The impact of Informal Credit on Poverty and Inequality: The Case of Vietnam

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Abstract

The informal credit market remains an important source of finance for the poor in Vietnam. Yet, little if anything is known about the ultimate impact of informal loans on poverty and inequality. If informal credit is an important means to decrease poverty, the government may want to reconsider its policy focus. Although it is possible to stimulate the availability of informal credit, the Vietnamese government has no policies to do so and focuses solely on direct provision of microfinance. In this paper we therefore estimate the average effect of informal credit on expenditures of borrowing households, and subsequently assess its impact on poverty and inequality. By using fixed-effect regressions with instrumental variables, we intend to eliminate the potential bias caused by differences between participants and non-participants in credit markets. We find that the poor borrowed proportionally more from informal sources than the non-poor and that informal credit was quite effective in decreasing poverty: it reduced the poverty incidence of borrowers by 8 percentage points and the overall poverty incidence of population by 1.4 percentage points in 2006. Similarly, informal credit significantly decreased the poverty gap index and the poverty-severity index. The effects on expenditure inequality were small.

Keyword: Micro-credit, informal credit, poverty, inequality, Vietnam.

JEL classification: I32; I38; H43; H81.

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1. Introduction

Credit is seen as an important tool for households to promote production and business, increase income and reduce consumption fluctuations. Micro-credit and other financial services would enable the poor to build assets, increase incomes, and reduce their vulnerability to economic stress. Credit is severely rationed for poor households. Commercial banks are not interested in poor clients because of information problems and lack of collateral (Hoff and Stiglitz, 1990; Nagarajan, et al, 1995; Kochar, 1997; Bell et al, 1997; Bose, 1998; Boucher et al, 2008). Governments and NGOs have stepped into the gap and have provided credit to the poor, often at highly subsidized interest rates. However, while micro-credit programs do not require collateral, they do screen borrowers by other eligibility criteria such as poverty status or repayment capacity, often indirectly through peer groups. Moreover, repayment requirements are usually inflexible. As a result, not all poor households may be able or willing to obtain micro-credit, and some may resort to informal credit.

The informal credit market remains an important source of finance for the poor (Nagarajan et al, 1995; Kochar, 1997; Bell et al, 1997; Agénor and Montiel, 1999; Conning and Udry, 2005; Guirkinger, 1998). Despite the popular view of moneylenders as usurers, informal loans may help to increase capital and mitigate consumption fluctuations and thus enable the poor to grow out of poverty. While the existing lending capacity of the informal sector is supposedly limited, carefully designed government policies could help expanding available resources and thus indirectly increase the volume of informal loans. Moneylenders could be linked to banks to enable the use of formal sector money for loans to the poor (Fuentes, 1996, Varghese, 2005). On the other hand, financial policies can limit the terms and availability of informal loans: Subsidized programs may attract the best borrowers and

leave the riskier clients with higher enforcement costs to non-subsidized lenders (Morduch, 1999; Hoff and Stiglitz, 1990; Bose, 1998; Jain, 1999). When designing policies to increase credit access for the poor, it is therefore important to consider not only microfinance programs and other formal sources of credit, but also the informal credit market. Yet few countries have explicit policies aiming to strengthen the informal financial sector, possibly because of limited knowledge of the role of informal credit in increasing household welfare and reducing poverty and inequality. It is our understanding that there are no studies on the quantitative impacts of informal credit on household welfare, while there are a large number of studies on empirical impacts of micro-credit (see Morduch and Haley, 2002, for review),

This paper contributes to the credit literature by presenting an empirical analysis of the impact of informal credit on poverty and inequality in Vietnam between 2004 and 2006. Vietnam is often mentioned as an example of a country successful in poverty reduction. Over the past decade, Vietnam has witnessed remarkable reduction in poverty. According to the Vietnam Household Living Standard Surveys, the poverty incidence decreased from 58 percent in 1993 to 29 percent in 2002, and continued to decrease to 16 percent in 2006. Informal credit is an important source of capital flows for people in Vietnam. In the early 1990s, informal credit accounted for more than 70 percent of total credit in the rural areas (McCarty, 2001; Pham and Lensink, 2007). The proportion of informal loans decreased over time because of the growing role of formal credit. Using a data sample of four provinces in Vietnam, Barslund and Tarp (2008) found that the informal loans still accounted for 36 percent of all loans in rural areas in 2003.

Yet, it seems that informal credit has mostly been ignored in both research and policy in Vietnam, while the substantial size of the informal sector and its generally low entrance barriers suggest that it is important for the poor. If indeed it is, the

government may shift their focus at least partly away from direct provision of credit to stimulating the linkages between the formal and the informal credit market, especially given the mixed results of existing impact studies for (mostly) formal credit. Using the Vietnam Living Standard Surveys (VLSS) for 1993 and 1998, Quach and Mullineux (2007) found that total credit helped increase household expenditure. Similarly, Nguyen (2008) found that micro-credit from Vietnam Bank for Social Policies had positive effects on income, consumption and poverty reduction of the borrowers in the rural areas using the Vietnam Household Living Standard Surveys (VHLSS) for 2002 and 2004. Using the two most recent VHLSSs - 2004 and 2006 - Pham and Lensink (2008) came to a different conclusion. They conclude that micro-credit did not affect household self-employment profits, while credit from commercial banks seemed to help households increase their self-employment profits. These studies indicate not only that the effect of credit may have changed over time, but also that impact differs depending of the source of credit.

Separating out the causal role of credit is extremely difficult, and there is no study yet that has achieved wide consensus as to its reliability (Armendáriz de Aghion and Morduch, 2005). The borrowing process depends on the characteristics of both borrowers and lenders. Borrowers are therefore different from non-borrowers. Unfortunately, not all of these differences are easily measured. Borrowers may, for example, have a more entrepreneurial spirit and better business connections than non-borrowers. These unobserved differences, and not getting access to credit, may explain income and investment differences between borrowers and seemingly similar non-borrowers. Failing to account for this attribution problem will lead to biased estimates of program impact, and the bias can be large. We apply fixed-effect regression with instrumental variables regression to prevent such biases. Based on the

regressions, we compute the average effects of informal credit on household expenditures and compute their on poverty and inequality.

The remainder of the paper is structured into 5 sections. The second section describes data set used in this study. The third section presents background information on poverty and informal credit. The fourth section presents the estimation method. Next, the empirical findings on impact measurement are presented in the fifth section. Finally, the sixth section concludes.

2. Data Sources

The study relies on data from the two most recent Vietnam Household Living Standard Surveys (VHLSS), which were conducted by the General Statistical Office of Vietnam (GSO) with technical support from the World Bank (WB) in the years 2004 and 2006. The 2004 and 2006 VHLSSs cover 9188 and 9189 households, respectively. The samples are representative for the national, rural and urban, and regional levels. The 2004 and 2006 VHLSSs result in a panel of 4216 households, for which data is available for both years. The number of urban and rural households is 1012 and 3204, respectively.

The sample selection of VHLSSs 2004 and 2006 follows a method of stratified random cluster sampling. GSO selected households in all rural and urban provinces of Vietnam, i.e. rural and urban areas of all provinces are strata. Among each stratum, communes were selected randomly as a primary sampling unit. The number of communes per stratum is proportionate to the population. The number of selected communes in each VHLSS is 3063. In each commune, about 3 households were selected randomly.

The surveys collected information through household and community level questionnaires. Information on households includes basic demography, employment and labour force participation, education, health, income, expenditure, housing, fixed assets and durable goods, participation of households in poverty alleviation programs, and especially information on loans that households had obtained or still owed during the 12 months before the interview.

Data on expenditures were collected using very detailed questionnaires. Information on small and detailed expenditure categories was collected and then aggregated into expenditure per capita. Food expenditure includes purchased food and foodstuff and self-produced products of households. Non-food expenditure comprises expenditures on education, healthcare, housing, consumer durables, power, water supply and garbage collection.

Information was also collected on commune characteristics, but only for rural areas. In our analysis, we use two commune level variables, namely distance to the nearest market and a dummy variable indicating whether the village has a road. Since our sample includes the entire country, we had to come up with estimates for the urban areas. We assumed that for urban areas, the variables "distance to market" and "have a road" are equal to 0 and 1, respectively. This is a reasonable assumption given the fact that in all cities there is a market and at least one road.

3. Poverty and Informal Credit in Vietnam

In this paper, a household is classified as poor if their per capita expenditure is below the poverty line set up by WB and GSO. The poverty line is equivalent to the expenditure level that allows for nutritional needs with food consumption securing 2100 calories per day per person and some essential non-food consumption such as

clothing and housing. The poverty lines for the years 2004 and 2006 are 2077 and 2560 thousands VND, respectively.[3]

The poverty rate declined continuously over the period 1993-2006. The proportion of poor dropped dramatically from 58 percent in 1993 to 37 percent in 1998, and continued to decrease to 20 and 16 percent in 2004 and 2006, respectively. In rural areas, however, poverty was more prevalent than the country-average, with a poverty rate of 20 percent in 2006. The reduction of poverty was associated with a moderate increase in inequality. The Gini index based on expenditure per capita increased from 0.33 in 1993 to 0.36 in 2006.

To examine how informal credit reached poor households, we calculate the percentage of households having informal credit using the data from VHLSS 2004 and 2006. There is a tendency of contraction of informal credit. The percentage of households borrowing from informal credit was reduced from 38 percent in 1993 (according to the 1993 Vietnam Living Standard Survey) to 20 and 16 in 2004 and 2006, respectively (Table 1). The poor are more likely to have informal loans than the non-poor. In 2006, informal credit covered 21 percent of poor households and 15 percent of non-poor households. However, the non-poor had much higher average loan sizes than the poor. In 2006, loan size per borrowing household was VND 3,977 and 6,372 thousand for the poor and non-poor respectively. The fraction of informal credit to total household expenditures was equal to around 38 and 54 percent for poor and non-poor households, respectively. Since the number of the non-poor was much larger than the number of the poor, the non-poor also accounted for most informal borrowers: In 2006, non-poor households accounted for 83 percent of all borrowing households and obtained 95 percent of total informal credit.

[3] 1 USD is approximately equivalent to 15,777 and 16,054 VND in January 2004 and January 2006, respectively.

[Table 1 about here]

It should be noted that the average interest rate of informal credit was higher than that of micro-credit provided by Vietnam Bank for Social Policies, but still lower than the average interest rate of formal credit. In 2006, the average monthly interest rate of formal credit, micro-credit and formal credit is 0.53 percent, 0.36 percent and 0.93 percent, respectively. A possible reason why the informal credit interest rate is lower than the formal credit interest rate is that informal loans from friends and relatives accounted for 76 percent of the total informal loans. People tend to charge low or zero interest rates for their friends and relatives.

[Table 2 about here]

One important issue in examining the effectiveness of the credit is the use of credit. Table 2 tabulates the informal loan size by the use purposes reported by households. Although credit is fungible, this table might give some insight how the credit are used. It shows that nearly one-third of informal credit is supposedly used for investment and production capital. In 2006, the poor and non-poor households claimed to use 22 and 10 percent of informal loans for agricultural production and investment. However, the non-poor reported higher spending of more credit on non-farm activities. In 2006, the poor and non-poor claimed to use around 2 and 16 percent of the VBSP credit for service and business activities, respectively. Credit was also used for debt repayment and important needs such as house construction, healthcare and education. More specifically, more than one-third of informal credit was said to be used for house construction and purchase, and the remaining amount of informal credit was spent in debt repayment and other consumptions.

4. Impact evaluation methodology

Impact of credit on expenditures

To assess the impact of informal credit, we assume welfare can be specified as follows:

$$\ln(Y_{ijt}) = \beta_0 + G_t\beta_1 + X_{ijt}\beta_2 + D_{ijt}\beta_3 + C_{jt}\beta_4 + \eta_{ijt}, \quad (1)$$

where $\ln(Y_{ijt})$ is logarithm of expenditures per capita. The subscripts *i*, *j* and *t* refer to household *i* in commune *j* at time *t*, respectively. Note that "per capita" refers to the average per household member at period *t.* Per capita expenditure is thus calculated as total household expenditures at period *t* divided by the number of household members at period *t.* G_t is a year dummy, with a one for 2006; This dummy enables to control for common macroeconomic changes between the two years. *X* and *C* are vectors of household and community level control variables. *D* is a dummy variable indicating whether a household obtained informal credit.[4]

The main problem in estimating the equation is the endogeneity of informal credit market participation. Borrowing can be correlated with unobserved characteristics of households such as abilities and skills in production and business. Failure to control for such factors leads to biased estimates of program impact. In this study, we use the panel nature of the data and instrumental variables regression to avoid endogeneity bias. Firstly, to show how the panel nature of the data helps reducing the endogeneity problem, suppose the error term can be split into two

[4] We do not use the loan size as the credit variable, since the loan size is continuous variable, and the semi-log function of consumption will impose an unrealistic assumption on the increasing marginal impact of credit on consumption. We do not use the logarithm of credit in the right-hand side, since there are many households without credit, and taking logarithm of zero returns missing values. In addition, using the dummy variable of credit recipient can reduce measurement error of credit data.

components: a combined household and commune specific error, u_{ij} + v_j, which is correlated with *D* but stable over time, and ε_{ijt}, which is allowed to change over time. Equation (1) then becomes

$$\ln(Y_{ijt}) = \beta_0 + G_t\beta_1 + X_{ijt}\beta_2 + D_{ijt}\beta_3 + C_{jt}\beta_4 + u_{ij} + v_j + \varepsilon_{ijt}, \quad (2)$$

or alternatively

$$\ln(Y_{ijt}) = \beta_{0ij} + G_t\beta_1 + X_{ijt}\beta_2 + D_{ijt}\beta_3 + C_{jt}\beta_4 + \varepsilon_{ijt}. \quad (3)$$

If ε_{ijt} is uncorrelated with *D*, equation (3) can be estimated without bias using fixed-effects techniques. However, it is possible that there is a correlation between ε_{ijt} and *D*. For example, households who experience an income reduction due to negative shocks such as labor and crop losses need to resort to informal credit. In other words, the remaining endogeneity can rise because of individual time-invariant unobserved variables, such as income shocks, which affect both household expenditures and the probability of borrowing from informal sources. To deal with this endogeneity, we use instrumental-variables regression.

It should be noted that we apply instrumental-variables regression to equation (3) instead of equation (1), i.e. we use fixed-effects with instrumental-variables regression. Equation (3) contains only one error term ε_{ijt} (the error terms, u_{ij} and v_j, are removed using fixed-effect transformation), and as a result the condition on the absence of correlation between error term and the *D* variable is more like to be achieved.

We will measure the impact of informal credit by calculating the Average Treatment Effect on the Treated (ATT) (Heckman et al., 1999). ATT is the expected impact of credit receipt on borrowers (with *D* = 1):

$$ATT_t = E\left(Y_{ijt(D=1)} \middle| D_{ijt} = 1\right) - E\left(Y_{ijt(D=0)} \middle| D_{ijt} = 1\right), \quad (4)$$

Where $E(Y_{ijt(D=0)}|D_{ijt}=1)$ is the expected value of the outcome variable of the borrowers, *i.e.* expenditure per capita had they not received credit. This is not observed and has to be estimated.

Using equation (1), we get

$$\begin{aligned}
ATT_t &= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left(Y_{ijt(D=0)}|D_{ijt}=1\right)\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left[e^{\ln\left(Y_{ijt(D=0)}\right)}|D_{ijt}=1\right]\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left[e^{\left(\beta_{0ij}+G_t\beta_1+X_{ijt}\beta_2+C_{jt}\beta_4+\varepsilon_{ijt}\right)}|D_{ijt}=1\right]\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left[e^{\left(\beta_{0ij}+G_t\beta_1+X_{ijt}\beta_2+C_{jt}\beta_4+\varepsilon_{ijt}\right)+D_{ijt}\beta_3-D_{ijt}\beta}|D_{ijt}=1\right]\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left[e^{\ln\left(Y_{ijt(D=1)}\right)-D_{ijt}\beta_3}|D_{ijt}=1\right]\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-E\left[e^{\ln\left(Y_{ijt(D=1)}\right)-\beta_3}|D_{ijt}=1\right]\\
&= E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)-e^{-\beta_3}E\left(Y_{ijt(D=1)}|D_{ijt}=1\right)\\
&= \left(1-e^{-\beta_3}\right)E\left(Y_{ijt(D=1)}|D_{ijt}=1\right).
\end{aligned} \tag{5}$$

The ATT at time *t* is thus estimated by:

$$\hat{ATT}_t = \frac{1}{n_t}\left(1-e^{-\hat{\beta}_3}\right)\sum_{i=1}^{n_t} Y_{ijt}\ , \tag{6}$$

where n_t is the number of the borrowers at the time *t*.

We estimate the standard error of the ATT estimates by using a non-parametric bootstrap technique. This bootstrap is implemented by repeatedly drawing samples from the original sample of the VHLSS panel data. Since the VHLSSs sample selection follows stratified random cluster sampling, communes instead of households are bootstrapped in each stratum (Deaton, 1997). In other words, the bootstrap is made of communes (*i.e.*, clusters) within strata. The number of replications is 500.[5]

[5] In order to examine the robustness of our bootstrap technique, we also tried to bootstrap households. The results were similar.

The impact of credit on poverty and inequality

We calculate poverty by three Foster-Greer-Thorbecke poverty indexes, which can all be calculated using the following formula (Foster, Greer and Thorbecke, 1984):

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - Y_i}{z}\right]^\alpha , \qquad (7)$$

where Y_i is a welfare indicator for person i. We use consumption expenditure per capita as the welfare indicator, since, as is well known, consumption is a better proxy for well-being than income. z is the expenditure poverty line, n is the number of people in the sample population, q is the number of poor people, and α can be interpreted as a measure of inequality aversion.

When $\alpha = 0$, we have the headcount index H, which measures the proportion of people below the poverty line. When $\alpha = 1$ and $\alpha = 2$, we obtain the poverty gap PG, which measures the depth of poverty, and the squared poverty gap P_2 which measures the severity of poverty, respectively.

To measure inequality, we use three common measures of inequality: the Gini coefficient, Theil's L index of inequality, and Theil's T index of inequality. The Gini index can be calculated from the individual expenditure in the population:

$$G = \frac{n+1}{n-1} - \frac{2}{n(n-1)\bar{Y}}\sum_{i=1}^{n}\rho_i Y_i \qquad (8)$$

where $\bar{Y}$ is the average per capita expenditure; ρ_i is the rank of person i in the Y-distribution, counting from the richest so that the richest has the rank of 1. The value of the Gini coefficient varies from 0 when everyone has the same income to 1 when one person has everything. The closer a Gini coefficient is to one, the more unequal is the income distribution.

The Theil L index of inequality is calculated as follows:

$$Theil\_L = \frac{1}{n}\sum_{i=1}^{n} \ln\left(\frac{\bar{Y}}{Y_i}\right), \quad (9)$$

The Theil L index ranges from 0 to infinity. A higher value of Theil L indicates more inequality.

The Theil T index of inequality is calculated as:

$$Theil\_T = \frac{1}{n}\sum_{i=1}^{n} \frac{Y_i}{\bar{Y}} \ln\left(\frac{Y_i}{\bar{Y}}\right) \quad (10)$$

The Theil T index ranges from 0 (lowest inequality) to ln(N) (highest inequality).

The impact of credit on the poverty indices of borrowers in period *t* is calculated as follows:

$$\Delta P = P(D_t = 1, Y_t) - P(D_t = 1, Y_{t(D=0)}), \quad (11)$$

where the first term on the right-hand side of (11) is the poverty measure of the credit receiving households given their credit. This term is observed and can be computed directly from the sample data. However, the second term on the right-hand side of (11) is the counterfactual measure of poverty, *i.e.*, poverty indexes of the borrower had they not borrowed. This term is not observed directly, and is estimated by using equation (1), and substituting these estimates of expenditure into equation (7).

We also measure the impact of credit on total poverty:

$$\Delta P = P(Y_t) - P(Y_{t(D=0)}), \quad (12)$$

where $P(Y_t)$ is the observed poverty index of the entire population and $P(Y_{t(D=0)})$ is the poverty index of the entire population if the borrower had not received the credit. The difference between equations (12) and (11) is that the latter only looks at the effect on borrowers, while the former considers the effect on the entire population. Regarding inequality, we only measure the impact of credit on inequality of the entire population. The impact on the inequality index is given by:

$$\Delta I = I(Y_t) - I(Y_{t(D=0)}), \quad (13)$$

where $I(Y_t)$ is observed inequality, which is calculated using the observed expenditure data. $I(Y_{t(D=0)})$ is an inequality index in the absence of the credit, which is estimated using the predicted counterfactual expenditure without the credit, using equation (1). The standard errors of the estimates of impacts on poverty and inequality are estimated using the same bootstrap technique as for ATT.

5. Impact Estimation Results

The Impact of Informal Credit on Per Capita Expenditure

To estimate the effects of informal credit on per capita expenditure, we regress per capita expenditure on the informal credit dummy and a set of control variables. Control variables include household composition, education of household members, land and housing, villages, urbanity, credit from other sources and regional variables. It should be noted that control variables should be exogenous to credit (Heckman et al., 1999; Ravallion, 2001). Thus, several asset variables such as living areas and housing types are not included as control variables since these variables can be affected by credit (Table 2 shows that some households reported the use of credit for housing construction and purchase). We tested whether informal credit had a different impact in rural and urban areas by including interaction terms for credit and a dummy for living in an urban area. These estimates indicate that the effects of credit do not differ between urban and rural areas. We, therefore, only present the estimates for the entire sample.

The list of the variables and summary statistics for borrowing and non-borrowing households are presented in Table A.1 in the Appendix. In order to control for inflation, we have deflated all variables in terms of 2004 prices. Table 3

summarizes the regressions without instrumentation (See Table A.2 in the Appendix for full regression results). We present both random effects and fixed effects estimates, without and with sampling weight and cluster correlation. It shows that OLS pooled sample and random-effects regressions without control variables give negative signs for informal credit. This is consistent with the description in Table 1 that poor households are more likely to borrow from informal sources than non-poor households. Adding control variables to OLS and random-effect regressions decreases the size of the informal credit effect, but the estimates remain negative. Instead, the fixed-effects regression with control variables, which the Hausman test strongly favors over the random effects regressions, produces a significantly positive effect. This finding implies that credit is correlated with unobserved household characteristics, and that without correcting for this we underestimate the positive impact of borrowing and even find negative effects.

[Table 3 about here]

Although fixed-effects regressions corrects for time-invariant unobserved variables, they fail to deal with time-variant unobserved variables as explained above. Thus, we also use instrumental-variables regression. In this study, we use the proportion of informal borrowers within a district as an instrument for the informal credit borrowing of households in that district. For each household, we calculate the proportion of informal borrowers within the district of residence, excluding the household itself. The average number of sampled households per district in the VHLSSs is 15. We do not estimate the fraction of informal borrowing households per commune, since there are only 3 sampled households in each commune.

The key identification assumptions of instrumental variables regression are that the instruments are correlated with borrowing from informal sources and excluded from the expenditure equation. The fraction of informal borrowers in a district reflects the availability of informal credit networks in the district. We expect that these networks affect the probability of obtaining informal credit but not household welfare directly. The condition of correlation between the instrumental variable and borrowing can be tested by running a regression of informal credit borrowing on the instrumental variable and other control variables. Table A.4 in Appendix report the first-stage regressions which show that "fraction of informal credit borrowers" is strongly correlated with the borrowing from informal sources. The tests for weak instruments also strongly reject the null hypothesis that instruments are weak (as a rule of thumb, when a test value is over 10, the instruments is not weak, see Staige and Stock, 1997).

When using the two instruments, we can perform overidentification tests. To find the second instrument, we interacted the first instrument "the district fraction of informal credit borrowers" with other exogenous household variables including household composition variables, and tested whether these interactions are significant in the first-stage regressions.[6] We selected the household composition variables for interaction, since household composition can be correlated with local networks. For instance, households with more elderly may have more relations with other local households. Among the interaction terms, only the interaction between the district fraction of informal credit borrowers and the proportion of elderly was statistically significant in the first stage-regressions. Therefore this term is used as the second instrument. Table A.5 reports overidentification tests of instrumental variables. It

[6] Suppose that Z is an instrument for D in equation (3). then one can use ZX is instrument for DX, where X is an exogenous control variable (see Wooldridge, 2001). It means that we can use both Z and ZX as instruments for D.

shows that we cannot reject the hypothesis on overidentification, which indicates that the instruments are valid.

In addition, the endogeneity of informal borrowing can be tested using the instruments. Results from Durbin-Wu-Hausman tests shows that the hypothesis on the exogeneity is strongly rejected.

Table 4 summarizes the results from the instrumental variables regressions: Random-effects and fixed-effect regressions with instrumental variables. (The full regression results are presented in Table A3 in the appendix.) The regressions suggest that borrowing from informal sources significantly increases per capita expenditure. Instrumental variables regressions produces higher point estimates of the informal borrowing than regressions without instrumental variables. Interestingly, all IV regressions yield very similar estimates of the impact of informal credit, indicating the robustness of the estimates.

[Table 4 about here]

We use results from the fixed-effect model with two instruments to estimate ATT of informal credit (Table 5). It shows that the borrowing from informal sources helped households increase their per capita expenditure by around 442 and 512 thousand VND in 2004 and 2006, respectively (approximately an increase of 14 percent for each year). At an average household size of five, this amounts to 2210 and 2560 thousand VND, respectively. It should be noted that the average loan size was 9396 in 2004 and 9676 in 2006. This implies that an increase of the loan by 1 VND would have resulted in an increase in household expenditure of 0.23 and 0.21 VND in 2004 and 2006, respectively.

[Table 5 about here]

The Impact of Informal Credit on Poverty and Inequality

Using results from the fixed-effect model with two instruments, we estimate the impact of informal credit on poverty and inequality. Table 6 shows that informal credit significantly decreased poverty. The observed headcount of poverty for informal borrowers was 39 percent in 2006. Without informal credit, this would have been 8 percentage points higher. Hence, the headcount was reduced by 28 percent in 2006. Similarly, borrowing from informal sources decreased the poverty-gap index by 0.02, which is a reduction of almost 35 percent. The percentage-reduction in the poverty-severity index was about the same. As 21 percent of poor households obtained informal credit, this translated in a decrease in the overall head count index of poverty by around 1.4 percentage points in 2006. The effects on the other poverty indicators are also negative and statistically significant. The effect estimates in 2004 and 2006 are quite similar.

Interestingly, informal credit helped decrease total expenditure inequality. With informal credit, Gini, Theil T and Theil L are all significantly lower than without informal credit, but the decrease is less than one percent of the without informal credit value. It is not surprising that these numbers are low, as they refer to the entire population, and informal credit covered only 21 percent of households.

[Table 6 about here]

6. Conclusions

When some people, especially the poor, do not have access to formal credit or micro-credit programs, they have to resort to informal credit. While more expensive, these loans may be more easily accessible for the poor than subsidized loans, which could be siphoned off by wealthier households. Informal credit remains popular in Vietnam as well as other developing countries, and it can help households not only increase capital for production but also smooth consumption fluctuations. Although it is possible to stimulate the availability of informal credit, the Vietnamese government has no policies to do so and its current subsidized credit policy may even inhibit the functioning of the informal credit markets by taking its best clients. If indeed informal credit is an important means to increase expenditures for the poor, the government may want to reconsider its policy focus.

Yet, little is known about the ultimate impact of informal loans on poverty and inequality. Most empirical studies focus on the impact of micro-credit. In Vietnam, there are no studies which measure the impact of informal credit. Thus, in this paper, we estimate the average effect of informal credit on expenditures of borrowing households, and subsequently assess its impact on poverty and inequality. By using fixed-effect regressions with instrumental variables, we intend to eliminate the potential bias caused by differences between participants and non-participants in credit markets. Data used in this paper are from two recent household surveys, the Vietnam Household Living Standard Surveys in 2004 and 2006.

We find that the poor borrowed proportionally more from informal sources than the non-poor. In 2006, 21 percent of poor households and 15 percent of non-poor households borrowed from informal sources. The impact of informal credit on household welfare was quite encouraging. Borrowing from informal sources seemed

to have increased per capita expenditures by about 14 percent. Not surprisingly, we therefore find that informal credit was quite effective in decreasing poverty: it reduced the poverty incidence of borrowers by 8 percentage points and the overall poverty incidence of population by 1.4 percentage points in 2006. Similarly, the program significantly decreased the poverty gap index and the poverty-severity index. Informal credit decreased expenditure inequality of the population, but the decrease is less than one percent of the without credit value.

Summarizing, we found empirical evidence that informal credit can be an effectively tool to increase household welfare, reduce poverty and inequality. Clearly, informal credit can help achieve the government objectives of decreasing poverty and inequality without subsidized funds from the government. While not directly under public control, financial intermediation through informal lenders is not immune to public policies. Governments can facilitate intermediation through the provision of important basic infrastructure, such as a systems of laws and courts to support the creation and enforcement of property rights and contracts, credit bureaus to publicize information, and prudential regulation of financial institutions (Conning and Udry, 2005).

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List of Tables

Table 1: The borrowing from informal credit sources

	2004			2006		
	Poor	Non-Poor	Total	Poor	Non-Poor	Total
% houses borrowing from informal sources	26.3	18.5	19.8	20.5	15.4	16.1
	[1.2]	[0.5]	[0.5]	[1.3]	[0.5]	[0.4]
Loan size per borrowing household (thousand VND)	3540.5	11111.7	9396.3	2968.9	11078.6	9676.9
	[378.3]	[1151.8]	[899.5]	[247.9]	[748.7]	[629.2]
Distribution of the borrowing households	22.7	77.3	100	17.3	82.7	100
	[1.1]	[1.1]		[1.1]	[1.1]	
Distribution of loan across borrowing households	8.5	91.5	100	5.3	94.7	100
	[1.3]	[1.3]		[0.7]	[0.7]	
Ratio of loan to expenditure	45.9	63.1	61.5	38.0	53.8	52.8
	[4.9]	[9.5]	[8.6]	[3.3]	[3.5]	[3.2]
Monthly interest (%)	0.60	0.62	0.61	0.85	0.51	0.53
	[0.11]	[0.09]	[0.08]	[0.19]	[0.05]	[0.05]
Number of observations	1769	7419	9188	1427	7762	9189

Standard errors in brackets. Standard errors are corrected for sampling weights and cluster correlation.
Source: Author's estimation from VHLSSs 2004 and 2006.

Table 2: The use of informal credit

Activities	2004			2006		
	Poor	Non-Poor	Total	Poor	Non-Poor	Total
Investment and production						
Agriculture/Fishery/Aquaculture	24.1	11.5	12.5	21.5	10.0	10.6
	[3.8]	[2.0]	[1.9]	[3.9]	[1.5]	[1.4]
Services and business	3.6	24.2	22.4	1.6	15.9	15.1
	[1.4]	[6.6]	[6.2]	[1.0]	[3.4]	[3.3]
Other non-farm activities	0.7	11.0	10.1	1.7	2.4	2.4
	[0.4]	[4.4]	[4.1]	[0.9]	[0.7]	[0.7]
Consumption						
Debt repayment	5.3	4.1	4.2	10.3	6.0	6.2
	[1.3]	[1.1]	[1.0]	[2.7]	[1.2]	[1.2]
House construction/purchase	29.4	21.7	22.4	36.4	31.7	32.0
	[5.7]	[3.3]	[3.1]	[5.5]	[3.1]	[3.0]
Education	0.6	1.7	1.6	2.7	3.0	2.9
	[0.3]	[0.3]	[0.3]	[1.1]	[0.5]	[0.5]
Healthcare	7.5	8.0	7.9	5.4	7.8	7.6
	[1.7]	[1.1]	[1.0]	[1.6]	[1.2]	[1.1]
Durable appliances	5.7	2.7	3.0	1.5	3.5	3.4
	[1.7]	[0.5]	[0.5]	[0.8]	[0.6]	[0.6]
Other consumption	23.1	15.3	15.9	19.0	19.7	19.7
	[6.6]	[2.5]	[2.4]	[2.8]	[2.7]	[2.6]
Total	100	100	100	100	100	100
Number of observations	498	1572	2070	305	1363	1668

Standard errors in brackets. Standard errors are corrected for sampling weights and cluster correlation.
Source: Author's estimation from VHLSSs 2004 and 2006.

Table 3: The effect of informal loans on per capita expenditures

Explanatory variables	OLS - pooled sample (with sampling weights)	Random effects panel data (no sampling weights)	Fixed effects panel data (with sampling weights)	OLS - pooled sample (with sampling weights)	Random effects panel data (no sampling weights)	Fixed effects panel data (with sampling weights)
Informal loans (× 1000 VND)	-0.2053***	-0.0535***	-0.0087	-0.0887***	-0.0187*	0.0297**
	[0.0180]	[0.0126]	[0.0143]	[0.0135]	[0.0112]	[0.0129]

Notes : The regressions include household and regional control variables
Robust standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: The effect of informal loans on per capita expenditures: Instrumental variables regressions

Explanatory variables	Pooled sample: IV regression with one instrument (with sampling weight)	Pooled sample: IV regression with two instruments (with sampling weight)	Random effects panel data: IV regression with one instrument (no sampling weight)	Random effects panel data: IV regression with two instruments (no sampling weight)	Fixed effects panel data: IV regression with one instrument (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
Informal loans (× 1000 VND)	0.0983**	0.1034**	0.1002***	0.1042***	0.1271***	0.1274***
	[0.0415]	[0.0413]	[0.0371]	[0.0369]	[0.0457]	[0.0445]

Notes : The regressions include household and regional control variables
Robust standard errors in brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Impact of informal credit on expenditures per capita measured by ATT

Year	Y_1	Y_0	ATT ($Y_1 - Y_0$)
2004	3701.1***	3258.3***	442.8***
	[78.8]	[166.8]	[154.7]
2006	4279.8***	3767.8***	512.1***
	[107.9]	[204.2]	[180.8]

* significant at 10%; ** significant at 5%; *** significant at 1%
Figures in parentheses are standard errors.
Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications.
Source: Estimation from VHLSSs 2004 and 2006

Table 6: Impact of informal credit on poverty and inequality

	2004			2006		
	With credit	Without credit	Impact	With credit	Without credit	Impact
Poverty of borrowers						
P0	0.2532***	0.3282***	-0.0750**	0.1972***	0.2805***	-0.0833**
	[0.0123]	[0.0326]	[0.0307]	[0.0135]	[0.0348]	[0.0327]
P1	0.0574***	0.0855***	-0.0281**	0.0468***	0.0694***	-0.0226**
	[0.0039]	[0.0127]	[0.0117]	[0.0045]	[0.0110]	[0.0098]
P2	0.0204***	0.0319***	-0.0115**	0.0170***	0.0262***	-0.0092**
	[0.0020]	[0.0058]	[0.0052]	[0.0021]	[0.0048]	[0.0041]
All poverty						
P0	0.1949***	0.2102***	-0.0153**	0.1597***	0.1736***	-0.0138**
	[0.0058]	[0.0084]	[0.0063]	[0.0059]	[0.0080]	[0.0055]
P1	0.0472***	0.0529***	-0.0057**	0.0383***	0.0421***	-0.0037**
	[0.0019]	[0.0031]	[0.0024]	[0.0019]	[0.0026]	[0.0016]
P2	0.0170***	0.0193***	-0.0023**	0.0137***	0.0152***	-0.0015**
	[0.0009]	[0.0015]	[0.0011]	[0.0009]	[0.0012]	[0.0007]
All inequality						
Gini	0.3698***	0.3742***	-0.0043**	0.3580***	0.3613***	-0.0034**
	[0.0050]	[0.0054]	[0.0019]	[0.0046]	[0.0047]	[0.0015]
Theil L	0.2235***	0.2291***	-0.0055**	0.2117***	0.2159***	-0.0041**
	[0.0062]	[0.0068]	[0.0025]	[0.0056]	[0.0059]	[0.0019]
Theil T	0.2407***	0.2466***	-0.0059**	0.2268***	0.2310***	-0.0043**
	[0.0077]	[0.0083]	[0.0026]	[0.0074]	[0.0076]	[0.0019]

* significant at 10%; ** significant at 5%; *** significant at 1%.
Figures in parentheses are standard errors.
Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications.
Source: Estimation from VHLSSs 2004 and 2006.

Appendix

Table A.1: Descriptive statistics of households with and without informal credit

Variables	Type	2004		2006	
		Household with informal credit	Household without informal credit	Household with informal credit	Household without informal credit
Household variables					
Ratio of members younger than 16 to total household members	Continuous	0.2970	0.2579	0.2735	0.2347
		[0.0058]	[0.0028]	[0.0062]	[0.0027]
Ratio of members older than 60 to total household members	Continuous	0.0748	0.0983	0.0670	0.1027
		[0.0035]	[0.0021]	[0.0037]	[0.0021]
Ratio of female members to total household members	Continuous	0.5050	0.5054	0.5097	0.5099
		[0.0044]	[0.0022]	[0.0047]	[0.0022]
Household size	Discrete	5.0194	5.0105	4.8786	4.8650
		[0.0593]	[0.0294]	[0.0551]	[0.0321]
Ratio of members with technical degree to total household members	Continuous	0.0568	0.0581	0.0636	0.0677
		[0.0037]	[0.0020]	[0.0048]	[0.0021]
Ratio of members with post secondary to total household members	Continuous	0.0150	0.0368	0.0183	0.0374
		[0.0020]	[0.0019]	[0.0024]	[0.0018]
Area of annual crop land per capita (m2)	Continuous	573.9	692.9	627.6	708.9
		[31.0]	[20.7]	[35.6]	[21.8]
Area of perennial crop land per capita (m2)	Continuous	183.2	206.7	221.7	241.5
		[27.8]	[15.6]	[24.2]	[15.4]
Forestry land per capita (m2)	Continuous	170.4	200.6	175.9	221.8
		[36.3]	[25.6]	[32.4]	[30.5]
Aquaculture water surface per capita (m2)	Continuous	27.6	67.6	43.0	65.4
		[5.2]	[8.7]	[13.9]	[9.0]
Commune variables					
Road to village (yes = 1)	Binary	0.6735	0.5846	0.7090	0.6208
		[0.0151]	[0.0103]	[0.0157]	[0.0101]
Distance to nearest daily market (km)	Continuous	2.3459	2.1588	2.7613	2.2634
		[0.1534]	[0.1049]	[0.2761]	[0.1091]
Regional variables					
Household in Red River Delta	Binary	0.2606	0.2071	0.2437	0.2105
		[0.0138]	[0.0082]	[0.0145]	[0.0082]
Household in North East	Binary	0.1172	0.1132	0.1340	0.1113
		[0.0092]	[0.0057]	[0.0108]	[0.0056]
Household in North West	Binary	0.0244	0.0308	0.0302	0.0321
		[0.0040]	[0.0030]	[0.0056]	[0.0031]
Household in North Central Coast	Binary	0.1536	0.1225	0.1513	0.1280
		[0.0132]	[0.0070]	[0.0134]	[0.0073]
Household in South Central Coast	Binary	0.0650	0.0907	0.0579	0.0899
		[0.0073]	[0.0056]	[0.0075]	[0.0055]
Household in Central Highlands	Binary	0.0772	0.0512	0.0885	0.0545
		[0.0089]	[0.0042]	[0.0101]	[0.0044]
Household in North East South	Binary	0.1400	0.1640	0.1370	0.1638
		[0.0129]	[0.0087]	[0.0133]	[0.0086]
Household in Mekong River Delta	Binary	0.1620	0.2205	0.1574	0.2099
		[0.0111]	[0.0084]	[0.0117]	[0.0081]
Household in Living in urban areas	Binary	0.2138	0.2693	0.1999	0.2806
		[0.0137]	[0.0096]	[0.0139]	[0.0095]
Observations		832	3384	634	3582

Standard errors in parentheses.
Source: Estimation from VHLSSs 2004-2006.

Table A.2: Regressions of per capita expenditures

Explanatory variables	OLS - pooled sample (with sampling weight)	Random effects panel data (no sampling weight)	Fixed effects panel data (with sampling weight)	OLS - pooled sample (with sampling weight)	Random effects panel data (no sampling weight)	Fixed effects panel data (with sampling weight)
Borrowing from informal sources	-0.2053***	-0.0535***	-0.0087	-0.0887***	-0.0187*	0.0297**
	[0.0180]	[0.0126]	[0.0143]	[0.0135]	[0.0112]	[0.0129]
Proportion of members younger than 16 to total household members				-0.5320***	-0.4902***	-0.2284***
				[0.0284]	[0.0321]	[0.0560]
Proportion of members older than 60 to total household members				-0.2120***	-0.2196***	-0.1843***
				[0.0269]	[0.0305]	[0.0641]
Proportion of female members to total household members				-0.0337	-0.0729**	-0.1062
				[0.0285]	[0.0318]	[0.0657]
Household size				-0.0372***	-0.0777***	-0.1563***
				[0.0130]	[0.0126]	[0.0254]
Household size squared				-0.002	0.0008	0.0066***
				[0.0012]	[0.0011]	[0.0024]
Ratio of members with technical degree to total household members				0.7527***	0.5466***	0.1259**
				[0.0338]	[0.0365]	[0.0586]
Ratio of members with post secondary to total household members				1.2640***	0.9964***	0.1351
				[0.0477]	[0.0593]	[0.0948]
Area of annual crop land per capita (10000 m2)				0.2401***	0.2298***	0.2588***
				[0.0306]	[0.0330]	[0.0495]
Area of perennial crop land per capita (10000 m2)				0.3599***	0.3141***	0.2086***
				[0.0474]	[0.0404]	[0.0593]
Forestry land per capita (10000 m2)				0.005	-0.0337	-0.0846***
				[0.0164]	[0.0209]	[0.0193]
Area of aquaculture water surface per capita (10000 m2)				0.4781***	0.2673***	0.0208
				[0.0698]	[0.0675]	[0.0930]
Road to village (yes = 1)				0.0302*	0.0228	0.0033
				[0.0156]	[0.0166]	[0.0203]
Distance to nearest daily market (km)				-0.0107***	-0.0038***	0.0003
				[0.0012]	[0.0013]	[0.0012]
Red River Delta	Omitted					
North East				-0.1293***	-0.1714***	
				[0.0172]	[0.0279]	
North West				-0.3339***	-0.4463***	
				[0.0308]	[0.0481]	
North Central Coast				-0.1823***	-0.1704***	
				[0.0183]	[0.0275]	
South Central Coast				-0.0498**	-0.0359	
				[0.0195]	[0.0316]	
Central Highlands				-0.1583***	-0.1704***	
				[0.0278]	[0.0441]	
North East South				0.2610***	0.1846***	
				[0.0210]	[0.0330]	
Mekong River Delta				0.0426**	0.0286	
				[0.0167]	[0.0253]	
Urban				0.3992***	0.4366***	
				[0.0203]	[0.0271]	
Time effect (2006 variable)				0.1062***	0.1191***	0.1264***
				[0.0106]	[0.0070]	[0.0075]
Constant	8.3163***	8.2446***	8.2814***	8.3995***	8.5235***	8.8336***

Explanatory variables	OLS - pooled sample (with sampling weight)	Random effects panel data (no sampling weight)	Fixed effects panel data (with sampling weight)	OLS - pooled sample (with sampling weight)	Random effects panel data (no sampling weight)	Fixed effects panel data (with sampling weight)
	[0.0084]	[0.0130]	[0.0025]	[0.0413]	[0.0449]	[0.0775]
Observations	8432	8432	8432	8432	8432	8432
R-squared	0.0154	0.0109	0.0109	0.4660	0.4570	0.1900
Number of households	4216	4216	4216	4216	4216	4216
Hausman test χ^2 (Prob) (H0: Difference in coefficients in fixed and random effects regression not systematic)			43.7 (0.000)			315.0 (0.000)

Robust standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Estimation from panel data VHLSSs 2004-2006.

Table A.3: Instrumental variables regressions of per capita expenditures

Explanatory variables	Pooled sample: IV regression with one instrument (with sampling weight)	Pooled sample: IV regression with two instruments (with sampling weight)	Random effects panel data: IV regression with one instrument (no sampling weight)	Random effects panel data: IV regression with two instruments (no sampling weight)	Fixed effects panel data: IV regression with one instrument (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
Borrowing from informal sources	0.0983**	0.1034**	0.1002***	0.1042***	0.1271***	0.1274***
	[0.0415]	[0.0413]	[0.0371]	[0.0369]	[0.0457]	[0.0445]
Proportion of members younger than 16 to total household members	-0.5581***	-0.5586***	-0.4994***	-0.4997***	-0.2295***	-0.2295***
	[0.0278]	[0.0278]	[0.0302]	[0.0302]	[0.0555]	[0.0555]
Proportion of members older than 60 to total household members	-0.2043***	-0.2038***	-0.2093***	-0.2090***	-0.1803***	-0.1803***
	[0.0234]	[0.0234]	[0.0268]	[0.0268]	[0.0651]	[0.0651]
Proportion of female members to total household members	-0.0367	-0.0368	-0.0715**	-0.0715**	-0.0926	-0.0926
	[0.0263]	[0.0263]	[0.0300]	[0.0300]	[0.0671]	[0.0671]
Household size	-0.0447***	-0.0448***	-0.0801***	-0.0802***	-0.1593***	-0.1593***
	[0.0103]	[0.0103]	[0.0109]	[0.0109]	[0.0254]	[0.0254]
Household size squared	-0.0013	-0.0013	0.0010	0.0010	0.0067***	0.0067***
	[0.0009]	[0.0009]	[0.0010]	[0.0010]	[0.0024]	[0.0024]
Ratio of members with technical degree to total household members	0.7901***	0.7902***	0.5424***	0.5422***	0.1260**	0.1260**
	[0.0330]	[0.0330]	[0.0321]	[0.0321]	[0.0521]	[0.0521]
Ratio of members with post secondary to total household members	1.3173***	1.3182***	1.0082***	1.0085***	0.1457	0.1457
	[0.0456]	[0.0456]	[0.0492]	[0.0492]	[0.0946]	[0.0946]
Area of annual crop land per capita (10000 m2)	0.2273***	0.2278***	0.2379***	0.2382***	0.2559***	0.2559***
	[0.0318]	[0.0318]	[0.0331]	[0.0331]	[0.0484]	[0.0484]
Area of perennial crop land per capita (10000 m2)	0.3956***	0.3957***	0.3123***	0.3122***	0.1990***	0.1990***
	[0.0408]	[0.0408]	[0.0396]	[0.0396]	[0.0580]	[0.0580]
Forestry land per capita (10000 m2)	0.0080	0.0081	-0.0323	-0.0323	-0.0844***	-0.0844***
	[0.0223]	[0.0224]	[0.0217]	[0.0217]	[0.0201]	[0.0201]
Area of aquaculture water surface per capita (10000 m2)	0.4968***	0.4971***	0.2650***	0.2649***	0.016	0.016
	[0.0860]	[0.0860]	[0.0795]	[0.0795]	[0.0912]	[0.0912]
Road to village (yes = 1)	0.0307*	0.0306*	0.0217	0.0216	0.0036	0.0037
	[0.0158]	[0.0158]	[0.0140]	[0.0140]	[0.0187]	[0.0187]
Distance to nearest daily market (km)	-0.0091***	-0.0091***	-0.0038***	-0.0038***	0.0004	0.0004
	[0.0009]	[0.0009]	[0.0008]	[0.0008]	[0.0009]	[0.0009]
Red River Delta	Omitted					

Explanatory variables	Pooled sample: IV regression with one instrument (with sampling weight)	Pooled sample: IV regression with two instruments (with sampling weight)	Random effects panel data: IV regression with one instrument (no sampling weight)	Random effects panel data: IV regression with two instruments (no sampling weight)	Fixed effects panel data: IV regression with one instrument (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
North East	-0.1525***	-0.1523***	-0.1671***	-0.1669***		
	[0.0177]	[0.0177]	[0.0226]	[0.0226]		
North West	-0.3778***	-0.3773***	-0.4358***	-0.4354***		
	[0.0279]	[0.0279]	[0.0351]	[0.0351]		
North Central Coast	-0.1484***	-0.1482***	-0.1659***	-0.1657***		
	[0.0186]	[0.0186]	[0.0239]	[0.0240]		
South Central Coast	-0.0088	-0.0083	-0.0259	-0.0255		
	[0.0202]	[0.0202]	[0.0258]	[0.0259]		
Central Highlands	-0.1460***	-0.1461***	-0.1734***	-0.1735***		
	[0.0245]	[0.0245]	[0.0311]	[0.0311]		
North East South	0.2046***	0.2049***	0.1914***	0.1916***		
	[0.0189]	[0.0189]	[0.0242]	[0.0242]		
Mekong River Delta	0.0567***	0.0570***	0.0368*	0.0371*		
	[0.0168]	[0.0168]	[0.0211]	[0.0211]		
Urban	0.3916***	0.3916***	0.4396***	0.4397***		
	[0.0186]	[0.0186]	[0.0201]	[0.0201]		
Time effect (2006 variable)	0.1206***	0.1208***	0.1242***	0.1244***	0.1309***	0.1310***
	[0.0102]	[0.0102]	[0.0064]	[0.0064]	[0.0071]	[0.0071]
Constant	8.3674***	8.3664***	8.5008***	8.5001***		
	[0.0377]	[0.0378]	[0.0401]	[0.0402]		
Observations	8432	8432	8432	8432	8432	8432
Number of households	4216	4216	4216	4216	4216	4216

Robust standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Estimation from panel data VHLSSs 2004-2006.

Table A.4: First-stage regressions of IV models

Explanatory variables	Pooled sample: IV regression with one instrument (with sampling weight)	Pooled sample: IV regression with two instruments (with sampling weight)	Random effects panel data: IV regression with one instrument (no sampling weight)	Random effects panel data: IV regression with two instruments (no sampling weight)	Fixed effects panel data: IV regression with one instrument (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
Proportion of informal borrowers per district (instrumental variable)	1.0029***	1.0513***	1.0008***	1.0486***	0.9648***	1.0177***
	[0.0320]	[0.0351]	[0.0325]	[0.0356]	[0.0611]	[0.0650]
Proportion of informal borrowers per district * Proportion of members older than 60 to total household members (instrumental variable)		-0.4349***		-0.4279***		-0.4448**
		[0.1290]		[0.1306]		[0.1994]
Proportion of members younger than 16 to total household members	0.0927***	0.0918***	0.0918***	0.0909***	-0.0011	-0.0063
	[0.0211]	[0.0211]	[0.0222]	[0.0222]	[0.0622]	[0.0623]
Proportion of members older than 60 to total household members	-0.0875***	-0.0357	-0.0863***	-0.0354	-0.0334	0.0149
	[0.0177]	[0.0234]	[0.0188]	[0.0244]	[0.0587]	[0.0614]
Proportion of female members to total household members	0.0143	0.0155	0.01	0.0113	-0.1507**	-0.1433**
	[0.0202]	[0.0202]	[0.0214]	[0.0214]	[0.0656]	[0.0658]
Household size	0.0113	0.0114	0.0112	0.0113	0.0221	0.0208
	[0.0079]	[0.0079]	[0.0083]	[0.0083]	[0.0187]	[0.0186]
Household size squared	-0.001	-0.001	-0.001	-0.001	-0.0004	-0.0003
	[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0015]	[0.0015]
Ratio of members with technical degree to total household members	-0.037	-0.0368	-0.0319	-0.0317	0.002	0.0036
	[0.0254]	[0.0254]	[0.0262]	[0.0262]	[0.0531]	[0.0531]
Ratio of members with post secondary to total household members	-0.1453***	-0.1438***	-0.1438***	-0.1424***	-0.1215	-0.1209
	[0.0346]	[0.0346]	[0.0364]	[0.0364]	[0.0837]	[0.0838]
Area of annual crop land per capita (10000 m2)	-0.0745***	-0.0756***	-0.0697***	-0.0707***	0.0324	0.034
	[0.0243]	[0.0243]	[0.0254]	[0.0254]	[0.0439]	[0.0443]
Area of perennial crop land per capita (10000 m2)	-0.0099	-0.0073	-0.0045	-0.0019	0.0915	0.0962
	[0.0314]	[0.0314]	[0.0324]	[0.0324]	[0.0592]	[0.0594]
Forestry land per capita (10000 m2)	-0.0252	-0.025	-0.0233	-0.0231	-0.0017	-0.0013
	[0.0172]	[0.0172]	[0.0177]	[0.0177]	[0.0205]	[0.0207]
Area of aquaculture water surface per capita (10000 m2)	-0.0284	-0.0298	-0.0222	-0.0237	0.0102	0.007
	[0.0661]	[0.0660]	[0.0677]	[0.0676]	[0.1072]	[0.1075]
Road to village (yes = 1)	-0.0043	-0.0045	-0.0029	-0.0031	0.0163	0.0158
	[0.0122]	[0.0122]	[0.0124]	[0.0123]	[0.0204]	[0.0204]
Distance to nearest daily market (km)	0.0009	0.0009	0.0007	0.0006	-0.0013	-0.0014
	[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0012]	[0.0012]
Red River Delta	Omitted					
North East	-0.0023	-0.0015	-0.0019	-0.0011		
	[0.0136]	[0.0136]	[0.0146]	[0.0146]		
North West	-0.0248	-0.0232	-0.024	-0.0224		
	[0.0213]	[0.0213]	[0.0228]	[0.0228]		
North Central Coast	0.0056	0.0055	0.0057	0.0057		
	[0.0143]	[0.0143]	[0.0154]	[0.0154]		
South Central Coast	-0.0065	-0.0068	-0.0067	-0.007		
	[0.0155]	[0.0155]	[0.0166]	[0.0166]		
Central Highlands	-0.0018	-0.0032	-0.0023	-0.0036		
	[0.0188]	[0.0188]	[0.0202]	[0.0202]		
North East South	-0.0146	-0.0143	-0.015	-0.0146		
	[0.0145]	[0.0145]	[0.0155]	[0.0155]		
Mekong River Delta	-0.0054	-0.0054	-0.0056	-0.0056		
	[0.0129]	[0.0129]	[0.0138]	[0.0138]		

Explanatory variables	Pooled sample: IV regression with one instrument (with sampling weight)	Pooled sample: IV regression with two instruments (with sampling weight)	Random effects panel data: IV regression with one instrument (no sampling weight)	Random effects panel data: IV regression with two instruments (no sampling weight)	Fixed effects panel data: IV regression with one instrument (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
Urban	0.0053	0.0047	0.0058	0.0051		
	[0.0143]	[0.0143]	[0.0149]	[0.0149]		
Time effect (2006 variable)	-0.0067	-0.0071	-0.0069	-0.0073	-0.0103	-0.0109
	[0.0078]	[0.0078]	[0.0072]	[0.0072]	[0.0082]	[0.0081]
Constant	0.028	0.0215	0.0283	0.022	0.0495	0.0445
	[0.0288]	[0.0289]	[0.0302]	[0.0302]	[0.0657]	[0.0656]
Observations	8432	8432	8432	8432	8432	8432
R-squared	0.130	0.131	0.132	0.133	0.113	0.113
Number of households	4216	4216	4216	4216	4216	4216
Weak IV identification test: Cragg-Donald F statistic (Ho: Instruments are weak)	882.2	497.4			372.2	188.9

Robust standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Estimation from panel data VHLSSs 2004-2006.

Table A.5: Tests on weak instruments and overidentification of IV, and endogeneity of formal credit IV regressions

	Pooled sample: IV regression with two instruments (with sampling weight)	Fixed effects panel data: IV regression with two instruments (with sampling weight)
Overidentification of IV: Hansen J statistic (Ho: Instruments are valid)	$\chi_{(1)}$ = 1.313 P-value = 0.251	$\chi_{(1)}$ = 0.002 P-value = 0.961
Test of endogeneity of "borrowing from informal sources": Durbin-Wu-Hausman statistic (Ho: Informal borrowing is exogenous)	$\chi_{(1)}$ = 21.6 P-value = 0.000	$\chi_{(1)}$ = 5.291 P-value = 0.021