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The empirical analysis of the impact factors influenced on the vulnerability of rural poverty

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ABSTRACT

In this paper, from the aspect of the vulnerability as Expected Poverty (i.e. VEP), the influence of current welfare for the rural households was emphasized and the vulnerability of poverty for rural households was measured. According to the information investigated in the six counties of the three provinces, China, the impact factors of the poverty vulnerability for rural households was analyzed through the Logistic model. The obtained results demonstrated that the factors including the own characters of rural households, the family property and the purchased insurance have the influences on reducing the vulnerability of households' poverty.

KEYWORDS

The vulnerability of poverty; Impact factors; Measure; Logistic model.



INTRODUCTION

Traditional poverty measure and policies to reduce poverty are the ex post intervention, currently, the vulnerability as ex ante situation obtained more and more attentions. The studies in the vulnerability of poverty mainly included two aspects: (i) the conception framework and measure of the vulnerability of poverty; (ii) the analysis of impact factors for the vulnerability of poverty.

Huang et al^[1] introduced the conception framework of the vulnerability and three measure approaches: vulnerability as expected poverty, (i.e. VEP), vulnerability as low expected utility, (i.e. VEU) and vulnerability as uninsured exposure to risk, (i.e. VER), respectively. Wan (2011) made the comparison between the predicted results and the practical poverty situation in the next three years based on a group of panel data of rural households and tested the accuracy. Dutta et al^[4] emphasized the influence of current welfare on the vulnerability of poverty and made the innovation in the measure approach of vulnerability based on the conception VEP.

In the aspect of the impact factors of the poverty's vulnerability, Tai et al^[5] demonstrated that the income increase of farmers to work in China's mountainous west could reduce the vulnerability of poverty caused by the loss of agricultural income; meanwhile, the social capital in family level could reduce the vulnerability of poverty and is also effective in reducing the vulnerability of poverty caused by the same type of risk. Li et al^[9] used the hierarchical model to make the improvement for the predicted measure model of poverty's vulnerability proposed by Chaudhuri^[3] and analyzed the influences of community and family on the poverty's vulnerability of rural households. Li^[7] measured and decomposed the VEP and made the cross analysis between city and the countryside, householder age and education level group. The studied results demonstrated that the poverty and rural family were more vulnerable. Chen et al (2011) showed that the risk is the major reason for the poverty of rural households; moreover, some factors, including the type of rural family, human capital and scale, had significant influences on the poverty vulnerability of rural households.

As above mentioned, the obtained results provided by the studies in the impact factor of poverty's vulnerability were different due to various measure approaches and data. In this research, the impact factors of the poverty vulnerability for rural households was analyzed through the Logistic model based on the information investigated in the six counties of the three provinces, China.

METHODOLOGY

The vulnerability as expected poverty, (i.e. VEP) means the possibility of individual or family in poverty. It is assumed that the limited set of individual welfare level in the future (income or expenditure) is $\{y_{t+1}^1, y_{t+1}^2, \dots, y_{t+1}^n\}$, the corresponding probability value is $\{p_1, p_2, \dots, p_n\}$, such that the discrete form of calculated formula for the VEP is formulated as follows:

$$V^{EP} = \sum_{s, \forall y_{t+1}^s < z} p_s \left(\frac{z - y_{t+1}^s}{z} \right)^r \quad r = 0, 1, 2$$

Where V^{EP} expresses individual poverty's vulnerability, z is the poverty line. V^{EP} is simplified as the probability of the poverty in the future when $r = 0$, is expected poverty torque when $r = 1$ and is expected poverty square torque when $r = 2$.

The measure approach of the vulnerability is proposed by Dutta et al^[4] and is formulated as follows:

$$V(L) = \sum p_s (R(z, y_t) - y_{t+1}^s)^r, \quad r > 1 \tag{1}$$

$$R(z, y_t) = z^{1-\alpha} y_t^\alpha, \quad 0 \leq \alpha \leq 1 \tag{2}$$

$$R(z, y_t) = z^{1+\alpha} / y_t^\alpha, \quad 0 \leq \alpha \leq 1 \tag{3}$$

Where $V(L)$ means the poverty's vulnerability of the individual, z is the poverty line, y_t is the current welfare level, $R(z, y_t)$ is the function of the reference line, which is the standard for meeting the standard of individual basic living level and depends on the poverty line z and the current welfare level y_t .

As pointed by Zhang (2006), the new problem will occur when weight is endowed to the probability in poverty in the future and it is hard to determine an appropriate "vulnerability line" for estimating whether family is vulnerable.

Therefore, the influence of current welfare level on the poverty's vulnerability is emphasized and the equation (1) is simplified as follows:

$$V = \sum_{s, y_{t+1}^s < R(z, y_t)} P_s \tag{4}$$

Therefore, the simplified measure approach of vulnerability is equal to V^{EP} when $\gamma = 0$, meanwhile, the influence of current welfare level on the poverty's vulnerability is emphasized through using baseline function to replace the poverty line. The integral form of equation (4) is written as follows:

$$V(L) = \int_0^{R(z, y_t)} dF(y_{t+1}) \tag{5}$$

Where $F(y_{t+1})$ represents the distribution function of individual welfare level in the future. In this paper, the negative correlation between baseline function and current welfare level is examined, such that the equation (5) would be changed as follows:

$$V(L) = \int_0^{z^{1+\alpha}/y_t^\alpha} dF(y_{t+1}) \tag{6}$$

Where $\alpha = 1/2$ for the empirical analysis; the welfare level in the future y_{t+1} represents the net income per capita.

STUDY DESIGN

Data source

The panel data is sourced from the questionnaire-investigated data of rural households in the six counties (including Qingyuan county, Faku county, Xiuyan county, Xifeng county, Zhangbei county and Tongyu county), three provinces (including Liaoning, Hebei and Jilin). In order to ensure the accuracy of the questionnaire-investigated results, it conducts the training for the investigated objects and ensures the investigated people have no doubts on the questionnaire questions. The questionnaire-investigated form is the households' survey. Finally, 1203 effective questionnaires are considered as research example after deleting some invalid data.

Model design

The estimation of poverty's vulnerability depends on the probability distribution of the future income y_{t+1} , the selection of poverty line and the vulnerability limits. Referring to Chaudhuri^[3], Zhang (2009) and Wan (2011), the distribution of the future income y_{t+1} is assumed as the lognormal distribution. The feasible three-stage least squares method is used to estimate the mean and variance values of farmers' expenditure. Referring to the discussion about the econometric models for the mean and variance of farmers' expenditure provided by Tai^[5], two models are formulated as follows:

$$\ln(c_i) = \beta_0 + \beta_1 assets_i + \beta_2 land_i + \beta_3 saving_i + \beta_4 labor_i + \beta_5 edu_i + \beta_6 age_i + \varepsilon_i \tag{7}$$

$$V(\ln(c_i)) = \beta_0 + \beta_1 physicap_i + \beta_2 medical_i + \beta_3 saving_i + \beta_4 labor_i + \beta_5 edu_i + \beta_6 age_i + e_i \tag{8}$$

Where $\ln(c_i)$ means the per capita income (in logs), $V(\ln(c_i))$ represents the residual square values estimated by equation (7). The relational variable information is provided in TABLE 1.

The poverty line is defined as the per capita net income (i.e. 2300 yuan) regulated by China at the end of 2011 and the corresponding vulnerability is named as V . The solution is obtained through the software MATLAB. Meanwhile, the limited value of the vulnerability is assumed as 0.5.

$$v' = \begin{cases} 1, v < 0.5 \\ 0, v \geq 0.5 \end{cases}$$

Next, the Logistic model is used to analysis the vulnerability with v' as dependent variable, where the Logistic model is formulated as follows:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \sum_{i=1}^n \beta_k x_{ki}$$

Where the equation $p_i = P(y_i = 1 | x_{1i}, x_{2i}, \dots, x_{ki})$ represents the probability of an event occurs given a series of independent variables $x_{1i}, x_{2i}, \dots, x_{ki}$, $\frac{p_i}{1-p_i}$ is the rate of an event occurs, α is the model's intercept, β_k is the regression coefficient.

RESULT ANALYSIS AND DISCUSSION

The explained variables in model is provided in TABLE 2.

TABLE 1 : The definitions of model variables

Variables	definitions
assets	The expenditure for buying seeds, fertilizer and other materials
land	The land area cultivated by households (excludes the rental land)
saving	The households' deposit
labor	The labor power quantity
edu	The highest level of education for the head household
age	The age of the head household
physicap	The money obtained through selling current house, land, crop and agricultural production materials.
medical	The medical expenditure of rural households

TABLE 2 : The description of model variables

Variable	Variable' explanations
age	The age of head household (it is 1 when female's age is under 54 or male's age is under 59, otherwise 0)
Cadre	Whether head household is the village cadre (yes = 1, no = 0)
edu	The highest educational level of household (no education =1, school = 2, middle school = 3, high school or secondary school =4, College or above major = 5)
labor	The number of farmers to work
land	The land area cultivated by households (excludes the rental land)
Physica	The money obtained through selling current house, land, crop and agricultural production materials.
mi	Whether participate in medical insurance (yes = 1, no = 0)
ai	Whether participate in agricultural insurance (yes = 1, no = 0)
diversity	The means avoiding productive risk- plants' diversity (yes = 1, no = 0)
reserves	The means avoiding productive risk- maintain property reserve (yes = 1, no = 0)

The logistic regression is accomplished through using the software SPSS 18.0 and the estimated results are provided in TABLE 3. When the baseline function is correlated to the income negatively, the Hosmer-Lemeshow values of the model is 8.097, p is 0.467, which means the model estimation is fitting the data; meanwhile, the chi-squared statistic is 36.23 at the 0.000 significance level. It is demonstrated that the variable could predicted whether happens the dependent variable. At the cut points of 0.5, the accuracy rate of model recognition reached 79%.

TABLE 3 : The estimated results of model variables

Variables	Variables estimation	Wald
age		
cadre		
edu	0.036*	3.855
labor	0.768**	11.916
land	0.855*	5.086
physicap	0.927**	37.91
mi	0.080	1.692
ai	0.055**	17.059
diversity	0.008	1.307
reserves	0.941*	7.226
Constant term	0.179*	4.601
Hosmer-Lemeshow 8.097	0.932*	6.635
Significant level 0.467	2.746*	4.363
Chi-square statistic 36.23		
Significant level 0.000		

Notes : *Indicates a significant level of 5%; **Indicates a significant level of 1%

When the negative correlation exists between baseline function and income, it means that the high living standard leads to the decreases in baseline and slows down the welfare loss. The analysis results of practical application are shown in follows:

Firstly, the positive correlation exists between age and reduction of poverty's vulnerability. The village cadre and educational level have positive correlation with the reduction of poverty's vulnerability. This is because that, the high education level or as the village cadre of the households means that they own marketing and competitive initiatives, such that the poverty's vulnerability of the family would be reduced.

Secondly, the numbers of farmers to work and have positive correlation with the reduction of poverty's vulnerability. Similarly, the land area owned by family is related to the reduction of poverty's vulnerability positively, although is less significant. This is mainly due to the fact that the as the further development of town construction, the amounts of young people working in cities would increase, therefore, the role which land is the main source of households' income is weaken gradually.

Thirdly, the medical insurance is correlated to the vulnerability reduction positively, although is less significant. The implementation of the new village cooperative effectively solves the problem which the farmers cannot bear the expense; nevertheless, it also has some problems, such as the low security level and the complex process of participation and reimbursement. The agricultural insurance has the significant positive correlation with the poverty's reduction.

Fourthly, the plants' diversity and the financial reserve have the positive correlation with the reduction of poverty's vulnerability, which means that the rural households prevent the possible risk impetus through enhancing plants' diversity and maintaining financial reserve.

CONCLUSION

The obtained results demonstrated that, while the negative correlation between baseline function and income is existing, the state of rural households, including age, educated level and whether they are the village cadre, has significant influences on the households' vulnerability; meanwhile, the income of farmers to work and their property are useful in reducing the poverty's vulnerability; moreover, the means of purchasing insurance and sharing risk also reduce the poverty's vulnerability of rural households.

Therefore, according to the obtained results provided by case study, the following policies and suggestions are given: (i) increase the fundamental investment in education for the rural district and enhance the training efforts for the farmers; (ii) organize rural surplus workforce come into and work in city and provide information service and policy support; (iii) perfect rural basic medical insurance, increase the rate of reimbursement for new village cooperative, simplify the reimbursement process and establish the social security system; (iv) enhance the financial investment for agricultural insurance and guide rural households to participate the agricultural insurance; (v) encourage rural households to cultivate various plants for effectively sharing risk and reducing the possibilities of poverty.

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