

Self-selection out of formal credit markets: evidence from rural Vietnam

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Abstract

Purpose – This paper examines why farmers self-select out of formal credit markets even though they need external funds.

Design/methodology/approach – We use probit and Bayesian probit estimators to detect the determinants of self-selection behavior based on a primary dataset of 2,212 rice farmers in Vietnam. After that, we use the multinomial probit (MNP) and Bayesian MNP estimators to reveal the impact of relevant factors on the decision to self-select for farmers belonging to each self-selection category.

Findings – The probit and Bayesian probit estimators show that the decision to self-select depends on household head age, income per capita, farm size, whether or not to have relatives or friends working for banks, the number of previous borrowings, risks related to natural disasters, diseases, and rice price, and the number of banks with which the farmer has relationships. The MNP and Bayesian MNP estimators give further insights into the decision of farmers to self-select in that determinants of the self-selection behavior depend on the reasons to self-select. In concrete, farm size and the number of previous borrowings mitigate the self-selection of farmers who did not apply for loans due to having access to other preferred sources of credit. The self-selection of farmers not applying for loans because of unfavorable loan terms is conditional on household head age, farming experience, income, farm size, the number of previous borrowings, natural disaster risk, and the number of banks the farmer has relationships with. Several factors, including education, income, the distance to the nearest bank, whether or not having relatives or friends working for banks, the number of previous borrowings, risks, and the number of banks the farmer has relationships with, affect the self-selection of farmers not applying for loans because of high borrowing costs. The self-selection of farmers not applying for loans because of complex application procedures depends on income and the number of previous borrowings. Finally, the household head's age, gender, experience, income, farm size, the amount of trade credit granted, the number of previous borrowings, natural disaster risk, and the number of banks the farmer has relationships with are the determinants of the self-selection of farmers not applying for loans because of a fear not being able to repay.

Practical implications – This paper fills the knowledge gap by investigating why farmers self-select out of formal credit markets. It provides evidence of how the farmers' subjective perceptions of rural credit markets contribute to their self-selection.

Originality/value – This paper shows that demand-side constraints are also vital for farmers' access to bank credit. Improving credit access via easing supply-side constraints may not increase credit uptake without addressing demand-side factors. Given that finding, it recommends policies to improve access to bank credit for farmers regarding the demand side.

Keywords Bayes, Credit, Multinomial probit, Subjective perception, Self-selection, Vietnam

Paper type Research paper

1. Introduction

Access to formal credit helps farmers improve productivity, product quality, and income (Chandio *et al.*, 2017; Hutchins, 2023; Kiros and Meshesha, 2022). Therefore, denied access, or

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credit rationing, imposes constraints and induces them to retreat to low-expected return activities (Kuhn and Bobojonov, 2023; Migheli, 2024). Studies have ascertained that supply-side factors stemming from information asymmetry, leading to adverse selection and moral hazard, are causes of credit rationing against farmers, especially smallholders (Barslund and Tarp, 2008; Do and Bauer, 2016; Dufhues *et al.*, 2004; Pham and Izumida, 2002; Phan *et al.*, 2013; Tran *et al.*, 2018). Alleviating supply-side constraints is thus recommended to get over the problem. However, that approach may not necessarily increase credit uptake without addressing demand-side factors, which also play a vital role in determining farmer access to credit. Farmers may decide not to apply for formal credit (or self-select) due to their perceptions of this credit source and risk preferences.

Self-selected farmers cannot be ignored in analyzing credit rationing because they are numerous (Briggeman *et al.*, 2009; Freel *et al.*, 2012; Levenson and Willard, 2000; Ogane, 2023). Failing to consider them can bias the estimates since their self-selection induces credit institutions to apply screening rules different from what would prevail if they did not self-select. Such a flaw would distort the empirical analysis of the efficiency of rural financial markets and result in disappointing policies to develop them. But, evidence on why farmers self-select out of formal credit markets is somehow scant. The present paper aims to fill the knowledge gap by investigating what drives farmers who need external funds to self-select. To do that, we use a primary data set from 2,212 rice farming households in the Mekong River Delta (MRD) in Vietnam – the region that accounts for more than 50% of the country's rice output. Its contribution to the existing literature is to provide evidence of how subjective perceptions of farmers propel their self-selection, distinguishing it from previous papers that mainly focused on firms (e.g. Beck *et al.*, 2018; Bircan and de Haas, 2019). Moreover, its finding implies that self-selection would have consequences for credit access denial, or one should consider self-selection behavior when studying credit rationing against farmers and proposing policies to develop rural credit markets.

This paper proceeds as follows. Section 1 of the introduction is followed by Section 2, which reviews the background literature. Section 3 presents the setting in which the farmers operate. The empirical model and the methodology appear in Section 4. Section 5 discusses sampling and the data set used in the paper. Section 6 presents the results, and Section 7 concludes and renders policy recommendations.

2. Background literature

In risky settings, agents may not know the probability of uncertain happenings and thus make decisions based on subjective perceptions that may not necessarily correspond to the truth. That holds for farmers regarding their loan applications. Sometimes, they know the bank's policy and decide to apply for loans. This action occurs in settings where borrowers frequently interact with banks. In other cases, they make decisions based on imperfect information, e.g. experience or past observations, instead of the will-be decision of the bank toward clients, which is known to successful applicants only. Then, they consciously self-select out of formal credit markets (i.e. demand-side constraint) due to their misperception of borrowing costs, screening rules, or interest rates, conditional on their risk preferences. Besides the supply-side constraint, demand-side factors could affect the functioning of rural credit markets, the adoption of new production technologies, and farmer livelihoods (Balana and Oyeyemi, 2022; Petrick, 2004). In the case of uncreditworthy borrowers, self-selection is not problematic since it adds to the efficient functioning of the credit markets. On the contrary, the behavior of creditworthy borrowers leads to sub-optimal levels of investment, suppressing their production and income. Therefore, if the extent of self-selection is substantial, addressing that issue provides more appropriate policy implications than the traditional supply-side mechanism (Freel *et al.*, 2012).

Nevertheless, the subjective perceptions of borrowers could be wrong since they would get the loans if applying (Ferrando and Mullier, 2022). Then, they falsely self-select because of their risk preferences, loss aversion, and information wedges between themselves and the banks. Given information wedges, they decide based on their experience or observations of banks' discrimination against disadvantaged borrowers with rejected applications. There are two types of discrimination, i.e. statistical and taste-based (De Andrés *et al.*, 2021; Han, 2004). Statistical discrimination occurs due to information asymmetry as banks reject applicants based on observed characteristics. They use a set of loan applicants' attributes (e.g. assets, income, age, or relationship lending) to predict their creditworthiness and decide whether or not to accept their loan applications. Taste-based discrimination emanates from animus or prejudices towards applicants according to specific features, e.g. race, gender, or ethnicity (Guryan and Charles, 2013).

Levenson and Willard (2000) and Freelt *et al.* (2012) reported that self-selected borrowers were twice as rejected. Briggeman *et al.* (2009) revealed the share of self-selected farmers being 16% of their sample. Therefore, a good understanding of self-selection and its consequences could be vital for designing appropriate policies to enhance the access to credit of economic entities. For banks, it is only profitable to lend to creditworthy borrowers, so they have to learn borrower characteristics through screening but possibly err. Screening errors occur when banks deny creditworthy applicants and accept uncreditworthy ones. Borrower characteristics and bank screening quality matter for self-selecting because of the sunk costs in the application process (Ferrando and Mullier, 2022). Borrowers who need credit trade off the costs and benefits of applying for a loan, conditional on their subjective perceptions. As argued by Kahneman and Tversky (1979), Kahneman *et al.* (1991), and Kahneman and Tversky (1992), outcomes perceived as gains are valued according to a concave function, whereas outcomes perceived as losses are valued according to a convex function, and the loss function is much steeper than the gain function. The estimates of this differential valuation are in the range of 2.25/1.00 (i.e. a loss of a value of x generates a degree of disutility that is more than twice the utility generated by a gain of the same value). Therefore, borrowers tend not to apply for credit when facing high borrowing costs (interest payments, opportunity costs, and application costs), low expected returns from production that determine their ability to honor the debts, and a high ex-ante likelihood of rejection. Application costs, which are among the most vital elements that drive farmer self-selection, take diverse forms, including financial (i.e. the cost of accountants), in-kind (time spent), and psychological (denial discomfort).

Studies often focused on developed countries where the problem of self-selection is less paramount than in developing ones with underdeveloped financial systems, a high degree of information asymmetry, and substantial borrowing costs (Popov and Ongena, 2011). In the latter countries, borrowers have difficulties signaling their unobservable quality to banks. Moreover, they are not always willing to release information since they find it time-consuming (costly) or want to hide away attributes and actions. The unobservable quality of the borrower, which renders banks' screening errors and substantial application costs, is also a determinant of self-selection (Gamma *et al.*, 2017; Kon and Storey, 2003). Self-selected borrowers give up seeking loans because they expect either high costs for getting loans or low credit limits maintained by banks to avoid defaults from borrowers (Chakravarty and Xiang, 2013). Those self-selected borrowers may be wrong in their anticipations because they may get loans if applying. Yet, most farm-level studies in the extant literature do not control for farmer self-selection, thereby rendering a potential source of bias in estimates. The present paper considers the choice of loan application as self-determined (i.e. borrowers themselves choose whether to apply or not according to their subjective perceptions), which helps better explain farmer access to credit, in addition to the credit rationing from the supply side often analyzed.

3. Setting

Vietnam's rice sector has played a vital role in helping ensure national food security and enabled the country to become a leading rice exporter since the 1980s (Ba *et al.*, 2019; Dao *et al.*, 2023; Pham and Izumida, 2002). That achievement was mainly attributable to the economic reforms (Doi moi) and the efficient cost competitiveness strategy. However, the reverse side of the medal is that Vietnam is often known for being an exporter of rice of inferior quality (Cao and Le, 2020), a bad reputation that persists and leads to a cost-price squeeze due to low prices and high production costs. Smallholders who account for approximately 70% of Vietnamese rice farmers and can no longer absorb high production costs procure inferior inputs, produce low-quality rice, and use outdated harvesting and post-harvest techniques and machinery. They thus create tiny added value and face declining profitability. One way to break the vicious circle of the cost-price squeeze and gain a brighter image for Vietnamese rice is to improve access to credit for its farmers, who have suffered a substantial extent of credit rationing (Barslund and Tarp, 2008; Nguyen *et al.*, 2022).

Several studies have investigated the incidence of credit rationing for Vietnamese farmers (Barslund and Tarp, 2008; Do and Bauer, 2016; Dufhues *et al.*, 2004; Nguyen *et al.*, 2022; Phan *et al.*, 2013; Tran *et al.*, 2018). They face credit rationing due to information asymmetry, lack of collateral, risks of many kinds (e.g. disease, rice and input price volatilities, drought, and flood), and high transaction costs. As a result, they find it hard to purchase inputs and apply dated production technologies, thus limiting the optimum production choice and product quality. They tend to stay small accordingly, failing to exploit economies of scale to improve efficiency and income. Those findings seemingly have meaningful policy implications for rural development and farming household livelihood (Pham and Izumida, 2002; Nguyen *et al.*, 2022). Access to credit affects farming household welfare via at least two channels. First, by alleviating capital constraints on households, access to credit improves their ability to procure necessary inputs, reduces the opportunity costs of capital-intensive assets, encourages labor-saving technology, and increases land productivity. Second, households with access to credit may be more willing to apply promising but risky technologies and will better stay away from risk-mitigating but undesirable livelihood strategies (Barslund and Tarp, 2008).

When studying credit rationing against farmers to propose solutions and policies, one may face potential selection bias because assigning them to credit-constrained and not credit-constrained groups may not be random. Instead, sorting them into various groups of credit rationing depends on their loan-applying behaviors determined by their subjective perceptions of the credit source and other relevant factors. Not fully considering this aspect, previous studies have just differentiated farmers who obtained credit after multiple attempts from those who did not. However, some farmers decided not to apply for loans or self-select (Briggeman *et al.*, 2009). The solutions and policies proposed may not work if excluding self-selected borrowers, a problem of many studies on credit access of Vietnamese farmers, which the present paper addresses.

4. Empirical model and methodology

We first identify the determinants of the self-selection of farmers by estimating an empirical model using a probit estimator. The model reads as follows:

$$SelfSelect_i = \alpha_i + \beta_i Z_i + \varepsilon_i, \quad (1)$$

where $SelfSelect_i$ takes a value of 1 if farmer i is self-selected and 0 otherwise, and Z_i is a vector of explanatory variables, including features of household heads (education attainment, age, gender, and farming experience) and of households (the number of family laborers, per capita income, farm size, the amount of trade credit granted, distance to the nearest bank, whether or

not to have relatives and friends working for banks, the number of previous borrowings, risks, and the number of banks the household has relationships with).

We then use a multinomial probit (MNP) regression to model the different reasons for the self-selection of the farmers. The multinomial specification allows us to jointly estimate all the reasons for self-selection while accounting for potential correlation between different reasons. The multinomial model is as follows:

$$\Pr(\text{ReasonSelfSelect}_i = j | \text{Apply}_i = 0) = \Psi(\gamma_j + \kappa_j Z_i), \quad (2)$$

where $\Psi(\cdot)$ is a multinomial function. $\text{ReasonSelfSelect}_i$ is a categorical variable taking value of 1 ($j = 1$) if the reason is “*having access to other preferred sources of credit*”; 2 ($j = 2$) if the reason is “*unfavorable loan terms*”; 3 ($j = 3$) if the reason is “*high borrowing costs*”; 4 ($j = 4$) if the reason is “*complex loan application procedures*”; and 5 ($j = 5$) if the reason is “*fear of an inability to repay the loan*”. Z_i is a vector of explanatory variables, and κ_j is the vector of coefficients to be estimated.

MNP model is commonly used when the dependent variable is categorical and takes more than two categories. In such a situation, the dependent variable y is an unordered categorical variable, and an individual may select one of the alternatives, or fall under one of the categories. The choices or categories can be coded as $j = 0, 1, \dots, m$, where m is the number of available choices or categories. In our analysis, we let y_i be the categorical variable that takes values $j = 0, 1, 2, \dots, 5$ that represents the i th household’s decision to self-select. Define y_{ij}^* as the unobserved propensity of the i th farmer to self-select for reason j :

$$y_{ij}^* = x_i' \beta + \varepsilon_{ij}$$

The observed category is the one with the highest propensity. The MNP model that the i th household falls in the j th decision to self-select can thus be modeled as follows:

$$P_{ij} = P(y_i = j) = P(y_{ij}^* > y_{ik}^*) = \varphi(x_i' \beta), \forall j \neq k,$$

where P_{ij} represents the probability that the i th individual falls into the j th category, x_i' is a vector of regressors, β is the parameters to be estimated, and φ is a probit functional evaluator.

5. Sampling and data

The data used in this paper come from a survey of 2,212 rice farming households in the MRD in 2018, a year before the breakdown of COVID-19. We use direct survey information to construct the dependent variable (i.e. the self-selection out of formal credit markets) and the explanatory variables in Models (1) and (2). To create the sample, we apply the stratified multistage cluster sampling method. The MRD consists of 12 provinces and one city. We stratify this region by province (city). First, we chose the district with the largest land area devoted to rice farming within each locality (province or city). From that, we selected the village with the largest rice land area. Then, we randomly selected 250 rice farming households from the selected village, using the lists acquired from the people’s committee, to interview. We use a questionnaire to conduct face-to-face interviews with household heads. However, due to difficulties reaching some household heads, being refused by them, and missing and implausible information, we could create a dataset of 2,212 households.

The MRD, which makes up more than 50% of Vietnam’s rice output, is a region endowed with favorable agro-ecological potential, especially in rice farming, and has numerous fertile areas naturally irrigated, helping produce up to three crops per year (Kompas *et al.*, 2012). Although this region does not represent the entire country and the larger region, its

importance in rice production, advanced rice farming techniques, vibrant rice market, and rich and diverse natural resources provide an excellent case for identifying the reasons behind the self-selection of farmers.

6. Results

6.1 Descriptive statistics

Table 1 shows that the education of the household heads is notably low, with a mean of 6.42 years of schooling. That fact is understandable since most household heads are relatively old (with a mean age of 52.10) and grew up in the central planning era when the education system was immature. Such a low level of education may induce them to self-select because it might be hard to grasp the loan application forms (Le, 2021), among others. About 92% of the household heads are male and are more active in rice farming, natural resource extraction (fishing, hunting, collecting, or logging), and social and business activities (e.g. waged laboring). The household heads have relatively long experience in rice farming (29.92 years on average) because they have almost resided there since birth.

The average household has 3.24 working-age members (Table 1), implying a labor abundance given the small farm size (see below). However, because young and better-educated people tend to migrate, leaving children, married women, and aged people behind, there is a lack of rural labor in the MRD. The annual per capita income is VND 41.13 million on average, with a standard deviation of VND 38.81 million. The mean farm size is 17.35 cong (i.e. 1,000 m²) with a standard deviation of 15.26 cong (Table 1), meaning that the sample covers a wide range of farm sizes (i.e. between 1 and 130 cong). In the MRD, land accumulation has occurred as well-off farmers purchased, while less productive ones with high levels of land endowment and fewer assets tend to sell it. Some farmers sold their land when migrating, temporarily or permanently, to take up opportunities elsewhere. This action results in a bit greater land-use efficiency but causes the emergence of a stratum of well-off farmers and smallholder and landless ones (Tran, 2018).

Table 1 also divulges that the farmers have received a lot of trade credit from input suppliers (VND 44.81 million on average), which benefits both parties (Amrango and Mensah, 2022; Burkart and Ellingsen, 2004). Nevertheless, this credit varies among them because the suppliers grant it based on buyer reputation, repayment ability, intimate relationships, and

Criteria	Mean	S.D.	Min	Max
Education of household head	6.42	3.16	0	15
Age of household head	52.10	11.70	24	93
Gender of household head	0.92	0.28	0	1
Farming experience (years)	29.92	12.20	0	70
Number of household laborers	3.24	1.13	0	8
Per capita income (VND million)	41.13	38.81	0	471
Farm size (1,000 m ²)	17.35	15.26	0	130
Trade credit (VND million)	44.81	60.98	0	993
Distance to the nearest bank (km)	6.46	5.12	0	40
Relatives or friends working for banks	0.17	0.37	0	1
Number of previous borrowings	1.34	2.34	0	19
Natural disaster-related risk	0.16	0.37	0	1
Disease-related risk	0.22	0.42	0	1
Output price-related risk	0.41	0.42	0	1
Number of banks with which the average farmer has relationships	0.77	0.49	0	5

Table 1.
Descriptive statistics

Source(s): The author

valuable assets (Cao and Le, 2020). At its simplest definition, trade credit allows its recipient to delay payment for the product. In other words, it is a joint commodity and financial transaction in which a seller sells a good and simultaneously extends credit for the purchase to the buyer. Trade credit is thus a substitute for bank credit (Amrago and Mensah, 2022; Murro and Peruzzi, 2022). Given the recent rural infrastructure developments as an effort of the government, the mean distance from a farmer's residence to the nearest bank is 6.46 kilometers, which is short and entails an advantage for the farmers if wishing to approach banks for loans. However, a relatively large deviation of 5.12 kilometers implies that the distance is diverse since the farmers reside sparsely and few commercial banks have branches in rural areas (Migheli, 2024). Farmers closer to a bank may enjoy lower transaction and opportunity costs in borrowing and better credit-related information and have access to a larger pool of credit opportunities.

About 17% of the surveyed households have relatives or friends working for banks. Under increasing competitive pressure, banks in Vietnam began to shift focus to an effective sales force to find clients to patronize products and retain them. This marketing strategy resorts to personal selling as a panacea to persuade clients to buy products. In this respect, intimate kinship and friendship ties bring a mutual benefit since they help the bank officers improve their work performance, and their relatives and friends get better access to credit. Relatives and friends working for banks also act as intermediaries that connect the farmers with prospective banks, thus reducing the information asymmetry that harms bank profits and incentivizing the former to apply for loans. The average number of previous borrowings is about 1.34, but the standard deviation (2.34) indicates that this figure largely varies across the farmers. Rice price-related risk, which results from the underdeveloped rice marketing channel and the state's distorted interventions in the rice market, seems permanent (Fulton and Reynold, 2015), risking the farmer's income. Natural disaster-related risks and diseases-related risks appear unimportant for farmers. Finally, the average farmer has relationships with only 0.77 banks because a few banks have operated in the rural MRD due mainly to high transaction costs and default risk.

6.2 Farmer self-selection

To obtain information about the self-section of farmers, we asked them if they had ever applied for a bank loan when wanting one. Any respondent answering "no" was kindly requested to choose one out of the following reasons for that decision: having access to other preferred sources of funds (Reason 1), unfavorable loan terms (Reason 2), high borrowing costs (Reason 3), complex loan application procedures (Reason 4), and fear of an inability to repay the loan (Reason 5). We regard self-selected borrowers as those who need external finance but choose not to apply for a bank loan for any of the abovementioned reasons.

There are 974 self-selected borrowers out of 2,212 surveyed households (44%), whereas 304 farmers applied but did not get through (13.74%). This outcome means that the demand side is more constrained than the supply side, reinforcing the rationale for this study. Table 3 documents the frequency of the reasons for self-selecting out of formal credit markets. This table shows that Reason 5 (fear of an inability to repay the loan or debt aversion) leads the reasons for farmers to self-select. Debt aversion (i.e. an unwillingness to enter a debt contract) distorts investment and financing decisions (Eckel *et al.*, 2007; Nguyen *et al.*, 2021) and is somehow related to their risk-averse attitude. Indeed, risk-averse farmers are less willing to take on activities that may bring good outcomes but carry risks of failure (Ullah *et al.*, 2015). The risk aversion stems from their perception of calamitous risk sources, including floods, heavy rains, pests, diseases, drought, and saline intrusion (Le and Truong, 2019; Nguyen *et al.*, 2022). Volatilities in rice prices also make them risk-averse concerning income that constitutes their ability to repay debts (Fulton and Reynolds, 2015). Facing multiple risks,

farmers self-select from formal credit markets because they perceive their debt repayment capacity as so low that they should not apply. Following Reason 5 is Reason 1 (having access to other preferred sources of funds), which accounts for 30.18% of the self-selected farmers. This finding implies that farmers use other credit sources (especially trade credit due to its popularity) as a substitute for bank credit (Amrago and Mensah, 2022).

When the lender cannot observe to condition loan offers on heterogeneous farmer characteristics, strict borrowing requirements might screen out uncreditworthy borrowers, who are more likely to default (Sengupta, 2014). As an unintentional mistake, they may also screen out credit-constrained farmers with high valuations who would repay their loans. Due to information opaqueness, transaction cost, and weak enforcement, banks often maintain detailed contracts to shift contractual risks to borrowers and have them repay the loan. Such a policy appears problematic for ill-educated farmers who find it hard to fulfill the loan application forms and those who reside afar from banks because of substantial travel costs. In our case, complex loan application procedures resulting from those strict borrowing requirements (Reason 4) induce 205 farmers (21.05%) to self-select.

According to Table 2, 120 farmers (12.32%) self-selected because of high borrowing costs (Reason 3). Indeed, transaction costs were unduly significant for rural credit transactions. Since credit contracts are not instantaneous like spot market transactions, the transacting parties face adverse selection and moral hazards, leading to transaction costs (Stiglitz and Weiss, 1981; Giné, 2011). Transaction costs in credit delivery can be nonfinancial ones incurred by lenders and borrowers before, during, and after disbursement. For borrowers, transaction costs include transportation costs to and from the bank and opportunity costs (i.e. time spent traveling, going through lengthy bureaucratic procedures, and waiting for acceptance by the bank). Given a low income, many farmers care about the cost savings associated with the ease and quickness of credit delivery, which explains why, in many cases, they prefer informal credit sources (Migheli, 2024).

The last reason for farmers to self-select (i.e. unfavorable loan terms, which include the loan's repayment period, the interest rate and fees associated with the loan, penalty fees charged to borrowers, and any other special conditions that may apply) appears trivial since it affects only 5.58% of the self-selected farmers. This finding is understandable, as numerous farmers have had to borrow from informal lenders and input traders at high effective interest rates due to the underdevelopment of the rural credit markets. Therefore, a few deem the loan terms maintained by banks unfavorable, although they do care that the time of selling rice to earn cash to repay the loan may not match its repayment period.

6.3 Self-selected versus non-self-selected farmers

Table 3 shows the *t*-test on the difference between non-self-selected and self-selected farmers. There is a significant difference in farming experience between these two categories of farmers as the non-self-selected appear more experienced than their counterparts. The

Table 2.
Reasons for self-
selecting

Reasons	Number of observations	Percentage of total
1 Having access to other preferred sources of funds	294	30.18
2 Unfavorable loan terms	57	5.85
3 High borrowing costs	120	12.32
4 Complex loan application procedures	205	21.05
5 Fear of an inability to repay the loan	298	30.60
Total	974	100.00
Source(s): The author		

Criteria		Non-self- selected farmers (N = 1,238)	Self-selected farmers (N = 974)	t-test
Number of schooling years of household head	<i>Education</i>	6.41	6.42	−0.049
Age of household head	<i>Age</i>	52.02	52.19	−0.341
Gender of household head (1 = male and 0 = otherwise)	<i>Gender</i>	0.92	0.91	1.088
Number of years that the household head has engaged in rice farming	<i>Experience</i>	30.43	29.17	2.453**
Number of family laborers	<i>FamilyLabor</i>	3.31	3.13	3.841***
Income per capita (VND million)	<i>Income</i>	38.05	44.54	−3.972***
Land area (hectare)	<i>FarmSize</i>	19.13	14.01	8.005***
The amount of trade credit granted (VND million)	<i>TradeCredit</i>	50.97	33.24	7.074***
Distance to the nearest bank (km)	<i>Distance</i>	6.48	6.43	−0.214
Relationship with banks (1 = having relatives or friends working for banks; 0 = otherwise)	<i>Relatives</i>	0.19	0.12	4.202***
Number of previous borrowings	<i>NumBorr</i>	1.99	0.39	17.346***
Natural disaster-related risk (1 = yes; 0 = otherwise)	<i>DisasterRisk</i>	0.17	0.15	1.148
Disease-related risk (1 = yes; 0 = otherwise)	<i>DiseaseRisk</i>	0.22	0.22	0.093
Output price-related risk (1 = yes; 0 = otherwise)	<i>PriceRisk</i>	0.41	0.39	1.063
Number of banks with which the farmer borrows from	<i>NumberBank</i>	0.98	0.45	18.070***

Table 3.
Non-self-selected vs.
self-selected farmers

Source(s): The author

number of family laborers of the non-self-selected farmers is significantly larger than that of the others. The plausible explanation for this difference is that more laborers are associated with a better ability to repay loans thanks to higher income from diverse sources, making them less self-selected. It is a surprise that the self-selected farmers have a significantly higher income than the others. This finding is consistent with the argument that well-off farmers have a higher opportunity cost of time spent completing complex borrowing procedures, traveling to banks to apply for loans, and waiting for the bank's decision. The non-self-selected farmers have more landholdings and better access to trade credit. Relatives and friends working for banks are more likely helpful for non-self-selected farmers. This discrepancy helps explain the gap in previous borrowings and the number of banks with which they have relationships between the non-self-selected and the other.

6.4 Findings

6.4.1 Determinants of self-selection. Table 4 provides the correlation matrix for the variables specified in Model (1), showing that excessive correlation is not a problem. Model (1) is estimated to reveal the determinants of farmer self-selection behavior. The hypothesized determinants encompass three sets of variables. The first consists of household head features regarding educational attainment, age, gender, and farming experience. The second concerns household attributes (i.e. the number of family laborers, income, farm size, the amount of trade credit granted, distance to the nearest bank, whether or not to have relatives or friends working for banks, the number of previous borrowings, and the number of banks with which

Variables	1	2	3	4	5	6	7
(1) <i>SelfSelect</i>	1.000						
(2) <i>Education</i>	0.007	1.000					
(3) <i>Age</i>	-0.026	-0.347	1.000				
(4) <i>Gender</i>	-0.031	0.155	-0.153	1.000			
(5) <i>Experience</i>	-0.089	-0.291	0.477	-0.077	1.000		
(6) <i>FamilyLabor</i>	-0.084	-0.093	0.202	0.077	0.226	1.000	
(7) <i>Income</i>	0.099	0.119	-0.022	-0.032	0.007	-0.055	1.000
(8) <i>Farmsize</i>	-0.172	0.118	0.040	0.106	0.134	0.131	0.155
(9) <i>TradeCredit</i>	-0.149	0.065	0.014	0.098	0.093	0.102	0.129
(10) <i>Distance</i>	0.007	0.001	-0.061	0.010	-0.118	0.019	-0.044
(11) <i>Relatives</i>	-0.086	0.037	0.016	0.005	0.052	0.003	0.070
(12) <i>Numborr</i>	-0.333	-0.022	0.072	0.026	0.0131	0.137	-0.032
(13) <i>Natrisk</i>	-0.025	-0.051	-0.007	0.027	0.013	0.017	-0.013
(14) <i>Diseaserisk</i>	-0.003	-0.024	-0.022	0.021	0.012	0.059	-0.081
(15) <i>Pricerisk</i>	-0.024	0.038	-0.003	0.034	0.019	-0.012	-0.016
(16) <i>Numbank</i>	-0.336	0.010	0.012	-0.008	0.012	0.114	-0.054
Variables	8	9	10	11	12	13	14
(8) <i>Farmsize</i>	1.000						
(9) <i>TradeCredit</i>	0.432	1.000					
(10) <i>Distance</i>	-0.022	-0.057	1.000				
(11) <i>Relatives</i>	0.041	0.064	-0.033	1.000			
(12) <i>Numborr</i>	0.176	0.202	-0.035	0.167	1.000		
(13) <i>Disasterrisk</i>	0.003	0.033	-0.072	0.049	-0.022	1.000	
(14) <i>DiseaseRisk</i>	0.074	0.069	-0.102	-0.068	-0.071	-0.233	1.000
(15) <i>PriceRisk</i>	0.057	0.059	0.035	0.039	0.083	-0.314	-0.443
(16) <i>NumBank</i>	0.074	0.070	-0.029	0.043	0.335	0.021	-0.074
Variables	15						16
(15) <i>PricRisk</i>	1.000						
(16) <i>NumBank</i>	-0.041						1.000

Table 4.
Correlation matrix of
variables

Source(s): The author

it has relationships). The last set regards the risks of natural disasters, diseases, and rice prices. Since the dependent variable (*SelfSelect*) is dichotomous, we apply the probit estimator. [Table 5](#) provides the estimates.

According to previous studies (e.g. [Asfaw and Admassie, 2004](#); [Asadullah and Rahman, 2009](#); [Le, 2021](#); [Nguyen et al., 2022](#); [Reimers and Klasen, 2012](#)), education enhances one's decision-making skills and improves access to and understanding of relevant information. Therefore, it is rational to expect that better-educated farmers are less self-selected. However, [Table 5](#) shows that education does not affect their decision to self-select from formal credit markets. Given a low level of education ([Table 3](#)), they have learned primitive knowledge via rote memorization, which does not help them handle needed information to improve decision quality.

Older farmers are inclined to self-select ([Table 5](#)). The average age of the farmers (around 52) is much higher than the middle age (between 35 and 45), which is the most productive ([Tauer, 1995](#)). Aged individuals like those farmers often have a high level of caring, responsibility, and conscientiousness, making them skeptical about incurring debt, especially since rice farming faces multiple risks that harm their repayment capacity. Household head

Dependent variable: SelfSelect – 1 if self-selecting and 0 otherwise

Variables (1)	Probit		Bayesian probit	
	Coefficient (2)	dy/dx (3)	Mean (4)	MCSE (5)
<i>C</i>	0.3177 (1.37)		0.2840	0.0080
<i>Education</i>	0.0077 (0.75)	0.0029	0.0072	0.0009
<i>Age</i>	0.074* (1.83)	0.0027	0.0067	0.0004
<i>Gender</i>	−0.0265 (−0.25)	−0.0099	−0.0114	0.0036
<i>Experience</i>	−0.0058 (−1.50)	−0.0021	−0.0052	0.0003
<i>FamilyLabor</i>	0.0013 (0.05)	0.0005	0.0028	0.0054
<i>Income</i>	0.0038*** (4.90)	0.0014	0.0038	0.0001
<i>FarmSize</i>	−0.0129** (−4.18)	−0.0048	−0.0140	0.0004
<i>TradeCredit</i>	−0.0003 (−0.34)	−0.0001	−0.0001	0.0001
<i>Distance</i>	−0.0049 (−0.85)	−0.0018	−0.0097	0.0015
<i>Relatives</i>	−0.1556* (−1.85)	−0.0573	−0.09646	0.0067
<i>NumBorr</i>	−0.3260*** (−10.15)	−0.0874	−0.2579	0.0013
<i>DisasterRisk</i>	−0.1620* (−1.70)	−0.0596	−0.1698	0.0029
<i>DiseaseRisk</i>	−0.1684* (−1.86)	−0.0621	−0.2102	0.0070
<i>PriceRisk</i>	−0.1280* (−1.69)	−0.0479	−0.1344	0.0015
<i>NumberBank</i>	−0.4471*** (−9.50)	−0.1681	−0.4389	0.0018
<i>N</i>	2,212		<i>N</i>	2,212
<i>LR χ^2</i>	530.37		MCMC iterations	12,500
<i>Pro > χ^2</i>	0.0000		MCMC sample size	10,000
<i>Pseudo R^2</i>	0.4705		Acceptance rate	0.1678

Source(s): The author

Table 5.
Determinants of the
decision to self-select

gender is neutral to their decisions to self-select. The rationale is that they may make decisions based on compromises with their spouses because males and females have had more or less equal access to productive assets like land and other properties (Goetz and Gupta, 1996). In addition, the household head may not always be present in the family or not even the principal income earner of the family at times (Carletto *et al.*, 2013; Chakrabarti, 2021).

Rice farming requires farmers to have enough knowledge that accumulates over time. They work in the field, learn to cultivate from their parents, and have increased knowledge (e.g. about soil fertility, depth of the arable layer, humidity, and exposure). Regular apprenticeship, work, and observation result in knowledge and skill. They monitor and evaluate the effectiveness of their relevant decisions. The adjustments that farmer makes never end because they constantly lead to further adjustments. This process is a spiral in that the farmer repeatedly adjusts, monitors, and evaluates. In this way, they learn by doing, which becomes their experience. That knowledge helps farmers better handle risks and make wise decisions. Nevertheless, Table 5 shows that experience does not affect their decision to self-select. That is because climate change and the increasing use crop and pest control models and remotely sensed information reduces the usefulness of the farmer experience (Deininger and Byerlee, 2012).

We expect that the number of family laborers positively affects their decision to self-select since those laborers can substitute for purchased inputs that demand credit. However, this expectation does not hold for our sample (Table 5). Perhaps, some family laborers may not always work on the farms but elsewhere for additional income as the income from rice farming has declined and largely fluctuated depending on rice price. Although we would like to include only on-farm laborers in our regression, the informants cannot provide concise information because some family laborers have randomly shared their time between on-farm work and waged jobs.

Table 5 shows that the per-capita income induces farmers to self-select. The reason is that well-off farmers may have accumulated sufficient equity for production and other activities, discouraging them from applying for loans. Since these farmers also have a high opportunity cost, especially regarding time, while applying for loans is time-consuming due to complex procedures, they walk away from that. Farm size positively relates to the decision not to self-select, or farmers with large landholdings are less likely to fall into the demand-side credit constraint category. On the one hand, large landholdings entail a high lump sum cost of production, inducing the farmers to apply for loans. On the other hand, large landholdings mean sizable collateral, making them confident about being granted credit.

Farmers who get better access to trade credit (proxied by the amount of trade credit granted) may have a higher propensity to apply for a new loan because they can signal their creditworthiness to the bank. However, the estimate in Table 5 shows no relationship between these two aspects because banks do not receive the signal. In other words, banks that often have branches in cities and towns do not have information about the amount of trade credit granted. If having, they may not trust the signal because banks and trade creditors use different mechanisms to screen borrowers.

Due to several reasons, farmers lack precise information about credit availability. Therefore, they make the wrong decision to self-select, although they may get through if applying. Our empirical model includes a variable on “having relatives or friends working for banks” (Relatives) to test if these agents communicate relevant information to farmers, thus correcting the borrowing decisions. The estimate shows that the variable has a negative and significant coefficient, implying that farmers without relatives or friends working for banks tend to self-select. In other words, the relatives or friends working for banks act as intermediaries between banks and farmers to get mutual benefits. This finding partially reflects the traditional relationship-based way of doing business in Vietnam.

The number of previous borrowings enters negative and significantly, reinforcing the arguments by relationship lending (Boot, 2000; Ghosh and He, 2023). Farmers face credit rationing due to information asymmetry and lack of collateral. Relationships with banks reduce the extent of information asymmetry between lenders and borrowers. Relationship lending also translates into economies of scale in acquiring and processing borrower-specific information, leading to lower costs and flexible loan terms for future loans (Bharath *et al.*, 2011). Therefore, the number of previous borrowings associated with creditworthiness encourages farmers to apply for a new loan or makes them less self-selected.

Model (1) also includes the risks for farmers, which stem from natural disasters (floods, droughts, and salt intrusion), diseases, and rice price volatility. Risks inherently involve adverse outcomes such as lower yields, suppressed income, financial hardship, food insecurity, and human health problems (Komarek *et al.*, 2020) and pose farmers with natural resource extraction for subsistence (Nguyen *et al.*, 2022). They thus make farmers, especially risk-averse ones, skeptical about incurring debts or self-selected. However, the estimation results in Table 5 reveal that all these risks make the farmers less self-selected, perhaps because they want to use loans to cope with risks and shift at least part of the risk consequence to the lenders.

The number of banks with which the farmer has borrowing relationships (NumberBank) has a negative coefficient statistically significant, implying that relationships with more banks reduce self-selection. Relationships with many banks allow farmers to select the ones offering the most favorite loan terms, inducing them to apply for a loan. Moreover, borrowers with more collateralized assets or high creditworthiness may opt for multiple borrowing to stimulate competition among banks, preventing them from extracting rents and avoiding the hold-up problem (Foglia *et al.*, 1998; Guiso and Minetti, 2010). Consequently, they enjoy better loan terms regarding interest rates and collateral requirements and thus are more motivated to apply for a new loan.

6.4.2 Reasons for self-selecting. In the previous subsection, we identified the determinants of the decision of farmers to self-select. However, as one has seen, there are several reasons behind that decision, and each may have different determinants. To give further insight into this behavior of farmers, we use a multinomial probit (MNP) estimator to model the reasons to self-select. The MNP estimator helps estimate the probability of self-selecting for every reason. We use the non-self-selected farmers as a base category in the MNP model and interpret the likely impact of dependent variables on the reasons for self-selecting against this base category. Table 6 presents the estimates.

Column (2) of Table 6 shows that if farm size increases, the farmers who self-select because of Reason 1 (having access to other preferred sources of funds) are likely to change behavior, and so does the number of previous borrowings. A larger firm size means more collaterals, which induces the lender to ease requirements (Migheli, 2024), depriving other sources of credit of attraction. The number of previous borrowings makes those farmers less self-selected because the repeated personal interactions facilitate the acquisition of soft information, which mitigates information asymmetry and increases the chance for these farmers to get access to the credit. The more the number of banks a farmer has credit relationships with, the less self-selected she is because it is easier for her to choose the prospective banks that most suit her quality, as argued by Ogane (2023).

Column (3) reveals that household-head age makes farmers who self-select because of Reason 2 (unfavorable loan terms) more likely to insist on such behavior. This finding is attributable to the aging process that makes people more conservative and prudent in decision-making. Farmers in this category become less self-selected as they get experienced. That is because, being more experienced, they can improve their production profitability, thus better enabling them to handle loan repayments. The income of those farmers makes them even more self-selected because they may have more savings and other financial assets ready for use and have a mindset of efficiency, so they tend to step away if loan terms are unfavorable. Farm size and the number of previous borrowings make those farmers less self-selected for reasons regarding collateral and improved soft information. Natural disaster risk induces them to borrow because they may fall into the auspice of the policy to relieve damages due to disaster and may want to shift a part of the risk to the lender. The number of banks with which the farmers have relationships encourages them to apply for loans because they may find a borrower offers loans with more favorable terms among those banks.

According to column (4) of Table 6, the educational attainment and income of farmers who self-select because of Reason 3 (high borrowing costs) make them even more so. Education helps people develop critical skills like decision-making, mental agility, problem-solving, and logical thinking. Therefore, better-educated farmers often better grasp the reasons behind high borrowing costs (e.g. corruption), thus not applying for a loan. The income of those farmers makes them more self-selected for reasons concerning financial asset availability and the mindset of efficiency. Those farmers are also self-selected due to the distance to the nearest bank because distance increases borrowing costs. Again, farm size reduces the degree of self-selection of those farmers since collaterals and economies of scale may help mitigate borrowing costs for them. Relatives or friends working for banks relieve the self-selection of those farmers, as they act as intermediaries between the farmer and the bank, inducing the former to curtail borrowing costs. The number of previous borrowings triggers their decision not to self-select, perhaps because they have gotten acquainted with banks and can negotiate to get loans of lower interest rates and manage to mitigate transaction costs. Counter to expectations, risks related to natural disasters, diseases, and rice price volatilities make farmers who did not borrow for high borrowing costs more likely to apply for a loan, perhaps from some credit programs targeted at relieving the losses for those suffering those risks. They probably use loans to cope with risks (Nguyen *et al.*, 2022) and may want to transfer part of the risks to the lenders, using the so-called limited liability in credit transactions.

Table 6.
MNP estimates of
reasons for self-
selecting

Dependent variable: SelfSelect - 1 if self-selecting and 0 otherwise					
Variables (1)	Having access to other preferred sources of funds (2)	Unfavorable loan terms (3)	Reasons for self-selecting High borrowing costs (4)	Complex loan application procedures (5)	Fear of an inability to repay the loan (6)
C	-0.1372 (-0.34)	-1.6594** (-2.82)	-0.4532 (-0.96)	-1.1849*** (-2.83)	-0.7270* (-1.81)
Education	0.0218 (1.20)	0.0226 (0.84)	0.0536** (2.45)	-0.0199 (-1.07)	0.0002 (0.01)
Age	0.0058 (0.83)	0.0168* (1.74)	-0.0065 (-0.74)	0.0082 (1.13)	0.0163** (2.41)
Gender	-0.1737 (-0.95)	-0.0668 (-0.26)	-0.2246 (-1.04)	-0.0497 (-0.27)	0.3690** (1.87)
Experience	-0.0082 (-1.22)	-0.0182* (-1.88)	-0.0006 (-0.07)	0.0022 (0.32)	-0.0152** (-2.22)
FamilyLabor	0.0639 (1.31)	0.0320 (0.45)	-0.0002 (-0.00)	-0.0055 (-0.12)	-0.0396 (-0.83)
Income	0.0021 (1.51)	0.0052*** (2.80)	0.0041** (2.52)	0.0044*** (3.32)	-0.0068*** (-5.32)
FarmSize	-0.0233*** (-3.72)	-0.0240** (-2.42)	-0.0133* (-1.86)	-0.0029 (-0.56)	-0.0280*** (-4.76)
TradeCredit	-0.0015 (-0.96)	-0.0004 (-0.15)	-0.0018 (-0.95)	-0.0018 (-1.30)	0.0023* (1.90)
Distance	-0.0083 (-0.83)	-0.0012 (-0.08)	0.0179* (1.69)	-0.0039 (-0.38)	-0.0156 (-1.53)
Relatives	-0.1487 (-0.97)	0.1415 (0.70)	-0.3690* (-1.86)	-0.1270 (-0.85)	-0.1408 (-0.98)
NumBorr	-0.4067*** (-7.39)	-0.2179*** (-3.35)	-0.2910*** (-4.79)	-0.2736*** (-6.60)	-0.2717*** (-6.25)
DisasterRisk	0.0384 (0.23)	-0.6585** (-2.16)	-0.6803*** (-3.08)	-0.2172 (-1.26)	-0.1111 (-0.70)
DiseaseRisk	0.0118 (0.07)	-0.1171 (-0.52)	-0.5235*** (-2.80)	-0.0681 (-0.43)	0.3188* (2.04)
PricRisk	0.0064 (0.05)	-0.0345 (-0.18)	-0.3918*** (-2.55)	-0.1060 (-0.77)	-0.0814 (-0.63)
NumberBank	-0.9084*** (-9.79)	-0.6305*** (-4.78)	-0.5130*** (-4.93)	-0.1295* (-1.63)	-0.6974*** (-8.20)
N		2,212			
Wald χ^2		545.84			
Pro > χ^2		0.0000			
Source(s): The author					

Finally, the multiple-bank relationship gives incentives to apply for a loan since they can select the bank that can fit their demand the most. The multiple-bank relationship also helps farmers reduce the “liquidity risk” that forces them to liquidate prematurely due to fund shortages (Detragiache *et al.*, 2000).

Like some other groups of farmers, the income of farmers who perceive the application procedures as complex likely induces them to self-select (column (5) of Table 6). This finding arises because well-off farmers may have a high opportunity cost of time and a strong mindset of efficiency, as earlier argued. The number of previous borrowings motivates those farmers to apply for a loan or not to self-select. This upshot makes sense since a lending relationship may help them fulfill the procedures faster and more smoothly (Murro and Peruzzi, 2022). Finally, the number of banks that those farmers have credit relationships reduces the degree of their self-selection for the reason identified previously.

Column (6) reveals that age makes farmers who self-select because of “fear of an inability to repay the loan” more self-selected because aging deprives them of self-confidence in the capacity to make money to repay debts. This column also shows that male farmers tend to be more self-selected since they are the ones who bear the expense burden of the family. This effect may be evident in low-income, smallholding households. Experience in rice farming inspires these farmers to apply for a loan because, as explained earlier, the experience may make them less risk-averse and their production profitable. Farmers with higher incomes and larger farm sizes tend not to self-select because they are wealthier and better able to honor the debt. Trade credit enters positively and significantly, implying that farmers who get trade credit are less likely to depend on bank loans that are probably substitutes for trade credit and vice versa. The number of previous borrowings stipulates farmer application for a new loan because of the effect of relationship lending (Murro and Peruzzi, 2022). Disease risk intensifies self-selection because of the fear of disease destroying the crop, exacerbating their ability to repay debts. Again, the number of banks alleviates their incentive to self-select for opening up chances for them to select the bank offering favorable loan terms.

6.4.3 Robustness checks. Robustness checks are a standard feature of empirical work. After establishing their main results, researchers may ask if alternative models can explain their findings and provide additional insights into the problem. As you may see, we rely on p -values for testing the effects of factors on the farmer’s decision to self-select (Table 5) and reasons for their self-selecting (Table 6) using the probit and the MNP estimators, respectively. Using p -values for hypothesis testing has been the norm in the economics literature. However, p -values reflect only the probability of the estimated effect, assuming the null hypothesis is true. p -values are calculated from an infinite number of replications that never really happened. They might overstate the evidence against the null (Kass and Raftery, 1995; Louis, 2005) and do not reflect the size of the impact of the independent variables on the dependent one. p -values are also sensitive to sample size and the data used, i.e. the so-called sampling-based concept. To avoid those limitations of p -values, one can resort to the Bayesian approach.

Given its advantages, Bayes posteriors (factors) can be a more attractive alternative for hypothesis testing than p -values (Assaf and Tsionas, 2018). Bayesian modeling can incorporate prior knowledge into the model. In other words, Bayesian modeling is an approach to data analysis based on Bayes’ theorem, which updates available knowledge about parameters in a statistical model with the information in observed data. The background knowledge is expressed as a prior distribution and combined with observational data via a likelihood function to reveal the posterior distribution (Van de Schoot *et al.*, 2021). Then, the posterior helps to make predictions about future events. Since the Bayes posteriors (factors) come from the Bayesian approach, which relies solely on the observed sample to provide direct probability statements about the parameters of interest, it is more suited for hypothesis testing. In addition, the Bayesian approach expands the range of testable

hypotheses and interprets results in intuitive ways that do not rely on null hypothesis significance testing like p -values. From this perspective, Bayes posteriors (factors) can be considered as alternatives to p -values (or significance probabilities) for testing hypotheses and for quantifying the degree to which observed data support or conflict with a hypothesis (Lavine and Schervish, 1999). The Bayesian approach enables us to make direct probability statements about the parameter of interest. Therefore, we perform robustness checks for the findings in Table 5 using the Bayesian probit estimator and Table 6 using the Bayesian MNP estimator, with non-informative priors selected. We select non-informative priors since we have no prior information about the parameters and want priors with minimal influence on the posteriors.

Columns 4 and 5 of Table 5 report the posterior means computed by the Bayesian probit estimator, and Table 7 reports the posterior means by the Bayesian MNP estimator. For all the variables in Table 5, the posterior means are acceptable (Assaf and Tsionas, 2018) and similar to the probit estimates. For all the variables that have statistically significant coefficients identified by the MNP estimator (Table 6), the posterior means (Table 7) are similar to the MNP estimates. For only three variables that do not have statistically significant coefficients (i.e. *education* in column 6, *familylabor* in column 4 and column 5, and *pricerisk* in column 1 of Table 7), the posterior means differ from the MNP estimates since the impacts of those independent variables on the dependent one are weak or ambiguous. All these findings help confirm the robustness of our results.

7. Conclusion and policy recommendations

Farmer self-selection out of formal credit markets is phenomenal in rural Vietnam, but previous studies have not documented it. The failure to account for this fact biases the results

Dependent variable: SelfSelect – 1 if self-selecting and 0 otherwise					
Variables (1)	Having access to other preferred sources of funds (2)	Reasons for self-selecting			
		Unfavorable loan terms (3)	High borrowing costs (4)	Complex loan application procedures (5)	Fear of an inability to repay the loan (6)
C	−0.1586	−1.6422	−0.4624	−1.1772	−0.8059
Education	0.0224	0.0271	0.0540	−0.0172	0.0072
Age	0.0047	0.0138	−0.0079	0.0055	0.0160
Gender	−0.1733	−0.0667	−0.2309	−0.0319	0.3226
Experience	−0.0068	−0.0144	0.0006	0.0043	−0.0134
FamilyLabor	0.0790	0.0358	0.0139	0.0132	−0.0251
Income	0.0023	0.0049	0.0042	0.0043	−0.0068
FarmSize	−0.0227	−0.0265	−0.0142	−0.0055	−0.0290
TradeCredit	−0.0018	−0.0003	−0.0020	−0.0016	0.0023
Distance	−0.0074	−0.0003	0.0182	−0.0026	−0.0155
Relatives	−0.1633	0.1111	−0.3692	−0.1343	−0.1621
NumBorr	−0.4153	−0.2286	−0.3022	−0.3085	−0.2905
DisasterRisk	0.0512	−0.6499	−0.6840	−0.2036	−0.0814
DiseaseRisk	0.0513	−0.1167	−0.5250	−0.0626	0.3496
PriceRisk	−0.0323	−0.0374	−0.3988	−0.0786	−0.0728
NumberBank	−0.9144	−0.6213	−0.5051	−0.1119	−0.6818
N		2,212			
MCMC iterations		12,000			
MCMC sample size		10,000			
Acceptance rate		0.2178			

Table 7.
Bayesian MNP
estimates of reasons for
self-selecting

Source(s): The author

since their self-selection may induce banks to apply different screening rules from those that would prevail if they did not self-select. It also leads to useless suggestions to improve lending policies in particular and monetary policies in general. This problem motivates us to conduct this paper to fill the gap in understanding this issue using a primary dataset of 2,212 rice farmers in the MRD of Vietnam.

The present paper uses the probit and Bayesian probit estimators to study the determinants of farmers' self-selection behavior. The results show that older farmers are inclined to self-select, as does the per-capita income. Farm size is positively related to the decision to apply for a loan because a large farm entails a high lump sum cost of production. Farmers with large farms have sizable collateral, making them confident about getting the loan. Farmers without relatives or friends working for banks are more inclined to self-select due to a lack of information. In other words, the relatives or friends working for banks act as intermediaries between banks and farmers to get mutual benefits. The number of borrowings enters positively and significantly, reinforcing the arguments by relationship lending. Risks stemming from natural disasters (floods, droughts, and salt intrusion), diseases, and rice price volatility make the farmers less self-selected. The number of banks with which farmers have borrowing relationships has a significantly negative coefficient, meaning that farmers who have established relationships with more banks tend not to self-select.

The results of the MNP and Bayesian MNP estimators reveal different determinants of the self-selection of farmers who do so for various reasons. This finding would infer that farmers are loss averse, i.e. a cognitive bias, meaning that they weigh a loss of resources more heavily than a gain of those. Loss aversion helps explain the widespread farmer risk aversion because resource losses could result in poverty, even starvation, and are thus a more important consideration than gaining an extra bit of them. As one may see, the determinants of self-selection vary according to why farmers do so. However, the results show consistent effects of per-capita income, the number of previous borrowings, and the number of banks farmers have relationships on the self-selection. This finding has noted policy implications that banks and policymakers should consider the demand-side credit constraints to induce farmers to apply for bank loans. Policies regarding reducing risks for farmers, like crop insurance, should be in place to safeguard banks from defaults since risks make farmers less self-selected. With adequate insurance coverage, farmers may undertake somewhat riskier but more rewarding farming activities and apply for bank loans. Although we can identify the determinants of farmers' self-selection out of formal credit markets, given the data set, we cannot test whether self-selection has real effects on farmers' production and income. This issue is perhaps a topic for further studies.

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