Applying the Probit and Tobit Models in Examining Factors Affecting the Access by Kiên Giang Farming Households to Bank Loans

ĐẶNG THANH SƠN*

ABSTRACT

Rural credit takes a crucial part in developing a backward small-sized agricultural production into a commercial production. Rural credit itself is also influenced by various factors. The present paper employs the Probit and Tobit models to analyze factors hindering households in Kiên Giang Province from accessing bank loans.

The findings show that the more assets households possess, the easier they can secure a bank loan. Apparently, banks merely lend the money to households on the basis of their mortgaged assets but not the effectiveness of their production project.

Such findings are one of scientific evidences helping researchers, banks, and decision-makers propose an appropriate policy for the sustainable development of Kiên Giang Province. It also helps farmers improve their use of bank loans, increase their income and escape poverty, thereby supporting the sustainable development in Kiên Giang.

Keywords: rural credit, Probit, Tobit, accessibility to bank loan, loan size

1. PROBLEM

Credit is an effective tool for agricultural development, hunger eradication, and poverty alleviation in rural areas. Yet, farmers have faced ample difficulties in accessing sources of credit for developing their livelihoods. Therefore, in order to improve the agricultural economy and rural areas in Vietnam, it is important to pay more attention to credit supply which takes a vital and indispensable part in the national economic development.

Apparently, to study the role of capital as well as the effectiveness of loans for the sake of rural residents is extremely crucial. It will help determine the role of farmers in utilization of loan capital and assist them in employing the working time and loan capital effectively.

2. SAMPLING METHOD AND SURVEY SITES

In order to ensure the representativeness of samples, the survey sites (i.e. districts, communes, and hamlets) are chosen in accordance with the total area of farming land (i.e. agricultural area), and types of agricultural production. There are 336 observed samples which are chosen from four representative districts namely Hòn Đất, Tân Hiệp, Châu Thành, and Giồng Riềng, where agricultural production is well developed, and demand for credit is high. Observed samples are distributed evenly among different types of agricultural production and sizes of farming land. The convenience sampling method is employed.

*Doctor of Philosophy at Community College of Kiên Giang

email: son.dt@kgcc.edu.vn

Table 1: Structure of Samples

Districts	Land area (km^2)	Agricultural area (ha)	Ratio of agricultural land (%)	Observations	As % of total observations
Châu Thành	285.41	40,531	7.03	86	25.6
Hòn Đất	1,046.73	132,780	23.00	85	25.3
Giồng Riềng	639.24	92,987	16.20	89	26.5
Tân Hiệp	419.34	72,372	12.55	76	22.6

Source: Kiên Giang Provincial Statistical Yearbook 2009, and the 2010 survey

The data are collated via face-to-face interviews with farming households. These districts possess an enormous area of farming land and supply agricultural products in large quantities to the entire province and thus satisfy the representativeness of samples.

3. SAMPLE DESCRIPTION

Table 2: Some Statistical Data from the Survey

Indicator	Min.	Max.	Mean	Standard deviation
Land area (m^2)	1,000	200,000	15,930.0	14.2
Ratio of households with male householder	0	1	0.7	0.4
Age of householder	24	86	49.6	11.4
Householder's education (grade)	0	12	5.9	4.0
Number of laborers	1	6	4.0	1.2
Households with title deeds	0	1	0.96	0.2
Ratio of dependents (%)	17	75	41.5	14.5
Households with some social status	0	1	0,28	0,6
Income (VND1,000)	8,600	2,282,000	125,925.2	34,389.1
Expenditure (VND1,000)	1,740	1,105,000	85,095.7	10,424.9
Gross value of assets (VND1,000)	46,000	4,511,430	643,282.0	695,066.2

Source: The 2010 survey

Table 2 shows that the average land area of each farming household in the survey site is roughly 1.6 ha, and some possess a high area of 20 ha or more. This reveals that there is an accumulation of farming land in the survey site. Some 96% of farming households have secured title deeds (land use right certificate as called in Vietnam) which can be mortgaged to take out a bank loan.

Households with male householders represent 72% of surveyed households with average age of 50 and so are supposed to be more experienced in production and life. Yet, their educational level is not high with a majority barely finishing primary education.

Moreover, due to the fact that almost all households live on agriculture, all household members at the working age (i.e. around four for each on average) are main laborers. The family planning is not popular in the survey sites with the result that around 41.5% of family members are under-working-age dependents and some are even over the working age. This can provide an adequate explanation for the poverty of such households.

Furthermore, there are around 28% of surveyed households with next-of-kin working in the non-agricultural sector; they earn more than VND125 million p.a. and their expenditure is also high, around VND85 million p.a. In terms of the gross asset value, each household holds around VND643 million on average. Some affluent households own around VND4,511 million; and the lowest figure is some VND46 million.

4. DATA COLLATION

The data is synthesized from questionnaires which were distributed among farming households in Kiên Giang Province in June 2010.

5. DATA ANALYSIS

The Probit and Tobit models are employed to analyze factors affecting the access to bank credit and loan size.

a. Probit Model:

The Probit model is used for analyzing the demand for bank credit of farming households. Accordingly, the model's dependent variable (Y) is household's bank borrowing.

The Probit model can be written as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \ldots + \alpha$

Where:

Y=1: The household secures a bank loan.

Y=0: The household does not secure a bank loan.

β_0, β_i: regression coefficients

X_i: The set of independent variables or factors affecting the household's demand for loan (including gender, ratio of dependents, educational level, age of householder, farming land area, title deed, gross asset value, household income and expenditure, and social status).

b. Tobit Model:

In order to identify factors affecting the loan capital demanded by the household, the Tobit model is employed to analyze the correlation between changes in dependent variable and independent ones. The Tobit model is written as:

$$y_i = \begin{cases} y_1^* = \beta X_i + u_i (*) \\ 0 (**) \end{cases}$$

(*) if $y_i^* > 0$

(**) if $y_i^* \leq 0$

Where:

y: the borrowed capital

β: the regression coefficient

X_i is the set of independent variables or factors affecting the household's ability to secure bank loans, including gender, educational level, age of householder, social status, farming land area, title deed, ratio of dependents, gross asset value, and household income and expenditure.

The Tobit model was first used by James Tobin (1958) who employed it to analyze household's expenditure on automobiles. This model is also known as the standard censored regression model because the latent variable (y_i^*) cannot always be observed while the independent variable (X_i) is observable

The model is estimated to measure the influential level of factors affecting households' access to bank loan and efficiency of employment of loan capital. Such factors include gender, age of householder, educational level, area of farming land, household's income and expenditure, gross asset value, title deed, ratio of dependents, etc.

a. Factors Affecting the Household's Accessibility to Loan Capital:

This section is devoted to results of the Probit model, determining which factor strongly affects the household's access to bank loan.

Dependent variable is accessibility to loan capital encoded as 1 for 'yes' or 'the household can secure a bank loan" and 0 otherwise.

The estimated result using Stata gives a Chi-square value of 30.35% and a p-value of 0.0000. Therefore, the model is statistically significant.

In Table 3, regression coefficients do not reflect the relationship between the dependent variable and independent variables but only the marginal effect coefficient to explain impacts of the independent variables on the dependent variable.

Table 3: The Probit Model Results

Independent variables	Code	dF/dX	P-value
Age	Tuoi	-0.0000209	0.024
Gender	Gtinh	0.0000442	0.058
Land area	Dtich	0.2670228	0.000
Educational level	Tdhv	-0.0562364	0.225
Income	Tnhap	0.5306630	0.351
Title deed	Bkhoan	0.0002090	0.026
Expenditure	Ctieu	-0.0000288	0.039
Gross asset	TongTS	0.0558533	0.083
Social status	Vtxh	0.0251637	0.420
Ratio of dependents	Tlephth	-0.0241904	0.078

Observations	336
P-value of the model	0.0000
Logarithm value of the appropriate function	-112.93685
Chi-square value	98.42

Source: Results of handling of survey data from Stata

As shown in Table 3, the variables educational level, income and social status of householder are not statistically significant. This implies that the banks do not weigh up these factors when extending a loan. The remainders have statistical significant levels from one to ten percent.

Age of householder is statistically significant at 5% with an expected sign. The older the householder is, the more difficult it is to take out a bank loan. Banking institutions always grasp adequate information about their customers. They reason that albeit the old may possess valuable assets and more experience in agricultural production, their educational level is not high; and thereby hindering their bank borrowing. Specifically, for each year of age added, their opportunity to bank borrowing decreases 0.0000209 time compared with the young (on the condition other variables are fixed).

The next explanatory variable of the Probit model is gender of householder, which has the statistical significance at 10% as expected. The result implies that a male householder will access bank loans more easily than a female one (i.e. around 0.031 time).

The model results also prove that realty is often used as a mortgaged asset in the rural credit market to secure a bank loan. Thus, the impact of land area on accessibility to bank loan of farming households is statistically significant at 1%. For each 1,000m^2 in size added, the accessibility to bank loan will increase 0.267%. Yet, the fact that whether or not a farming field can be used as a mortgaged asset depends not only on the plot area but also on its legal status (i.e. the land owner should produce a title deed).

The effect of variable "title deed" on householder's accessibility to bank loan is statistically significant at 5%. When extending a loan, many banks often require farming households to mortgage their title deed though many farmers can secure fiduciary loans. This explains the fact that a household with a title deed will take out a bank loan more easily than those without (i.e. around 0.000145 time).

The variable "expenditure" bears a negative sign and has a statistical significance at 5%. Obviously, the higher the expenditure (i.e expenditures on production and basic necessities), the lower their accessibility. This can be explained by the fact that most of bank loans are at the service of agricultural production, and thus the size of loan is not big and can be easily secured. However, farmers often borrow a large sum to meet their spending on both agricultural production and basic necessities; making banks afraid of extending big loans.

The gross value of assets is statistically significant at 10%. The higher the gross value is, the more affluent the household is. This variable yields a positive coefficient as expected. This implies that those with more assets will access bank loans more easily. The Probit model results show that if other factors are fixed, ability to access banks loans will increase 0.0558% when the gross value of assets goes up by one unit.

Furthermore, the ratio of dependents also influences the access to bank loans at the significant level of 10%. Dependents include those under or over the working age, and those unable to work for some reason, and consequently they have to rely on the income of another household member. Once the ratio of dependents is high, so is the need for credit. Meanwhile, banks do not extend a loan for the purpose of daily consumption, and thus such households constantly face difficulty in bank borrowing. The model results show that ability to access bank loans decreases 0.1686 time if the ratio of dependents get higher.

b. Tobit Model and Factors Affecting the Size of Loan:

The null hypothesis which states that all coefficients of the Tobit model (excluding the intercept coefficient) equal zero is rejected by the approximate value. The p-value is 0.0000, implying the good fit of the model. Yet, in the model, regression coefficients cannot reflect changes in the loan size once an explanatory variable changes (other factors are fixed). The paper just focuses on qualitative analyses in order to explain impacts of explanatory variables on the dependent one.

Table 4: The Tobit model results

Independent variables	Code	Slope coefficient	P-value
Gender	Gtinh	-2103.1070	0.010
Age	Tuoi	-7669.2290	0.407
Educational level	Tdhv	458.1350	0.646
Title deed	Bkhoan	-6038.4500	0.059
Ratio of dependents	Tlephth	113.6226	0.470
Social status	Vtxh	17503.0000	0.096
Land area	Dtich	181277.5000	0.000
Income	Tnhap	0.3358	0.000
Expenditure	Ctieu	-14201.4900	0.050
Gross value of assets	TongTS	0.0281	0.000
Observations	336		
P-value of the model	0.0000		
Logarithm value of the appropriate function	-2.279.0167		
Chi-square value	474.55		

Source: Results of handling of survey data from Stata

In the Tobit model, the variables age of householder, educational level, ratio of dependents, and income are not statistically significant and thus are not considered by banking organizations before extending a loan. The Tobit model reflects its goodness of fit by producing seven significant variables to be considered before extending a loan.

Of factors affecting the loan size, the variable ‘title deed’ is statistically significant at 10%. Indeed, all banking organizations deem title deeds as a mortgaged asset for bank loans, and farmers are afraid of being foreclosed once they cannot repay the loan on the due date. Thus, a farmer with a title deed will be extended a larger loan than those without.

The variable 'social status' is statistically significant at 10%. Social relationship plays a very important role in acquiring bank loans. Given the results of the Tobit model, if a household with a member working in an economic organization or having a close relationship with the manager of a bank, their loan will be larger than those without due to the fact that they gain latest information on lending procedure or preferential lending package, etc.

The statistical significance level of land area is at 1% implying that the larger the land area, the bigger the loan. Because land is the primary and most valuable asset of farming households, banking organizations often appraise the land value as the basis for determining the lending level. Land is also used as a mortgaged asset when entering into a lending contract.

The income of householder positively affects the loan size with a significant level of 1%. This meets the expectation for bearing a positive value. Thus, the higher the householder's income, the bigger the loan. This is easily explicable due to the fact that according to banking organization, once borrowers earn high income, they are able to repay the loan on mature day, and their operation will not be impeded.

The variable 'household expenditure' bears a negative sign and is statistically significant at 5%. If the household spending on production and daily life is high, their loan will be small. This can be explained by the fact that a household with huge spending on production must be affluent, and thus they actively prepare capital for their business; if they even have to take out a loan, it is just a small amount.

The statistically significant level of total asset value is at 1% implying a positive impact on the loan size. A household with tremendous value of total asset will be treated as a customer with high reliability and be able to repay the loan punctually. The total asset value is often a basis for a banking organization to define the size of loan; and thus the larger the total asset value, the larger the loan amount.

7. CONCLUSION

In sum, the access of farming households to bank loans and the loan size are affected by various factors. The Probit model shows that the age of householder, gender, land area, title deed, household's spending, total asset value and the ratio of dependents sharply affect the access to bank loans. In the Tobit model, the loan size is decided by the educational level of householder, title deed, social status, land area, household income and spending, and the total asset value. The statistical significance level of these factors ranges from one to ten percent. By combining the two models (Probit and Tobit) we confirm that banking organizations often pay attention to land area, title deed, and spending and income of the householder before extending a loan. These factors profoundly affect the accessibility to bank loans and the loan size■

References

Lê Khương Ninh (2007), *Giáo trình tài chính-tín dụng nông thôn* (A coursebook on rural finance and credit), Cần Thơ University.

Mai Văn Nam (2006), *Giáo trình kinh tế lượng* (Econometrics textbook), HCMC: Thống Kê Publisher.

Võ Thị Thanh Lộc (2001), *Thống kê ứng dụng và dự báo trong kinh doanh và kinh tế* (Applied statistics and prediction in business and economy), 2nd ed., HCMC: Thống Kê Publisher.