

## Are different income sources fungible? The effects of agricultural subsidy and disaster relief on household consumption in China

### RESEARCH ARTICLE

Xiaohui Peng<sup>a</sup>, Li Zhao<sup>ab</sup>, Chengyan Yue<sup>c</sup>, and David Ahlstrom<sup>d</sup>

<sup>a</sup>Associate professor, Business School, Nanjing Normal University, No.1 Wenyuan Road, Qixia District, Nanjing, China P.R.

<sup>b</sup>Lecturer, College of Economics and Management, Shanghai Maritime University, 1550 Haigang Avenue, Pudong New District, Shanghai, China P.R.

<sup>c</sup>Professor, Department of Applied Economics and Department of Horticultural Science, University of Minnesota-Twin Cities, 1420 Eckles Avenue, St. Paul, MN, USA

<sup>d</sup>Professor, Department of Management, CUHK Business School, The Chinese University of Hong Kong, 12 Chak Cheung Street, Shatin, N.T., Hong Kong

---

### Abstract

This paper uses panel data from a sample of farm households in the northeastern China to examine the non-fungibility of different income sources. The results show the private transfer income has a high and significant impact on household consumption while agricultural subsidy and disaster relief have insignificant impacts. Empirical findings prove that the Behavioral Life Cycle Hypothesis is more practical than the Life Cycle Hypothesis. Moreover, they provide important macro policy implications as for how to stimulate farm consumption and expand domestic demand and encourage economic growth.

**Keywords:** behavioral life cycle hypothesis, farm household consumption, marginal propensity to consume, agricultural subsidy, disaster relief

**JEL code:** D12, Q12, O13

---

<sup>ⓧ</sup>Corresponding author: [li\\_zhao1017@hotmail.com](mailto:li_zhao1017@hotmail.com)

## 1. Introduction

How do agricultural subsidies and disaster relief impact household consumption in China? The country has achieved substantial economic growth since the start of economic reform in the late 1970s, creating a more developed industrial structure and a greatly reduced poverty rate (Ahlstrom, 2010; Ding and Knight, 2009; Enright *et al.*, 2005; Liu *et al.*, 2002; Parker, 2009). Yet more recently, the uneven structure of China's reforms has contributed to relatively low consumption levels, particularly in the countryside, as well as increasing income inequality, which are potential sources of tension and upheaval (e.g. Huang, 2008, 2009, 2010; Huang and Cui, 2005; Pickett and Wilkinson, 2015; Ravallion and Chen, 2007; Shambaugh, 2013). This is a concern not only about standards of living and stability, but also about the steady economic growth of which consumption is a key lever (Ahlstrom, 2015; Barro and Sala-i-Martin, 2004; Hubbard and Navarro, 2011; McCloskey, 2016; Solt, 2016). This has also prompted new policy to focus on the increase of domestic demand and establishment of long-term mechanisms for consumer demand expansion.

As such, increasing rural residents' consumption is of great importance to the expansion of domestic demand and promotion of sustainable and more balanced economic development in China (Carvalho and Rezai, 2016; Huang, 2008, 2010). Though China has experienced rapid economic growth, farm household income has accounted for a declining proportion of total household income and experienced a flattening growth while off-farm income has seen almost annual increases (Ding and Knight, 2009; Huang, 2008; Ravallion and Chen, 2007). Meanwhile, agricultural subsidies have become another source of income for farmers since the government began to implement direct subsidies for main grains in 2004.

Despite these major changes to the levels and structures of farm income, the impact that different income sources have on household consumption in China is not well understood, which in turn raises several questions. What is the impact of other forms of income or transfer payments such as disaster relief and how fungible are different income sources? Thus, this paper examines the effect of different types of income sources on farm household consumption levels to empirically examine the practicality of the Behavioral Life Cycle Hypothesis as opposed to the Life Cycle Hypothesis. It is well known that the Life Cycle Hypothesis and the persistent income hypothesis are key aspects of the consumption function, but the theory assumes homo economics.

For example, the Life Cycle Hypothesis holds that people have much foresight, and at any time will consider decades of their long-term interests, and (according to total wealth) maximize their utility in each phase of their lives. This is obviously not consistent with people's observed behavior of person and cannot explain many economic phenomena. In fact, people will make their own choices based on key cognitive and social psychological factors present in the environment as well as their limited rationality (Cialdini, 2006; Thaler and Sunstein, 2015). Therefore, the study of economic behavior should also be based on the psychological characteristics of reality, not just on the assumption of abstract homo economics. The behavioral life-cycle hypothesis based on bounded rationality incorporates self-control, mental accounting and framing in consumer behavior and has more explanatory power of consumption behavior in the real world. The key assumption of the behavioral life-cycle theory is that rural households believe components of their wealth are nonfungible, even in the absence of credit rationing. Specially, wealth is assumed to be divided into three mental accounts: current income, current assets and future income (Shefrin and Thaler, 1988). The basic hypothesis states the marginal propensity to consume is greatest for current income. This paper uses survey data of Chinese farm households to empirically analyze rural household consumption behavior to show the value of the Behavioral Life Cycle Hypothesis over the Life Cycle Hypothesis.

Theoretically, the psychological factors do affect the economic behavior of farmers, but they have commonly been neglected by traditional economic analysis until recently (Cartwright, 2011; Kahneman, 2011). The psychological factors including self-control, willpower, endowment effect and the like (Kahneman, 2011; Thaler and Sunstein, 2015). As such, this paper focuses on psychological accounts. This study also contributes to the literature on the life cycle hypothesis by considering the impact of psychological factors and different

sources of farm households income on the marginal propensity to consume. Empirically, this study contributes to research on consumption in Chinese farm households, which represents a large segment of China's population. Our results have important policy implications for emerging economies that are struggling with agricultural earnings and ways to enhance rural consumption while expanding domestic demand to stimulate economic growth.

## 2. Literature review

There is a fairly extensive literature on the marginal propensity to consume (MPC) disposable income (e.g. Friedman, 1957; Langemeier and Patrick, 1990). The Life Cycle Hypothesis and permanent income hypothesis are classical theories regarding the relationship between disposable income and consumption (Shefrin and Thaler, 1988; Song *et al.*, 1998; Lee and Kong, 2000). To get a well-defined optimization solution, the Life Cycle Hypothesis assumes that utility functions in different periods are homogeneous and different types of incomes are fungible in terms of their impact on consumption. However, empirical findings have often not supported the Life Cycle Hypothesis (Blake, 2004; Courant *et al.*, 1986; Pitelis, 1987). To reconcile the difference between theoretical expectations and empirical findings (Christensen, 2006), economists have extended life cycle theory by adding the bequest motive, imperfect capital markets, and the assumption that people's utility functions change over time. For instance, Shefrin and Thaler (1988) applied prospect theory (Kahneman, 2011; Kahneman and Tversky, 1979) to consumer decision-making and proposed the behavioral life cycle hypotheses. Shefrin and Thaler (1988) argued that the Behavioral Life Cycle Hypothesis is the generalized Life Cycle Hypothesis, so it is somewhat more realistic than the Life Cycle Hypothesis. The Behavioral Life Cycle Hypothesis states that the current income, the current asset, and the future income are not completely fungible (Shefrin and Thaler, 1988). Additionally, the MPC of current income is highest as current consumption is more attractive than future consumption and utility loss is larger when decreasing current consumption through the self-imposed trade-off of current consumption for future consumption. The marginal propensity to consume current assets will generally be the second as people have a certain insight into future uncertainty, such as unemployment or illness, such that they do not want to increase current consumption by utilizing current assets except in the case of an accident. The marginal propensity to consume future income such as social insurance, pensions, personal insurances, and home equity is lowest because such kind of income is fairly fixed, which individuals cannot freely control (Thaler, 1990).

In theory, wealth can be classified as the sum of current income, net current assets and future income. However, mental accounts are more complex (Belsky and Gilovich, 2010; Shefrin, 2002; Shefrin and Thaler, 1988). The division of mental accounts can become blurred with the change of wealth. People usually classify windfalls such as unexpected capital gains as current assets, while the sale of a security asset is usually classified as current income (Hatsopoulos *et al.*, 1989; Summers and Carroll, 1987), and will thus impact behavior accordingly.

Behavioral Life Cycle theory also assumes the short-term MPC changes with wealth. Behavioral Life Cycle theory suggests that different scales of wealth change have different MPC (Thaler, 1990). Usually a small one-off income is classified as the account of current income while a large one-off income is usually classified as current assets (Shefrin and Thaler, 1988), so the small one-off income has a higher MPC than the larger one-off income. Finally, larger wealth has a higher MPC than smaller wealth in the same mental account. In summary, Behavioral life cycle hypothesis generally follows behavioral economics and emphasizes the key impact of psychological factors on consumer behavior, which is more realistic and has often been overlooked by the traditional economic analysis until recently. Therefore, this paper studies the impact of different income sources on farmer consumption based on Behavioral Life Cycle Hypothesis.

There have been only a few studies that focus on the marginal propensity to consume from different income sources. Currently there are two primary streams of literature on this topic. First, the impact of different income sources on saving has been examined. Cagan (1965), Green (1981), Shefrin and Thaler (1988) show the propensity to save income from different sources varies such that different income sources are

not always completely fungible. A second line of research studied effects of different income on some types of consumption. Levin (1998), using the behavioral life cycle savings model, asserted that consumer expenditure is more sensitive to changes in current income and assets compared to other types of assets, such as housing and social security. Hymans and Shapiro (1976) used household survey data of 5,000 U.S. households from 1968 to 1972 and found that transfer payments and subsidies have higher MPC than wages and other income. Peter Kooreman (2000) examined the Child Benefit System and found that propensity to consume out of income from Child Benefit in one-child families on children's clothing is higher than income from other sources. However, some researchers have argued that different income changes have a relatively stable MPC (Bradbury, 2004; Kwon *et al.*, 2006; Langemeier and Patrick, 1993). Holbrook and Stafford (1971) confirmed this view and stated that MPC of personal total revenue is only the weighted average propensity to consume out of different income sources, with the weight being the proportion of various income sources of total income.

In recent years, some scholars also addressed the effect of different sources of income on consumption. Zhao (1999) studied the impact of farm income and off-farm income on farm household consumption expenditure using the Chinese farmers household survey data in Sichuan Province from 1994-1995 and found that consumption increased by 0.4% when farm income increased by 1%, while consumption increased by only 0.005% when the migrant income increased by 1%. The reason why farm household agricultural operating income elasticity of consumption was much higher than that of migrant labor income is that migrant labor income is essentially seen as a sort of temporary income in China, and is important to save. Xu and Li (2009) further used rural resident consumption and living expenditure data from 1978 to 2007 to study the impact of various sources of income on rural resident consumption expenditure. They found that the consumption function has significant two-stage characteristics when sources of income change. Farm income showed a higher impact on consumption expenditure while wage income has a lower effect after the change of income sources. The impact of property income or transfer income on consumption changed significantly if they account for a higher proportion in gross annual income.

The effect of agricultural subsidies has drawn public attention in recent years in China and elsewhere (e.g. Floyd, 1965; Hennessy, 1998; Rashida *et al.*, 2013). For example, Dewbre and Mishra (2007) studied the impact of agricultural subsidies on the configuration of production factors, production, and consumption. Additionally, Sand (2002), Keeney (2009) and Whitaker (2009) examined the impact of different agricultural subsidies on consumer behavior and found the marginal propensity to consume income from direct subsidies is higher than that from price subsidies, loan subsidies or counter-cyclical subsidies. In summary, there are a few studies on the impact of different income sources on consumption and the effect of agricultural subsidies policy on farmers' production and consumption. However, the related research in China is still relatively limited.

This paper utilizes panel data of farm households in the northeast of China from 2002-2007 to study the impact of income from various sources on farm household consumption. As noted, this paper contributes to the existing literature in three areas. The existing literature explains differences on the marginal propensity to consume out of different income sources based on the income stability or variability while this paper will address this issue based on the impact of mental accounts on the consumption of farmers. Additionally, in terms of methods, we used generalized moment method (GMM) and farm household panel data to generate more accurate and reliable results (Baltagi, 1995; Greene, 2011). Finally, the study objectively evaluates the impact of policies of agricultural subsidies and government disaster relief measures on farm household consumption behavior and provides implications on making the most effective related governmental policies.

### 3. Methods

#### 3.1 Model

The lifecycle hypothesis states that a rational consumer makes consumption decisions according to the present value of total current resources. It also argues that current consumption is related to the current disposable income, lagged wealth, and the present value of future income (Ando and Modigliani, 1963). In the empirical analysis future income is generally assumed as given. However, Hall (1978) stated that empirical evidence is lacking to support the impact of other lagged variables ( $t-2$ ,  $t-3$ ,  $t-4$ ...) than the  $t-1$  lagged variables on current consumption and that the consumption at period  $t-1$  carries the information of these other lagged variables.

Combined with Life Cycle Hypothesis and the conclusion of Hall (1978), Langemeier and Patrick (1990) and Carriker *et al.* (1993) assume the consumption function is

$$C_t = \beta_0 + \beta_1 Y_t + \beta_2 C_{t-1} + \beta_3 W_{t-1} \quad (1)$$

where  $t$  is time,  $C_t$  and  $C_{t-1}$  are current and lagged consumption,  $Y_t$  is current disposable income, and  $W_t$  is current wealth.  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  are parameters to be estimated, where  $\beta_0$  is autonomous consumption,  $\beta_1$  is MPC of gross disposable income,  $\beta_2$  and  $\beta_3$  measure the impact of lagged consumption and current wealth on current consumption, respectively.

Life Cycle Hypothesis shows different income sources are completely fungible, so Equation 1 equals to

$$\begin{aligned} C_t &= \beta_0 + \beta_1 (Y_{1t} + Y_{2t} + \dots + Y_{zt}) + \beta_2 C_{t-1} + \beta_3 W_{t-1} \\ &= \beta_0 + \beta_1 \sum_{i=1}^z Y_{it} + \beta_2 C_{t-1} + \beta_3 W_{t-1} \end{aligned} \quad (2)$$

where  $Y_{it}$  is income from source  $i$  at time  $t$ ,  $i=1, 2, \dots, z$ . All other variables are as previously defined in Equation 1. Obviously, Equation 2 would not hold if different income sources are not fungible.

We change Equation 1 into Equations 3a-c based on Shefrin and Thaler (1988) and the hypothesis that different income sources are not fungible.

$$\lambda_1 C_t = \beta_{01} + \beta_{11} Y_{1t} + \beta_{21} C_{t-1} + \beta_{31} W_{t-1} \quad (3a)$$

$$\lambda_2 C_t = \beta_{02} + \beta_{12} Y_{2t} + \beta_{22} C_{t-1} + \beta_{32} W_{t-1} \quad (3b)$$

$$\vdots \quad \quad \quad \vdots$$

$$\lambda_z C_t = \beta_{0z} + \beta_{1z} Y_{zt} + \beta_{2z} C_{t-1} + \beta_{3z} W_{t-1} \quad (3c)$$

where  $\lambda_i$  is an unknown impact of income  $i$  on consumption and  $\sum_{i=1}^z \lambda_i = 1$ . All other variables are as previously defined in Equation 1.

Equations 3a to 3c cannot be estimated directly, but we can get Equation 4 by summing Equations 3a to 3c.

$$\begin{aligned} C_t &= \sum_{i=1}^z \lambda_i C_t \\ &= \sum_{i=1}^z (\beta_{0i} + \beta_{1i} Y_{it} + \beta_{2i} C_{t-1} + \beta_{3i} W_{t-1}) \\ &= \beta_0^* + \sum_{i=1}^z \beta_{1i} Y_{it} + \beta_2^* C_{t-1} + \beta_3^* W_{t-1} \end{aligned} \quad (4)$$



where  $\beta_0^* = \sum_{i=1}^z \beta_{0i}$ ,  $\beta_2^* = \sum_{i=1}^z \beta_{2i}$ ,  $\beta_3^* = \sum_{i=1}^z \beta_{3i}$ .  $\beta_0^*$  is the intercept,

$\beta_{1i}$  is propensity to consume out of different income sources,

$\beta_2^*$  is the impact of lagged consumption on current consumption, and

$\beta_3^*$  is the impact of current wealth on current consumption.

We have two models denoted as Equations 5 and 6, respectively based on Equations 1 and 4. Equation 5 means different income sources are fungible, while Equation 6 means different income sources are not fungible.

$$C_{it} = \alpha_i + \beta_1 Y_{it} + \beta_2 C_{it-1} + \beta_3 W_{it-1} + \varepsilon_{it} \quad (5)$$

$$C_{it} = \alpha_i^* + \sum_{i=1}^z \beta_{1i} Y_{it} + \beta_2^* C_{it-1} + \beta_3^* W_{it-1} + \eta_{it} \quad (6)$$

where  $\varepsilon_{it}$  and  $\eta_{it}$  are random errors;  $\alpha_i$  and  $\alpha_i^*$  are intercepts.

Generally, there are two kinds of methods to analyze panel data – the random effects model and the fixed effects model. Based on the Hausman test results, fixed effect models should be adopted for our analysis (Table 2). However, because the lagged dependent variable (which is also the independent variable in Equations 5 and 6) is correlated with the random error term, fixed effect models can yield biased or inconsistent estimation results (Baltagi, 1995; Nickell, 1981). Thus, difference generalized moment method (difference GMM) is utilized to obtain an unbiased and consistent estimation results. However, difference GMM is vulnerable to the dynamic panel data with short time span and large cross sections (Roodman, 2009). Blundell and Bond (1998) proved that the system generalized moment method (System GMM) is superior to difference GMM under for dynamic panel data with short time span and large cross sections. System GMM uses first order difference of the lagged dependent variable as an instrumental variable in the level equation and treats the lagged dependent variable as an instrumental variable in the difference equation so that it takes full advantages of the information from both the difference equation and the level equation to decrease estimation bias and inconsistency effectively. Therefore, system GMM is adopted in our study. Additionally, we test the correlation between the lagged dependent variable and random error term and the effectiveness of instrumental variable through AR test and Hansen test to ensure the validity of the estimated results. (Blundell and Bond, 1998).

### 3.2 Data

The data in this study comes from the national rural socio-economic survey, conducted by the Office of Rural Fixed-Observation Points (ORFP) at the Ministry of Agriculture in China. Started in 1986, this program has run annually except for a temporary discontinuation between 1992 and 1994 due to financial reasons (Chen *et al.*, 2010). It was initiated in 28 provinces and municipalities, and recently was extended to all provincial-level units on the Chinese mainland. Three to twenty representative villages are selected in a provincial unit by the local ORFP office, depending on its rural population. The farm households within a village were randomly sampled. Once a farm household was selected, it was recorded as a fixed-observation point and is surveyed subsequently until it could not be tracked due to reasons such as immigration, death, or family division. There are over 20,000 households in this system. The annual survey questions are comprehensive, covering the farm households' socio-economic characteristics and behaviors, including but not limited to family composition, land, assets, production, and consumption (Xu *et al.*, 2012). Contents of the survey cover six parts including basic conditions, situation of production and products sale, family business, annual family balance, annual cash balance, and main food consumption.

We used panel survey data of farm households in northeastern China between 2003 and 2008, including 912 households in Liaoning Province, 751 households in Jilin Province and 478 households in Heilongjiang Province based on the fact that the northeastern China accounts for about one fifth of the national grain yield, where Heilongjiang is the largest grain-producing province accounting for 10% of grain yields in China

(CMOA, 2012). Compared with Henan and Sichuan Province, Heilongjiang and Jilin are the new granaries of China (Peng *et al.*, 2018); their grain yield is significantly higher than that of Henan and Sichuan, accounting for 15.86% of the total in 2016. The representative villages were selected using stratified sampling strategy and then the farm households are randomly sampled from a village.

The sample data shows that sources of household income in these three northeastern provinces are diversified with the economic and social development in recent years. For example, on average, per capita net annual income was 4,467 RMB<sup>1</sup> from 2002-2007, where farm income was 2,495 RMB, off-farm income was 1,276 RMB, property income was 238 RMB, and transfer income was 458 RMB. The sample data was consistent with NBSC (2008) which shows per capita net income was 4,348 RMB in northeastern China, where farm income was 2,764 RMB, off-farm income was 1,049 RMB, property income was 216 RMB, and transfer income was 319 RMB. In the empirical analysis, the dependent variable is per capita consumption, and independent variables include per capita net income, net household per capita farm income, per capita off-farm income, per capita property income, per capita transfer income, lagged per capita consumption and lagged per capita housing area. In theory, per capita wealth should include housing equity, financial assets, deposits, and net fixed assets, but it is difficult to gather those data. Therefore, following Zhu *et al.* (2009) we use per capita housing area as the proxy variable of current wealth. Variable definition and summary statistics are presented in Table 1.

<sup>1</sup> 10 RMB = 1.45 USD, calculated on the basis of the exchange rate on August 15, 2018.

**Table 1.** Variable definition and summary statistics (in RMB).

Variable	Definition	Mean	SD	Min	Max
Per capita consumption	Per capita expenditure on necessities of life, fuel, insurance and life service	2,441	2,160	170	53,369
Lagged per capita consumption	Per capita expenditure at time t-1	2,128	1,810	170	46,836
Per capita net income	Gross annual per capita income minus gross annual per capita expenditure	4,467	3,884	-3,898	106,669
Net per capita farm income	Per capita farm gross income minus per capita production and business operation costs	2,495	3,204	-56,800	159,824
Per capita off-farm income	Per capita migrant labor income, business income and village cadres wage income	1,276	2,664	0	83,333
Per capita property income	Per capita interests, stock bonus, income from leasing and sale property	238	1,138	0	41,020
Per capita transfer income	Per capita private and government transfer income	458	1,439	0	57,120
Per capita agricultural subsidy	Direct subsidies to grain producers and subsidy from returning farmland to forests and grassland	195	864	0	5,662
Per capita disaster relief	Per capita disaster relief and compensation	6	94	0	8,365
Per capita private transfer income	Income from relatives and friends	263	1,140	0	34,500
Per capita housing area	Per capita housing area (square meter per person) as the proxy variable of wealth	28	66	5	67

## 4. Results

Estimated results are shown in Table 2. Regression 1 illustrates the result of Equation 5 with the assumption that different income sources are fungible while Regression 2 shows the result of Equation 6 with the assumption that different income sources are not fungible. Regression 3 shows the estimation result in Equation 6 again after the transfer income is divided into agricultural subsidy and disaster relief based on Zhao (1999) so that impacts of these two income sources on farmer household consumption can be examined.

Regression 1 results show farm household consumption is significantly affected by current net income and lagged consumption. However, housing area per capital (a proxy for the wealth) has no significant impact on consumption. Additionally, MPC of net income is 0.32 for farmers while the propensity is higher than 0.51 for urban citizens (Fang and Zhang, 2011; Gu *et al.*, 2009; Ye, 2007). The findings show that Chinese farm households have a higher propensity to save and lower propensity to consume, as traditional economic theory predicts.

Results from Regression 2 confirm that the propensities to consume out of different income sources have significant differences. It indicates that different farm household income sources are not fungible, which is consistent with the behavior Life Cycle Hypothesis originally proposed by Shefrin and Thaler (1988). Additionally, the income sources can be ranked from highest to lowest based on the correlated propensity to consume: transfer income, property income, agricultural management income, off-farm income and wealth. Transfer income and property income are associated with a higher propensity to consume, which is also consistent with findings by Carriker *et al.* (1993), Sand (2002), and Whitaker (2009). In China, most private transfer income and government transfer income represent one-off income. Table 1 shows government or private transfer income only accounts for a small proportion in the net income, so households

**Table 2.** System generalized moment method (GMM) estimation results.<sup>1</sup>

Explanatory variable	Regression 1	Regression 2	Regression 3
Intercept	896.35*** (166.91)	1,323.17*** (111.69)	1,373.52*** (119.52)
Lagged per capita consumption	0.42*** (0.08)	0.25*** (0.04)	0.26*** (0.04)
Net per capita income	0.32*** (0.09)	—	—
Net per capita farm income	—	0.09*** (0.02)	0.09*** (0.02)
Per capita off-farm income	—	0.08*** (0.02)	0.08*** (0.02)
Per capita property income	—	0.21** (0.08)	0.20** (0.08)
Per capita transfer income	—	0.51*** (0.11)	—
Per capita agricultural subsidy	—	—	0.15 (0.45)
Per capita private transfer income	—	—	0.50*** (0.11)
Per capita disaster relief	—	—	0.58 (0.49)
Lagged per capita housing area	0.06 (0.14)	0.01 (0.09)	0.01 (0.09)
Wald chi	Wald chi(3)=87.22 $P > \chi^2 = 0.00$	Wald chi(6)=124.00 $P > \chi^2 = 0.00$	Wald chi(8)=123.93 $P > \chi^2 = 0.00$
AR(1) test	0.00	0.00	0.00
AR(2) test	0.46	0.61	0.63
Hansen test	Chi(24)=58.16 $P > \chi^2 = 0.00$	Chi(57)=151.11 $P > \chi^2 = 0.00$	Chi(57)=153.09 $P > \chi^2 = 0.00$
Hausman test	chi2(3) = 4,504.66 $P > \chi^2 = 0.00$	chi2(6) = 6,434.25 $P > \chi^2 = 0.00$	chi2(8) = 7,082.66 $P > \chi^2 = 0.00$
Valid observations	11,214	11,214	11,214

<sup>1</sup> \*\*\*, \*\* and \* denote significance at 1, 5 and 10% levels, respectively, and numbers in parentheses are SEs. Since the estimated SEs in two-step System GMM are biased, results shown in the table are all from one-step System GMM. Estimation procedures in details can be found in Roodman (2009).



classify transfer income as current income with a resulting high MPC. This is consistent with findings and predictions by Hymans and Shapiro (1976) and Shefrin and Thaler (1988). Moreover, the MPC of property income is high since farm household property income in China mainly comes from property rental and sale while interests and dividends during the transaction are almost negligible; most people classify property income into the account of current income (Thaler, 1990). Rental income mainly comes from land lease or subcontract for Chinese farmers, and this rental income is persistent since farmers have the right to use rural land for a long term, land is often regarded as the last safeguard by farmers, land has special emotion and affection for farm household in China, thus the related MPC is reasonably higher. Net farm income has a larger impact on consumption than off-farm income because the major off-farm income of Chinese farmers comes from migrant working which farmers tend to regard as a temporary activity under the dual urban-rural household registration management system in China (Zhao, 1999) and that off-farm income in developing countries is generally viewed as a way to smooth consumption fluctuation (Anderson *et al.*, 1995; Kwon *et al.*, 2006; Lamb, 2003; Sumner, 1982) even if agricultural management income remains its level (Mishra and Sandretto, 2002).

Regression 3 estimates the results when transfer income is further divided into disaster relief income and agricultural subsidy income. The results show the following income sources have significant impact on the propensity to consume: private transfer income, property income, farm income, and off-farm income. The reason why private transfer income is of more significance than agricultural subsidy income (government transfer income) is that in the same account, the private transfer income account has a higher balance than the agricultural subsidy as shown in Table 1. The MPC of property income doubles that of farm income or off-farm income, so it is more effective for government to expand domestic demand by increasing farm property income, particularly farmland rental income as opposed to farm income and off-farm income. Disaster relief policy is an *ex-post* mechanism to compensate farmers' farm income loss and helps smooth household consumption volatility. Our results indicate that disaster relief income has an insignificant impact on household consumption, due to limited agricultural insurance and social security systems in China's rural areas. In China, farmers have very low health insurance (a new type of cooperative medical insurance), no accident, unemployment, and maternity insurance, so they must cope with all risks through high savings.

We also studied the effect of the agricultural subsidy, that is, the direct subsidy to grain production since 2004, on farm household consumption. The result shows that agricultural subsidy income has no significant impact on consumption so the effect of agricultural subsidy on consumption may be less than that on production. Because the government implements the agricultural subsidy policy to increase agricultural output rather than provide farmers' income and increase the consumption of farmers, the absolute number of agricultural subsidies is relatively small relative to the farmers' income.

## 5. Conclusions and policy implications

Traditional economics often assumes different sources of wealth are fungible and can be simply summed into a single wealth figure with different sources having no differential impact on consumption (Cartwright, 2011). The behavioral economics literature shows that this assumption should be relaxed (Belsky and Gilovich, 2010; Cartwright, 2011; Montier, 2003; Thaler, 1990), and our results are generally consistent with expectations from behavioral economics. Consistent with the research utilizing behavioral economics and prospect theory (Belsky and Gilovich, 2010; Kahneman, 2011; Leung and Tsang, 2013; Shefrin, 2002; Thaler, 1990) our study divided China's farm household income into different sources including farm and off-farm income, property income, and transfer income, and utilized the system GMM method to analyze the different income sources' impacts on MPC. The findings showed that different income sources are not fungible. Moreover, we found that farmers would allocate their various income sources into different mental accounts, and their propensities to consume out of different income sources vary considerably. We also found that private transfer income has a greater impact on consumption than government transfer income such as agricultural subsidies and disaster relief.

Our results have several research contributions and policy implications. First, in terms of theory, the psychological factors do affect the economic behavior of farmers, but they have commonly been neglected by traditional economic analysis until recently (Cartwright, 2011; Kahneman, 2011). Psychological factors from behavioral economics are helpful in conventional economic analysis in understanding decision-making in general, as well as consumer choices (Cartwright, 2011; Kahneman, 2011; Shefrin, 2002). This study also contributes to the theory of the Life Cycle Hypothesis by considering the impact of the mental accounts and the different sources of farm households' income on the marginal propensity to consume. Empirically, this contributes to the literature on the consumption of Chinese farm households, which represents a large segment of China's populations.

Second, our results indicate that the MPC of agricultural subsidy and disaster relief proved to be high since farmers typically classify these as current disposable incomes. But maybe because agricultural subsidy and disaster relief just account for a small proportion of disposable income, their impact on consumption is not significant. Based on the findings that different sources of income have varied effects on the farm household economic behaviors, the Chinese government can support agriculture development based on the scale of agricultural subsidies, the type of subsidy, the frequency of payment, and the relative requirement of subsidies as different agricultural supports or subsidies will have a different impact on farmers' economic behavior. China agricultural subsidies include direct subsidies for grain growing, for improved varieties, and subsidies for purchasing agricultural machinery and the like. The initial goal of direct agricultural subsidy was to promote grain production. But in fact, it has become a kind of income subsidy because it is based on farmland scale according to the household contract responsibility system, regardless of whether grain is grown. And hence a part of the direct subsidy for grain growing has been consumed, which in turn improves farm household consumption. The other three are related to grain production, and thus they belong to production subsidies. If government would like to achieve its initial goal of stimulating agricultural development, agricultural subsidies should be more closely tied to production.

Finally, this study also has policy implications for emerging economies that are struggling with agricultural earnings and ways to enhance rural consumption and expand domestic demand to stimulate economic growth. Researchers and policymakers in China alike agree that it is vital to increase property income (like full ownership of farmland) and off-farm income while promoting China's rural consumption by expanding domestic demand. This will also encourage rural health improvements and growth through these important consumption levers (Carlson *et al.*, 2014; Huang, 2008). Huang (2008, 2010) has argued that given the size of China's rural population, policymakers in China should place a greater emphasis on increasing rural income and consumption, both of which have significantly lagged their urban counterparts in recent years. This can be achieved in part by adding income opportunities to farmers that are more effective in terms of their MPC while improving property rights, commercial institutions, and addressing land use concerns (De Soto, 2000; Young *et al.*, 2014). Given the importance of the welfare of the rural Chinese and their contribution to the economy, driving farm household consumption is a key policy lever in maintaining steady economic growth and stable social structures (Rodrik, 2017) while rebalancing the growth and income in China's economy.

## Acknowledgments

This paper is supported with the funding from Natural Science Foundation of China (Numbers 71473165, 71333010, 71773076, 71473163, and 71673186), the National Planning Office of Philosophy and Social Science (No. 14CJY082 and 15CGL008) and the Key Project of Philosophy and Social Science Research in Colleges and Universities in Jiangsu Province (No. 2017ZDIXM106). We also thank the guidance from Professor Qinghua Shi at Shanghai Jiao Tong University.

## References

- Ahlstrom, D. 2010. Innovation and growth: how business contributes to society. *Academy of Management Perspectives* 24: 10-23.
- Ahlstrom, D. 2015. Innovation and growth in emerging economies. In: *Austrian council for research and technology development. Designing the future: economic, societal, and political dimensions of innovation*. Echomedia, Vienna, Austria, 353-387.
- Anderson, J.R., A.T. Corbett, K. Koedinger and R. Pelletier. 1995. Cognitive tutors: lessons learned. *The Journal of Learning Sciences* 4: 167-207.
- Ando, A. and F. Modigliani. 1963. The life cycle hypothesis of saving: aggregate implications and test. *American Economics Review* 53: 55-84.
- Baltagi, B.H. 1995. *Economic analysis of panel data*. Wiley, New York, NY, USA.
- Barro, R.J. and X. Sala-i-Martin. 2004. *Economic Growth*. The MIT Press, Cambridge, MA, USA.
- Belsky, G. and T. Gilovich. 2010. *Why smart people make big money mistakes and how to correct them: lessons from the life-changing science of behavioral economics*. Simon and Schuster, New York, NY, USA.
- Blake, D. 2004. The impact of wealth on consumption and retirement behaviour in the UK. *Applied Financial Economics* 14: 555-576.
- Blundell, R and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115-143.
- Bradbury, B. 2004. Consumption and the within-household income distribution: outcomes from an Australian "Natural Experiment". *Cesifo Economic Studies* 50 (3): 501-540.
- Cagan, P. 1965. *Determinants and effects of changes in the stock of money*. NBER, Columbia University Press, Washington, DC, USA, pp. 1875-1960.
- Carlson, A., D. Dong and M. Lino. 2014. Association between total diet cost and diet quality is limited. *Journal of Agricultural and Resource Economics* 39: 47-68.
- Carriker, G.L., M.R. Langemeier, T.C. Schroeder and A.M. Featherstone. 1993. Propensity to consume farm family disposable income from separate sources. *American Journal of Agricultural Economics* 75: 739-744.
- Cartwright, E. 2011. *Behavioral economics*. Routledge, Abingdon, UK.
- Carvalho, L. and A. Rezai. 2016. Personal income inequality and aggregate demand. *Cambridge Journal of Economics* 40: 491-505.
- Chen B., M. Lu and N. Zhong 2010. Household consumption constrained by Hukou system (in Chinese). *Economic Research* 1: 62-71.
- China Ministry of Agriculture (CMOA). 2012. *China Agricultural Yearbook*. China Agriculture Press, Beijing, China P.R.
- Christensen, C.M. 2006. The ongoing process of building a theory of disruption. *Journal of Product Innovation Management* 23: 39-55.
- Cialdini, R.B. 2006. *Influence: the psychology of persuasion*. Harper Business, New York, NY, USA.
- Courant, P., E. Gramlich and J. Laitner. 1986. A dynamic micro estimate of the life cycle model. *Retirement and Economic Behavior* 10: 832-857.
- Dewbre, J. and A. Mishra. 2007. Impact of program payments on time allocation and farm household income. *Journal of Agricultural and Applied Economics* 39: 489-505.
- De Soto, H. 2000. *The mystery of capital: why capitalism triumphs in the west and fails everywhere else*. Basic Books, New York, NY USA.
- Ding, S. and J. Knight. 2009. Can the augmented Solow model explain China's remarkable economic growth? A cross-country panel data analysis. *Journal of Comparative Economics* 37: 432-452.
- Enright, M.J., E. Scott and K-M. Chang. 2005. *Regional powerhouse: the greater Pearl River Delta and the rise of China*. John Wiley, New York, NY, USA.
- Fang, F. and Y. Zhang. 2011. Marginal propensity to consume and tendency of different incomes of urban and rural residents. *Finance and Trade Economics* 4: 22-30 (in Chinese).
- Friedman, M. 1957. *A theory of the consumption function*. Princeton University Press, Princeton, NJ, USA.

- Floyd, J.E. 1965. The effects of farm price supports on the returns to land and labor in agriculture. *Journal of Political Economy* 73: 148-158.
- Green, F. 1981. The effect of occupational pension schemes on saving in the United Kingdom: a test of the life cycle hypothesis. *Economic Journal* 91: 136-154.
- Greene, W.H. 2011. *Econometric analysis* (7 ed.). Prentice Hall, New York, NY, USA.
- Gu, B., H. Li, and H. Ye. 2009. The Study of the marginal propensity of consumption of urban and rural residents in china. *Journal of Financial Research* 3: 199-206 (in Chinese).
- Hall, R.E. 1978. Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence. *Journal of Political Economy* 86: 971-987.
- Holbrook, R. and F. Stafford. 1971. The propensity to consume separate types of income: a generalized permanent income hypothesis. *Econometrica* 39: 1-21.
- Hubbard, R.G and P. Navarro. 2011. *Seeds of destruction: why the path to economic ruin runs through Washington, and how to reclaim American prosperity*. FT Press, New York, NY, USA.
- Hymans, S.H. and H.T. Shapiro. 1976. The allocation of household income to food consumption. *Journal of Econometrics* 42: 167-188.
- Hatsopoulos, G.N., P.R. Krugman and M.P. James. 1989. *Overconsumption: the challenge to U.S. economic policy*. American Council for Capital Formation, Center for Policy Research, Washington, DC, USA.
- Hennessy, D.A. 1998. The production effects of agricultural income support policies under uncertainty. *American Journal of Agricultural Economics* 80: 46-57.
- Huang, Y. 2008. *Capitalism with Chinese characteristics: entrepreneurship and state during the reform era*. Cambridge University Press, New York, NY, USA.
- Huang, Y. 2009. *Hukou system and government land ownership: effects on rural migrant workers and on rural and urban hukou residents*. Paper prepared for the OECD conference on Global Development Outlook, November 22, 2009. OECD, Paris, France.
- Huang, Y. 2010. Debating China's economic growth: The Beijing consensus or the Washington consensus? *Academy of Management Perspectives* 24: 31-47.
- Huang, P. and Z. Cui. 2005. *China and globalization: Washington consensus or Beijing consensus?* Social Science Academic Press, Beijing, China, P.R.
- Kahneman, D. 2011. *Thinking, fast and slow*. Farrar, Straus and Giroux, New York, NY, USA.
- Kahneman, D. and A. Tversky. 1979. Prospect theory: an analysis of decision under risk. *Econometrica* 47: 263-291.
- Keeney, R. 2009. Transfer efficiency and distributional impacts of US farm support: evidence from a macro-micro simulation. *American Journal of Agricultural Economics* 91: 1289-1295.
- Kooreman, P. 2000. The labeling effect of a child benefit system. *American Economic Review* 90: 571-583.
- Kwon, C.W., P.F. Orazem and D.M. Otto. 2006. Off-farm labor supply responses to permanent and transitory farm income. *Agricultural Economics* 34: 59-67.
- Lamb, R. 2003. Fertilizer use, risk, and off-farm labor markets in the semi-arid tropics of India. *American Journal of Agricultural Economics* 85: 359-371.
- Langemeier, M.R. and G.F. Patrick. 1990. Farmers' marginal propensity to consume: an application to Illinois grain farms. *American Journal of Agricultural Economics* 72: 309-316.
- Langemeier, M.R. and G.F. 1993. Patrick. Farm consumption and liquidity constraints. *American Journal of Agricultural Economics* 75: 479-484.
- Lee, H.K and M.K. Kong. 2000. Consumption of durable goods and tests of the permanent income hypothesis: evidence from Korean macro data. *Applied Economics* 32: 39-44.
- Leung, T.C. and K.P. Tsang. 2013. Anchoring and loss aversion in the housing market: implications on price dynamics. *China Economic Review* 24: 42-54.
- Levin, L. 1998. Are assets fungible? Testing the behavioral theory of life-cycle savings. *Journal of Economic Behavior and Organization* 36: 59-83.
- Liu, X., P. Burridge and P. J. Sinclair. 2002. Relationships between economic growth, foreign direct investment and trade: evidence from China. *Applied Economics* 34: 1433-1440.
- McCloskey, D.M. 2016. *Bourgeois equality: how ideas, not capital or institutions, enriched the world*. University of Chicago Press, Chicago, IL, USA.



- Mishra, A.K. and C.L. Sandretto. 2002. Stability of farm income and the role of nonfarm income in US agriculture. *Review of Agricultural Economics* 24: 208-221.
- Montier, J. 2003. *Behavioural finance: insights into irrational minds and markets*. John Wiley and Sons, Chichester, UK.
- National Bureau of Statistics of China (NBSC). 2008. *China statistics yearbook*. China Statistics Press, Beijing, China, P.R.
- Nickell, S. 1981. Biases in dynamic models with fixed effects. *Econometrica* 49: 1417-1426.
- Parker, J. 2009. Burgeoning bourgeoisie: a special report on the new middle classes in emerging markets. *The Economist*, February 14. Available at: <https://www.economist.com/sites/default/files/special-reports-pdfs/13092764.pdf>.
- Peng, X., Q. Shi and X. Zhu. 2018. The source of China's grain production growth (2000-2013) (in Chinese). *Agricultural Economic Problem* 1: 97-109.
- Pickett, K.E. and R.G. Wilkinson. 2015. Income inequality and health: a causal review. *Social Science and Medicine* 128: 316-326.
- Pitelis, C.N. 1987. Corporate retained earnings and personal sector saving: a test of the life-cycle hypothesis of saving. *Applied Economics* 19: 907-913.
- Rashida, S., N. Teferab, N. Minota and G. Ayelec. 2013. Can modern input use be promoted without subsidies? An analysis of fertilizer in Ethiopia. *Agricultural Economics* 44: 595-611.
- Ravallion, M. and S. Chen. 2007. China's (uneven) progress against poverty. *Journal of Development Economics* 82: 1-42.
- Rodrik, D. 2017. *Straight talk on trade: ideas for a sane world economy*. Princeton University Press, Princeton, NJ, USA.
- Roodman, D. 2009. How to do xtabond2: an introduction to difference and system GMM in Stata. *Stata Journal* 9: 86-136.
- Sand, R. 2002. The propensity to consume income from different sources and implications for saving: an application to Norwegian farm households. In: *International agricultural policy reform and adjustment project workshop on the farm household-firm unit: its importance in agriculture and implications for statistics*. Wye Campus, Imperial College. Available at: <https://core.ac.uk/download/pdf/6407984.pdf>.
- Shefrin, H.M. 2002. *Beyond Greed and fear: understanding behavioral finance and the psychology of investing*. Oxford University Press, Oxford, UK.
- Shefrin, H.M and R.H. Thaler. 1988. The behavioral life-cycle hypothesis. *Economic Inquiry* 26: 609-643.
- Shambaugh, D. 2013. *China goes global: the partial power*. Oxford University Press, Oxford, UK.
- Solt, F. 2016. The standardized world income inequality database. *Social science quarterly* 97: 1267-1281.
- Song, H., P. Romilly and X. Liu. 1998. The UK consumption function and structural instability: improving forecasting performance using a time-varying parameter approach. *Applied Economics* 30: 975-983.
- Sumner, D.A. 1982. The off-farm labor or supply of farmer. *American Journal of Agricultural Economics* 64 (3): 499-509.
- Summers, L. and C. Carroll. 1987. Why is the U.S. saving rate so low? *Brooking Papers on Economic Activity* 75: 607-635.
- Thaler, R.H. 1990. Anomalies saving, fungibility, and mental accounts. *Journal of Economic Perspectives* 4: 193-205.
- Thaler, R. and C. Sunstein. 2015. *Improving decision about health, wealth and happiness*. China Citic Press, Beijingm, China, P.R. (in Chinese).
- Whitaker, J.B. 2009. The varying impacts of agricultural support programs on US farm household consumption. *American Journal of Agricultural Economics* 91: 569-580.
- Xu, C., H. Wang and Q. Shi. 2012. Farmers' income and product responses to rural taxation reform in three regions in China. *Journal of Agricultural Economics* 63 (2): 291-309.
- Xu, H. and J. Li. 2009. The effect of different kinds of income on farmer consumption, *Economic Review* 3: 44-46 (in Chinese).
- Ye, Z. 2007. An empirical study on the marginal consumption tendencies of the urban residents of our country. *Economic Survey* 6: 64-66 (in Chinese).



- Young, M.N., T. Tsai, X. Wang, S. Liu and D. Ahlstrom. 2014. Strategy in emerging economies and the theory of the firm. *Asia Pacific Journal of Management* 31: 331-354.
- Zhao, Y. 1999. Leaving the countryside: rural-to-urban migration decision in China. *American Economic Review* 89: 281-286.
- Zhu, X., X. Ma, and Q. Shi. 2009. An empirical analysis of reputation, wealth and rural credit rationing: study on the supply behavior of different rural financial organizations in less developed areas. *Journal of Finance and Economics* 35: 4-14 (in Chinese).