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The Role of Income Structure Improvement in Helping Broaden the Rural Consumer Market

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Abstract Too large urban-rural gap and weak rural consumption is the most significant problem in rural areas, and also an insurmountable barrier to the process of China's economic development. At the same time, the modernization of agriculture is proposed as the major policy for China to actively solve issues concerning agriculture, countryside and farmers. Using panel data model and taking into account the regional characteristics and time effects of the sample data, we conduct analysis of the farmers' income structure in the five provinces and one city of East China at the upper reaches of economy, and estimate the effects of farmers' income on farmers' consumer spending, in order to find the main channel for improving farmers' consumption. This paper emphasizes the great significance of farmers' consumption improvement to China's economic restructuring and solving the future economic development in the context of current financial crisis.

Key words The income structure, Rural areas, Consumer market

1 Introduction

1.1 Qualitative analysis Dual economic structure is China's basic national condition, and significant difference in the level of social development is reflected in imbalance in economic development between urban and rural areas. Especially in terms of consumption, urban and rural development is highly uneven, and there is a huge difference in the level of consumption. Increasing farmers' income is a fundamental way to improve the farmers' consumption level. Shan Yuli (2003) takes Fujian Province for example, to explore the impact of the rural reform, market construction, consumer environment, monetary income and other factors on the farmers' income and consumption, through the analysis of changes in farmers' income and consumption since the reform and opening up, in order to provide a theoretical basis for increasing farmers' income and improving the farmers' consumption level. Fu Min (2007) believes that on the one hand, China's consumption growth relies mainly on urban consumption, and from the preponderance of rural population, lagged rural consumption will inevitably affect the overall consumption growth seriously; on the other hand, there is greater potential and room for improving rural consumption. She also points out that the main reason for slow growth of the current urban residents' consumption is that the consumption of consumer durables has been basically saturated; in face of the future expected risks of income and expenditure, residents' propensity to save is always high.

The rural market capacity is relatively large, and serious overcapacity of the current industrial products, especially the consumer industrial products, is in stark contrast to reduced spending power of farmers. If turning the purchasing power of farmers into reality, it will definitely bring about substantial growth of con-

sumption, and promote investment and production, to play multiplier effect, thus contributing to the sound development of the economy. Farmers' income is related to the interests of farmers, and related to the overall economic development. Zhao Deqi (2008) pointed out that there were great changes in the income structure of farmers, and in order to improve the level of consumption of farmers, we could find better solutions through the perspective of farmers' income structure. Increasing farmers' income is also a key to solving issues concerning agriculture, countryside and farmers. Liu Fang (2010) studied the links between changes in farmers' income structure and farmers' income growth, to creatively point out that increasing farmers' income is not only of great significance to promoting farmers' consumption and putting in place the basic policy of expanding domestic demand, but also of great significance to promoting China to completely get rid of the onrush of international financial crisis, and propelling stable and sustained economic growth.

1.2 Quantitative analysis In the income structure of the Chinese farmers, different sources of income have different effects on farmers' consumption. Luo Jia (2007) conducted a stationary test of income and consumption, and found that the productive income from agriculture played a crucial role for farmers' consumption. In order to promote new socialist countryside construction, it is necessary to promote the development of modern agriculture, strive to improve farmers' income and expand rural consumption. GAO Mengtao *et al.* (2008) used the micro panel data of 1 420 rural households in China's eight provinces, and found that permanent income hypothesis, life cycle hypothesis and liquidity constraints hypothesis on farmers' consumer behavior were difficult to realize comprehensive interpretation of farmers' consumption.

Hang Bin (2009) included habit factors into buffer stock theory, and corrected the above three hypotheses to explain consumer behavior of Chinese farmers. Wang Jianyu *et al.* (2010) from the broad concept of income, proposed the concept of income nature

and research hypotheses, and conducted empirical analysis of the impact of income nature on farmers' consumption based on the panel data on 30 provinces (autonomous regions and municipalities) during the period 1997–2006. The empirical results show that: (i) In the case of given income values, the differences in the nature of income will make farmers' consumption exhibit significantly different characteristics of consumer behavior; (ii) Income growth and income permanency have a significant positive effect on farmers' consumption, and the improvement of income growth and income permanency will promote the expansion of farmers' consumption; (iii) Income uncertainty has a significant negative effect on farmers' consumption, to a certain extent, curbing the improvement of farmers' consumption.

On the basis of the previous studies, we mainly focus on observing the East China areas with similar natural and geographical conditions; we do not consider Taiwan due to the differences in the economic development patterns. Through sorting the data on rural residents' income and living consumer spending in five provinces and one city of East China during the period 1990–2011, we divide the income structure according to different sources of income of farmers. Based on the different effects of different nature of income in different regions on farmers' living consumer spending, coupled with the current economic development situation and issues concerning agriculture, countryside and farmers during modernization building, we use the panel data to propose the policy recommendations for helping to increase farmers' income and expand consumption in different cultural environments and policy preferences, according to the calculation results of model.

2 Data and model

2.1 Data and variables The data used in this article are the data on farmers' income and consumption in the five provinces and one city of East China (Fujian, Jiangsu, Shanghai, Shandong, Shanxi, Zhejiang) during the period 1990–2011. The data are from *Statistical Yearbook and Economic Statistics Communique* of the provinces and cities during the period 1991–2011. The natural conditions and factor endowments are similar in East China. The geographic conditions of 6 regions provide almost the same consumer environment, which ensures that we can focus the factor influencing consumption on the income structure. In addition, by the classification of nature of the income, we can clearly see the geographical differences in farmers' income. This paper uses the data on farmers' income and consumption of various provinces and cities for conversion.

2.2 Model

2.2.1 Model selection. In statistics and econometrics, the term panel data refers to multi-dimensional data frequently involving measurements over time. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same firms or individuals. In biostatistics, the term longitudinal data is often used instead, wherein a subject or cluster constitutes a panel member or individual in a longitudinal study. Time series and

cross-sectional data are special cases of panel data that are in one dimension only (one panel member or individual for the former, one time point for the latter). It can solve for the multicollinearity problems for time series analysis, and unit root test and co-integration analysis of panel data are the most cutting-edge areas.

In this study, we will use unit root test and co-integration test of panel data to examine the relationship between farmers' consumer spending and various incomes, and then build econometric model to quantify the intrinsic link between them.

2.2.2 Model introduction. Panel model can reflect the variation of the study object in the direction of time and cross-sectional unit at the same time, as well as the properties of different time and different units.

Meanwhile, due to the existence of individual effects in the data, each region's agricultural situation and spending habits have their own characteristics, so the general expression of the used panel data model is as follows:

$$y_{it} = y_i + \beta_i x_{it} + u_{it} \quad i = 1, 2, \dots, N \quad t = 1, 2, \dots, T \quad (1)$$

where i is the individual, t is the time; μ_{it} is trait error, reflecting the effects caused by unobserved factors; x_{it} contains the variables changing with time and individual, respectively, and the variables changing with time and individual, simultaneously; y_i is the individual effects, reflecting the individual heterogeneity of cross-sectional units.

The model reflects that there are individual effects and changing economic structure in the cross section for the analysis object.

2.3 F test When the analysis object has the model without individual effects and structural changes in cross section:

$$y_{it} = y + \beta x_{it} + u_{it} \quad (2)$$

When the analysis object has the model with individual effects but no structural changes in cross section:

$$y_{it} = y_i + \beta x_{it} + u_{it} \quad (3)$$

To make the model correctly estimate the object, we must first conduct F test to determine the changes in gradient and intercept in different cross-sectional sample points and time.

Hypothesis 1: The gradient is the same in different cross-sectional sample points and time, but the intercept is different.

F statistic is:

$$F_1 = \frac{(S_1 - S_2) / [(N-1)(K+1)]}{S_2 / [NT - N(K+1)]} \subset F[(N-1)(K+1), N(T-K-1)] \quad (4)$$

Hypothesis 2 Intercept and gradient are the same in different cross-sectional sample points and time. F statistic is:

$$F_2 = \frac{(S_3 - S_2) / [(N-1)(K+1)]}{S_2 / [NT - N(K+1)]} \subset F[(N-1)(K+1), N(T-K-1)] \quad (5)$$

S_1, S_2, S_3 in F statistic are the residual sum of squares of model (1), (2), (3), respectively; N is the number of cross-sectional sample points; T is the timing period; K is the number of independent variables.

Through testing, we adopt fixed-coefficient variable intercept panel model. G_{it} signifies the farmers' actual consumer spending in

region i , year t ; JT_{it} , GZ_{it} , ZY_{it} , CC_{it} signify farmers' net incomes from family operation, wage, transfer payments and property in various regions each year, respectively; j represents the lag period. All data have excluded the factors influencing prices. To smooth the volatility of the data, double logarithmic modes are adopted for the model:

$$\ln CC_{it} = \beta_0 + \beta_1 \ln JT_{it} (1-j) + \beta_2 \ln GZ_{it} (1-j) + \beta_3 \ln ZY_{it} (1-j) + \beta_4 \ln CC_{it} (1-j) + u_{it} \quad j=0, 1, 2, \dots \quad (6)$$

3 Empirical results

3.1 Estimation results of model without lags When $j=0$, we establish fixed-coefficient variable intercept model, to estimate the impact of actual net income of farmers on the living expenditure for the year, and the results are shown in Table 1.

As can be seen from Table 1, the consumption level of farmers is closely related with the income of the farmers, and the coefficients of explanatory variable are less than 1, confirming Keynes' hypothesis of propensity to consume less than 1. The income of farmers will not be fully used for consumption, and the portion of savings is not considered in this article. Family operating income, as one of traditional incomes for farmers, has greater impact on farmers' consumer spending than all other incomes, which shows that family operating income reflects the fact that agricultural pro-

duction is still the main pillar for the living of farmers. Transfer payments are the state subsidies to farmers, and relative to wage income and property income of farmers, transfer payments also have a significant impact on farmers' spending on living and consumption, reflecting the support of national and regional agricultural policy to agricultural development and improvement of farmers' living.

The rural labor transfer and increase in property income are not developed evenly in the vast rural areas, and not the main source of livelihood for farmers, thereby having limited impact on the living and consumption of farmers. In addition, regional differences also obviously manifest the role of regional economic development in promoting the growth of farmers' income. At the same time, the government's agricultural policy and transfer payments also play a role in orienting farmers' consumer spending. Shanghai maintains the position of leader in the whole region, which also proves the fact that regional development and social security are both strong support to living and consumer spending of farmers.

3.2 Estimation results of model with lags The model introduces lag, namely $j=1, 2, 3, 4, 5$. We calculate the statistic of S_1, S_2, S_3, F_1, F_2 of various lag models, respectively, and the measurement results also meet the conditions for fixed-effects variable intercept model. The estimation results are shown in Table 2.

Table 1 The estimation results of fixed-coefficient variable intercept model of farmers' net income to consumer spending in East China

Variable	Coefficient	Standard deviation	T statistic	Probability value	
C	0.986 860 24	0.160 973	6.1305 838	6.130 583 839	
ln(JT)	0.436 342 67	0.082 196	5.308 584 2	5.308 584 216	
ln(GZ)	0.139 052 05	0.044 944	3.093 915 1	3.093 915 092	
ln(CC)	0.105 946 75	0.036 802	2.878 864	2.878 863 952	
ln(ZY)	0.181 729 34	0.037 267	4.876 404 4	4.876 404 417	
Fixed effects (cross-section)					
Jiangsu	-0.002 021 1	Zhejiang	-0.008 806	Fujian	-0.057 828
Shanghai	0.194 573 83	Shandong	-0.051177	Shanxi	-0.074 742
R-squared	0.981	ADJ R-squared	0.979	F-statistic	631.356

Table 2 The variable intercept model estimation results of lag fixed-effects of farmers' net income on consumer spending in East China

	1-year lag	2-year lag	3-year lag	4-year lag	5-year lag
C	1.386 5(7.338 7)	1.973 4(8.145 0)	2.549 1(8.978 9)	2.844 1(9.472 5)	2.889 9(9.346 6)
ln(JT)	0.321 0(3.345 7)	0.090 7(0.743 0)	-0.139 8(-0.980 6)	-0.277 8(-1.841 9)	-0.286 9(-1.849 6)
ln(GZ)	0.116 1(2.137 3)	0.158 3(2.237 1)	0.210 0(2.451 8)	0.328 3(3.483 3)	0.400 7(3.994 6)
ln(CC)	0.166 2(3.771 3)	0.206 0(3.596 9)	0.208 4(2.998 4)	0.128 7(1.701 2)	0.060 9(0.754 2)
ln(ZY)	0.116 1(3.608 0)	0.155 6(2.572 1)	0.168 4(2.227 4)	0.145 9(1.615 2)	0.102 1(0.964 4)
R-squared	0.972 0	0.950 4	0.924 1	0.905 3	0.893 8
ADJ R-squared	0.969 6	0.945 8	0.916 7	0.895 3	0.881 9
F-statistic	401.284 9	208.645 5	124.482 4	91.309 6	74.812 6

For the consumer spending, Keynes' absolute income hypothesis makes clear the relationship between current income and current consumption. And Friedman and Modigliani extend the consumer issues to long-term plan. Friedman believes that under infinite life conditions, permanent income is the most important factor affecting consumer spending; Modigliani holds that life is limited, and consumption expenditure will be in a relatively stable proportion. The common point of both is emphasizing the impact of in-

come in the previous period on the current consumption.

By comparing Tables 1 and 2, Keynes' absolute income hypothesis is to a certain extent in line with the empirical results. The net income of farmers in the current period has strong explanation for living and consumer spending of farmers in the current period; the degree of fitting of model without lags is higher than that of model with lags. From empirical point of view, if the lag period is longer, then its explanatory power for family operating

income is weaker, and its impact on current consumer spending will decline.

In addition, in the lag model, by judging the fixed effects from the intercept, Shanghai is still in a leading position, indicating that the impact of farmers' income on consumption also has continuity and persistence, and it is difficult to change the level of farmers' consumer spending throughout the region merely depending on the short-term transfer payment policy.

4 Conclusions and recommendations

Using panel data model, this article carried out an empirical research on the relationship between net income and living consumption expenditure of farmers in five provinces and one city of East China during the period 1990–2011.

4.1 Using the modernization of agriculture to promote steady growth of family operating income, to ensure consumer base unwavering

One of the most significant features of relationship between farmers' income and consumption in various regions is that family operating income is the main source of income of the farmers, and the most important support for farmers' living and consumer spending. The living consumption of farmers is to ensure the basic living conditions and meet their material and spiritual needs. The basic purpose of family operation is consistent with the purpose of living consumption, so the primary condition for raising farmers' consumption level is to improve farmers' family operating income, and the modernization of agriculture is closely related to it. It is necessary to implement the strategy of invigorating agriculture by science and technology, increase scientific and technological input to agriculture, and increase the contribution rate of high technology to agriculture; advocate educational guidance integration, increase the proportion of professional agricultural technical personnel, to improve the quality of farmers; gradually promote the large-scale production using machinery plan, widely promote the mechanization of rural basic working tools, to improve agricultural output power; realize industrialization of agriculture, increase agricultural self-accumulation and self-development capacity, and use the joint operation mode of production, supply and marketing to improve agricultural competitiveness. In short, the realization of agricultural modernization is the only way to improve the family operating income of farmers, and increase of the family operating income of farmers is the main driving force for promoting farmers' living consumption spending.

4.2 Using diversification of agricultural operating organizations to increase income sources for farmers and make rural consumption growth momentum inexhaustible

From the data analysis, we can see that the share of wage income and property income of farmers is small in the total income, and the contribution to consumer spending is not obvious, but there is a growing trend. At the same time, through the estimation of the lag model, we find that the accumulation effect of wage income and property income of farmers is significant, so improving the diversification of agricultural business organizations is the basis for the growth of

wage income and property income of farmers. It is necessary to improve regional cooperative organizations of farmers, perfect the agricultural management system for agricultural development in various regions, extensively propel the service industries related to the agricultural production in rural areas, form the integrated mode of production with eco-cycle characteristics combining forestry, animal husbandry, side occupation, fishery and other related industries, to make the agricultural operation in a virtuous cycle and self-sufficient state. According to the seasonal characteristics of the agricultural economy, coupled with the economic base in East China, there is much room for the growth of labor compensation income of farmers. Promoting the transformation of China's industrial structure, and combination of three industries, is also the focus of the modernization of agriculture. Increasing farmers' income is the main channel for promoting farmers' consumer spending, and the improvement of farmers' consumption can digest more industrial products.

4.3 Using transfer payment policy to strengthen security system in rural areas and consolidate farmers' consumption confidence

Transfer payment policy represents the national and regional support to agriculture. As China is attaching great importance to issues concerning agriculture, countryside and farmers, agricultural transfer payments have increased year by year, but what can not be ignored is the regional differences in the farmers' transfer payment income. From the collected data, the transfer income of farmers in Shanghai has a high starting point, with significant incremental rate; in addition, compared to other five provinces, Shanghai as the municipality has more direct and compact management of urban and rural areas, so both the policy preferences and geographical radiation effects in Shanghai, to some extent improve local farmers' consumer spending. Furthermore, increasing the proportion of farmers' transfer payment income is a booster for enhancing farmers' enthusiasm for labor. Compared with other industries, agriculture plays the fundamental important role. But because of this, the profits of agriculture is relatively low among various industries, so it is necessary to improve the proportion of transfer payments, and make farmers actively participate in the improvement of labor environment and technology innovation, to form a virtuous circle of the modernization of agriculture. In short, increasing farmers' income to promote the consumption of farmers, is the only way to achieve agricultural modernization. All regions need to rely on their own development characteristics and location advantages to increase farmers' income from expanding farmers' income channels and increasing agricultural support policies. The increase of farmers' living consumption is the a key for the industrial and service products to obtain greater space to digest. The economic level of East China is in the forefront of China, and solving the problems for farmers is a top priority for shortening the gap between urban and rural areas, which is also a stage to solve the large national income gap, so for the entire region, increasing farmers' income should be the main topics.

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proportion of exported live pig products.

3.4 Farming technologies and concepts In the future live pig industry chain, "intellectualized live pig breeding" will be promoted, *i. e.* internet of things will be widely applied in live pig breeding, for example, intelli-sense, auto-control, monitoring and early warning can be applied to improve live pig production level and efficiency, reduce consumption of energy and inputs. Specifically, realize the whole-chain traceability of live pig products, ensure quality of live pig products; realize fine production, and individualized breeding according to the growth stage or growth conditions of each live pig, improve the production efficiency to the most; apply intelligent equipment, such as intelligent live pig-gery, feeding station, manure processing, auto-monitoring and warning.

In terms of breeding concept, "animal welfare" should be popularized^[9]. Animal welfare has been well known in developed countries and many developing countries, but not introduced to China in recent years. Application of animal welfare measures is to improve security of animal-derived foods, and raising live pigs in healthy and comfortable environment will bring more income to peasants. In terms of environmental protection, ecological breeding will be the major development trend to integrate agriculture, animal husbandry and low-carbon emission. According to the UN-FAO, animal husbandry is one of the major industries producing the most greenhouse gases, its ammonia emission accounts for 2/3 of the global total ammonia emission, and its methane emission accounts for 1/3 of the global total methane emission. Among the livestock, cattle is responsible for the most greenhouse gas emission, but live pig quantity in China is much larger than that of cattle, so live pig industry produces tremendous greenhouse gases. Without low-carbon animal husbandry, there will be no low-carbon life, so it is the key task for the future live pig industry to settle carbon emission problems.

4 Conclusions

Great achievements of live pig industry in China are closely related to the evolution of industrialized live pig breeding model, and to ensure the sustained and stable development of animal husbandry,

it is important to grasp the development trend of industrialized live pig breeding. Evolution of industrialized live pig breeding model refers to the relatively stable live pig breeding model in different periods centering on production elements of live pig industry, on the basis of socioeconomic development. Since 1978, live pig industry has witnessed the household operation model, large-scale operation model and industrialized operation model, successively, and the industrialized live pig breeding model has been seriously impacted by global economic competition, development of experience economy, and consumers' green consciousness. Furthermore, industrialized live pig breeding of China shows the development trend of "expanding international market, consolidating domestic market, integrating resources of live pig industry for the integrated operation, promoting the industrialization model and breeding technology driven by live pig processing, applying animal welfare and the internet of things in live pig breeding industry".

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