Hue University Journal of Science
ISSN 1859-1388
Vol. 113, No. 14, 2015, pp. 137-145

USING PROBIT MODEL TO MEASURE FACTORS AFFECTING NON-AGRICULTURAL EMPLOYMENT OF RURAL WORKERS IN BINH DINH PROVINCE

Nguyen Dinh Phuc[1]*, Nguyen Ngoc Khac[2], Dang Hoai Tan[3]
[1]College of Economics, Hue University
[2]Center of water resource conservation and development (WARECOD)
[3]Binh Dinh's Farmers' Association

Abstract: This research was conducted based on the survey data of 267 non-agricultural workers in rural areas of Binh Dinh province, using Probit model. The results show that the correct forecasting probability of the model is 82.56%, there are 9 factors explaining the participation of non-agricultural employment of workers, and the effect level of these factors is different. Additionally, the free time after harvest, cooperation and apprentices are three factors that have the greatest effects on the ability to participate in non-agricultural employment of workers in the region. Based on the research results, this article proposes recommendations in order to create more non-agricultural employment opportunities for rural workers in Binh Dinh province.

Keywords: Probit, Econometric, Non-agricultural employment, Factor, Binh Dinh

1 Introduction

Employment plays an important role in the individual's life, as well as in socio-economic life of each country. With the rapid development of today's economy, there are many jobs beeing created and lost simultaneously [5]. In the open economy period, especially the change in economic structure along with the process of industrialization and modernization of rural agriculture, developing agriculture is considered to be an indispensable way to promote and develop the rural economy. However, with the limited land area, high population growth rate in rural areas and low education level, it is really difficult for those who live in rural areas to find a suitable job as they are separated from the unskilled laborers in agriculture [6]. Therefore, the need to research on jobs for rural is essential for both laborers and local government. On this basis, the article aimed to find out main factors which have effects on employment in rural areas as well as to direct policies to promote the restructuring of labor from agricultural laborers to non-agricultural laborers [2]. The development of non-agricultural employment in rural areas will contribute to solving the issue of free time after harvest for workers, while creating employment opportunities for the unemployed labor force, increasing income for people and reducing the wave of immigration from the countryside to the city. Based on the practical problems, the research on the factors affecting non-agricultural jobs for rural laborers in Binh Dinh Province is very necessary. The research also contributes its scientific and practical value to Binh Dinh province as well as to the supportive employment programs for rural workers.

**Corresponding: nguyendinhphuc2009@gmail.com*

Submitted: September 08, 2015; Revised: January 09, 2016; Accepted: February 25, 2016.

2 Literature review

Ba Le Xuan and Hai Nguyen Manh (2006) presented that the restructuring of laborers from agriculture to non-agricultural sector was affected by the following factors: age, gender, production land, main laborers, asset, employment creation program, number of factories in the area, traffic, agricultural income, free time after harvest, and eco-regions.

Minh Phuong Tran Thi and Minh Hien Nguyen Thi (2013) conducted a research on factors affecting the ability to get a non-agricultural employment in rural areas of Ha Noi city and found that gender, age, years attending the school, number of manufacture factories, employment creation program, services and industrial structure, and developing project affected non-agricultural employment of rural workers at their community.

Cam Van Doan Thi, Hau Le Long and Duy Vuong Quoc (2010) found that the factors significantly affecting employment and non-agricultural income in Tra Vinh province included main laborers, age, education, agricultural income, value of assets, production land size, and employment creation program.

Phuc Tran Thanh and Phuong Huynh Thanh (2011) also showed that employment and non-agricultural income of rural workers in Long An province were affected by 3 main group factors as follows: (1) characteristics of head of household (age, gender, education level, and apprentice), (2) characteristics of household (scale, average age, year attending school, number of main laborers, and asset), and (3) characteristics of community (access to employment information, traffic, credit).

From the deficiency of previous research, our research has found additional new factors that affect non-agricultural employment based on the current situation at the localities of Binh Dinh province. The theoretical model and recommended factors affecting non-agricultural employment of rural workers in Binh Dinh province are shown in Figure 1.

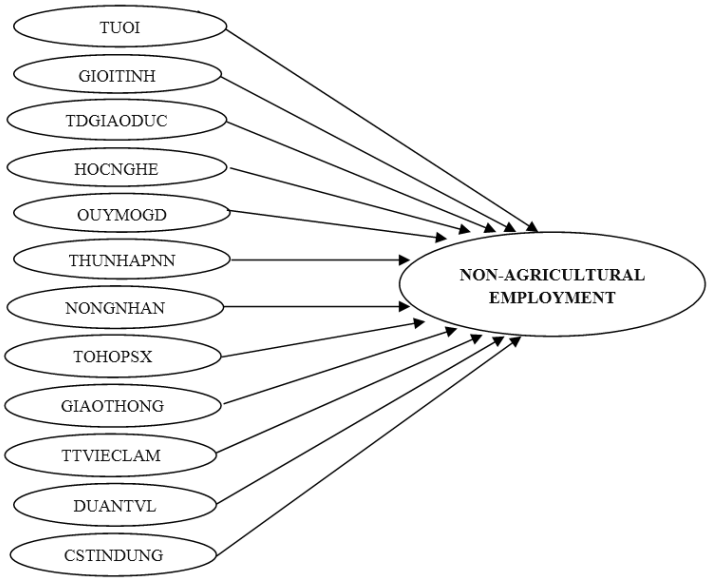

Fig. 1. The proposed research model

3 Research methods

The research was conducted on the basis of a combination of qualitative and quantitative methods.

Qualitative methods: group discussion was conducted to develop the research model. In addition, in-depth interviews with some key persons such as non-agricultural workers were also implemented. The primary purpose of the qualitative research is to form the basis for questionnaire development in the quantitative research.

Primary data are collected through surveys stratified randomly from 270 agricultural households in the working age (15 and older) who have participated in non-agricultural occupations in Tuy Phuoc, Vinh Thanh district and An Nhon town, Binh Dinh province. This is a locality where there are a large number of local employees participating in non-agricultural sectors in rural areas in Binh Dinh province. The team made a total of 270 questionnaires, and after filtering and cleaning they had 267 valid questionnaires for data analysis.

Quantitative analysis methods: There are several research models available for analyzing factors affecting non-agricultural employment of rural laborers. In this article, we use Probit model (the dummy variable is a dependent variable) to determine the influence degree of these factors on the possibility to participate in non-agricultural employment of rural laborers in Binh Dinh province [1].

Equation of regression probability models – Probit models: $Y = \beta iXi + \varepsilon$

in which,

Y: The dummy variable, the dependent variable,

Y = 1: The laborers participated in non-agricultural employment,

Y = 0: The laborers did not participate in non-agricultural employment,

Xi: The independent variables,

βi: The vector of parameters,

ε: The random error of the model.

$$Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + \beta7X7 + \beta8X8 + \beta9X9 + \beta10X10 + \beta11X11 + \beta12X12 + \varepsilon$$

$$Y=\beta0 + \beta1TUOI + \beta2GIOITINH + \beta3TDGIAODUC + \beta4HOCNGHE + \beta5QUYMOGD + \beta6THUNHAPNN + \beta7NONGNHAN + \beta8TOHOPSX + \beta9GIAOTHONG + \beta10TTVIECLLAM + \beta11DUANTVL + \beta12CSTINDUNG + \varepsilon \quad (1)$$

In this equation, the left side is the dependent variable Y, the value of which is 1 if the laborers participated in non-agricultural employment, and 0 if the laborers did not participate in non-agricultural employment. The variables on the other side of the question are independent which describe the factors affecting non-agricultural employment of rural laborers.

Table 1. The independent variables and expectation in Probit models

Variable	Explain for meaning	Expectation
TUOI	The age of a laborer	(+/-)
GIOITINH	The dummy variable for gender, male laborer is 1; female laborer is 0	(?)
TDGIAODUC	Education level is the number of years attending school of a laborer.	(+)
HOCNGHE	The dummy variable for apprenticeship, a laborer attending apprenticeship is 1; a laborer without attending apprenticeship is 0	(+)
QUYMOGD	Family scale, the number of members in family households (the number of people)	(+)
THUNHAPNN	Non-agricultural income, income per capita from agricultural activities (million/year)	(+/-)
NONGNHAN	Free time after harvest, the free time of the laborer in a family (hour/year)	(+/-)
TOHOPSX	Cooperative groups, the number of businesses or production facilities attracting local laborers	(+)
GIAOTHONG	The dummy variable for traffic, the area with a roads for vehicles is 1; the area without a roads for vehicles is 0	(+)
TTVIECLAM	The dummy variable for employment information, the laborer who accesses the employment information is 1; the laborer who does not access the employment information is 0	(+)
DUANTVL	The dummy variable for the locality with employment creation program for laborers is 1; the locality without employment creation program for laborers is 0	(+)
CSTINDUNG	The dummy variable for credit policy, the locality with supportive policy on capital for laborers is 1; the locality without supportive policies on capital for laborers is 0	(+)

4 Research results

4.1 Employment status of rural workforce by sectors

According to the statistics in Table 2, the employment growth rate of rural labors in Binh Dinh in the period of 2011 - 2013 was 2.21% per year, 0.12% higher than the growth rate of the rural labor force. During this period, while the number of non-agricultural employees in the sectors has increased, the figure for agricultural employment tends to decrease. A number of people working in agriculture, forestry and fisheries fell 9,351 persons, corresponding to 15.92%, while the non-agricultural laborers in industry, transport and construction increase 9.7%; in trade and service increase 10.93% over the years. This shows that non-agricultural employment in the locality is now attracting a significant part of rural laborers. Therefore, to encourage the development of non-agricultural activities and employment providing for rural idle laborers is re-

garded as fundamental factors contributing to raise incomes and improve living standards of rural people.

Table 2. Number of laborers in Binh Dinh province by sectors

(Unit: people)

Criteria \ Year	2011	2012	2013	2013/2011	
				(+/-)	(%)
Agriculture, forestry and fisheries	78746	72475	69395	-9351	- 15.92
Industry, transport, construction	57500	55961	63080	5580	+ 9.70
Trade and service	77959	82842	86477	8518	+ 10.93
Total	214205	211278	218952	4747	+2.21

(Source: Binh Dinh Annual Statistics, 2014)

4.2 Research model testing

After testing the multi – collinearity by the correlation matrix between the variables, the research has shown that GIAOTHONG, TTVIECLAM, CSTINDUNG have relatively high correlation, greater than 0.8, thus these three variables were excluded from the initial estimation model.

The research model was estimated with 9 remaining variables. The correlation matrix (Table 3) shows that these variables have relatively low correlation (< 0.6) in the model, allowing the next step of testing the model [3].

Table 3. The correlation matrix between the independent variables

	TUOI	GIOITINH	TDGIAODUC	HOCNGHE	QUYMOGD	THUNHAPNN	NONGNHAN	TOHOPSX	DUANTVL
TUOI	1								
GIOITINH	0.5424	1							
TDGIAODUC	0.5271	0.3367	1						
HOCNGHE	0.2546	0.2482	0.3821	1					
QUYMOGD	0.3285	0.4569	0.5256	0.4158	1				
THUNHAPNN	0.4826	0.3258	0.2849	0.3427	0.2864	1			
NONGNHAN	0.5509	0.4275	0.3367	0.5653	0.3272	0.4146	1		
TOHOPSX	0.2463	0.2754	0.4251	0.2481	0.1689	0.2283	0.2492	1	
DUANTVL	0.5412	0.5173	0.4826	0.4592	0.4572	0.5217	0.4365	0.3579	1

(Source: The survey data and quantitative analysis, 2014)

The results shown in Table 4 indicate that this model is appropriate in the research. The determination coefficient R^2 of models is 0.6438, meaning that 64.38% significance of the dependent variable is explained by the independent variables. The research also showed that the

correct forecast level of the estimation model is 82.56%, meaning that the correct forecast ability of the model is relatively high.

The estimated result of the probability regression models Probit obtained in Table 4 shows that the independent variables are statistically different from 0 at the various levels of meaning from 1 to 10% and sign of the estimated regression coefficient in the model is completely appropriate for economic theory. To see more clearly the degree of influence of each variable explains for each independent variable we consider each specific variable.

Table 4. The result analysis of the Probit model

Independent variable	Estimated Regression Coefficient (β)	Marginal Effects (dy/dx)	Value P
CONSTANT	5.4623	-	1.2670
TUOI	- 0.0785	- 0.0149	0.0325
GIOITINH	1.6892	0.0763	0.0064
TDGIAODUC	0.2594	0.0852	0.0028
HOCNGHE	1.2458	0.1426	0.0429
QUYMOGD	0.6257	0.0615	0.0527
THUNHAPNN	- 0.7854	- 0.0731	0.0214
NONGNHAN	0.9627	0.2187	0.0436
TOHOPSX	0.6871	0.1549	0.0071
DUANTVL	0.2728	0.0865	0.0359
The number of observations	267		
The inspection value of model	0.0000		
The average probability	0.8256		
The determination coefficient R^2	0.6438		

(Source: The survey data and quantitative analysis, 2014)

The variable that is meaningful in model is TUOI of laborer; this variable has statistical meaning of 5%, and it significantly affects non-agricultural employment and is relevant to the sign expectation. According to a statistical survey, the older is the employee the more likely is that the ability to participate in non-farm employment is highly limited, because of the fact that most of the older laborers have low education level; their health is not guaranteed to participate in non-agricultural employment that requires employment skills or heavy employment. The analysis results shows if the age of a laborer is 1 year older, the ability to participate in non-agricultural employment reduces 0.0149 times in comparison with younger laborer in terms of the other fixed factors.

The next significant variable is GIOITINH of a laborer. This variable has the statistical meaning at 1% and marks a positive expectation. GIOITINH is put in the model to consider if gender of laborers affects the decision of participating in non-agricultural employment in the locality or not. The research findings show that when laborers participate in non-agricultural employment, male laborers will take the initiative more easily than female laborers in the re-

gion. The research results also present that when other factors are fixed, if the laborer is male, the ability to get a non-agricultural employment in the region of this group is 7.63%, higher than female group because the health of the male laborer is generally better and the ability to adapt to the available employment in the locality is higher, and additionally men mostly spend less time on household chores, such as housework, taking care of children and the others in the family.

TDGIAODUC is a positive variable to non-agricultural employment because the regression coefficient has a positive value and the statistical meaning is high at 1%. Normally, the longer time the laborers attend school, the higher ability to get the non-agricultural employment because most of the laborers who get training will have certain knowledge, and have opportunities to find a better employment than the low income activities from agriculture. When the average time attending school of laborers is 1 year longer, the ability to participate in non-agricultural employment increases 8.52% with the terms of other factors fixed.

The dummy variable – HOCNGHE shows that local laborers have participated in the training course, including short and long term. The impact of this variable is similar to TDGIAODUC; the regression coefficient is positive at 5% level of significance. In the model, this variables has a significant impact on non-agricultural employment of rural laborers in the region, especially for those who are in apprenticeship. On the other hand, most of businesses or manufacturing factories in the locality require laborers who join in non-agricultural sectors with knowledge, skills and expertise in the field. Therefore, the laborers with experience, skills and basic training have the higher ability to join non-agricultural employment than those who are not apprentices. The analytical results show that when other factors are fixed, laborers who are well trained will have more opportunities to join the non-agricultural employment, increasing 0.1426 times in comparison with unskilled ones.

QUYMOGD is the variable which describes the number of people living in the household. The regression coefficient of this variable marks a positive expectations with the statistical meaning of 10%. This shows that the bigger the family is, the higher ability for laborers to join the non-agricultural employment. Besides, the analytical result also demonstrates that if the average number of household is 1 person more, with the terms of other factors fixed, the ability to join the non-agricultural employment of laborers in the household increases 6.15%.

The agricultural income is described by THUNHAPNN. The estimated result shows that the regression coefficient of this variable has a negative value and the statistical meaning is rather high at 5%, and it means that if the average agricultural income of a household is higher, the ability to join the non-agricultural employment of the laborer is lower. When the average agricultural income of households increases 1 million/year, the ability to join the non-agricultural employment of laborers in this family household decreases 7.31% with the terms of other factors fixed.

NONGNHAN describes the free time of each laborer in family. The result shows that the variable NONGNHAN has a positive value and high statistical meaning of 5%, and it means the free time of the laborer is equal to the ability to join the non-agricultural employment of the laborers who can earn high income. The analysis shows that if the labourers have more than one free hour and when the terms of other factors are fixed, the demand to join the non-agricultural employment of laborer in the region increases 0.2187 times.

The research shows that the variable TOHOPSX has the statistical meaning at 1% and the estimated coefficient marks a positive value; it means that the number of local businesses or manufacturing facilities have positive affects to the non-agricultural employment of the laborers in the region. If there are more businesses and manufacturing facilities at the local area, the ability to join the non-agricultural employment of the laborer is higher. If the number of local businesses or manufacturing facilities increases more than 1, the ability to join the non-agricultural employment of the laborer in this businesses increases 0.1549 times with the terms of other factors fixed.

DUANTVL for the laborers is a dummy variable. The estimated result of this model shows that this variable has a positive effect and the statistical meaning is 5%. It can be concluded that if the locality really has employment creation projects for laborers, the ability to attract employees to join the non-agricultural employment is higher. When the terms of other factors are fixed and if there is an employment creation project, the ability to attract the employees to join the non-agricultural employment increases 8.65%. It means that the employment policy has been carried out effectively in the rural areas of Binh Dinh province in recent years.

5 Proposed Solutions

Based on the research results, some solutions for promoting non-agricultural employment opportunities for rural laborers in Binh Dinh province are suggested as follows:

Improving the level of education, especially for local laborers in order to easily and actively grasp non-agricultural employment opportunities and adapt to the development of the rural economy.

Developing strategies and specific plans for vocational training for laborers, focusing on non-agricultural occupations that have practical implications for economic development in the region.

Localities should regularly coordinate with relevant government authorities to open short training courses to improve business capabilities and market access for business owners and non-agricultural households, as well as to diversify non-agricultural employment for local laborers.

Households should implement planning policies, which contribute to limiting the drag of family scale as well as to create more chances for members of the households to access to the knowledge and the non-agricultural employment.

Developing the traditional villages, together with preserving the scenic and historic sites to promote local tourism development, creating more employment opportunities for laborers in the region.

Local governments should pay more attention to projects and employment supporting policies for laborers by orienting export laborers, promoting the industrialization process, developing local economy which might contribute to creating favorable conditions for the laborers to join non-agricultural sectors.

Improving and promoting policies to encourage investment, facilitating the development of small and medium enterprises in rural areas and creating favorable conditions for in-

dustrial parks, industrial clusters and branches of the company to exploit the advantages of local raw materials. Besides, supporting market linkages to the cooperative groups in order to obtain sustainable development and contribute to diversification of non-agricultural employment for local laborers.

6 Conclusion

The research on factors affecting non-agricultural employment of rural laborers in Binh Dinh province applies the estimation method of the probability regression of Probit model. The research results show that there are nine factors in the model explaining the participation of non-agricultural employment of laborers in the region and the different influence levels of these factors on the ability to join the non-agricultural employment of laborers. Among which, the three most infuencial factors are freetime after harvest, cooperative groups and apprenticeship. The agricultural income and age have an opposite effect on the ability to participate in non-agricultural employment. The participation and participation level in any non-agricultural activities of the local laborers also have a significant impact on increasing the incomes and improving livelihoods for rural household in Binh Dinh province.

References

1. Ba Le Xuan and partner (2006), *Factors affecting the process of restructuring employees in Vietnam rural area*, the Central Institute for Economic Management, Hanoi.
2. The report summarizes the economic – social situation in Binh Dinh province, 2014.
3. Ho Dinh Phi (2012), *Quantitative research methodology and practical research in economic development - agriculture*, Phuong Dong Publisher, HCMC.
4. Hoai Nguyen Trong (2008), *The dependent variable is limited - economic curriculum Fulbright*, University of Economics HCMC.
5. Quang Chu Tien (2001), *The employment in rural areas, situation and solutions*, Agricultural publishers, Ha Noi.
6. Central Institute for Economic Management (2006), *Factors affecting the labor restructuring in Vietnam rural*, Research Report 12/2006.