An Empirical Study on the Influencing Factors of Farmers' Net Income——Based on Social Embedded Thinking and Multi-Level Statistical Model

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Keywords: Peasant net income; Multi-level statistical model; Pan-Pearl River Delta region; New economic sociology; Economic management

Abstract. The article takes the net income of farmers in the Pan-Pearl River Delta region from 2005 to 2014 as the research object. Based on the "embeddedness theory" of the new economic sociology, this paper engages in cognitive, political, cultural, structural and relational embedding of a layer of variables. Through the comparison and analysis of the zero model, the covariance model, the random coefficient model and the complete model, it is found that the complete model has better fit with the data, and is more suitable as a mathematical model for the pure income evaluation of the Pan-Pearl River Delta farmers. It is found that the cultural factor-urbanization rate has a significant impact on the net income of farmers in the Pan-Pearl River Delta region. Therefore, it is necessary to pay attention to urban construction and increase the rate of urbanization.

Introduction

Agriculture, rural areas and peasants are the primary issues in the overall situation of reform, opening up, and modernization. The core issue of the three rural issues is the peasant problem, and the peasant problem is manifested by the low income of the peasants and the difficulty in increasing income. This paper takes it as the starting point and selects the net income of farmers in the Pan-Pearl River Delta region from 2005 to 2014 as the research object, which affects the net income of farmers. This solves the three rural issues and has practical significance for China to achieve the economic goal of building a well-off society in an all-round way.

Wu Sizhen, etc.[1](2013)constructed a logarithmic model based on rural economic statistics of Longsheng County of Guangxi in 1991-2010, and the results show that except for the negative effect of agricultural intermediate consumption, the other indicators have a positive effect on farmers' net income. He Zefeng, etc.[2](2015)analyze the spatial and temporal changes of farmers' per capita net income in Guizhou Province from 2003 to 2012. The results show that relative difference in per capita net income show an expanding trend. Parakrama Weligamage, etc.[3](2014)finded irrigated areas in different seasons and propose ways to increase net income and reduce income inequality. Sitakanta Panda[4](2015)used the ordinary least squares regression model to study the difference of rural household agricultural income in rural areas with the analysis of rural household income. Foreign countries adopt a constructor model or an experimental pilot analysis method to focus on the impact of single factors on farmers' net income. Domestically, they tend to explore the multiple factors affecting farmers' net income. The literatures examined are mostly empirical analysis of a certain region or province, considering that data sampling often comes from different levels and units[5], and according to the social research scientific hypothesis, individual behavior is not only affected by its own characteristics, but also by its The impact of the environment. Therefore, this paper intends to use the multi-level statistical model to distinguish the individual effect from the environmental effect, and to deeply explore and analyze the factors affecting the net income of farmers in the Pan-Pearl River Delta region.

  DOI: 10.25236/icess.2019.271

Methodology

Model settings and variables. The data used in this paper mainly comes from the statistical bulletin of the National Bureau of Statistics and the Pan-Pearl River Delta Region 2005-2014 National Economic and Social Development. Linear interpolation is used for predictive estimation of partially missing values. Considering that there are many factors affecting the net income of farmers, this paper completes the initial explanatory variables of the first layer from the perspectives of regional total output value composition, agricultural production and technology, investment and economic environment. The selection of indicators.

Table 1 initial one-level variable indicator

Select angle	Corresponding indicator
Regional gross output value	Gross output value of agriculture, forestry, animal husbandry and fishery and total non-agricultural output value; Agricultural product production price index; total crop planting area
Agricultural production and technology	The total power of agricultural machinery; employees of agriculture, forestry, animal husbandry and fishery; Effective irrigated area and agricultural chemical fertilizer application
Investment and economic environment impact	Fixed assets investment in agriculture, forestry, animal husbandry and fishery; Rural hydropower construction completed investment amount this year, inflation rate; Number of professional and technical personnel in public economic enterprises and institutions

The following uses the social embedded thinking[6] and the linear multi-level statistical model method[7-8], the following are divided into the following four types:

Zero model: level one:$Y_{ij} = \beta_{0j} + \gamma_{ij}$ and $Var(e_{ij}) = \sigma^2$ (1)

level two:$\beta_{0j} = \gamma_{00} + u_{0j}$and $Var(u_{0j}) = \tau_{00}$ (2)

Merge model:$Y_{ij} = \gamma_{00} + \gamma_{ij} + u_{0j}$ (3)

Where β_{0j} represents the average of the j-th two-layer unit Y, γ_{ij} represents the variation of the j-th second-level unit Y, γ_{00} refers to the population average of all the two-layer units$Y$, and u_{0j} represents the residual of the second-layer equation.

Covariance model: level one:$Y_{ij} = \beta_{0j} + \beta_{1j}(x_{ij} - \bar{x}) + e_{ij}$ (4)

level two:$\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10}$ (5)

Random effect regression model: level one:$Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + r_{ij}$ (6)

level two: $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{1j}$ (7)

Complete model: level one:$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \gamma_{ij}$ (8)

level two:$\beta_{0j} = \gamma_{00} + \gamma_{01}W_{1j} + u_{0j}$ and $Var(u_{0j}) = \tau_{00}$ (9)

$\beta_{1j} = \gamma_{10} + \gamma_{11}W_{1j} + u_{1j}$ and $Var(u_{1j}) = \tau_{11}$ (10)

Among them, the second 0 represents the intercept, and 1 has different meanings in the two-layer equation: in the first layer equation, 1 represents the regression coefficient related to the first predictor X_1 of the first layer, in the second layer. In the equation, 1 represents the slope.

Results[9-10]

Data screening. [11-13]Microscopic variables of the first layer of indicators-based on multicollinearity screening. Considering that there may be some correlation between variables, we first use Eviews software to perform multi-collinearity test on the initial layer of variables to screen, and finally obtain four individual explanatory variables: agriculture, forestry, animal husbandry, fishery, social fixed assets investment (GDZC), total fishery output (YY), total agricultural machinery (JX) and inflation rate (TZL).

Macro variables of the second level indicator. This paper selects the Baidu index, urbanization rate, local fiscal, forestry and forestry affairs, and the added value of the primary industry as a percentage of the Pan-Pearl River Delta primary industry and logistics. This paper adopts the ratio of import and export to GDP as the relationship embedding index, and because there are two parts of import and export, one is related to goods, and the other is related to foreign direct investment. Therefore, the relationship embedding is divided into logistics relationship embedding and capital flow relationship. Logistics relationship embedded in the choice of domestic destinations and sources of import and export total/GDP, capital flow relationship embedded in the selection of foreign-invested enterprises import/export/ GDP.

Multi-layer statistical analysis model. Since the length is too long, each model step is omitted, and the result is directly described.

Zero model: The calculated intra-group correlation coefficient ICC is 0.672, which is a highly correlated degree, which is a non-negligible difference between groups and 67.2% of the total variation of farmers' net income is from the difference between the urbanization rate (WH) of the scene variable and the local fiscal, forestry and water affairs expenditure (ZZ). The impact of fiscal, forestry and water affairs expenditures on farmers' net income is very large.

Covariance model: We first construct the first layer model. The predictive variables of the individual characteristics of farmers' net income include the total output value of fisheries, the total power of agricultural machinery, the fixed assets investment of agriculture, forestry, animal husbandry and fishery, and the inflation rate. The regression results show that except for the fixed assets investment of agriculture, forestry, animal husbandry and fishery in the whole society, the coefficients of other variables are not significant.

Random coefficient model: From the output, it can be found that the intercept term estimated by the random coefficient model is the same as the intercept term of the null model and the covariance model. The slope estimation of the covariance model is not much different from the random coefficient model. In addition, the variance of the slope term is smaller than the variance of the intercept term. The variance of the first layer error term is slightly smaller than the covariance model, which R square is equal to 54.13%. In terms of the farmer's net income research model, the random coefficient model has better fitness than the covariance model. The variance of the first layer of error terms is slightly smaller than the covariance model, at this point, the R side becomes 89.89%.

Complete model: Since society is a hierarchical structure, individuals are in various social scenarios and will be affected by the social environment in which they live. The following one will provide a more complete model for assessing farmers' net income:

Table 2 Complete regression model output

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1,β_0					
INTRCPT2,γ_{00}	15229395.766222	613116.253844	24.839	6	<0.001
WH,γ_{01}	41301707.002106	4690738.024159	8.805	6	<0.001
ZZ,γ_{02}	65139.882810	3570.494249	18.244	6	<0.001
For GDZC slope,β_1					
INTRCPT2,γ_{10}	36177.830066	5111.747614	7.077	6	<0.001
WH,γ_{11}	76289.954848	56477.747316	1.351	6	0.225
ZZ,γ_{12}	63.703770	45.523905	1.399	6	0.211

Table 3 Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	d.f.	$\chi 2$	p-value
INTRCPT1, u0	2180913.62354	4756384233362.2070	6	95.620	<0.001
GDZC slope, u1	13994.68516	195851212.60841	6	52.498	<0.001
level-1, r	1784481.23693	3184373284943.6221			

From the regression results of the complete model above, it can be found that the urbanization rate and the local fiscal, forestry, and water affairs expenditures have a significant impact on the average net income of farmers: under the premise of controlling the other second-level predictors, the urbanization rate is With an increase of 1%, the average net income of farmers increased by 4,131,070.002 billion yuan; for every 10 billion yuan increase in local finance, agriculture, forestry and water affairs, the average net income of farmers increased by 6,513,882,810 million yuan. The factors of urbanization rate and local financial, forestry, forestry and water affairs expenditure factors have no significant impact on farmers' net income through the fixed assets investment of agriculture, forestry, animal husbandry and fishery. However, it is worth noting that impact of urbanization rate on farmers should not be neglected.

Conclusion and discussion

By comparing the above four models, it can be found that the results of the covariance model, the random coefficient model and the complete model are close. In addition, in the variance test of random effects, then the R side is 92.95%. In contrast, the compatibility between the complete model and the farmers' net income data is better than the random coefficient model, the covariance model and the empty model, and is most suitable as a mathematical model for the Pan-Pearl River Delta farmers' net income evaluation. By comparing the parameter estimation and test results of the above four models, it is found that the basic situation of farmers and the net income of farmers are different in different regions.

Seen from the above. Compared with other multi-level statistical analysis models, the complete model has a better fit to farmers' net income data. In the multi-layer model modeling process, the difference between the groups cannot be ignored. Second, the cultural factors and political factors in the second layer have a significant impact on farmers' net income. Third, according to the new economic sociology theory, this paper carries out the embedding of the two-layer variables and finds that the urbanization rate has a greater impact on the net income of farmers. Although the coefficient is not significant, the absolute value of the coefficient is large, which cannot be ignored. The higher the rate of urbanization, the more fixed assets are invested in agriculture, forestry, animal husbandry and fishery, and the higher the net income of farmers. In contrast, the impact of

local fiscal, forestry and water affairs expenditures on farmers' net income is not significant and has little impact.

In summary, attaching importance to urban construction and increasing the rate of urbanization will not only improve the net income of farmers in the entire Pan-Pearl River Delta region, but also promote social and economic progress, spur the national economy, and narrow the gap between urban and rural areas.

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