

## Article

# Determinants of Farming Households' Credit Accessibility in Rural Areas of Vietnam: A Case Study in Haiphong City, Vietnam

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**Abstract:** The role of agricultural sectors in the economic development of a country is undeniable, especially in developing and least-developed ones, ensuring food supply, increasing national income, export earnings and poverty reduction. Vietnam is known as an emerging market, depending directly on agriculture-related activities for their livelihood, in which the issue of rural credit access still remains a confounding problem. The paper focuses on identifying the determinants of credit access in rural areas of Vietnam using Haiphong city as a case study, including formal and informal credit. The paper uses data collected from a survey of 180 rural households in a district of Haiphong city. The probit and linear regression models are applied to investigate the factors that determine household credit accessibility, i.e., the household's decision to borrow and borrowing amounts. Results of this analysis reveal the different significant determinants of formal and informal credit market access. Group membership and connection are found to have significantly strong impacts on formal credit accessibility while informal credit access is strongly influenced by agriculture income and dependency ratio. The implications of these findings for enhancing formal credit accessibility and decreasing the dependence on informal markets are discussed.

**Keywords:** agriculture credit; access to credit; credit constraints; rural credit markets; developing countries; Vietnam

## 1. Introduction

Agriculture is known as the root of rural development as well as one of the key sectors of all economies. Undeniably, the agriculture sector especially plays an important role in developing countries with a large number of people living in rural areas. In reality, agricultural production of rural areas in these countries make up a big proportion, contributing to internal food security, poverty reduction and employment of the majority of farmers, helping them expand production and increase welfare [1,2]. Therefore, raising funds for agriculture production is indeed crucial. The lack of capital, especially in rural zones, will lead to a drop in output, an impact on GDP, and national food insecurity in poor countries. Vietnam has been known as a developing country with more than 70% of their population living in rural zones with their main source of income from agriculture. However, rural credit access in developing countries, such as Vietnam, still remains a confounding

problem. This credit restriction is likely due to the nature of the rural credit markets as well as the lending procedures. The credit markets in Vietnam are quite segmented, in which informal and formal markets are observed to commonly exist in rural Vietnam. In reality, informal credit sources seemingly tend to be dominant in rural areas because of the limitation of the formal markets.

Haiphong, now, is the second largest city in the north of Vietnam. In reality, Haiphong is known as one of five municipalities of Vietnam, which are administratively on the same level as provinces. Despite its status as a big city, Haiphong has a high proportion of their population living in the rural areas, accounting for 54% of the total [3]. Moreover, around one third of Haiphong's area is used for agriculture production [3]. On the other hand, the number of agricultural labor in Haiphong city is even much larger than that of industry. As of 2018, 35% of the total workforce was employed in agriculture and fishery, which implies the important role of agriculture in raising income and enhancing farmers' livelihood [3].

In practice, farming households are often constrained to access formal credit because they do not have enough collateral, as well as they cannot borrow on the basis of their income. The number of studies focusing on the importance of rural credit in some provinces of Vietnam has significantly grown in recent years. However, there have been few studies conducted in rural areas of big cities (provinces), such as Haiphong city, where almost all rural districts are highly urbanized. Therefore, interesting results of this study will emerge.

Based on the consideration above, the aim of this study is to find out the determinants of farming household credit accessibility in both formal and informal credit markets in rural areas of Vietnam with the case in Haiphong city. The rest of this paper is organized, as follows. Section 2 summarizes some previous literature from a descriptive viewpoint to compare the determinants of access to rural credit in Vietnam with other developing nations. Section 3 presents the methodology used in this paper. Some results and discussion about the determinants of the research site are shown in Section 4. There are some differences of important factors affecting credit access between formal and informal markets, such as gender, attendance of credit group, connection, regions, dependency ratio and household income. Based on that, some implications that can be proposed to facilitate rural credit access of households for agriculture production and conclusions are presented in Section 5.

## 2. Literature Review

### 2.1. The Concept of Rural Credit Accessibility

Credit sources are generally divided in three categories: formal, semi-formal and informal credit sources. The semi-formal ones make up a very small share in the total, including microfinance institutions or NGOs, government-supported lending programs that are aimed at particular sections of the population, and other non-government projects [4]; so, it is the reason that semi-formal sectors are excluded in the study. The two main remaining markets: formal and informal markets that are coexisting, are segmented in rural zones. Formal institutions in the rural markets are commercial banks or credit funds while informal sources can come from moneylenders, local sellers, informal credit associations, relatives or friends.

Households' access to rural credit markets can be simply defined as approaching credit services [5]. In other words, rural credit access means that households have access to specific sources among many available ones. Subsequently, access to credit is measured by the amount of money that a household can borrow from lenders [6]. Accordingly, Zeller et al. indicated that formal credit accessibility of farming households should be considered under the two main actors: borrowers—households/credit demand and lenders—credit suppliers [7]. The authors also indicated that credit rationing is the measurement of access to credit [7], in which the demand factors are to provide information if a household is constrained to a credit source or not, while the supply factors present the amount that borrowers can obtain from the given source. The two aspects/sides of household credit access have been figured out in most of the research in developing countries. In some other studies, credit constraints are considered to measure credit accessibility, in which there is a mismatch

between borrowers' credit demand and lenders' lending decisions [8]. However, there are some differences of between the meaning of credit constraints and credit accessibility in some research.

## 2.2. Determinants of Access to Rural Credit in Some Developing Countries and Vietnam

Determinants of credit access are factors of household characteristics and capacities that affect household credit demand and decisions to participate in the credit markets. In other words, credit-side and supply-side factors should be taken into account [7]. Credit-side or household-related factors are demographic characteristics which often affect households' credit demand while supply-side factors are often socio-economic characteristics or capacities which the lenders employ as criteria in selecting and screening potential borrowers who are eligible to receive loans [9].

Many studies suggest that formal credit accessibility are likely to be affected by households' basic demographic and socio-economic characteristics, such as: gender, age, education, household size, family income, attendance of credit group, dependency ratio, size of farming land, size of land with certificate of ownership. Age, education, dependency ratio and family income all have significant effects on access to formal rural credit [10,11]. In the research of Hananu et al. [11] and Kosgey [12], age of the farmers has positive correlation with the probability of the households' credit access decision while the increase in the household heads' age was found to decline the households' formal credit accessibility in the paper of Luan et al. [13]. Barslund also confirmed this negative relationship between age and both formal and informal credit accessibility with the case of four provinces in Vietnam [14]. Farming experience in agricultural production is also an influential factor highlighted in some studies [15]. Gender of households' heads is one of the significant variables that has impacts of household access. In some studies, male farmers are perceived to be more creditworthy by formal lenders so have higher chance of access to credit than females [12]. On the other hand, women are expected to outstrip men in the probability of formal credit access, especially in poor and developing countries. This fact is clearly indicated in microcredit that is supported by NGOs (non-governmental organizations) or subsidized by the government that are targeted towards women [11,16].

Education level is found to have a positive sign with households' probability to participating in credit markets in a lot of previous literature [11,17]. Higher levels of education infer better knowledge, farming skills, as well as ability to obtain more information on credit markets so more educated farmers have easier access to credit [12,18,19]. The two variables that are closely related to each other are household size or total people in a family and dependency ratio, i.e., the ratio of dependent people to total people in a family. The more number of people in a family could increase credit demand [12,19–21]. Additionally, the lenders are likely to offer loans to these households because of high earning capacity and ability to share the financial burden between members. However, a negative relationship between household size and formal credit accessibility was found in the paper of Hananu et al. [11]. This negative result of family size was also confirmed by Li et al. in the study of microcredit program accessibility, in which larger family are possibly exposed to low repayment ability because of low expected income per capita [22]. On the other hand, the households with high dependency ratio are exposed to be credit rationed [23]. The high dependency ratio reflects the probability of being poor or the fewer members taking up regular income [22].

Farming size is not only the reflection of households' production capacity but also a condition when a bank screens loan applications. So, the area of farming land is confirmed to be positively related to the probability of farmers' formal credit access [16,19,24–28]. This variable is also presented in some studies in Vietnam [14,29]. Family income including agricultural and non-agricultural income can be regarded as a proxy of production scale and debt repayment capacity. Hanunu et al. in Africa and Khoi et al. in Vietnam also confirm this significant relationship between household income and credit accessibility [11,30]. Separate non-agricultural income is indicated in few papers [19]. In many studies, the distance between households and the nearest financial institutions is found to affect formal credit sources [26]. This negative correlation between distance and probability of household credit access is consistent in the findings of Hananu et al. [11], Rahji et al. [31], Ayamga et al. [32] and many researches in rural Vietnam [14,21,30].

Households with better land ownership status have more chance to participate in the credit markets, especially the formal ones [26,33–35]. Land area with ownership certificate is a substitute of asset possession and collateral security. In reality, many financial institutions or commercial banks are only willing to offer loans on the basis of collateral. Even most informal lenders decide to approve loans based on borrowers' assets [7]. Collateral is believed to increase households' repayment possibility [36–38]. In Vietnam, this variable is not significantly found so much in the surveys of rural credit. Especially, the value of land with ownership certificate, that is little indicated in previous researches of Vietnam, is one of the criteria of the loan application screening procedures. Approved amounts from banks are based on the assessed value of the collateral. Some types of formal institutions in Vietnamese rural areas require no collateral for lending to farmers, such as: VBSP (Vietnam Bank for Social Policies) or PCFs (People's Credit Funds) (depending on each PCFs: some require and some do not). So, one of the conditions for farmers to be able to borrow from these institutions is being members of given credit groups [39]. Therefore, the factor of credit group membership has been explained to be a guarantee of household loans in some studies in Vietnam and developing countries [7,11,30]. Concerning credit factors, Kosgey has demonstrated the positive relationship between repayment period and household credit accessibility [12]. The others, such as: loan duration, loan processing, interest rate and loan size were confirmed as the main factors affecting the probability of farmer credit access in Philippines [10]. These credit elements are less mentioned in studies of Vietnam than the other countries. Credit history known as a "not paid" variable in the survey of Barslund et al. [14], captured if a household has defaulted or not. However, this "not paid" variable is significantly related to informal credit access.

All variables indicated above are observable factors. However, unobservable factors, i.e., social capital/social networks have been figured out in relationship with farmers' credit accessibility. There are different variables in each study, known as the proxy of social capital. Members of a family working as local officials presuming a good relationship with local financial institutions tend to access formal credit sources more easily [22]. Many other authors share the same view of social network reflection on household credit accessibility [40,41]. Many authors who conduct surveys in rural areas in Vietnam emphasize the effects of this social connection variable. Luan et al. indicated social capital as the numbers of helpers and number of contacts with agricultural extension in the last 12 months [42] while the dummy variable of households' social network is named as the dummy variable households' acquaintances in existing credit institutions in the paper of Barslund et al. [14], and as the reputation and social status in the survey of Duong et al. [29].

There are few studies of developing countries specifying the relationship between formal and informal credit markets as well as the determinants of informal credit access separately. Hananu indicated that informal credit participation have impacts on the probability of formal credit access [11]. The decision to borrow, of a household, from formal sources in rural areas is affected by obtained informal amounts [43]. This correlation was confirmed in a Vietnamese research of Mekong River Delta [30]. In Vietnam, formal and informal credit markets have been demonstrated to be independent and segmented, especially in some studies of Vietnam [14,29,44]. Concerning non-institutional markets, some papers in Thailand and Philippines presented that interest rate and loan size are crucial determinants of household access [45,46].

Many authors in other countries often focus on households' credit market participation instead of the borrowed amounts while almost all papers conducted in Vietnam usually indicate the two aspects of credit access. These authors have emphasized the segmentation of Vietnam rural credit markets through exploring the determinants of both household credit participation and loan amounts.

### 3. The Rural Credit Markets in Vietnam

Vietnamese rural credit markets are divided in three categories: formal, informal and semi-formal. Semi-formal sources in Vietnam make up a small credit market share as well as having specific characteristics, so these markets are excluded in the paper. The three state-owned financial institutions are the three main formal sources in rural Vietnam, i.e., Vietnam Bank for Agriculture

and Rural Development (VBARD), Vietnam Bank for Social Policies (VBSP) and the People's Credit Funds (PCFs). The three institutions control around 70% rural credit market share. The Bank for Agriculture and Rural Development and The Vietnam Bank for Social Policies have more branches than the other formal institutions, spreading all over the country. VBARD is a commercial bank whose targeted customers are larger-scale households. VBARD requires collateral for almost all loans offered. The Vietnam Bank for Social Policies, formerly known as the Vietnam Bank for the Poor, often provides low-interest rate credit to poorer people without collateral. VBSP offers most of their loans on the basis of a group-based lending scheme through local associations, i.e., Women's Union, Farmers' Association, Veterans Association, and Youth Union. The role of local associations is providing guarantees of loans to the borrowers. The People's Credit Fund system operates mainly in rural areas. The purpose of the funds is to mobilize on-the-spot deposits for local loans as the ways to support community and local development. Especially, PCFs often lend the locals in the commune where it is located. Each of the PCFs have specific lending policies, requiring collateral or not.

Concerning the informal credit sector in rural Vietnam, there are many studies that have indicated its importance in financing household production in case of formal credit shortage [14,29,30]. Informal credit sources in rural areas of Vietnam are mainly from relatives, friends, informal revolving credit associations ("ho, hui, phuong"), and local lenders with high interest rates or goods on credit from local sellers. Informal credit includes interest and no-interest loans as well as collateral-required and no-collateral loans. A major informal credit source from moneylenders in Bangladesh is also indicated in the research of Ghosh et al. [47].

The salient characteristics of rural credit markets in Vietnam can be described as segmented and lender participation constrained [39]. The segmentation of rural credit markets is due to borrowing purpose differences. While formal loans are often used for production, informal credit is seemingly referred to in order to meet diverse demand of rural households [14,29]. The constraints of rural credit participation, especially formal participation, result from the nature of agricultural production and the imperfection of formal markets. That is the reason why the informal credit sources are likely to be prevalent in rural areas. The agricultural production can be considered to be so risky, attributed to complicated uncertainties of weather or diseases [48]. The uncertainties will grow up in developing countries such as Vietnam with the lack of technology, skill and inappropriate agriculture policies [49,50]. Then, financial institutions, such as commercial banks in Vietnam, are reluctant to enter the agricultural credit markets in rural zones. They have the rights to choose good low-risk potential customers instead of high-risk ones.

## 4. Materials and Methods

### 4.1. Selection of the Study Area

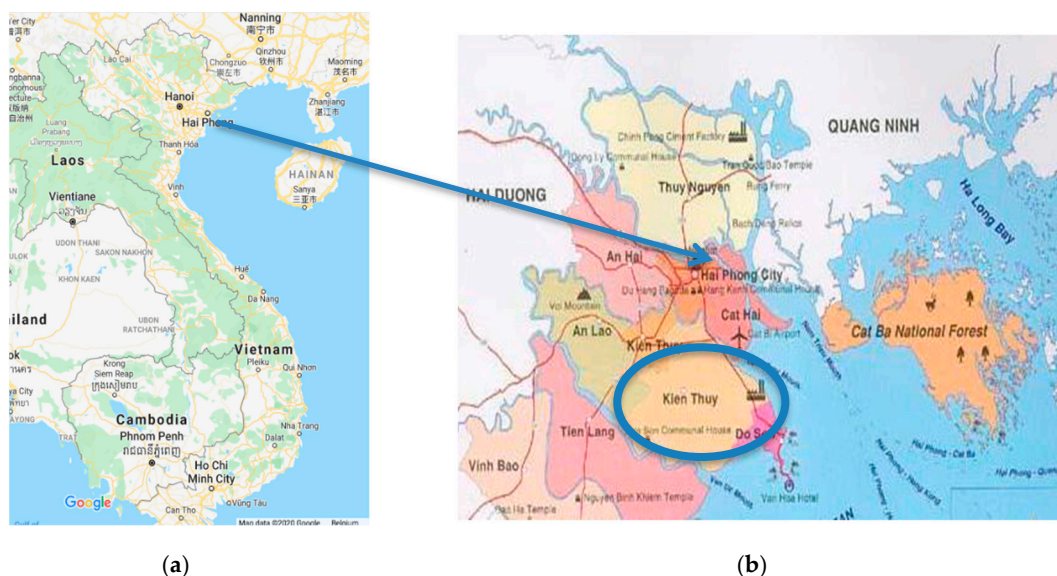
The study is conducted in Haiphong city of Vietnam. Haiphong is the center of economy and trade in the northern coast of Vietnam, 120 km east of Hanoi—the capital of Vietnam as shown in Figure 1 (a). It has a total natural area of around 1.561 km<sup>2</sup> with population of about two million [51]. Haiphong is subdivided into 15 district-level sub-divisions, including 8 rural districts and 7 urban districts. Kienthuy rural district in Figure 1 (b) was selected as the representative rural area of Haiphong city. Kienthuy is the district of which GDP in the agricultural sector accounts for 33% of the total. This proportion is greatest as compared to the other districts in Haiphong city. Moreover, people working in the agricultural sector make up a high percentage of the total in this district, as 65% in 2018 [3]. The main agricultural income of households in Kienthuy comes from animal production.

### 4.2. Data Collection

Key primary data used here were generated in a comprehensive household survey with sets of structured questionnaires in Kien Thuy district of Haiphong city. A multi-stage random sampling technique was applied to collect data. At the first stage, four communes of the district have been selected, i.e., Tuson, Tanphong, Nguodan and Nguphuc, in which the main household income comes

from agricultural production. At the second stage, four villages of each commune have been randomly selected and from each village, 11 to 12 farming households have been personally interviewed. The results of the research are based on valid data from 180 farming households.

The questionnaires were used to collect information on socio-economic characteristics, income and production factors. All factors captured in the survey are shown in Table 1 below.



**Figure 1.** Map of Survey Location: (a) Hanoi, capital of Vietnam; (b) Kienthuy rural district.

**Table 1.** Description of variables.

Variables	Description
Age	Age of household head (year)
Gender	Gender of household head, man = 1, woman = 0
Education	Education levels of household head (year of schooling)
Farming Experience	Farming experience of household head (year)
Occupation	1 = Head of family is farmers only; 0 = otherwise
People in family	Total people in a family (person)
Dependency ratio	People without income/People in family
Ln_farm_land	Log of value of farm land (land for farming activities) (m <sup>2</sup> )
Ln_owned_land	Log of value of dwelling land with ownership certificate (m <sup>2</sup> )
Ln_agri_income	Log of value of income from agriculture production (million VND)
Non_agri_income	Income from non-agriculture activities (million VND)
Ln_total income	Log of (Agri_income + Non_agri_income)
Connection	1 = having job related to government or have acquaintances in financial institutions, 0 = otherwise
Group membership	Member of a credit group: 1 = yes, 0 = no
Livestock	Value of household in cash at purchase (thousand VND)
Number of households	180 samples of 4 communes

#### 4.3. Empirical Models

The probit and normal regression model was applied to identify the determinants of credit access at the household level. Household credit accessibility includes households' participation in credit markets and the borrowed loan amounts based on previous literature, which are assumed to be influenced by a number of household characteristics as two equations as follows:

$$Y_i^* = \alpha_1 + \beta_1 X_i + u_i \quad (1)$$

$$Y_i = 1 \text{ if } Y_i^* > 0$$

$$Y_i = 0, \text{ otherwise}$$

$$B_i^* = \alpha_2 + \beta_2 X_k + e_i \quad (2)$$

$$B_i = B_i^* = \alpha_2 + \beta_2 X_k + e_i, \text{ if } Y_i^* = 1$$

$$B_i = 0, \text{ otherwise}$$

In equation (1)  $Y_i = 1$  if a household has access to credit (including formal and informal sources) and 0 if otherwise,  $X_i$  and  $X_k$  captures all household socio-economic characteristics, income, credit and production factors, as shown in the table.

Next, household characteristics are also assumed to have effects on the size of loans the household takes up in equation (2). Under the case  $Y_i = 1$ ,  $B_i$  represents the log of the expected value of the amount received by each household. That means  $B_i$  is observed only when  $Y_i = 1$ , i.e., the household  $i$  has access to credit. The equation (1) is estimated using the probit model while normal OLS is used for equation (2).

#### 4.4. Socioeconomic Description of the Sample

Table 2 below shows the means and standard deviations of some key indicators of all samples. The notable feature of the four surveyed communes is that land area for farming per household varies dramatically, ranging from 100 m<sup>2</sup> to 18,000 m<sup>2</sup>. The average age of farmers is quite high at 51 and education level is 8. In details, statistical data of age has been divided in three groups: age 29–42, 43–56 and 57–70. The largest proportion of farmers are in the age of 43 to 56, about 58.8%, while the group of ages 29–42 accounts for 13.5% and the rest is 27.7%. In reality, at the age of 29–42 years, farmers in urbanized communes like Kienthuy district, have a big chance to work at industrial zones in the urban areas or seek a free job in the city with higher income. The average number of people in a typical family is three and the dependency ratio is quite low. The reason is that the greatest percentage of farmers is in the age of 43 to 56 whose children are often mature.

On the other hand, the variation of the value of livestock is quite large, ranging from 32,000 to 3,030,000 thousand VND. The agricultural income of farming households is commonly greater than non-agricultural income. On average, the amounts of informal loans are greater than the formal loan. In the study site, a formal loan from VBARD and PCFs has usually a term of one year while the longer-term loan is from VBSP. The term of informal loans is very flexible, depending on the negotiation between lender and borrowers. In addition, the informal interest rate is often excessively higher than the formal one.

Table 3 shows the percentage of credit sources as total samples and as of each commune. The proportion of households that borrow from both formal and informal sources is biggest, compared to others. About 50% of households prefer to borrow from two sources rather than only one while borrowers from formal or informal sources only account for 10.6% and 29.4%, respectively. It is the fact that the informal credit is dominant in many rural areas of Vietnam [30].

**Table 2.** Means and standard deviations of some indicators.

	Unit	Minimum	Maximum	Mean	Std. Deviation
Age	Years	29	70	51,483	7802
Education	Years of schooling	5	12	8706	1827
Farming Experience	Years	8	50	29,183	7859
Occupation	–	0	1	0.639	0.482
People in a family	Person	1	6	2994	1049
Dependency ratio	–	0	0.67	0.162	0.221
Farm land	m <sup>2</sup>	100	18,000	4,046.056	2,495.604
Owned land	m <sup>2</sup>	75	7200	445.572	561.753
Agri_income	Million VND	20	1000	193.228	159.447
Non_agri_income	Million VND	0	360	67,822	68,976
Total_income	Million VND	30	1300	261.050	187.531
Livestock	Million VND	32,000	3,030.000	667,983.333	516,065.646
Network connection	–	0	1	0.633	0.483
Formal amount	Million VND	20	1000	105.688	141.626
Informal amount	Million VND	15	1100	242.182	160.207
Number of observations		180			

Source: Authors' household survey in 2019.

**Table 3.** Distribution of loans by sources and communes.

	Total		Tu Son		Tan Phong		Ngu Doan		Ngu Phuc	
	Number of HHs	%	Number of HHs	%	Number of HHs	%	Number of HHs	%	Number of HHs	%
None	18	10	2	4.3	1	2.3	5	11.1	10	22.7
Formal	19	10.6	3	6.4	0	0	10	22.2	6	13.6
Informal	53	29.4	14	29.8	16	36.4	12	26.7	11	25
Both	90	50	28	59.6	27	61.4	18	40	17	38.6
Total	180	100	47	100	44	100	45	100	44	100

Source: Authors' household survey in 2019. HHs: Households.

Table 4 highlights formal financial activities of surveyed households with detailed information of the four communes. The data shows that the main formal source of all samples and of each commune is from VBSP. Loans from VBSP occupy the biggest percentage of all four communes. Households borrowing from PCFs are found in two communes, i.e., Ngudoan and Nguphuc. The reason being that PCFs just offer loans to borrowers living in the commune where they are located.



**Table 4.** Distribution of formal sources.

Formal Sources	VBARD	VBSP	VBARD and VBSP	PCF	PCF and VBSP	Subtotal	Total Sample
Number of HHs	22	61	9	16	1	109	180
%	20.18	55.96	8.26	14.68	0.92	100	

Source: Authors' household survey in 2019.

All informal credit sources are presented in Table 5. There are 91 households, as of the total borrowing from local sellers, accounting for around 65%. The large-scale households often approach local seller source through buying on credit. This informal source is so popular in rural areas and easy to borrow without collateral. The transactions are mostly based on the relationship between households and local suppliers.

**Table 5.** Distribution of informal sources.

Informal Sources	Relatives/Friends	Local Sellers	CSG*	Relatives & Local Sellers	CSG & Local Sellers	Money Lenders & Local Sellers	Relatives & CSG	Sub-Total	Total Sample
Number of HHs	1	91	7	19	18	3	2	141	180
%	0.71	64.54	4.96	13.48	12.77	2.13	1.42	100	

Sources: Authors' household survey in 2019. \* CSG: Informal Credit and Saving Group (known as: "ho", "hui", "phuong").

## 5. Results and Discussion

### 5.1. Determinants of Households' Participation in the Credit Markets

Households in the research site borrow from both the formal and informal credit markets, so the results will be biased if we pool informal and formal demand. To deal with the issue, Table 6 reports results from estimation of function (1) using probit regression where households' formal and informal credit market access is studied separately.

In this estimation, based on the sample description above and previous studies, our hypothesis is that the coefficient sign of formal and informal credit access are quite different because of market segmentation. Consequently, authors can expect the sign of coefficients as follows: gender (+/-), age, education, occupation, group membership, owned\_land, agri\_income (+) for both informal and formal access, and dependency ratio (+) for formal access and (−) for informal access. Dependency ratio is often a proxy of the poor, so families with a high dependency ratio seem to approach formal credit because of a lower interest rate than an informal one. Farm-land and connection are assumed to receive (+) for both.

When we study credit accessibility as pooled sources, the factors significantly affecting households' participation in credit markets are regions. The signs of region dummy variables for two communes, Tuson and Tanphong, are positive and significant at the 5% level. It supports the fact that households in these two communes have greater demand for loans than the base commune, Nguphuc. The differences have large economic significance as well.

Concerning the determinants of borrowing by households from the formal institutions, the significant factors are the variables of gender, group membership, dependency ratio, region (Tuson commune) and connection as proxy of social network. The coefficient of gender variable is significantly positive at 10%. That result suggests that the households whose head are men have greater demand in borrowing money for production. This is consistent to the studies of Kosgey and Barslund [12,14]. As expected, factors of group membership and network connection are positively correlated with formal credit access at 1% and 5% level of statistical significance, respectively. The result of group membership factor is also confirmed by other authors [7,11,30]. The result of network

connection means that a household with a higher level of social interaction is more likely to access formal credit. This result is indicated in the findings of many studies in Vietnam [14,21,42,52] and other countries [22]. Network connection is proxy of households with members working as local government officials or households having acquaintances in formal financial institutions. Accordingly, people with high network connection are likely to have access to more information about credit formal programs. On the other hand, these members are often highly recognized by the leaders of communes or financial institutions, which raises their family's reputation. This relationship will facilitate the process of the lending decision [29,30].

The variable of dependency ratio presents a significantly positive influence on formal credit accessibility at the 10% level. This result means families with more dependent people prefer to borrow money from formal credit sources rather than informal ones because of the lower interest rate. This finding is presented in the research of Li and Okurut [22,23]. Among three communes, Tuson, Tanphong and Ngudoan, just the Tuson commune has significantly found to have greater formal credit demand than the base commune, Nguphuc, at the level of 10%.

The big right-hand column of Table 6 reports the results of household informal credit accessibility of the research site. Interestingly, dependency ratio variables have a significantly negative relationship with informal credit access, as opposite to a formal one. This is very likely due to the high interest rate of informal credit sources. This means the families with more dependent people want to decrease expenditures, so they prefer to borrow from formal institutions with lower interest rates. The explanatory variable, *ln\_agri\_income*, indicating household income from agriculture production has a positive effect on informal credit access and is highly significant at the 5% level while this variable has no impact on household formal credit accessibility. That means informal borrowings have a positive relationship with production scale and agriculture income. This finding means that informal markets can be a substitute source when formal credit does not meet enough demand of farming households. In the study site, farming households are willing to finance their production in informal markets because of limited formal borrowed amounts as shown in Table 6.

While Tuson commune has found to have greater formal credit demand than the base commune, households in Tanphong commune prefer to borrow from informal sources to finance their production rather than base commune Nguphuc. The coefficient of Tanphong is significantly positive at the level of 5%. Compared to the determinants of formal sources, the coefficients of group membership and network connection are also positive, however, no significant impacts on informal accessibility are found. In reality, the households easily buy agriculture production inputs on credit from local sellers without collaterals or deposits.

In order to investigate the relationship between the formal and informal credit markets, the authors included "borrowing formal" as an independent dummy variable in the estimation of the probability of formal credit access in Table 7. This variable has no impact on household formal credit accessibility. The segmentation of rural credit markets has indicated in some previous studies both in Vietnam and other developing countries [14,18,29]. In reality, many households prefer taking informal loans rather than formal ones due to the easy procedures and quick access, especially larger-scale households.

**Table 6.** Determinants of households' participation in the credit markets.

	All Sources			Formal Sources			Informal Sources		
	Coefficient	S.E.	Sig.	Coefficient	S.E.	Sig.	Coefficient	S.E.	Sig.
Age	0.032	0.074	0.671	0.153	0.108	0.157	−0.057	0.047	0.223
Gender	0.179	0.731	0.807	2,487	1348	0.065*	−0.203	0.456	0.656
Education	0.197	0.204	0.335	0.025	0.301	0.935	0.141	0.138	0.306
Occupation	0.467	0.739	0.528	−0.180	1793	0.920	0.517	0.477	0.279
Group_membership	20,449	3,801.872	0.996	12,521	3746	0.001***	0.469	0.553	0.396
Ln_owned_land	−0.607	0.712	0.394	−0.469	0.787	0.552	−0.356	0.400	0.374
Ln_agri_income	0.267	0.587	0.650	0.877	0.956	0.359	0.723	0.362	0.046**
Dependency_ratio	−1532	2516	0.543	6513	3864	0.092*	−3398	1,644	0.039**
Tuson	2.18	1025	0.033**	4640	2403	0.054*	1089	0.724	0.132
Tanphong	2701	1342	0.044**	2755	2561	0.282	2534	1,152	0.028**
Ngudoan	0.631	1076	0.558	−1.301	2125	0.540	−0.378	0.670	0.573
Ln_farm_land	0.301	0.847	0.723	1,024	0.902	0.256	0.202	0.296	0.495
Connection	0.265	0.843	0.753	5521	1787	0.002***	0.018	0.584	0.975
Constant	−3445	8208	0.675	−28,993	11,368	0.011	−0.209	4067	0.959
Observations	180			180			180		
−2 Log Likelihood	69,825			33,467			144		
Omnibus tests of model coefficients	Chi-square: 47,204 (Sig. 0.000)			Chi-square: 207,83 (Sig. 0.000)			Chi-square: 44,153 (Sig. 0.000)		
Hosmer and Lemeshow test	Chi-square: 4891 (df: 8, Sig. 0.769)			Chi-square: 9329 (df: 8, Sig. 0.315)			Chi-square: 3369 (df: 8, Sig. 0.909)		
Correct Predicted Percentage	91.1			98.3			81.7		

Source: Authors' household survey in 2019. \*: Significant at 10% level. \*\*: Significant at 5% level. \*\*\*: Significant at 1% level.

**Table 7.** Formal credit accessibility and interaction with informal markets.

	Coefficient	S.E.	Sig.
Age	0.156	0.111	0.161
Gender	2,529	1362	0.063*
Education	0.013	0.309	0.967
Occupation	−0.040	1855	0.983
Group_membership	12,507	3743	0.001***
Ln_owned_land	−0.526	0.809	0.516
ln_agri_income	0.926	0.966	0.338
Dependent_ratio	6486	3928	0.099*
Tuson	4791	2485	0.054*
Tanphong	2868	2602	0.27
Ngudoan	−1355	2110	0.521
Ln_farm_land	1008	0.902	0.264
Connection	5572	1838	0.002***
Borrowing_informal	−0.385	1352	0.776
Constant	−28,795	11,504	0.012
Observations	180		
−2 Log Likelihood	33,349		
Hosmer and Lemeshow test	Chi-square: 9243 (df: 8, Sig. 0.322)		
Correct Predicted Percentage	97.8		

Source: Authors' household survey in 2019. \*: Significant at 10% level. \*\*: Significant at 5% level. \*\*\*: Significant at 1% level.

## 5.2. Determinants of Borrowing Amounts of Households

In addition to the variables estimated as in Table 7 (based estimation), the paper also implements the extended estimation in Table 8 to make the results robust. According to previous literature, borrowing amounts are based on lenders' decisions through screening loan applications from households. Borrowers' characteristics will be inputted in lenders' data. In the extended estimation, the variable agriculture income is excluded while the two variables of total people in family and *ln\_total\_income* are included. In reality, lenders focus on total income of a family to consider the debt repayment rather than only agriculture income. Total people in a family (number of people) are also a proxy for family earning capacity.

Compared to the determinants of household credit market participation, the sign of coefficients of borrowing amounts estimation will be a little bit different as follows: gender (+/−), age, education, group membership, owned land as proxy of family wealth in informal markets as well as the value of collateral as to which lender will consider in formal markets (+), total income, total people, farmland and connection (+), dependency ratio (+) for formal access and (−) for informal access. However, the sign of occupation is likely to be negative. The reason is that people with non-agriculture jobs have substitute sources for debt repayment in case of agricultural uncertainties.

**Table 8.** Determinants of borrowing amounts.

	Formal				Informal			
	Based		Extended		Based		Extended	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.
(Constant)	1109	0.378	−0.183	0.898	0.486	0.511	−0.505	0.597
Age	0.005	0.688	0.009	0.436	0.001	0.933	0.001	0.888
Gender	−0.133	0.299	−0.143	0.277	0.030	0.663	0.096	0.260
Education	0.003	0.934	−0.008	0.829	0.001	0.961	−0.014	0.556
Occupation	−0.259	0.066*	−0.212	0.140	0.122	0.122	0.318	0.002***
Group_membership	−0.997	0.000***	−0.909	0.00***	−0.047	0.572	−0.063	0.555
ln_owned_land	0.085	0.443	0.169	0.198	0.037	0.547	0.094	0.262
ln_agri_income	0.239	0.014**			0.827	0.000***		
Dependency_ratio	0.308	0.418	0.046	0.916	0.005	0.983	0.246	0.428
Tuson	−0.145	0.512	−0.013	0.952	0.526	0.000***	0.808	0.000***
Tanphong	−0.218	0.315	−0.094	0.65	0.459	0.000***	0.701	0.000***
Ngudoan	0.059	0.776	0.192	0.345	0.449	0.001***	0.746	0.000***
ln_farm_land	0.238	0.003***	0.257	0.001***	−0.026	0.659	0.041	0.553
Connection	0.287	0.185	0.27	0.216	0.047	0.605	0.228	0.050*
Total people			0.124	0.14			−0.091	0.102
ln_total_income			0.223	0.054*			0.763	0.000***
Observations	109		109		141		141	
R square	0.553		0.549		0.799		0.701	

Source: Authors' household survey in 2019. \*: Significant at 10% level. \*\*: Significant at 5% level. \*\*\*: Significant at 1% level.

Table 8 reveals the differences in borrowed amounts of farming households from formal and informal credit sources. The big second column of the table presents the determinants of formal borrowing amounts in the based estimation. Interestingly, group membership variable has significantly negative impacts on the formal amounts at the level of 1%. This result is inconsistent with the hypothesis. However, this is reasonable. In the research site, borrowers of VBSP or PCFs are required to be a credit group member while borrowers of VBARD are not required. Accordingly, that result means households who borrow from only VBARD could obtain larger amounts than those who borrow from just one other formal source (i.e., just from VBSP or PCFs) or from two sources (i.e., VBARD and VBSP or VBARD and PCFs). The descriptive data of formal sources are shown in the section above. Or in other words, households having demand of large amounts prefer applying for loans to VBARD rather than to other formal institutions.

As expected, the variables of agriculture income and farming land in m<sup>2</sup> are positive and highly significant at the level of 5% and 1%, respectively. One percent of increase in income from agricultural activities raises the formal credit amounts by 24.1%. This is consistent to the research of Khoi et al. [30]. Similarly, the positive coefficient of total farming land implies an increasing correlation between farming area and loan amount borrowed. This effect of total farming land on formal amounts is found in a lot of researches in Vietnam [29,30]. The coefficient of the occupation variable has a negative sign with significant level of 10%. That means families whose head have jobs both in agriculture production and non-agriculture sectors could borrow more money from formal sources. This is indicated as in the hypothesis because income from other sources except agriculture production can increase their debt repayment ability.

In the extended estimation, the ln\_total\_income variable positively influences on formal amounts. That means the households having more total income including from agriculture and non-agriculture sectors can take bigger borrowing amounts. The remaining factors: group membership and farm\_land have the same correlation as in the based test. This suggests that the based results are indeed robust.

On the other hand, the factors affecting informal loan amounts are different. The positive coefficient of the variable agricultural income means that households' income from agriculture production has positive correlation with informal amounts. This variable is highly significant at the

level of 1%. The remaining variables of region are also highly significantly at the 1% level. It implies that households in Tuson, Tanphong and Ngudoan communes are more likely to participate in the informal credit markets than the base commune Nguphuc. On the other hand, the results show that the farmers in Tuson commune could take the largest informal loan amounts compared to the three others. Accordingly, Tuson also stands out as the most developed commune with the largest average production scale.

Concerning the extended estimation of informal markets, *ln\_total\_income*, connection and occupation are found to have significant influence on informal amounts. Like formal credit providers, informal lenders also focus on households' total income. The sign of occupation is positive which means households whose heads are farmers seemingly borrow more money than others from informal sources. This enhances the fact that the informal sector could have been the substitutable option for agriculture production. This extended estimation also makes the based test more robust.

## 6. Conclusion and Implications

This research attempts to identify the determinants of farming households' credit accessibility in rural Vietnam with the case of Haiphong city. Our results confirm the segmentation of rural credit markets in the research site, in which the informal credit markets coexist with the formal ones. Informal credit is the important financial source for agriculture production when capacity of formal markets is not enough in response to households' credit demand.

The results of the paper confirm that households' formal credit market participation is significantly influenced by the following factors: gender, group membership, dependency ratio, region and connection. Male-headed families are likely to have greater formal demand than female-headed. Attending a credit group membership or having high connections increase the probability of farmers' formal credit access. The farmers with these two conditions often have more information and knowledge about formal institutions as well as lending procedures, while high connections will raise their credit worthiness. Due to the lower interest rate, families with higher dependency ratio prefer borrowing from formal sources rather than informal to decrease expenditure. On the other hand, informal credit access has no effect on the probability of formal credit markets.

Interestingly, the variable of agriculture income has a positively strong impact on informal accessibility while it is proven to affect insignificantly on formal access. In this case, borrowing from informal sources can be regarded as an important kind of capital supplement for agriculture production, especially with larger-production families. These families even prefer borrowing from informal markets attributed to convenient procedures. In addition, the communes with larger-scale agriculture production have greater informal credit demand than the remaining, indicated through the region variable.

From the regression model OLS, it was shown that total farming land has strong impact on the borrowing amounts in only formal markets. The amount of formal borrowing is also explained by the variables of occupation and agriculture income. Household heads that have non-agriculture income are likely to have better repayment ability, so they often obtain more money from formal credit providers. The more income from agriculture activities, the bigger amounts the households can borrow. This result also enhances the fact of rural credit market segmentations, in which the formal sectors are specialized in lending for production purposes while lending purposes in the informal ones are often diverse. It is very notable that in the research site, agriculture income affects significantly not only on informal credit access but also informal amounts. This means informal credit sources are the important substitute in case of formal credit shortage. The variable of total income is proven to be positively related to both formal and informal amounts in the extended estimation.

Results of the research pose some policy implications focusing on enhancing household credit accessibility in rural areas of Vietnam with the case in Haiphong city. In rural areas, many households prefer borrowing informal credit sources to finance their production, which can be considered a serious problem in rural development. Therefore, financial institutions should have more supportive policies to facilitate farmers' borrowing for agriculture production by enhancing loan procedures and reducing lending costs. Now, banks are focusing on high-return customers rather than agriculture-

production customers. Commercial banks and PCFs are the two main important credit suppliers who provide bigger amounts than the others. Lending procedures of PCFs are much more convenient than commercial banks like VBARD but the interest rates of PCFs are the highest. In reality, the salient constraint of taking big-amount loans from commercial banks is collateral in the research site in particular and in many other rural zones of Vietnam in general. Almost all commercial banks just accept households' dwelling land with ownership certificate as the high-liquidity asset. The reason being that a large proportion of rural farming land has not granted officially the ownership certificate due to limitation of Vietnam land policies. In practice, the value of farmers' dwelling land as collateral is quite small so large-production households can hardly borrow the amounts as big as they want. It is because of credit constraints that households cannot boost their production, resulting in inefficient production. Therefore, the government should have policies to fill the gap between borrowers and formal lenders, meeting credit demand to maximize their production, especially in rural areas of big cities with large production.

This study is subject to certain limitations due to the small sample size of a specific city in Vietnam, however, it also provides insights for further research. In spite of the sample size limitation, the results of the paper can be applied for the other big cities in Vietnam or the zones where informal credit is dominant compared to formal credit.

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