“Does access to finance improve household welfare?”

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Does access to finance improve household welfare?

Abstract

In this paper, the author develops an econometric framework to analyze the effect of access to credit on the economic welfare of households in Vietnam. The findings confirm that household credit contributes positively and significantly to the economic welfare of households in terms of per capita expenditure, per capita food expenditure and per capita non-food expenditure. The positive effect of credit on household economic welfare is observed regardless of whether they are poor or better-off households. The author also finds that credit has a greater positive effect on the economic welfare of poorer households and finds that the age of the household head, the household size, land ownership, and savings and the availability of credit at village level are key factors that affect household borrowing. Some policy implications are drawn.

Keywords: microcredit, household welfare, poverty reduction, Vietnam.
JEL Classification: Q14, O16, O18.

Introduction

It has been well postulated that the provision of financial services to the poor, or microfinance[1], is a powerful means of providing low income households with the chance to escape from poverty and to transform their lives. It is also evident that there is a strong demand for small-scale commercial financial services – both credit and savings – from low-income households (see, for example, Beck, 2015; Robinson, 2001 for comprehensive review). The strong demand for financial services by low income households, together with the evidence that access to credit reduces household poverty, provides clear incentives for policy makers to develop a framework for providing financial services to low-income households.

As many studies have shown, by providing low-income households with access to financial services, the service providers help them to improve their productivity and management skills, create jobs, smooth income and consumption flows, enlarge and diversify their businesses, and increase their income and other benefits, such as health care and education. The various evidence supporting this assertion can be found from a variety of empirical study around the world (Beck, 2015).

Pioneer research studies that find the positive impact of access to credit on household welfare include Khandker (1998, 2001, 2003), Pitt and Khandker (1998), Coleman (2002), etc. More recent studies continue to show the link, such as findings from Karlan and Zinman (2010), Augustburg et al (2014), Angelucci, Karlan and Zinman (2015), Banerjee et al. (2015), etc. Moreover, it is also well documented that microfinance programs do not serve the poorest, but when they do so, the poorest can benefit from microfinance through increased income and reduced vulnerability (Morduch and Haley, 2002). There is also some evidence that the degree of poverty may affect the response. Better-off poor households have a larger positive response than the very poor (Coleman, 2002).

With respect to Vietnam context, there are a number of research papers that look at this literature and find some mixed findings on the impact of credit on household welfare. For example, Lensink and Pham (2012) find a positive impact of access to credit and of the accumulated amount of credit on self-employment profits in Vietnam. Nghiem et al. (2012) conduct a quasi-experimental study on households of microfinance programs by NGOs and find that there are no significant impact of participation on household welfare proxied by income and consumption per adult equivalent. Doan et al. (2014) suggest that formal credit has positive impact on education and healthcare spending, while the informal credit does not. Another research by Barsland and Tarp (2008) examines the use of credit and finds that formal credit is used mostly for production and asset accumulation, while formal credit is for consumption smoothing.

Paramount among the limitations of the existing studies is the absence of a coherent econometric methodology that would make empirical findings easily comparable. The key methodological problem with most research studies is the issue of sample selection bias (Heckman, 1979) in which the household characteristics may well affect both the probability of access to credit and the ability to achieve better welfares. Differences in research methodology seem to account for differences in research findings.

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[1] Microfinance is defined either narrowly as microcredit or broadly as microcredit plus micro savings, micro insurance, pre and post loan technical trainings and business supports. In this paper, we use the term microcredit for narrow microfinance to distinguish against broad definition of microfinance.

The objective of this paper is to propose and implement an econometric framework which seeks to overcome the shortcomings of the research methodology employed in previous studies. In addition, the paper seeks to obtain evidence on the impact of credit on household economic welfare in rural areas in Vietnam. Specifically, the paper addresses two questions: (i) the determinants of household borrowings in rural Vietnam and (ii) the impact of household borrowing on household economic welfare. The data used for this paper are from the two Vietnam Household Living Standard Surveys taken in 1992/1993 and 1997/1998 (for simplicity purpose, we will call it Survey 1 and Survey 2, respectively). We use these samples simply for the reason that they are the first and the only two surveys that are implemented with assistance from international organizations which are more comprehensive to cover better the rural areas across Vietnam.

The remainder of this paper is organized as follows. Section 1 develops the econometric framework. We discuss the characteristics of data in section 2. In the following section, we present and discuss our test results. The concluding section summarizes the main findings of our paper and draws policy conclusions.

1. The model

We consider a simple two-period economy in which there are two sets of actors: households and the lenders. We assume that households finance their economic activities by borrowing from the lenders. The impact of borrowing during the period is expected to occur at the end of the period and to affect household economic welfare. For simplicity, we look at household *i* in location *j* at time *t*. During the period from *t*-1 to *t*, this household would have a demand for credit C^d_{ijt}. However, household demand for credit is constrained by the supply of credit C^s_{ijt}. While the demand depends on household characteristics, the supply of credit depends on the availability of funds and the lender's characteristics. The household borrowing function is jointly determined by demand and supply functions, denoted as C_{ijk}. During the period from *t*-1 to *t*, the household generates its economic welfare, which is observed at time *t* and denoted as Y_{ijt}. The Figure below illustrates our approach.

...	t-1	t
Demand function C^d_{ijt-1} Supply function C^s_{ijt-1} Borrowing function C_{ijt-1}	<u>At t-1:</u> Observed economic welfare Y_{ijt-1} Observed borrowing C_{ijt-1} <u>From t-1 to t:</u> Demand function C^d_{ijt} Supply function C^s_{ijt} Borrowing function C_{ijt}	<u>At t:</u> Economic welfare Y_{ijt} Observed borrowing C_{ijt}

For the purpose of assessing the impact of credit on household economic welfare, an output supply function is employed in which we introduce credit as a separate explanatory variable in the welfare function. Household welfare may be reflected in income and expenditure indicators, etc. At the household level, the welfare is most likely to be affected by the household characteristics such as the age of household head, the education of household head, total farming area, etc. At village and commune levels, household welfare is possibly affected by the characteristics of the village and commune in which the households live. For example, the prices of selected goods and services in the village and commune may affect household expenditure or income. We recognize those characteristics as the local market characteristics. Household welfare is also affected by household and local market characteristics that we cannot observe or measure. For instance, households exerting more effort may generate higher income. The controlling variables, therefore, include household characteristics, local market characteristics and unobservable characteristics. The household welfare function takes the structural form as follows:

$$Y_{ijt} = \beta + X_1{}'_{ijt}\,\beta_1 + X_2{}'_{ijt}\,\beta_2 + C_{ijt}\beta_c + \\ + W'_{ij}\,\beta_w + \varepsilon_{ijt}, \qquad (1)$$

where X_1, X_2 and W are vectors of household characteristics, local market characteristics and unobservable characteristics, respectively. *Y* and *C* represent household welfare and total household borrowing. The estimation of parameter β_c would show the effect of credit on the household welfare.

There are, however, some concerns about the equation (1). Firstly, is it appropriate to use the total household borrowing? If *C* represents borrowing from a specific source (e.g., controlled program or borrowings from one type of lenders), the parameter β_c may not be consistent. Specifically, a household may borrow from a bank and from a money lender or whatever. Then, if we consider the effect of bank loans on household welfare and find β_c, it is less convincing to conclude that β_c shows solely the effect of bank borrowings since it is possible that household welfare results from the borrowings from the money lender. Therefore, the use of total household borrowings should be better than the use of borrowings from a specific source.

Second, is the total household borrowing an exogenous variable in equation (1)? To answer this question, we consider a function of household borrowing which results from the interaction between demand and supply function. Note that the

econometric literature on the identification problem (see Greene, 2003; Manski, 1995; for examples) shows that identifying separate demand and supply functions of household credit from a sample of households is impossible without further information about either demand or supply. However, this is not our purpose in this paper. We consider neither the demand nor the supply of household credit, but the function of household borrowing for a representative household. One may think of our approach as identifying the factors that determine the quantity of credit that a typical household may receive. Consequently, the understanding and interpretation of determinants of household borrowing should take into account both the demand and the supply side.

The household demand for credit depends on a number of observable factors, such as: household characteristics, local market characteristics, etc. Examples of household characteristics may include the gender of household head, the education of household head, the ownership of farm land, the initial endowment, etc. Local market characteristics may include the prices of selected goods and services, average education levels, farm landowning levels etc. It is also likely that the unobservable characteristics of household and local market affect household demand for credit. These types of variables may include the human effort and dedication, etc. Hence, the demand function takes the general form:

$$C^{d}_{ijt} = \beta^{d} + X_{1}'_{ijt}\,\beta_{1}^{d} + X_{2}'_{ijt}\,\beta_{2}^{d} + \\ + W_{d}'_{ij}\,\beta_{w}^{d} + \varepsilon^{d}_{ijt}, \tag{2}$$

where X_1 is a vector of household characteristics; X_2 is a vector of local market characteristics; and W_d is a vector of unobservable characteristics of households and the local market.

Similarly, the supply of credit depends on the lenders' characteristics, local market characteristics and some unobservable characteristics. The lenders' characteristics may include the type of lender, such as formal or informal, the availability of funds, the allocation pattern of funds and the competition between lenders, etc. Local market characteristics may be the same as in the credit demand function. The unobservable characteristics may include valuation of the lender based on, for example, the average effort and dedication to work by households in a specific market. The supply takes the form:

$$C^{s}_{ijt} = \beta^{s} + X_{3}'_{ijt}\,\beta_{3}^{s} + X_{2}'_{ijt}\,\beta_{2}^{s} + \\ + W_{s}'_{ij}\,\beta_{w}^{s} + \varepsilon^{s}_{ijt}, \tag{3}$$

where X_3 is a vector of lenders' characteristics; X_2 is a vector of local market characteristics; and W^s is a vector of unobservable characteristics of households and the local market which correlates with supply of credit.

In theory, the demand and supply of credit would determine the amount and price of credit granted to a representative household. However, the credit market is special. The existence of asymmetric information may lead lenders into the problems of adverse selection and moral hazard (Alkelof, 1970). One solution to these problems is for the lenders to tailor their loan contract covenants, which may act as a screening device to distinguish borrowers (Bester, 1985; Bester, 1987). Another solution is for the lenders to ration credit (Stiglitz, 1981). For these reasons, the function of household borrowing may result not only from pure demand and supply functions but also from variables controlling for asymmetric information problems, such as collateral, interest rates, availability of funds and competition amongst borrowers etc[2]. The reduced form of household borrowing function, therefore, should be estimated as follows:

$$C_{ijk} = \beta_{0}^{c} + X_{1}'_{ijk}\,\beta_{1}^{c} + X_{2}'_{ijk}\,\beta_{2}^{c} + X_{3}'_{ijk}\,\beta_{3}^{c} + \\ + W_{c}'_{ij}\,\beta_{w}^{c} + \varepsilon^{c}_{ijk}, \tag{4}$$

where X_1 is a vector of household characteristics; X_2 is a vector of local market characteristics; X_3 is a vector of lender's characteristics and W^c is a vector of unobservable variables.

Now, we look at the equations (1) and (4). We may see that with a cross sectional data, i.e., households are observed at only one point of time (i.e., at the end of the observed period), it is likely that the unobservable characteristics of household and local markets, W^c in equation (4) and W in equation (1), are correlated, so that the estimate of Y based on (1) could result in biased coefficients. More specifically, because of unobservable characteristics of households and the local market, such as a household's special effort and dedication, and the natural comparative advantages of the local market, etc, it is possible that an increase in a household's welfare is not the result of household borrowings, but because of that the household has invested more effort or they live in a better location for farming, for example. Alternatively, the lenders may screen households using their characteristics. As a result, better-off households receive loans, but better-off households may also be able to generate higher welfare outcomes. Therefore, the estimation of β_c based simply on the welfare equation (1) may not be consistent.

[2] Khandker (2001, 2003) discusses this issue but our setup is slightly different.

Econometrically, the solution to the issue of endogeneity of credit is to employ instrumental variables and two-stage regression method. We, first, estimate the determinants of household credit, which include instrumental variables that will not be included in Equation (1), but can be used to predict the amount of household credit that does not depend on household characteristics. Selecting appropriate instrumental variables is, therefore, a crucial task, as the instruments must not be correlated with household welfare, but must be closely correlated with the amount of credit borrowed. Given the existence of credit rationing in the market, the high demand and limited supply of credit in rural areas, what actually matters is the supply of credit. The instrumental variables must, therefore, be those which well describe the characteristics of the lender.

From the Equation (4), there are two sets of observable variables, of which we can see that the lender's characteristics may serve as the instrumental variables. The lender characteristics influence the supply of credit and they do not directly affect household welfare. But which of these characteristics should be chosen? One may think the lending interest rate could be a good instrument as it describes the response of supply, i.e., the amount of credit supplied. However, in rural Vietnam, because of the government restrictions on the lending interest rates, the "interest rate" can not serve as an instrument, as it does not vary very much across the sample. The instrumental variables that we select include: the availability of funds; the credit allocation pattern; and the competition between lenders at commune and village levels.

Hence, in the first stage, the household borrowing is estimated based on Equation (4) where lenders' characteristics play the role of instrumental variables. The predicted values of household credit that are obtained from Equation (4) are, then, used, instead of actual values, in the second stage (i.e., Equation 1) to correct for the problem endogeneity of credit. The alternative option is to include both the actual values and the predicted residuals computed from the first stage (Equation 1) into the second stage regression (Equation 2). The coefficient of the predicted residuals in the second stage regression shows the Durbin-Wu-Hausman test (see more about this test in Greene, 2003), which indicates that whether or not the endogeneity of credit is significant, and that the two-stage regression is appropriate.

Having solved the problem of the endogeneity of credit, our next concern is about the selection of the sample. From a household survey, we can observe that there are a number of households who borrow and other households who do not. For a number of reasons, including credit rationing by the lenders, the non-borrowing households cannot get loans, even if they wish to do so. The allocation of credit, therefore, is not a random process. If we select only borrowing households and estimate the effect of credit on household welfare, the estimation may be biased. For example, the lenders select households, because they are more credit-worthy, but credit-worthy households may achieve higher welfare outcomes. Hence, the effect of credit on household welfare is not consistent.

To control for sample selection bias, the whole sample, which includes both borrowing and non-borrowing households, should be used. The first stage regression using Equation (4) is, then, reconsidered as follows. For the purpose of convenience, we denote vector $X = (X1, X2, X3)$, i.e., X includes household characteristics, local market characteristics and lender's characteristics. The structural form of household credit function (4), therefore becomes:

$$C_i^* = X_i^{'}\beta + \varepsilon_i \text{ with } \varepsilon_i \left| X_i \sim N(0,\sigma^2) \right. .$$

Econometrically, if we observe (Y_i, X_i) for a random sample, the estimation of the coefficients β using ordinary least squares (OLS) regression produces a consistent estimation of β, i.e.

$$\hat{\beta} = (X'X)^{-1}(X'C^*).$$

However, as we can observe only borrowing households, resulting in a random sample conditional on $C_i^* > 0$, the least squares regression may not be appropriate. The reason is as follows. Consider the following credit equation for every observation:

$$E[c_i \left| x_i, c_i > 0\right.] = x_i^{'}\beta + E[\varepsilon_i \left| \varepsilon_i > -x_i^{'}\beta\right.] =$$

$$= x_i^{'}\beta + \sigma E[\frac{\varepsilon}{\sigma}\left|\frac{\varepsilon}{\sigma} > -\frac{x_i^{'}\beta}{\sigma}\right.].$$

We assumed $\varepsilon_i \left| X_i \sim N(0,\sigma^2)\right.$, so we can arrange this equation for[3]:

$$E[c_i \left| x_i, c_i > 0\right.] = x_i^{'}\beta + \sigma\lambda(x_i^{'}\beta/\sigma). \quad (5)$$

Equation (5) implies that a marginal effect of x'_i on c_i differs from β which results from the OLS regression, which is, therefore, not appropriate. A number of studies have proposed different methods to solve this problem using log likelihood function maximization. We follow Tobin's (1959) approach, which is, then, called the Tobit model[4].

2. Data and measurement

Survey 1 covers a sample of 4,799 households, 150 communes and 300 villages over the country. In which there are 3,839 rural households, accounting for 80% of the overall sample. Of the rural

[3] See Appendix 1.
[4] See Appendix 2.

households, there are 1,985 households (41.4%) being indebted from various sources. Survey 2 was designed to provide an up-to-date source of data on households. It covers a sample of 5,999 households, 194 communes and 388 villages, including all households studied in Survey 1. The proportion of rural households is 71.2% (4,269 households). There are 38.9% of rural households borrowing from all sources. The timing of the second sample approximately five years after the first allows analysis of medium term trends in living standards.

The construction of variables plays an important part in our study. The dependent variables, which proxy for household welfares, include per capita expenditure, per capita food expenditure and per capita non-food expenditure. The variable of total household credit is constructed by summing all loans from the formal and informal sources such as bank loans and loans from Rotating Savings and Credit Associations (ROSCA). The household characteristics include variables measuring natural attributes such as age, gender of household head; variables measuring household assets, such as savings and farm-land owning. Local market characteristic variables include: the prices of selected goods and services; the averaged household characteristics in a commune, such as averaged education, averaged farm-land owning. The construction of variables measuring local market characteristics is mainly for the purpose of controlling for the location fixed effects, rather than for comparison. The lender characteristics include proxy variables of the availability of funds at province, commune and village levels and the competition between lenders. The discussion of variables is in Section 3.

3. Econometric procedures and results

In this section, we implement the tests and report the empirical evidence on the effect of household credit on household welfare. The first stage regression estimates the determinants of household borrowing. The question that we want to answer in this stage is: what are the determinants of household borrowing? In other words, we are interested in exploring: (i) whether or not the natural attributes of a household affect its amount of borrowing; (ii) how the household's endowment affects its borrowings?; and (iii) does the supply of loans by the lenders play any role on household borrowing?

In the second stage, the predicted residuals resulting from the first stage are included as an explanatory variable to control for the endogeneity of credit in the estimation of household welfare. The questions that we will answer in this stage are as follows: (i) is the household credit endogenous and is the two-stage regression appropriate?; (ii) what is the effect of household credit on household welfare?; and, (iii) is there any difference in the degree of effects between the two samples?

3.1. Determinants of household borrowing. In the first stage, we use the Equation (4) and implement tests using the Tobit model. We select and implement the tests separately for two samples. After adjusting for missing data, the Survey 2 includes 4,101 rural household houses, of which 2,108 households are borrowing households. The Survey 1 includes 3,264 rural households, of which 1,733 households borrowed. The test results are reported in Table 1.

Table 1. First stage Tobit regression: determinants of household credit. The whole samples

Dependent variable: total household credit (VND1000, Logarithm)	Survey 2			Survey 1		
Explanatory variables	Coefficients	z-statistic	Prob.	Coefficients.	z-statistic	Prob.
The age of household head	1.349238	2.743424	0.0061	-0.534680	-6.649445	0.0000
The age of household head squared	-0.222313	-4.091714	0.0000			
Education of household head (years)	0.074426	2.079463	0.0376	-0.004059	-0.111232	0.9114
Dummy variable: farm household =1; otherwise, =0	-0.218607	-0.737600	0.4608	-0.222741	-0.736479	0.4614
Dummy variable: gender of household head: male =1; female=0	0.308263	1.041345	0.2977	0.215318	0.764030	0.4448
Household size (persons)	0.523353	8.092091	0.0000	0.434557	7.904087	0.0000
Farm land owned (hectare, logarithm)	0.231562	5.406392	0.0000	0.092318	2.212809	0.0269
Financial savings (VND1000, Logarithm)	-0.216638	-4.325020	0.0000	-0.237987	-5.413677	0.0000
Non-financial savings (VND1000, Logarithm)	-0.313294	-9.322477	0.0000	-0.221818	-6.282292	0.0000
Price of detergent in the village (VND1000/kg, Logarithm)	-0.110967	-0.319148	0.7496	-0.017907	-0.054083	0.9569
Price of fish source (VND1000/bottle, Logarithm)	-1.196459	-4.213158	0.0000	-0.382876	-1.445793	0.1482
Price of noodle (VND1000/pack, Logarithm)	2.887991	3.191280	0.0014	0.470643	0.639311	0.5226
Price of pork (VND1000/kg, Logarithm)	0.798256	0.815365	0.4149	0.081513	0.108388	0.9137
Price of normal rice (VND1000/kg, Logarithm)	-1.209699	-1.243912	0.2135	-0.226098	-0.264794	0.7912
Price of sewing service (VND1000/trouser, Logarithm)	2.166007	4.950512	0.0000	0.310168	0.966095	0.3340
Averaged education in commune (years)	0.017579	0.209168	0.8343	-0.032988	-0.350469	0.7260
Averaged land owned in commune (Hectare, Logarithm)	-0.248341	-1.000495	0.3171	0.151792	1.643362	0.1003
Price index in the region	5.121724	1.625574	0.1040	-9.186247	-2.677549	0.0074

Table 1 (cont.). First stage Tobit regression: determinants of household credit. The whole samples

Dependent variable: total household credit (VND1000, Logarithm)	Survey 2			Survey 1		
Explanatory variables	Coefficients	z-statistic	Prob.	Coefficients.	z-statistic	Prob.
Availability of informal funds in village (VND1000, Logarithm)	0.391335	8.247937	0.0000	0.881074	10.56694	0.0000
Number of households in commune	0.000433	1.435173	0.1512	-0.000145	-1.090582	0.2755
Availability of formal funds in province (VND1000, Logarithm)	0.292953	3.189332	0.0014			
Availability of formal funds in commune (VND1000, Logarithm)	-0.231167	-2.201784	0.0277	0.106379	1.369011	0.1710
Availability of formal funds in village (VND1000, Logarithm)	0.667861	7.758944	0.0000	0.272537	5.315236	0.0000
C	-22.05987	-5.381328	0.0000	-0.658902	-0.172808	0.8628
R-squared		0.145800			0.122646	
Adjusted R-squared		0.140771			0.116691	
Log likelihood		-8284.762			-6489.587	
Uncensored observations			2108			1733
Total observations			4101			3264

The Survey 2

Considering the test results for the Survey 2 from Table 1, we find that, of the natural attributes of households, the age of household head and the size of household are significantly related to total household borrowing at 1% level of significance. In Survey 2, the middle-aged households tend to borrow more than the other households. The household size is positively and significantly related to household borrowing, indicating either that larger-size households demand more loans or that the lenders allocate more credit to households with more laborers. The gender of the household head and the dummy variable of whether a household is a farm household are not significantly related to household borrowing. This result indicates that in rural areas there is no distinction between genders and type of households in demanding loans and the allocation of credit.

The proxy variables for household assets are found to be significantly related to household borrowing. At the 5% level of significance, the education of the household head is positively and significantly related to household borrowing, implying that more educated households tend to borrow more than others. At the 1% level of significance, we find that the ownership of farming land positively and significantly affects the amount of household borrowing. This indicates either that the ownership of land is very important for gaining access to loans, since the formal lenders normally require land use certificates as collateral for loans, or that households owning more farming land borrow more, i.e., bigger farm need more money. Financial savings and non-financial savings are negatively and significantly related to household borrowings, at the 1% level of significance. This shows that the households with smaller endowments tend to demand more and borrow more.

Our next concern is about whether or not the availability of funds (or the supply of credit) plays any role in household borrowings. To proxy for the availability of funds, we calculate the sum of all household borrowings by source at village, commune and province level. We, then, consider the availability of *formal funds* at village, commune and province level and the availability of *informal funds* at village level. At the 1% level of significance, we find that the availability of *informal* funds at village level, the availability of formal funds at village level and the availability of formal funds at province level are positively and significantly related to household borrowings. However, the availability of formal funds at commune level is negatively and significantly related to household borrowing at the 5% level of significance. The opposite signs of the effect of *formal sources* of credit at different levels may imply that in order to help rural households to gain access to formal sources of credit, the network of formal lenders must be extended at the village level. The negative effect of the availability of formal credit at commune level possibly implies that, where formal credit supply is restricted, households may borrow more from informal lenders. The effect of the availability of informal sources of funds at village level on household borrowing indicates that informal sources of credit remain important in rural credit markets.

The Survey 1

The findings from the Survey 1, as shown in Table 1, are similar and confirm the main findings from Survey 2. We find the negative and significant effect of the age of household head on household borrowing at the 1% level of significance. This result also indicates older households tend to borrow less. Household size is, again, positively and significantly related to household borrowing at the 1% level of significance. The gender of the household head and farm household variable are not found to be significantly related to household borrowings.

Of the proxy variables for household assets, the ownership of farming land, the value of financial savings and non-financial savings are all significantly related to the total household borrowing, but we do not find evidence for the influence of the education of the household head. At the 5% level of significance, the positive effect of the ownership of farming land on the amount of household borrowings confirms the implication that we found in Survey 2 that households owning more land demand more loans for their production or that the lenders use land owning as a priority criteria for offering loans. At the 1% level of significance, the negative effects of financial and non-financial savings are relevant to previous findings that better-off households borrow less.

Regarding the availability of funds and competition between lenders, at the 1% level of significance, we find similar results as in Survey 2 that the availability of informal funds and the availability of formal funds at village level are positively and significantly related to household borrowings. However, the availability of funds at the commune level is not significantly related to household borrowings. The findings, again, strengthen the view that, for rural households to gain access to credit, its supply at the village level must be improved.

3.2. Impact of credit on household welfare. In the second stage of regression, we use the Equation (1) and conduct tests using ordinary least squares method. The predicted residuals that are resulted from the first stage have included in the second stage to correct for sample selection bias and endogeneity of credit. We conduct separate tests for the two samples. Table 2 shows the Durbin-Hausman-Wu test which indicates whether or not the credit is endogenous and should the two stage regression is appropriate. Table 3 shows a summary of the tests of effect of credit on household welfares for the Survey 1 and 2, respectively. The test results are reported in Table 4 and 5. The dependent variables include the logarithm forms of per capita expenditure, per capita food expenditure and per capita non-food expenditure.

Table 2. Results of Durbin-Wu-Hausman tests

	The whole sample				Better-off households				Poorer households			
	Survey 2		Survey 1		Survey 2		Survey 1		Survey 2		Survey 1	
Dependent variable (logarithm)	t -sta.	Prob.	t-sta.	Prob.	t -sta.	Prob.	t-sta.	Prob.	t -sta.	Prob.	t-sta.	Prob.
Per capita expenditure	-9.149071	0.0000	-7.650737	0.0000	-3.596091	0.0003	-2.176149	0.0297	-8.444651	0.0000	-5.173894	0.0000
Per capita food expenditure	-6.002171	0.0000	-5.910136	0.0000	-2.780305	0.0055	-1.319384	0.1872	-3.107590	0.0019	-2.612428	0.0091
Per capita non food expenditure	-11.14564	0.0000	-9.021461	0.0000	-2.979476	0.0029	-3.031199	0.0025	-10.94111	0.0000	-6.905298	0.0000

Table 3. Effect of credit on household welfares

	The whole sample				Better-off households				Poorer households			
	Survey 2		Survey 1		Survey 2		Survey 1		Survey 2		Survey 1	
Depen-dent variable (logarithm)	Coeff.	t-sta.	Coeff.	t-sta.	Coeff.	t-sta.	Coeff.	t-sta.	Coeff.	t-sta.	Coeff.	t-sta.
Per capita expenditure	0.058897	10.76278	0.069796	8.594428	0.026106	4.016450	0.022210	2.993245	0.018306	3.268044	0.049039	5.273333
Per capita food expenditure	0.031550	6.596244	0.051011	6.560122	0.015926	2.590315	0.014053	1.768436*	0.124351	12.49764	0.027171	2.615912
Per capita non food expenditure	0.114328	13.29480	0.124194	9.877993	0.039319	3.753593	0.045279	3.783517	0.051041	9.501470	0.132783	7.017389

Notes: Significant at 1% for all. * Significant at 10%.

Table 4. Second stage least squares regression: effect of credit on household welfares. Survey 2 – The whole sample

Dependent variable	Per capita expenditure (VND1000, logarithm)			Per capita food expenditure (VND1000, logarithm)			Per capita non food expenditure (VND1000, logarithm)		
Explanatory variables	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.
The age of household head	0.177633	7.306821	0.0000	0.141211	6.645651	0.0000	0.236982	6.203212	0.0000
The age of household head squared	-0.011968	-4.495937	0.0000	-0.010793	-4.638587	0.0000	-0.013962	-3.337507	0.0009
Education of household head (years)	0.021521	11.73443	0.0000	0.011561	7.211788	0.0000	0.035329	12.25802	0.0000
Dummy variable: farm household =1; otherwise, = 0	-0.023968	-1.597689	0.1102	-0.024622	-1.877764	0.0605	-0.021334	-0.904948	0.3655
Dummy variable: gender of household head: male = 1; female = 0	0.001698	0.114598	0.9088	0.042384	3.272195	0.0011	-0.057059	-2.450155	0.0143

Table 4 (cont.). Second stage least squares regression: effect of credit on household welfares. Survey 2 – The whole sample

Dependent variable	Per capita expenditure (VND1000, logarithm)			Per capita food expenditure (VND1000, logarithm)			Per capita non food expenditure (VND1000, logarithm)		
Explanatory variables	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.
Household size (persons)	-0.102083	-27.05984	0.0000	-0.095099	-28.84122	0.0000	-0.115973	-19.56257	0.0000
Farm land owned (Hectare, logarithm)	-0.011821	-5.475450	0.0000	-0.005308	-2.813256	0.0049	-0.019447	-5.732373	0.0000
Financial savings (VND1000, logarithm)	0.058729	22.25537	0.0000	0.041436	17.96455	0.0000	0.086300	20.81076	0.0000
Non-financial savings (VND1000, logarithm)	0.045339	23.76919	0.0000	0.025533	15.31461	0.0000	0.077134	25.73254	0.0000
Price of detergent in the village (VND1000/kg, logarithm)	0.005053	0.288457	0.7730	0.025555	1.668933	0.0952	-0.032365	-1.175645	0.2398
Price of fish source (VND1000/bottle, logarithm)	0.063933	4.294735	0.0000	0.048672	3.740697	0.0002	0.093392	3.992248	0.0001
Price of noodle (VND1000/pack, logarithm)	0.081608	1.738382	0.0822	0.101111	2.464200	0.0138	-0.042754	-0.579544	0.5623
Price of pork (VND1000/kg, logarithm)	0.406621	8.407764	0.0000	0.296651	7.017768	0.0000	0.520518	6.848926	0.0000
Price of normal rice (VND1000/kg, logarithm)	0.210225	4.321962	0.0000	0.247643	5.824863	0.0000	0.204924	2.680927	0.0074
Price of sewing service (VND1000/trouser, logarithm)	0.070426	2.987775	0.0028	0.007520	0.365022	0.7151	0.162953	4.399208	0.0000
Averaged education in commune (years)	0.011397	2.747349	0.0060	0.010979	3.027804	0.0025	0.020441	3.135507	0.0017
Averaged land owned in commune (Hectare, logarithm)	0.058936	4.704746	0.0000	0.065031	5.939285	0.0000	0.063567	3.229086	0.0013
Price index in the region	-1.925638	-12.36355	0.0000	-1.486674	-10.92062	0.0000	-2.830734	-11.56548	0.0000
Total household credit (VND1000, logarithm)	0.058897	10.76278	0.0000	0.031550	6.596244	0.0000	0.114328	13.29480	0.0000
Predicted residuals	-0.051599	-9.149071	0.0000	-0.029587	-6.002171	0.0000	-0.098780	-11.14564	0.0000
C	6.471063	31.34931	0.0000	6.224408	34.49953	0.0000	5.165934	15.92564	0.0000
R-squared	0.474517			0.385771			0.443598		
Adjusted R-squared	0.471941			0.382760			0.440870		
F-statistic	184.2145			128.1238			162.6414		
Probability (F-statistic)	0.000000			0.000000			0.000000		
Observations	4101			4101			4101		

Table 5. Second stage least squares regression: effect of credit on household welfares. Survey 1 – The whole sample

Dependent variable	Per capita expenditure (VND1000, logarithm)			Per capita food expenditure (VND1000, logarithm)			Per capita non food expenditure (VND1000, logarithm)		
Explanatory variables	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.
The age of household head	0.090527	15.87109	0.0000	0.068599	12.56038	0.0000	0.137327	15.55116	0.0000
Education of household head (years)	0.025197	10.58782	0.0000	0.016105	7.067884	0.0000	0.041430	11.24481	0.0000
Dummy variable: farm household =1; otherwise, = 0	-0.150273	-7.622210	0.0000	-0.098088	-5.196055	0.0000	-0.234073	-7.668874	0.0000
Dummy variable: gender of household head: male = 1; female = 0	-0.021696	-1.186900	0.2354	0.018206	1.040173	0.2983	-0.095532	-3.375689	0.0007
Household size (persons)	-0.078290	-18.48049	0.0000	-0.074983	-18.48536	0.0000	-0.088868	-13.54973	0.0000
Farm land owned (Hectare, logarithm)	-0.001443	-0.533001	0.5941	1.65E-05	0.006351	0.9949	2.70E-05	0.006436	0.9949
Financial savings (VND1000, logarithm)	0.040729	13.67241	0.0000	0.032491	11.39107	0.0000	0.058051	12.58704	0.0000
Non-financial savings (VND1000, logarithm)	0.036854	14.84336	0.0000	0.021212	8.922329	0.0000	0.063629	16.55315	0.0000
Price of detergent in the village (VND1000/kg, logarithm)	-0.111503	-5.218410	0.0000	-0.096806	-4.731683	0.0000	-0.126994	-3.838965	0.0001
Price of fish source (VND1000/bottle, logarithm)	-0.051007	-2.966216	0.0030	-0.059988	-3.643340	0.0003	-0.043821	-1.646044	0.0999
Price of noodle (VND1000/pack, logarithm)	-0.238041	-4.992694	0.0000	-0.166472	-3.646553	0.0003	-0.426246	-5.774601	0.0000
Price of pork (VND1000/kg, logarithm)	0.297911	6.016148	0.0000	0.270648	5.708156	0.0000	0.357521	4.663510	0.0000
Price of normal rice (VND1000/kg, logarithm)	0.082461	1.551289	0.1209	0.222024	4.362158	0.0000	-0.119833	-1.456118	0.1455
Price of sewing service (VND1000/trouser, logarithm)	0.134822	6.573578	0.0000	0.032058	1.632429	0.1027	0.309711	9.753856	0.0000
Averaged education in commune (years)	0.017738	2.853165	0.0044	0.016384	2.752460	0.0059	0.023928	2.486101	0.0130
Averaged land owned in commune (hectare, logarithm)	-0.005925	-1.014662	0.3103	-0.006104	-1.091577	0.2751	-0.011215	-1.240420	0.2149
Price index in the region	1.102585	4.867014	0.0000	0.700230	3.228127	0.0013	1.549224	4.417173	0.0000
Total household credit (VND1000, logarithm)	0.069796	8.594428	0.0000	0.051011	6.560122	0.0000	0.124194	9.877993	0.0000
Predicted residuals	-0.064254	-7.650737	0.0000	-0.047526	-5.910136	0.0000	-0.117299	-9.021461	0.0000
C	4.658843	18.72168	0.0000	4.903242	20.57829	0.0000	2.398795	6.226434	0.0000

Table 5 (cont.). Second stage least squares regression: effect of credit on household welfares. Survey 1 – The whole sample

Dependent variable	Per capita expenditure (VND1000, logarithm)			Per capita food expenditure (VND1000, logarithm)			Per capita non food expenditure (VND1000, logarithm)		
Explanatory variables	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.	Coeff.	t-statistic	Prob.
R-squared	0.375452			0.245630			0.387949		
Adjusted R-squared	0.371794			0.241211			0.384364		
F-statistic	102.6397			55.59346			108.2218		
Probability (F-statistic)	0.000000			0.000000			0.000000		
Observations	3264			3264			3264		

From Table 2, at the 1% level of significance, the Durbin-Wu-Hausman tests show that the household credit is, indeed, endogenous for all dependent variables. Therefore, using instruments and analyzing the role of credit on household welfares based on the two stage regression are appropriate. Briefly, at the 1% level of significance, we find that household borrowing is positively and significantly related to household welfares, in terms of per capita expenditure, per capita food expenditures and per capita non-food expenditure for both the Survey 1 and Survey 2, as shown in Table 3. We also find that, in Survey 1, household borrowing contributes more to household welfares than in Survey 2. The effect of borrowing on non-food expenditure is found to be higher than on food expenditure in both Survey 1 and 2. The effects on food and non food expenditures are lower in Survey 2.

Although the findings show very small effects, they do reveal that household borrowing has a positive impact on household welfare[5]. This result supports the view that providing credit to rural households may increase their welfares and reduce poverty. The greater effect of credit on non-food expenditure in both samples, possibly, implies that households need to borrow to finance other activities, such as production and trading business, rather than daily sustenance. However, further discussion and the correct policy assessment of the impact of credit needs to take into account cost and benefit analysis.

3.3. The main implications. In short, our findings reveal some important implications. First, a schematic picture of a typical household, which borrows in the rural Vietnam, is presented. A typical household owns an area of farming land and borrows to finance its production, because it lacks an endowment (i.e., savings). The middle-aged and larger sized households tend to borrow more. The gender of household head and the type of household (i.e., form or non-farm household), however, do not affect the amount of household borrowing. This snapshot shows that the households who borrow are those who lack endowments, but have land and labor. They, indeed, need loans for production. However, the amount of household borrowing is influenced by the availability of funds at the village level. This implies an important policy conclusion: in order for rural households to gain access to credit, the formal/semiformal credit network must be extended to the village level.

Second, the positive impact of household borrowing on household economic welfare indicates that the provision of credit to rural households is an effective tool for improving their living standards. However, the very small values of the estimated coefficients raise the question of whether it is efficient to provide financial services to the rural households. The traditional view (Robinson, 2001) on rural finance emphases that providing credit to rural households involves high risk and/or high transaction costs. If the costs are too high, one may question: (i) whether providing credit to rural households is good policy, and if it is; (ii) how should we provide financial services to them? This returns us to the debate of whether we should follow a subsidized poverty reduction approach or a market risk related approach aimed at achieving sustainability of financial services provision, which is well discussed in Robinson (2001).

Conclusions

Although there has been substantial research on the relation between microfinance and household economic welfare, the research approach and methodology has been flawed. The main problems in the study of credit impact assessment include: the endogeneity of credit; and sample selection bias. In this paper, we have: (i) proposed an econometric framework that aims at minimizing the above problems; and (ii) provided the empirical evidence on the role of household credit on household economic welfares with the case of rural Vietnam.

[5] Econometrically, we may be concerned with the standard errors when using two *separate* stage regressions, as discussed in Maddala (2001, pp. 360-363). As Maddala analyzes, although the two separate stages of regression may produce consistent coefficients, the standard errors may be incorrect, since, in the second stage, the predicted values are used instead of the actual values. If so, the interpretation of the test results may lead to different conclusions. To check this, we conduct extra tests using 2SLS estimator directly. The extra tests, however, do not contradict our findings.

We have found that household borrowing is affected by various factors, of which the following are important: the age of the household head, the household size, the ownership of farming land, the value of financial savings, the value of non financial savings, the availability of informal funds and the availability of formal funds at village level. The positive effect of the ownership of farming land implies either that the households owning more farming land tend to borrow more or that the lenders lend more to those households. This, possibly, demonstrates that the formal/semiformal lenders require rural households to provide collateral in the form of land use certificates. The negative coefficient of the value of financial savings and the value of non-financial savings on the amount of household borrowing indicates that households with insufficient endowments (i.e., low savings) tend to borrow more to finance their production. We also found that the availability of informal and formal/semiformal funds at village level increases the amount of household borrowing. This finding has a very important implication that, in order to help rural households to gain access to the formal sources of credit, the banking network must be extended to the villages.

The main purpose of this paper is to assess the influence of credit on household economic welfare. We have found that household borrowing is positively and significantly related to the household welfare in both samples. The similarity of finding for each of the two samples informally supports robustness tests. Although the effect is small, the finding implies that providing loans to rural households is a tool to help poor rural households to escape from poverty. Moreover, we found that household borrowing has a greater positive impact on poorer households, compared with better-off households. This strengthens the view that poorer households can potentially gain from access to formal/semiformal credit, in particular, and financial services, in general.

However, we may be concerned about the very low impact of credit on household welfare. Given the high transaction costs of providing credit to rural households, the benefit, or the impact, may be lower than the cost, and hence, the question is raised: should we provide credit on a risk-related, or a subsidized basis? The main case for subsidizing credit is to reduce poverty by supplying cheap credit, but, as we and many others have found (e.g., Khandker, 2003; Khandker and Faruque, 2003), the marginal of impact is low. Moreover, credit is not the only tool in a poverty reduction strategy, so why do we need to commit a cheap credit? The risk related approach, which aims at assuring sustainability of the providers, results in the supply of much more expensive credit to rural households and we may expect exclusion of the very poor households to result. We, thus, return to the debate of which is better: the risk oriented or the subsidized poverty alleviation approach? We leave this for future research.

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Appendix 1

$$E[c_i|x_i, c_i > 0] = x_i'\beta + E[\varepsilon_i|\varepsilon_i > -x_i'\beta] = x_i'\beta + \sigma E[\frac{\varepsilon}{\sigma}\Big|\frac{\varepsilon}{\sigma} > -\frac{x_i'\beta}{\sigma}].$$

We assumed $\varepsilon_i|X_i \sim N(0,\sigma^2)$, so we can arrange this equation for

$$E[c_i|x_i, c_i > 0] = x_i'\beta + \sigma\frac{\phi(-x_i'\beta/\sigma)}{1-\Phi(-x_i'\beta/\sigma)} = x_i'\beta + \sigma\frac{\phi(x_i'\beta/\sigma)}{\Phi(x_i'\beta/\sigma)},$$

where $u = \frac{e-0}{\sigma}$; $\phi(u) = \frac{1}{\sqrt{2\pi}}e^{\left(-\frac{1}{2}u^2\right)}$; and $\Phi(u) = \int_{-\infty}^{u}\phi(z)dz$.

Set $\lambda(x_i'\beta/\sigma) = \frac{\phi(x_i'\beta/\sigma)}{\Phi(x_i'\beta/\sigma)}$, we, then, have

$$E[c_i|x_i, c_i > 0] = x_i'\beta + \sigma\lambda(x_i'\beta/\sigma). \quad (5)$$

Appendix 2

Consider the distribution of C, given X conditional on C > 0:

$$f_{C|X,C^*>0}(c|x) = \frac{f_{C^*|X}(c|x)}{1-F_{C^*|X}(0|x)}.$$

We, then, arrange for the distribution of the observed dependent variable:

$$f_{C|X}(c|x) = \frac{(1/\sigma)\phi((c-x'\beta)/\sigma)}{1-\Phi(-x'\beta/\sigma)}.$$

The log likelihood function is, then, constituted as a function of logarithm of sum of distribution function of all observed dependent variables with respect to β and σ.

$$L(\beta,\sigma^2) = \sum_{i=1}^{n}\left[-\frac{1}{2}\ln(2\pi\sigma^2) - \frac{1}{2\sigma^2}(c_i - x_i'\beta)^2 - \ln\left(1-\Phi(-x_i'\beta/\sigma)\right)\right].$$

The Tobit model is used to estimate the consistent parameters β and σ by maximizing this log likelihood function by differentiating the above equation with respect to β and σ and setting the derivatives equal to zero.