenous.

To correct for these problems, we selected the lagged values of the endogenous variables to use as instrumental variables (IVs) for the corrected estimation. While local government expenditure might be endogenous for the current period and therefore correlated with the current period's residual, the value from the previous period is probably not correlated with the shock of the current period μ_{it}. For each endogenous variable, we tested up to three-period lagged values to see if any of them could serve as an appropriate IV. We tested the IVs' relevance to the endogenous regressor as well as its exogeneity to the error term using Hansen J statistics reported as the over-identifying restrictions tests for all GMM models. Model 2, model 4 and all subsequent models utilize the GMM estimation.[8]

The basic findings of model 1 remain robust in model 2. The effect of local governments' expenditure on education and health not only continues to be significant, but also doubles in its magnitude (reaching from .67 to 1.17). In our data set for 1979–2004, the average ratio of government spending on health and education out of total revenue is .25. An increase of one standard deviation to .3 will on average raise the ratio of household consumption to GDP by .06, which represents a 12% increase from a mean of .49 to .55. Again, the second strongest effect comes from the size of the state sector in the local economy. The GDP growth rate, dependency ratio and the tax variable have the same impact on the dependent variable in model 2 as compared with model 1, and inflation and GDP per capita are insignificant as before.

The next two base models (models 3 and 4) add time dummies to our estimates along with cross-provincial effects. Because China went through major changes regarding the tax, banking and corporate governance systems beginning in 1994 (Naughton, 2007), we included dummy variables chosen for several time periods to capture the trend in China's economic reforms and economic activities.[9] Fig. 1 shows that the household consumption to GDP ratio was relatively stable until 1989. Therefore, our first time dummy starts from 1990 and ends in 1994 when China started a major fiscal reform–tax sharing system (fenshuizhi). The next time dummy covers the period of 1995 to 1999, the year that marked the beginning of China's residential housing reforms.[10] Housing reforms changed the former scheme of housing allocation among urban employees, which is likely to affect household consumption behavior. The last dummy variable covers the time period between 1999 and 2004.

Model 3 is reported in Table 2, and replicates model 1 except that these estimates include the time fixed effects as well as the provincial fixed effects. The newly generated time dummy variables are statistically significant and produce coefficients with a clear trend: over time the coefficients decrease each year. This is consistent with the decreasing trend in China's household

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[6] See the report published by Bazhong Shi Price Bureau (Sichuan Province). Report available at: http://www.bzpi.gov.cn/Body.asp?Id=330. There are many other similar reports on this topic. For example, see the article on education expenses at the Xinhua News Agency (the State News Agency) at http://news.xinhuanet.com/fortune/2005-09/26/content_3544715.htm.

[7] We would like to thank Xuepeng Liu for suggesting that migration may be playing a role.

[8] We tested our models with both standard two-stage least square models as well as GMM estimation. Both methods generate very similar results. GMM estimation normally produces more efficient estimates under over-identification and the two-stage least squares estimator can be considered a GMM estimator with a suboptimal weighting matrix when the errors are not i.i.d. (Baum, 2006, p. 197).

[9] We also estimated our models using one time dummy for each year, which results in estimating 24 more coefficients in our model, and losing many degrees of freedom. This generated near perfect collinearity problems. To capture time fixed effects while still resolving the potential collinearity issues, we constructed dummy variables for time periods.

[10] See discussions of housing reforms at http://finance1.jrj.com.cn/news/2008-06-28/000003797311.html.

consumption to GDP ratio. Model 4 replicates model 2 (both utilizing GMM) but adds time period dummies. Since the DWH test confirms endogeneity issues for model 3, we will focus on interpreting model 4, which controls for endogeneity in model 3.

Local governments' expenditure on health, education and culture still remains the strongest factor in model 4 although the size of the coefficient dropped from 1.17 to .9. The newly added time effects most likely picked up some of the variations in the dependent variable, reducing the impact of this variable compared to models 1 and 2. The state sector variable is insignificant in this model, perhaps for similar reasons, although the tax variable remains significant. The effect of the GDP growth rate on household consumption remains the same. Inflation, the dependency variable, the size of the urban sector and GDP per capita are insignificant with the added time fixed effects, but now financial market development becomes a new factor that influences household consumption ratios. We see that higher financial market development fosters more consumption, consistent with expectations. Financial development has the expected positive sign, suggesting that better access to credit helps to smooth consumption decisions and so does not suppress consumption. Recently, studies have shown that better access to credit increases the average poor household's total borrowing by about 62 yuan per capita (Han & Hare, 2008).

Overall, there are some changes in the estimation results by model 4 as compared with model 2, but the strongest effect on household consumption remains the local governments' expenditure on health, education and culture, followed by the tax share. We believe that model 4 with provincial and time fixed effects is the best model for what we are trying to analyze, and hence is our preferred base model.

Table 3 presents a series of robustness checks on model 4. Model 5 re-estimates model 4 using two-year averages of all data. The results are fairly similar. The joint F-stat on all excluded instruments (5.83) is smaller compared to that of other models, though it is significant at the 1% level. We conducted further analyses on the relevance and strength of the instruments to the endogenous

Table 3
Estimation results of robustness tests (dependent variable: household consumption to GDP).

Regressors (symbol)	Regressors	Model 5	Model 6	Model 7	Model 8
		(2 year avg data)	(Alt. state sector size)	(Alt. state sector size)	(Add variance of income)
$\hat{Y}$	GDP growth rate	− 0.001**	− 0.002**	− 0.001**	− 0.0009*
		(.0006)	(.0004)	(.0003)	(.0005)
$\prod_{it}$	Inflation	0.0005	− 0.0004	0.0002	0.0008
		(.0008)	(.0006)	(.0005)	(.0006)
S_{it}	State sector size	−.002			.22***
		(.02)			(.02)
S_{it} alt 1	Fixed inv. to SOE		− .0004		
			(.0003)		
S_{it} alt 2	Share of SOE employment			.13**	
				(.06)	
G_{it}	Gov't spending on health etc.	.74*	.95***	.82***	1.09***
		(.28)	(.19)	(.19)	(.07)
F_{it}	Financial dev. indicator	.02**	.01***	.02*	− .02***
		(.006)	(.005)	(.005)	(.006)
U_{it}	Share of urban employment	− .17	.05	.03	.009
		(.11)	(.09)	(.08)	(.03)
d_{it}	Dependency ratio	.0005	− .0003	− .0005	− .002***
		(.0009)	(.0004)	(.0004)	(.0005)
y_{it}	GDP per capita	1.12E-06	6.49E-07	1.81E-06*	7.36E-06***
		(9.96E-07)	(1.03E-06)	(1.1E06)	(9.89E-07)
T_{it}	Tax rev. to GDP	.46*	.45*	.41***	.77***
		(.24)	(.13)	(.13)	(.13)
Dummy90_04		− .04**	− .07***	− .08***	
		(.02)	(.01)	(.02)	
Dummy95_09		− .06***	− .1***	− .11***	
		(.02)	(.02)	(.02)	
Dummy00_04		− .09***	− .12***	− .13***	
		(.02)	(.02)	(.02)	
Var	Variance of income				− .11***
					(.01)
Prov. effects		Yes	Yes	Yes	No
Time effects		Yes	Yes	Yes	Yes
Instruments		G_{it} lag1	G_{it} lag1	G_{it} lag1	S_{it} lag1,
		G_{it} lag2	G_{it} lag2	G_{it} lag2	G_{it} lag1, G_{it} lag2
DWH test		.08	.000	.000	.07
1st-stage F stat & DF (Shea R^2)		5.83, 2	17.57, 2	31.65, 2	166.02, 3
		(.16)			131.47, 3
Over-identifying J stat		.69	.95	.98	79-04
# Obs. (years)		224 (1979–2004)	427 (1979–2004)	427 (1979–2004)	423
Adj. R-square		.57	.51	.53	.47
F-stat		19.12	31.22	31.8	58.35

Note: *denotes 10% significance level, **5% significance level, ***1% significance level.

Table 4
Estimation results of a different sample period 1995–2004 (dependent variable: household consumption to GDP).

Regressors (symbol)	Regressors	Model 9 (1995–2004)	Model 10 (1995–2004 with real interest rate)
$\hat{Y}$	GDP growth rate	− 0.0002 (.0007)	− 0.003 (.0007)
$\prod_{it}$	Inflation	0.001 (.001)	0.005* (.002)
S_{it}	State sector size	.08* (.05)	.11** (.04)
G_{it}	Gov't spending on health etc.	1.04*** (.32)	.94** (.43)
F_{it}	Financial dev. indicator	.02** (.008)	.005* (.003)
U_{it}	Share of urban employment	− .02 (.12)	− .07 (.09)
d_{it}	Dependency ratio	.0004 (.002)	− .0002 (.001)
Y_{it}	GDP per capita	1.26E-07 (1.17E-06)	4.01E-07 (1.03E-06)
T_{it}	Tax rev. to GDP	.40 (.35)	.34 (.32)
Dummy00_04		.001 (.01)	.01 (.01)
r_{it}	Real interest rate		.006 (.03)
Prov. effects		Yes	Yes
Time effects		Yes	Yes
Instruments		S_{it} lag1 G_{it} lag1 G_{it} lag2	S_{it} lag1 G_{it} lag1 G_{it} lag2
DWH test		.02	.001
1st-stage F stat & DF (Shea R^2)		10.63, 3 1.58, 3 (.07)	8.24, 3 1.19, 3 (.06)
Over-identifying J stat		.71	.49
Time range		96–04	96–04
# of obs.		244	244
Adj. R-square		.06	.10
F-stat		12.29	12.64

Note: *denotes 10% significance level, **5% significance level, ***1% significance level.

variable for this model. The additional partial R-square statistic in the first-stage regression is reported (16%) and shows that the instruments do have fairly strong explanatory power for the endogenous variable—government spending. Hence we conclude that the instruments are appropriate.

Models 6 and 7 use alternative measures of the size of the state sector. Model 6, which adopts the state sector's share of fixed investment as the state size measure, generated similar results as the base model which uses the share of state industrial output in total industrial output. Model 7 uses the share of state employment in total employment to capture the importance of the state sector. The results of model 7 show that the share of state employment has a statistically significant and positive impact on household consumption as a share to GDP. It seems that the state sector's influence on consumption enters through the employment effect (rather than the size of the state economy as illustrated by models 4 and 6). Though the state share in the economy is declining in the reform process by all three measures, the better employment benefits of the state sector seem to boost consumption.[11]

Model 8 includes the variance of income across time for each province as an alternative measure of uncertainty to the state sector.[12] The more variation a province experiences, the more uncertain people's income. We would expect that this would dampen the consumption share on average. This variable did indeed have a negative and significant coefficient. The results for the other variables included in model 8 were also consistent with our earlier results, with the added significance of the dependency variable.

As a further robustness check, Table 4 reports estimates for the more recent period, 1996–2004. We include the interest rate because it is available for this period, although it turns out to be insignificant. However, inflation becomes significant, and our other

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[11] DWH tests show that we can treat the state sector variable as an exogenous regressor so there is only one endogenous variable in models 5–7.

[12] The calculation of the variance of income gives each province a variance figure for all years in the data set (i.e., no time variation in each province). Therefore we had to drop the provincial fixed effects in estimating this model or the income variance will lead to perfect collinearity as another set of "provincial fixed effects."

key variables–government spending, the size of the state sector, and financial development–continue to be significant. We also see smaller first-stage F-statistics for models 9 and 10 (similar to that of model 5). Since we have two endogenous variables here (the size of the state sector and government spending), we also reported Shea partial R-square.[13] Generally, a very small Shea partial R-square indicates that instruments lack sufficient relevance to explain all endogenous variables. Though our Shea partial R-square is not extremely small (6% for model 9 and 7% for model 10), we did find that the instrument for the state sector variable has no explanatory power for the endogenous government spending regressor, G_{it}. Hence adding the instrument for the state sector variable in the first-stage regression for G_{it} adds more noise, which drives the F-statistics down. This is also consistent with the significance of the F-statistics on only the two instruments for G_{it} (as opposed to the joint F-statistics that also includes the state sector's instrument), as well as the significance of t-statistics and p-value on the two instruments for G_{it} in the first stage regressions. Therefore, we believe the lagged values of the government spending variable are still reasonable instruments.

5. Discussion and conclusion

We use various models and estimation techniques to examine what factors affect the variation in household consumption as a share of GDP. Based on the life cycle hypothesis, other studies found that savings would rise with higher growth rates in income, and we found the mirror result that consumption lagged income growth. However, variations in income growth explain only a small part of the variation in consumption patterns. In our study, the most significant and robust discovery is that reducing motivations for precautionary savings through government's fiscal responsibility at the local level will have the strongest effect in increasing household consumption. All of our models show that higher government expenditure on education and health has the biggest impact on increasing household consumption. The share of the state sector also seems to be important as it serves a similar purpose by providing more job security and better benefits than the private sector. While the positive results of this variable are not as robust as those of government spending, the alternative measure that captures the size of the state sector through the employment share was significant. This underscores the likelihood that the state sector variable is a proxy for certainty. The share of tax revenue in provincial GDP was also significant in our preferred specification and in most of the robustness tests. Contrary to our expectation, it resulted in a positive coefficient and therefore may instead be reflecting a higher role of government as a substitute for private spending. In most of our models the significance of the development of financial markets to provide more financing channels to stimulate consumption was also demonstrated.

The dependency ratio and inflation are not always robust regressors with significant influence on household consumption to GDP ratios. Our inflation measure may suffer from the same problem as interest rates—that is, the official data understate the real situation. The dependency ratio, when significant, had the opposite sign from what life-cycle theory would suggest, but was consistent with what other studies have found in the case of China. There is a need for further research to understand the effect of changing dependency ratios on household behavior in the case of China. Separating the young from the elderly to see if there is a divergence in spending based on the two dependency groups would be one approach. Urban employment–our measure of the size of the urban sector–was never significant, despite our expectations from other work that it would matter. In addition to the possibility that our official urban employment data fail to capture the very large "floating population" of migrant workers in urban areas, this may also imply that while the types of goods and services that are purchased may be different in urban and rural areas, our data does not reveal any difference in overall consumption expenditures as a share of provincial GDP.

These results point to several trends and also raise additional puzzles. From this macro, expenditure side view, private consumption has not kept up with growth in total economic activity as measured by GDP. Though the focus of our study is to analyze the determinants that affect the provincial variation in private consumption as a share of provincial GDP, one further hypothesis that may explain the overall falling trend of the consumption share is that household income as fallen behind overall growth. Indeed, several reports show that the compensation to employees as a share of GDP (measured from the income approach) "has declined from 60% in early years of economic reforms to only 38.7% in 2006" even for Guangdong Province, one of the most wealthy provinces in China.[14] In addition, others have pointed out that wages for employees in private firms have not keep up with the GDP growth.[15] This trend may reflect a time-lag; however, the trend has persisted throughout the reform period and may be the result of something more structural that favors capital over labor and producers over consumers. These trends do not bode well for a reverse of the consumption share trends. In addition, as demonstrated in this study, to help increase domestic consumption in the future, new options to replace the declining security of the prior state-dominated system will be needed. As long as the reform process results in more privatization without insurance options and ways to smooth consumption and diversify risk, the incentives to save may overwhelm the incentives to spend.

Some analysts argue that the time for building China's domestic engine of growth is when growth is robust (Summers, 2007). Japan's experience shows that building domestic demand in a downturn does not work. A response of Chinese consumption to wealth effects tied to changing values of equities is already evident (Deutsche Bank, 2008). Releasing competitive forces across sectors and geography within China could help a great deal to stimulate domestic demand. Building a national transit infrastructure,

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[13] The Shea partial R-square is a useful measure in the case of multiple endogenous regressors (Shea, 1997). It takes the intercorrelations among instruments into account.

[14] http://big5.xinhuanet.com/gate/big5/gd.xinhuanet.com/newscenter/2008-07/11/content_13789316.htm. Also available at http://news.sina.com.cn/pl/2008-07-11/073415913142.shtml.

[15] Article available at: http://news.0898.net/2007/11/24/347028.html.

opening the financial sector, encouraging rural development and crafting a competition law are some of the policy pieces already moving forward in this next stage of China's development.

Acknowledgements

Appendix A

Household and government final consumption and GDP (expenditure approach) data for China are obtained from the University of Michigan China Center Database website, http://chinadatacenter.org. Household consumption expenditure includes the total expenditure of resident households on final consumption of goods and services.

The Michigan China Center Database also reports industrial output value by enterprise ownership for each province over our study period. We took the gross industrial output value from state owned enterprises (SOEs) and then divided by the total industrial output value of that province to calculate our estimate of the "state share" variable.

The government expenditure variable is the ratio of expenditure on education, health and culture out of total local government expenditure by province. These data are available at the Michigan Data Center for 1978–2005. These data are also available in various China Fiscal Yearbooks (*Zhongguo Caizheng Nianjian*) and China Statistical Yearbook (Zhongguo Tongji Nianjian). The main categories under local expenditure are capital construction, enterprise innovation funds, expenditure for supporting agricultural production, expenditure for government administration, and operating expenses for health and education and culture. Our local expenditure data are not the budgetary data, but are the actual spending data at the end of each fiscal year. Our provincial total expenditure data do not include transfers to central government, or the expenditure for using loans of national debt.

Inflation data are calculated from the provincial consumer price indices reported from the Michigan data base.

Interest rates are financial institutions' one-year savings deposit interest rates for households, reported by various years of China Statistical Yearbook. Note that while nominal interest rates are the same for all provinces, because the variation in provincial consumer price indices, the real interest rates vary from province to province.

The GDP per capita data also come from various issues of the China Statistical Yearbook.

We estimate the urban share of employment by using the employed person statistics in urban areas versus the total employed number in each province reported by the Michigan China Center Database.

Our financial development indicator measures the total amount of deposits and loans processed by all financial institutions as a percentage of GDP data in each province. These data are available from the NBS publication Comprehensive Statistical Data and Materials on 50 Years of New China (Xin Zhongguo 50 Nian Tongji Ziliao Huibian).

The dependency ratio is defined by the population 14 and under plus those 65 and older as a proportion of the total population. These data are available from 1990 to 2005, and were provided by the U.S. Census Bureau.

We take the local total tax revenue reported by the Michigan China Center Database divided by provincial level GDP as our measure of tax burden for each province.

The micro-level survey data on rural and urban households' disposable income and living expenditure are obtained from the Historical Statistical Almanac for China's Provinces, Autonomous Regions and Cities, 1949–1989 and various years of the China Statistical Yearbooks for more recent years.

Finally, we take the fixed investment data from the Michigan China Center Database and from various years of China Statistical Yearbook. The share of state sector employment is calculated using data reported in various years of the China Labour Statistical Yearbook.

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