Empirical Analysis on Factors Affecting Demand Scale of Land Circulation in Rural China

——A Case of Rizhao City, Shandong Province, China

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Abstract Literatures about factors affecting demand scale of rural land circulation are reviewed. Based on this, a total of 5 deficiencies in these literatures are put forward, which are the inconsistency between model selection and sample data type in some literatures, the lack of analysis from the perspective of internal family, the incomplete or inaccurate research factors, the lack of analysis on causation, and the mixture of inflow and outflow of land circulation. According to the 109 valid questionnaires in Lanshan Area, Rizhao City, Shandong Province, China, Optimal Scaling Regression Analysis is used to conduct empirical study on the land circulation status of Rizhao City by selecting three variables including family size, the annual net income of rural household and the proportion of cultivating income in annual net income. Function model of factors affecting demand scale of rural land circulation is established. Result shows that, as for a single rural household, these three variables are the most significant factors affecting demand scale of rural land circulation, and have positive correlation with the demand scale of land circulation.

Key words Demand scale of rural land circulation; Family size; Annual net income of rural household; Cultivating income; China

With the development of economy and science, agricultural production is at a transition to mechanization, specialization and large scale, which requires land concentration in a certain scale by land circulation. However, with the development of secondary and tertiary industries and the acceleration of urbanization, more and more young labor forces in rural areas begin to work in non-agricultural industries, leaving a large area of land unused and reducing the efficiency of land use. Therefore, land circulation becomes one of the important issues crying out for solutions.

Shandong Province is a major agricultural province in China with large population and distinct agricultural features in different areas. Secondary and tertiary industries and urbanization process have developed rapidly in Lanshan District, Rizhao City, Shandong Province, turning a large number of rural laborers into workers in non-agricultural sector. According to the 2006 *Lanshan District Yearbook of Rizhao City*, total output values of secondary industry and primary industry account for 59% and 15% in the year 2006, respectively. But professional research on land circulation is rare in Lanshan District and there are many problems to be solved in the circulation process. Empirical analysis on field research data is conducted in Lanshan District, so as to find out the factors affecting the demand scale of land circulation in rural areas and to provide a basis for the formulation of relevant policies.

1 Literature review

Researches on land circulation factors by Chinese scholars are mostly qualitative analysis[1-2]. Literatures using quantitative analysis are only at the level of simple statistical description[3-9].

He Guojun and Xu Chong analyze and verify the effects of social security, legal constraints and urban labor market on the farmers' attitudes towards land circulation. They argue that per capita income, social security and difficulty in finding a job have significantly affected the farmers' will of land circulation[10]. Liu Yan uses Principal Component Analysis Method and Gray Correlation Analysis Method to conduct Regression Analysis on 142 samples in Zhejiang, Hubei and Sichuan Provinces. Result shows that correlation coefficient between the land circulation and the proportion of output value of secondary and tertiary industries in GDP is 0.836 9 in research area. Correlation coefficient between per capita rural education expenditure and land circulation scale and that between government's fiscal expenditure on agricultural land circulation are 0.833 0 and 0.753 1, respectively[11]. Lu Wencong and Zhu Zhiliang conduct an empirical analysis on supply and demand situation of land circulation in Shanghai suburbs taking grain and vegetable fields as examples. Result shows that the main factor restricting the transfer of grain crop fields is the farmers' insufficient demand for land, and the key factor restricting the transfer of vegetable field is that farmers are unwilling to supply land. Thus, expansion of the management scale of agriculture is restricted[12]. Liu Kechun and Linjian carry out empirical analysis of the effects of rural married women on farm land circulation, arguing that land-lost married women have promoted the farmers who take agriculture as the main source of income to lease more agricultural land to a certain extent, but they have little impact on leasing out land[13]. Whether land-lost farmers lease land or not is determined by their economic condition and factor endowment, but not the land-lost married women. Zhang Wuwei *et al.* study on the relationship between the transfer degree of surplus agricultural labor force and the disposal way of land by using Optimal Scaling Regression Analysis. Result shows that non-agricultural employment time of rural labor force has the greatest impact on the disposal way of land, followed by the transfer to

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other places. And transfer rate of labor force in a family has the smallest impact[14].

The literatures mentioned above mainly have the following five deficiencies. Firstly, model selection and the sample data type are inconsistent in some of the literatures[13]. Logistic Regression Method requires numerical data, or at least data can be turned into numerical type, while categorical variable usually uses dummy variable. But the relationship among ordered categorical variables is fuzzy. Although the type can be encoded, the distance between them is not clear. Moreover, as the code is random, different coding schemes will produce different coefficients. Therefore, it is of little practical significance to apply Logistic Regression Model in data with more categorical variables[15]. Secondly, few of the literatures mentioned above have conducted a comprehensive analysis from the aspect of single family. And most of the researches are focused on the macro-level factor affecting the circulation of agricultural land[10-11]. Thirdly, factors studied in some literatures are not the major factors in general which affect the transfer of agricultural land, or are only partial factors[13-14]. Fourthly, some papers only study on the scale of supply and demand of agricultural land transfer, but fail to reveal the specific factors affecting supply and demand status of agricultural land circulation[12]. Fifthly, some of the papers have not separated the land inflow from the land outflow when studying on land circulation. We believe that factors affecting land inflow and outflow are not exactly the same. Therefore, without a differentiated research, the reliability of conclusions will be affected[10-11]. The above analyses show that empirical study on factors affecting rural land circulation by domestic scholars is relatively less and the researches are at an initial stage.

2 Data and models

2.1 Basic data Data are from the land circulation investigation in rural Rizhao City in July, 2008. We mainly investigated land inflow of peasant households in several villages and towns near Lanshan District with a total of 120 questionnaires sent out and 109 valid questionnaires.

2.1.1 Basic situation of samples. Definitions of sample variables are listed in Table 1. Table 2 indicates that people investigated mostly live in plain areas. Labor forces engaged in farming at home are mostly the middle aged and elderly people. Moreover, they are mostly families having 3 to 4 member with annual net income at most 10 thousand to 20 thousand yuan, among which, cultivating income only accounts for 10% –30% annual net income of most peasants households. Land circulation ways are mainly the subcontract and release, while contracted land is used mainly to plant crops or for construction. People investigated are mostly above the age of 50, reflecting the prominent "hollow out" problem in rural China at present. That means more and more strong and young labor forces in rural areas prefer to work in non-agricultural industries. Thus, the elderly people become the main labor force in agriculture.

Table 1 Description of variables

Variable name	Type	Definition
Quantity of land inflow//hm^2	Categorical variable	1="(0,0.067]";2="(0.067,0.133]";3="(0.133,0.200]";4="(0.200,0.333]";5="(0.333, +∞)"
Family size	Numerical variable	Actual total population per family
Annual net income of rural household//yuan	Categorical variable	1="(0,500 0]";2="(5 000,10 000]";3="(10 000,20 000]";4="(20 000,40 000]";5="(40 000, +∞)"
Proportion of cultivating income in annual net income//%	Categorical variable	1="(0,10]";2="(10,30]";3="(30,50]";4="(50,80]";5="(80,100]"

Table 2 The general situation of sample

Item	Sample content	Frequency	Percentage %	Item	Sample content	Frequency	Percentage %
Geographical position	Hilly region	19	17.4	Proportion of cultivating	≤10%	30	27.5
	Plain	83	76.1	income in annual	10% –30%	48	44.0
	Mountainous region	7	6.4	net income	30% –50%	13	11.9
Gender	Male	60	55.0		50% –80%	12	11.0
	Female	49	45.0		80% –100%	6	5.5
Age	≤20	5	4.6	Circulation way	Subcontract	35	32.1
	21 –30	12	11.0	Transfer way	Lease	39	35.8
	31 –40	26	23.9		Transfer	8	7.3
	41 –50	27	24.8		Exchange	26	23.9
	>50	39	35.8		Donation	1	0.9
Household population	1	2	1.8	Usage of contracted land	Planting crops	43	39.4
	2	8	7.3		Developing	13	11.9
	3	34	31.2		vegetable		
	4	40	36.7		greenhouse		

Table 2 (continued)

Item	Sample content	Frequency	Percentage %	Item	Sample content	Frequency	Percentage %
	5	23	21.1		Construction land	34	31.2
	6	2	1.8		Subcontract	2	1.8
Annual net income	≤5 000 yuan	8	7.3		Others	17	15.6
of rural household	5 000 – 10 000 yuan	22	20.2				
	10 000 – 20 000 yuan	69	63.3				
	20 000 – 40 000 yuan	10	9.2				
	>40 000 yuan	0	0				

2.1.2 Statistical analysis on the scale of land inflow. According to statistics, family size, the annual net income of rural household and the proportion of cultivating income in annual net income have the most significant impact among the factors affecting the scale of land inflow. Results are shown in Table 3, 4 and 5.

Table 3 Statistical analysis of family size and land inflow scale

Family size // W	Land inflow scale Z // hm^2					Total
	$Z \leqslant 0.067$	$0.067 < Z \leqslant 0.133$	$0.133 < Z \leqslant 0.200$	$0.200 < Z \leqslant 0.333$	$Z > 0.333$	
1	0	1	1	0	0	2
2	1	4	2	0	1	8
3	5	20	8	1	0	34
4	1	17	13	9	0	40
5	1	9	9	4	0	23
6	0	0	0	2	0	2
Total	8	51	33	16	1	109

Note: Data are the number of samples, the same as Table 4 and 5.

Table 4 Statistical analysis of the annual net income of rural household and the land inflow scale

Annual net income of rural household X	Land inflow scale Z // hm^2					Total
	$Z \leqslant 0.067$	$0.067 < Z \leqslant 0.133$	$0.133 < Z \leqslant 0.200$	$0.200 < Z \leqslant 0.333$	$Z > 0.333$	
$X \leqslant 5\ 000$	1	4	3	0	0	8
$5\ 000 < X \leqslant 10\ 000$	2	11	7	2	0	22
$10\ 000 < X \leqslant 20\ 000$	5	29	20	14	1	69
$20\ 000 < X \leqslant 40\ 000$	0	7	3	0	0	10
$X > 40\ 000$	0	0	0	0	0	0
Total	8	51	33	16	1	109

Table 5 Statistical analysis of the proportion of cultivating income in annual net income and the land inflow scale

Proportion of cultivating income in annual net income Y // %	Land inflow scale Z // hm^2					Total
	$Z \leqslant 0.067$	$0.067 < Z \leqslant 0.133$	$0.133 < Z \leqslant 0.200$	$0.200 < Z \leqslant 0.333$	$Z > 0.333$	
$Y \leqslant 10$	5	13	9	3	0	30
$10 < Y \leqslant 30$	1	26	13	7	1	48
$30 < Y \leqslant 50$	0	2	6	5	0	13
$50 < Y \leqslant 80$	1	7	3	1	0	12
$80 < Y \leqslant 100$	1	3	2	0	0	6
Total	8	51	33	16	1	109

Table 3 indicates that in families having 3 or 4 members, land inflow frequency is the maximum and the inflow scale between 0.067 and 0.133 hectare is the most common, followed by 0.133 – 0.200 hectare. According to the general situation of sample, inflow scale of 0.067 – 0.133 hectare is the most, accounting for 46.8% of the total samples, that is, a total of 51 families.

Table 4 shows that annual net income of rural household between 10 000 and 20 000 yuan are the most common with the largest land inflow frequency. There are in all 69 families, occupying 63.3% of the total samples. Among them, inflow scale of 0.067 – 0.133 hectare is the most, followed by 0.133 – 0.200 hectare.

Table 5 reports that families with cultivating income accounting for 10% – 30% of the annual net income have the maximum land inflow frequency, occupying 44% of the total samples. Among them, inflow scale of 0.067 – 0.133 hectare is the most, followed by 0.133 – 0.200 hectare.

Data in Table 3, 4 and 5 show that land inflow scale is relatively small and the annual land inflow of most families is only about 0.133 hectare.

2.2 Regression Model

2.2.1 Selection of regression method and description of variable. Ordinary regression methods usually require numerical data, or at least data can be turned into numerical type. But this research is mainly categorical variables. Therefore, result of normal Regression Model is of little practical significance. Optimal Scaling Regression turns categorical variable into numerical variable, so that an optimum Regression Model can be found out after repeated iteration, which has unique advantages when dealing with categorical variables. Therefore, we select Optimal Scaling Regression to conduct estimation.

As is mentioned above, the family size, the annual net income of rural household and the proportion of cultivating income in annual net income have the most significant impact on the scale of land inflow. Thus, we set up a relation model of land inflow scale and the three factors:

$$Z = \alpha W + \beta X + \gamma Y + \varepsilon, \quad (1)$$

where Z is the land inflow scale, W is the family size, X is the annual net income of rural household, Y is the proportion of cultivating income in annual net income, ε is error term, and α, β and γ are coefficients.

2.2.2 Result of model estimation. Optimal Scaling Regression Analysis is conducted by SPSS13.0. Result shows that coefficients of the family size, the annual net income of rural household and the proportion of cultivating income in annual net income are 0.223, 0.210 and 0.251, respectively. Standard deviations of the three variables are 0.092, 0.096 and 0.097, respectively; and their F test values are 5.815, 4.768 and 6.698, respectively.

Under 95% confidence level, results of F test on variable coefficients are all less than 0.05, indicating that estimation of coefficients is of statistical significant and the fitting effect of model is relative good. Besides, tolerance degree of each variable is greater than 0.1 before and after conversion, showing that model has no problem of collinearity.

Table 6 Correlation coefficient and tolerance degree

	Correlation coefficient			Significant coefficient	Tolerance degree	
	Zero-order correlation	Partial correlation	Part correlation		Before conversion	After conversion
Family size	0.266	0.231	0.220	0.412	0.973	0.999
Annual net income of rural household	0.141	0.210	0.199	0.206	0.900	0.712
Proportion of cultivating income in annual net income	0.219	0.247	0.236	0.382	0.883	0.712

Table 6 reports that correlation coefficient between the variables are all positive, showing there is a positive correlation among independent variables. Family size is the most important among the three independent variables, followed by the proportion of cultivating income in annual net income. And annual net income of rural household takes the last place. Hence, we have the Regression Model:

$$Z = 0.223W + 0.210X + 0.251Y. \quad (2)$$

2.2.3 Economic significance of Regression Model and its explanation. The following conclusions can be drawn from equation (2). For a single rural household, bigger family size results in larger scale of land inflow. Keeping other conditions constant, every one unit increase in annual net income of rural household will cause 0.21 unit rise of land inflow scale. Similarly, every one percentage increase of the proportion of cultivating income in annual net income will result in 0.251 percentage rise in land inflow scale.

The actual situation is in line with the analysis. Investigation shows that peasant households with higher annual net income are mostly engaged in vegetable greenhouse or economic crop planting. Thus, their land inflow scale is relatively big. Families with more population relatively need more land and their land inflow scale is also relatively large. The situation is the same to families with larger proportion of cultivating income, because they mainly live on agriculture.

3 Conclusion and enlightenment

Conclusions are obtained through the empirical analysis on a total of 109 valid questionnaires in Rizhao City, Shandong Province. For a single family, the most important factors affecting the land inflow scale are family size, the annual net income of rural household and the proportion of cultivating income in annual net income; and these three factors have positive correlation with the scale of land inflow.

The above conclusion has some guiding significance to practical activities. Scale of land inflow has close relation with family size, the annual net income of rural household and the proportion of cultivating income in annual net income. Therefore, we should start from the three factors in order to enlarge the scale of land circulation, to control the controllable variables, to improve the price of agricultural products, to increase farmers' annual net income, to promote the proportion of cultivating income in annual net income, and to enhance the enthusiasm of the farmers. Besides, we should make efforts to accelerate the speed of land circulation and to enlarge the scale of land circulation. Towns and village committees should effectively monitor the transfer of rural labor force, carry out land circulation on time, avoid the phenomenon of uncultivated farmland and improve the use efficiency of land. Due to the different levels of economy and the unequal distribution of population in different areas, there are certain differences in the annual net income of rural household and the proportion of cultivating income in annual net income. Therefore, regions should adopt unified planning and classified guidance based on their actual situations so as to reasonably guide the land circulation and to practically guarantee the interests of farmers.

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农村土地流转需求规模影响因素的实证分析——以山东省日照市为例

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摘要 综述了有关中国土地流转影响因素的文献,在此基础上,提出了已有文献的5点不足。一是部分文献的模型选择与样本数据类型不符;二是缺乏从家庭内部角度进行的分析;三是研究的因素不全面或不准确;四是没有对问题的成因作出分析;五是没有把土地流入和流出分开研究。根据在中国山东省日照市岚山区实地调研所得的109份有效调查问卷,运用最优尺度回归分析法,选取了农村单个家庭人口数、农村家庭年纯收入及种地收入占农村家庭年纯收入的比重3个变量,实证研究了山东省日照市农村的土地流转情况,并建立了农村土地流转需求规模影响因素的函数模型。结果表明,对单个农户家庭而言,种地收入占年纯收入的比重、家庭人口数、家庭年纯收入是3个影响农村土地流转需求规模最显著的因素,且三者都与土地流转需求规模呈正相关关系。

关键词 土地流转需求规模;家庭人口数;家庭年纯收入;种地收入

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我国农村居民收入结构变化与消费关系研究

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摘要 首先,分析了我国农村居民收入结构变化和消费现状,指出我国各地区农村居民收入结构变化的层次水平不平衡,工资性收入占人均纯收入的比重按东、中、西部逐渐递减,且工业化及城市化水平较高的地区,农村居民收入结构变化的层次水平较高,其整体收入及消费水平也相对较高,农村居民边际消费倾向高于城镇边际消费倾向。其次,从理论上分析了我国农村居民收入结构变化与消费关系,指出我国农村居民生活性消费水平的高低在很大程度上是受收入结构变化的层次水平影响,农村居民收入结构变化的层次水平越高(工资性收入占人均纯收入比重越高),越有利于提高我国农村居民收入及消费水平、缩小各地区间收入及消费差距从而实现我国农村经济全面稳定的持续发展。最后,实证分析了我国农村居民收入结构变化与消费,按照工资性收入占人均纯收入比重的高低将我国农村居民的收入消费水平划分为低收入消费层次(工资性收入占人均纯收入比重为0~35%)、中收入消费层次(工资性收入占人均纯收入比重为35%~60%)、低收入消费层次(工资性收入占人均纯收入比重为60%以上)3个层次,指出随着工资性比重的提高,我国农村居民在各个收入消费层次的边际消费倾向都呈现近似的"倒U"型关系。

关键词 收入结构;边际消费倾向;"倒U"