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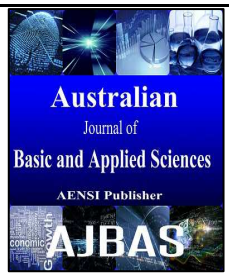

Impact of Access to Credit on Multidimension Poverty Indicators of Households in Mekong Delta of Vietnam

Vuong Quoc Duy

Department of Finance and Banking, College of Economics, Can Tho University, Vietnam

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ABSTRACT

This paper investigates the impact of access to formal microcredit on the multidimensional poverty indicators of household for a case study in the Mekong Delta in Vietnam. The paper compares two determinants of household access to formal credit and the effects of access to credit on indicators of household multidimension poverty such as total income and expenditure (short term outcome indicators) and households' total assets, educational costs, healthcare costs, and food consumption (long term effects). For these indicators a comparison is made between borrowers and non-borrowers in a sample of 325 households using propensity score matching methods. The findings confirm the impact of microcredit on household welfare for borrowers, both group-based and individual, and on long term livelihood aspects (expenditure levels on education and health care). Income and expenditure levels were significantly higher for group-based borrowers than for non-borrowers.

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INTRODUCTION

Poverty analysis attracts more attention from researchers and policy makers due to its interesting issues. Sen (1999) introduced and developed the Capability Approach that viewed poverty as a multidimensional aspect and not just a result of deprivation of a single aspect. Sen (2000) added that this approach is not a theory to explain poverty, inequality, or wrll-being as it provides concepts and frameworks within which to conceptualize, measure, and evaluate poverty as well as the institutions and policies that effect it (Crocker and Robeynsk, 2010; Robeyns, 2003). Given approach focuses on the real oppurtunities that people face and has opened the ground of a novel line of research on the space of capabilities (Ballon and Krishnakumar, 2010). The approach evaluates policies in terms of their impact on people's capabilities as well as their actual functioning (Robeyns, 2003).

A number of empirical studies have highlighted the role of microcredit in raising household welfare levels and the reduction of poverty (Hossain and Diaz, 1997, pp. 89-121, Mourji, 2000, Islam, 2007, Swain, *et al*., 2008, pp. 191-215, Ang, 2004, pp. 485-494). Credit has been found to provide a wide range of opportunities for reducing the household poverty levels as measured by per capita income, per capita expenditure and asset levels (Khandker, 2001). Mosley and Mosley (1996) show that when they have access to credit, poor people are likely to invest in livelihood strategies and break out of the poverty cycle. Zaman (1999) shows the positive impact of microcredit provided by the Bangladesh Rural Advancement Committee. Khandker (2005, pp. 263-286), Morduch and Haley (2002), Robinson (2001) all validate the importance of microfinance for poverty alleviation, as it offer opportunities for improvements in household productivity levels, and hence the smoothing of income and consumption (Robinson, 2001). A study by Pitt, *et al*. (2003, pp. 87-118) found that credit lending to females had a large and significant impact on two out of three health measures for children (while male borrowing had no such effect).

Similar findings have emerged with specific reference to Vietnam. Quach, *et al*. (2003) found that credit had a positive and significant long-term impact on household welfare in rural Vietnam by increasing per capita expenditure. Their results also show that although both formal and informal credits contribute to the alleviation of household poverty, the former has a relatively greater impact. Similarly, Cuong, *et al*. (2007) and Duong and Izumida (2002, pp. 319-335) find a positive impact of credit on household income in Vietnam. Furthermore, Swain, *et al*. (2008, pp. 191-215)'s study of microfinance and poverty reduction in the MD found that microfinance

Corresponding Author: Vuong Quoc Duy, Department of Finance and Banking, College of Economics, Can Tho University, Vietnam.
Tel: +84.0919.748.448; E-mail: vqduy@ctu.edu.vn

may lead to accumulation of assets and enable women to adopt livelihood strategies that lead to poverty reduction.

Not all studies, however, have reached these conclusions. Other studies have found no significant impact of microcredit on household welfare and poverty reduction. For instance, study of Coleman (1999, pp. 105-141) on microcredit programme in Thailand concludes that microcredit has no impact on household income. Diagne and Zeller (2001) did not find any statistically significant impact of microcredit on household income in Malawi. Chowdhury (2008), in his study of poor households in Bangladesh, even suggests that the burden of debt actually makes households poorer.

The aim of this paper is to analyze whether the outreach projects of the Vietnamese Bank of Agriculture and Rural Development (VBARD) and the Vietnamese Bank Social Policy (VBSP) have any effect on the multidimension poverty levels for the beneficiaries, namely on levels of income, expenditure on food, education and health care. This research setting allows a comparison of these effects according to mode of access to credit. By extending the outcome variables to include expenditure on food, education and health care, the analysis attempts to check for long-term effects on household livelihoods, beyond simply income and expenditure patterns.

2. Methodology:

2.1. Propensity score matching :

As introduced by Rosenbaum and Rubin (1983, pp. 41-50), the propensity score is used to provide an alternative method for estimating treatment effects when treatment assignment is not random but can be assumed to be un-confounded. This method has been applied in a wide variety of fields (Heckman, *et al*., 1998, pp. 261-294, Dehejia and Wahba, 1999, pp. 1053-1062, Moser, 2005, Smith and Todd, 2005, pp. 305-353). The propensity score is defined as the conditional probability of treatment given background variables. Normally a logit or probit function is used for this purpose, given that treatment is typically dichotomous (i.e., D=1 for the treated and D=0 for the control units) as follows:

$$P(x) = Prob(X_i|D_i=1,\ p(X_i)=p) = Prob(X_i|D_i=0,\ p(X_i)=p) = Prob(X_i|p) \quad (1)$$

Let Y_{1i} and Y_{0i} denote the potential outcomes under treatment and control groups respectively. Then treatment assignment is (conditionally) un-confounded if treatment is independent of potential outcome conditional on X.

A household's decision about whether to take credit is expected to be affected by institutional (bank) factors, product (loan) features and household/client socio-economic characteristics (Okurut, 2006). Among the institutional factors are the location of the financial service providers and the conditions they set, which are expected to influence the probability of attracting rural borrowers (Dallimore and Mgimeti, 2003). Product features may include issues of credit rationing such as the interest rates in operation and collateral requirements (Kochar, 1997, pp. 339-371).

The impact of credit is measured on the total asset value, income, total expenditure, and expenditure on food, education and health care. Total asset value includes values of livestock, buildings, television, irrigation pump, motorbikes, bicycles, boats and other durables. This variable is measured in millions of dongs (Duong and Izumida, 2002, pp. 319-335). There is a difference by type of expenditures. First, expenditure on farming is defined as the expenses for farming inputs such as seeds, fertilizers, pesticides, young animals, hired labour and hired machines. Second, non-farm expenditure is defined as expenses for family labour, transport to work, households business and other household business not related to farming. Last, off-farm expenditure refers to the expense of households in off-farm activities such as household business in agricultural activities and other farming services. Expenditure on education is defined as total school fees of household members who are under 18 years of age. Health care expenditure is defined as the total cost for all household members to receive basic treatment from the health services, such as health insurances fees and basic health care services. Total income is defined as total income from farming, non-farming and off-farm activities of the households.

2.2. Propensity Score Matching Method:

The average treatment effects (ATT) are defined as the average treatment effect for the sub-population with a given value of the pre-treatment variables. It is estimated by taking the difference between the treatment and control averages in the sub-population that are matched through the propensity scores. The ATT are then estimated by weighting these sub-population estimates. The ATT effect is thus (Becker and Ichino, 2002, pp. 358-377):

$$ATT = E\{Y_{1i} - Y_{0i}|D_i=1\} \quad (2)$$

$$ATT = E[E\{Y_{1i}-Y_{0i}|D_i=1,\ p(X_i)\}] \quad (3)$$

$$ATT = E[E\{Y_{1i}|D_i=1,\ p(X_i)\} - E\{Y_{0i}|D_i=0,\ p(X_i)\}|D_i=1] \quad (4)$$

where ATT is the average treatment on the treated; Y_{1i} and Y_{0i} are the potential outcomes in the two counterfactual situations of the borrowers and non-borrowers respectively; $p(X_i)|D_i=1$ is the propensity score of the treated households, given its characteristics X_i. Several matching techniques can be used (Caliendo and Kopeinig, 2005). This paper uses a Stratification matching and a Kernel matching approach.

1) Stratification matching approach (SM):

The stratification procedure is based on the same approach used for estimating the propensity scores such that, within each interval, treated and control

units have on average the same propensity score (Dehejia and Wahba, 1999, pp. 1053-1062). It is advisable to use the same blocks within which the balancing property is examined. Within each interval, the difference between the average outcomes of the treated and the control observation is computed as follows (Dehejia and Wahba, 1999, pp. 1053-1062).

$$T_q^S = \frac{\sum_{i\in I(q)} Y_i^T}{N_q^T} - \frac{\sum_{j\in I(q)} Y_j^C}{N_q^C} \quad (5)$$

where: I(q) is the set of units in block q that is automatically chosen in the propensity score estimation; Y_i^T and Y_i^C are the outcomes of the treated and control units respectively; N^Tq, N^C_q are the numbers of treated and control units in block q respectively. The total number of blocks is Q.

Finally, the ATT is obtained as an average of the ATT of each block with the weight of each block given by the corresponding fraction of treated units (Dehejia and Wahba, 1999, pp. 1053-1062).

$$T^S = \sum_{q=1}^{Q} T_q^S \frac{\sum_{i\in I(q)} D_i}{\sum_{\forall i} D_i} \quad (6)$$

3.2.2. Kernel matching approach (KM):

In the Kernel matching method, all treated cases are matched with a weighted average of all controls using weights that are inversely proportional to the distance between the propensity scores of treated and controls. The ATT is then calculated as follows (Heckman, *et al*., 1997, pp. 1017-1098).

$$ATT = \frac{1}{N_1}\sum_{i\in I_1}\left\{Y_i - \sum_{j\in I_0}\frac{K\left[(P(x_j)-P(x_i))/h\right]}{K\left[(P(x_j)-P(x_i))/h\right]}Y_j\right\} \quad (7)$$

where $Y_{i,}$ and Y_j are the outcomes of treated and non-treated households respectively; K(.) is the Kernel function; h is the estimated bandwidth; I_1 is the sample of the treated cases and I_0 is the sample of non-treated controls; P(.) are the probabilities of treated and non-treated cases.

Apart from the two methods used in this paper, other propensity score matching methods are available (Heckman, *et al*., 1997, pp. 1017-1098). But these have a number disadvantages and therefore were not considered for this study. The Nearest neighbor matching approach (NNM) method may violate the common support assumption (Cochran and Rubin, 1973, pp. 417-446). This approach will provide an estimate even when there are no sufficient comparable units. Radius matching approach (RM) is more suitable but the estimated results are relatively imprecise compared to the SM and KM approaches because only one control is matched with each participant. Instead, the SM method matches the average of several individuals. Yet, equal weights are given to an individual at the limit of the stratum and to an individual close to the observed unit, since the average is only arithmetic (Chemin, 2008, pp. 463-U26). The KM method overcomes this problem by giving each individual a weight decreasing with distance compared to the intentional unit. As all individuals in the control group are used, the KM method is also likely to relax the common support assumption (Chemin, 2008, pp. 463-U26).

The robustness checks of standard errors of propensity score matching are obtained by using a bootstrap method. These robustness checks help to increase the reliability of the results by demonstrating that the estimations do not depend too much on the particular methodology chosen.

3. Empirical results:

3.1. Household characteristics:

In this section, an overview is given of the households' characteristics before turning to the estimation results. Tables 1, 2 and 3 compare the household characteristics of borrowers and non-borrowers. Heads of borrower households were relatively older and had lower educational levels than non-borrower households. No differences in family sizes and dependency ratio were found between the two groups. Land endowments and average income also seemed not to differ. Land can also be used as collateral for the loan. In the survey, the average land area under control by individual borrowers and non-borrowers was about 11.8 and 15.3 thousand squared meters, respectively while that of group-based-borrowers was about 6.4 thousand squared meters, and the difference was statistically significant at 1% level. Most households in the survey held a 'red certificate' and thus had property rights on the land.

Individual borrowers registered a higher value of assets such as building value and other fixed assets and they spent more on education and health care. On the other hand, group-based borrowers were found to be on average poorer than individual borrowers. Non-borrowers spent on average more on food.

There were relatively more female borrowers among the group-based borrowers. Among the borrowers, 43% of individual borrowers and 51% of group-based borrowers were of Vietnamese origin, compared to 61% among non-borrowers. It was furthermore hypothesized that if the household head has any social and/or political positions in the village, he or she will have a high probability of access to formal credit and is therefore less likely to borrow from the informal sector. However, this could not be confirmed by the chi-square analysis. Individual borrowers were relatively more involved in community work. Over 60% of the respondents in each group adhered to at least one religion. As noted above, individual borrowers were found to be more prevalent in Soc Trang while most group borrowers and non-borrowers were in Can Tho.

Table 1: Household characteristics of borrowers and non-borrowers (continuous variables).

n	Non-borrowers 106	Group-based Borrowers 113	Individual Borrowers 106	F-stat
Yearly income (1,000 dongs)	77,188 (88,908)	71,911 (72,972)	101,034 (72,950)	4.13***
Income per person per year (1,000 dongs)	15,845 (15,280)	15,985 (17,693)	22,531 (21,145)	4.68***
Food consumption per year (1,000 dongs)	17,906 (9,373)	14,283 (6,763)	16,684 (9,030)	5.30***
Food consumption per person per year (1,000 dongs)	3,862 (1,979)	3,139 (1,662)	3,676 (2,348)	3.89***
Food consumption/Income (%)	0.48 (0.48)	0.27 (0.14)	0.22 (0.17)	22.00***
Education expenditure per year (1,000 dongs)	3,802 (6,967)	4,939 (5,044)	6,081 (6,772)	3.47**
Education/Total expenditure (%)	10.55	11.67	9.02	0.96
Education expenditure per person (1, 000 dongs)	781 (1,306)	1,050 (1,061)	1,339 (1,670)	4.46***
Healthcare expenditure per year (1,000 dongs)	805 (1,829)	2,657 (2,814)	2,865 (2,067)	26.59***
Health/total expenditure (%)	1.03	2.50	1.40	1.88**
Healthcare expenditure per person (1,000 dongs)	190 (263)	606 (722)	623 (459)	20.39***

Notes: Standard deviation in parentheses; *, **, ***: Significant at 10%; 5%; and 1%.

Table 2: Household expenditure on education and health services by province.

	Can Tho	Soc Trang	Tra Vinh	F-stat
Education expenditure (1,000 dongs)	8,119 (11,286) [67.60%]	6,536 (7,436) [74.31%]	4,348 (6,102) [54.63%]	3.10**
Education to total expenses (%)	12.13	9.81	9.33	1.14
Education per person (1,000 dongs)	1,635 (2,198)	1,460 (1774)	892 (1,280)	4.46***
Healthcare expenditure (1,000 dongs)	556 (831) [57.41%]	1,414 (2,991) [65.14%]	2,124 (4,337) [51.86%]	3.98***
Healthcare to total expense (%)	0.61	1.39	3.00	4.82***
Healthcare per person (1,000 dongs)	106 (152)	324 (673)	485 (1,138)	3.80***

Notes: Percentage of households who have spent on education and health services in brackets; *, **, ***: Significant at 10%; 5%; and 1%.

Table 3: Household characteristics (categorical variables).

n	Non-borrowers 106	Individual borrowers 106	Group-based borrowers 113	X^2-stat
Gender (% male)	67	71	52	9.10***
Married (% yes)	90	96	99	10.97***
Red book certificate (% yes)	92	97	82	13.94***
Vietnamese (% yes)	62	41	51	9.15***
Community involvement (% yes)	18	19	18	0.44
At least one religion (% yes)	61	69	62	2.69**
Can Tho (% yes)	37	27	35	8.72**
Soc Trang (% yes)	33	37	31	0.50
Tra Vinh (% yes)	28	37	35	1.85*

Notes: *, **, ***: Significant at 10%; 5%; and 1%.

3.2. Determinant of access to credit:

Table 4 gives the factors that affect the probability of access to formal credit for rural households in the Mekong Delta. As noted above, these factors include household characteristics, assets levels, institution characteristics and location effects. As the table shows, distance to a market center (higher likelihood when closer), marital status and location of households were found to be determinants of access to credit for the pooled sample. These findings can be explained as follows. Firstly, distance from their dwelling place to a market centre may affect a household's credit accessibility. Greater proximity may afford significantly more information on financial markets. The more financial information the household receives, the faster it can decide to borrow. We believe that marital status is important for both demand and approval of credit. Married household heads may need to generate an income to support the family, which is probably higher than one-person households. From a lender point of view, married credit takers may be better as asset levels (hence collateral) would be higher and the level of income is also probably higher. Furthermore, they are less likely to move. Households from the Tra Vinh province are more likely to borrow. As noted earlier, households from Soc Trang and Tra Vinh provinces have a high concentration of minority ethnic groups and are therefore more targeted by the poverty alleviation programs of the Vietnamese government. The results concur with the findings of Okurut (2006) and Ha (1999).

There are some differences between group-based and individual borrowers. The group-based borrowers are poorer than individual borrowers. The likelihood of borrowing in a group system was lower for large landowners, non-married households, households living further from the bank, and

households not located in the Tra Vinh province. As group-based systems do not require collateral, they will probably attract households with limited land endowments who are excluded from private lending schemes. The influence of marital status, distance to the bank and location in Soc Trang or Can Tho is explained above. Individual borrowers were more likely to be of married households, living closer to a market center, and households with fewer children. Separate models have been estimated for the propensity scores of the subsamples of households with non-zero education costs and non-zero health care expenditure. The results of these models are available upon request.

Table 4: Factors affecting access to credi by rural households.

Independent variables	Heckman selection model			Double hurdle model		
	Pooled sample	Individual borrowers	Group-based borrowers	Pooled sample	Individual borrowers	Group-based borrowers
Gender (male=1)	-0.156	-0.090	-0.353	-0.156	-0.070	-0.353
	(-0.79)	(-0.39)	(-1.39)	(-0.79)	(-0.30)	(-1.39)
Marriage status (married=1)	1.171***	0.816**	1.887***	1.171***	0.828**	1.887***
	(3.17)	(1.96)	(3.17)	(3.17)	(1.99)	(3.17)
Children ratio	-0.847*	-1.316**	-0.406	-0.847*	-1.238**	-0.406
	(-1.70)	(-2.21)	(-0.63)	(-1.70)	(-2.10)	(-0.63)
Elderly ratio	1.176	1.141	0.367	1.176	1.365	0.367
	(1.42)	(1.27)	(0.30)	(1.42)	(1.50)	(0.30)
Education level (years)	-0.014	0.037	-0.053	-0.0144	0.029	-0.053
	(-0.55)	(1.20)	(-1.57)	(-0.55)	(0.93)	(-1.57)
Experienced farm (years)	-0.005	-0.003	-0.004	-0.005	-0.001	-0.004
	(-0.48)	(-0.24)	(-0.28)	(-0.48)	(-0.05)	(-0.28)
Community involvement (yes=1)	0.030	-0.100	0.399	0.0295	-0.095	0.399
	(0.12)	(-0.35)	(1.25)	(0.12)	(-0.33)	(1.25)
Farmers (yes=1)	-0.0441	0.215	-0.123	-0.0441	0.167	-0.123
	(-0.23)	(0.92)	(-0.50)	(-0.23)	(0.72)	(-0.50)
Total land (1000m2)	-0.007	0.006	-0.036**	-0.008	0.005	-0.036***
	(-0.90)	(0.69)	(-2.89)	(-0.90)	(0.54)	(-2.89)
Distance to market centre (m)	-0.002***	-0.002***	-0.002***	-0.002***	-0.001***	-0.002***
	(-8.77)	(-6.64)	(-7.89)	(-8.77)	(-6.54)	(-7.89)
Soc Trang province (yes=1)	0.212	0.270	0.264	0.212	0.336	0.264
	(0.96)	(1.03)	(0.88)	(0.96)	(1.29)	(0.88)
Tra Vinh province (yes=1)	0.382*	0.427	0.531*	0.382*	0.416	0.531*
	(1.75)	(1.60)	(1.87)	(1.75)	(1.57)	(1.87)
Constant	1.289**	0.483	0.860	1.289**	0.408	0.860
	(2.27)	(0.74)	(1.00)	(2.27)	(0.63)	(1.00)
Mills	0.242*	-0.003	0.285			
Lambda	(1.96)	(-0.03)	(1.59)			
N	325	212	219	325	212	219
Censored obs./Pseudo R2	106	106	106	0.300	0.269	0.438
Uncensored obs./Log likelihood	219	105	113	-143.61	-107.49	-85.28
Wald chi2/LR chi2	85.86	33.82	99.92	123.19	78.92	132.80
Prob>Chi2	0.000	0.002	0.000	0.000	0.000	0.000

Notes: t statistics in parentheses; *, **, ***: Significant at 10%; 5%; and 1%.

The data available for matching methods are critical in order to justify the assumption that, once all relevant observed characteristics are controlled for, comparison units have, on average, the same outcomes that treated units would have had in the absence of the intervention. Thus, to obtain impact estimates that are generalizable to the population of interest, it is important to consider the balancing tests of data availability. The balancing properties are mainly satisfied for the pooled sample by 6 blocks and for group-non borrowers and for individual non-borrowers by 5 blocks. This confirms that the pool of comparison units have a sufficient number of observations with characteristics corresponding to those of the treated units for all given models.

3.3. The impact of access to credit on rural household poverty:

The ATT calculated using the stratification and kernel matching alternatives are given in tables 5. The findings indicate that there is a tendency for borrowers to improve their living standard in the long-run, mainly through increased expenditure on education and health care. In table 2, borrowers seem to have spent more on education and health care. The results show a limited impact of credit on our short run indicators. Only for group-based borrowers does credit seem to improve their income and to increase their farm expenditure.

It is somewhat surprising that expenditure on food in table 2 is significantly lower for borrowers than for non-borrowers. This may imply that borrowers tend to spend less on food and more on other goods, or

alternatively, that their levels of home farm production are higher as a result of higher investments, which increases the subsistence food available to the household. This may also suggest that access to credit used in a productive way contributes to smooth consumption. However, I was not able to check this.

It needs to be remembered that the propensity score method attempts to reduce selection bias. The difference in income can therefore be attributed to access to credit, given that other factors are controlled for by the propensity scores. Unobservable factors such as entrepreneurship and attitudes towards work or risk may of course play a role, and we have not been able to control for such factors.

The robustness checks confirm the reliability of results. The impacts found on total income, education expenses, healthcare expenses, and farming expenses and food consumption do not appear to depend critically on the algorithm used, since both the value of the coefficients and its significance are very similar using different alternatives.

Table 5: ATT for income, assets, food consumption and livelihood expenditure.

	Pooled model		Individual-Non borrowers		Group -Non borrowers	
	Stratification	Kernel	Stratification	Kernel	Stratification	Kernel
Total income	-9,066	1,544	-8,349	4,222	39,224***	40,794***
(1000 dongs)	(30,880)	(-)	(21,157)	(-)	(9,617)	(-)
	[28,878]	[12,586]	[21,775]	[17,488]	[12,381]	[11,230]
Asset total	-151,000	-72,800	-214,000	-136,000	45,119	151,000
(1000 dongs)	(259,000)	(-)	(228,000)	(-)	(196,000)	(-)
	[234,000]	[14,800]	[256,000]	[187,000]	[147,000]	[130,000]
Food expenses	-2,678**	-1,947	-2,738*	-1,832	213	1,023
(1000 dongs)	(1,408)	(-)	(2,014)	(-)	(3,374)	(-)
	[1,512]	[1,394]	[2,049]	[1,670]	[2,781]	[3,018]
Food per person	-175	-109	-216	-104	243	474
(1000 dongs)	(262)	(-)	(349)	(-)	(678)	(-)
	[241]	[314]	[360]	[420]	[566]	[544]
Farming expenses	-7437	-3,842	-6,945	-2,650	9,714***	10,875***
(1000 dongs)	(11,819)	(-)	(8,900)	(-)	(2,992)	(-)
	[10,169]	[6,067]	[8,767]	[6,892]	[3,321]	[4,578]
Nonfarm expenses	2,395	1,844	-7,385	-5,080	4,465	4,406
(1000 dongs)	(2,254)	(-)	(9,169)	(-)	(3,511)	(-)
	[2,208]	[4,617]	[10,110]	[6,312]	[3,642]	[3,158]
Off-farm expense	1,144	523	-1,762	-1,453	3,428	4,010
(1000 dongs)	(3,134)	(-)	(3,755)	(-)	(3,330)	(-)
	[3,084]	[6,862]	[3,934]	[5,072]	[4,742]	[7,181]
N	315	315	191	191	200	200

Notes: Standard errors in parentheses, bootstrapped clustered errors in the brackets; *, **, ***: Significant at 10%; 5%; and 1%.

5. Conclusions and implications:

This paper investigates the impact of access to formal credit on poverty levels of household in the MD in Vietnam. A comparison is made between borrowers, both individual and group-based, and non-borrowers for a sample of rural households using a propensity score matching approach. From the descriptive, it is clear that individual borrowers are among the richer households in the area; in particular, they are better endowed in land and assets, while group-based borrowers are poorer. These latter tend to have lower education levels and less land compared to the control group. Overall, proximity to the market center, marital status and the province where the households live seemed to be important determinants of access to credit.

The findings on the treatment effect suggest that group-based borrowers are better off in terms of income and farm expenditures. Expenditures on health care and education, considered to be long-term livelihood investments, are higher for borrowers than for non-borrowers. This would imply that access to credit has a particularly beneficial effect on improving the living standards of children in the household. And, in turn this improvement may improve the overall household welfare and wellbeing. These findings confirm the findings of Diagne and Zeller (2001), Navajas, *et al*. (2000, pp. 333-346), and Dunn (1999).

Three more issues deserve our attention: the lack of access of poor households to individual credit, the importance of remoteness in access to credit and the lack of evidence of credit used to increase income and investment in income generating activities. Individual loans seem not be accessible to poorer households with limited collateral. Poor rural households are required to borrow in groups which themselves act as collateral for the lending. Furthermore, remote rural households seem not to be adequately served by the formal banking institutions. Finally, little evidence is found that credit consistently increases income and expenditure in any of farming, nonfarm or off-farm activities in the short term. While this may be due to unobservable factors which we could not control for in the analysis, the lack of short-term response to credit suggests that credit alone is not sufficient to improve the living conditions of the rural households. Many clients of formal credit programs face a lack of skills and training, and limited access to markets and technology. As a result, when these households have access to credit to invest in human capital or start-up new businesses or firms, the sustainability of these businesses becomes a topic of consideration. It is very important for the financial institutions to facilitate or directly involve themselves in “credit plus” services that may contain skill development/training, marketing facilities and business development services to their customers to

help them to sustain the economic activities supported by their financial schemes. However, the planning and evaluation of such services are issues for future research. An important related issue would be to investigate whether individual or group lending systems would be most appropriate for organizing these services.

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