Does Microfinance Improve Household Welfare of Ethnic Minorities? Evidence from Bac Kan Province, Vietnam

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Abstract

In Vietnam, despite the remarkable achievement in poverty alleviation, high poverty rates are still present in mountainous regions, where 75% of minority ethnic group members live. Ethnic minorities account for only 15% of the entire population, but they make up 50% of the impoverished population. Ethnic minorities have absolute disadvantages in access to fundamental economic elements: market information, productive land, mobility, educational opportunity and financial opportunity. The microcredit from the Vietnam Bank for Social Policies (VBSP) is considered as one of the key initiatives to improve the welfare of the low-income class and ethnic minority impoverished people in particular. This study examines whether the microfinance loan for the low-income class from VBSP reduces poverty in the northern mountainous area, where many ethnic minorities live. A stratified random sampling technique is applied to a sample of 289 households, including 204 loan beneficiaries and 85 control households. Among the 289 households, 263 households are inhabited by ethnic minorities. Propensity score matching (PSM) is applied to estimate the impacts (as average treatment effects on the treated) of microfinance loans on total cash income per capita, total expenditure per capita, food expenditure per capita, health expenditure per capita, and educational expenditure per student. As an alternative estimation method, regression-adjusted matching is adopted to check the robustness of estimations. The results show that the impacts of the microfinance loan on total expenditure per capita and educational expenditure per student are positive and robust, which supports the poverty alleviation effects of microfinancing in areas populated by ethnic minorities in Vietnam.

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1. Introduction

The success story of Grameen Bank in Bangladesh has encouraged many developing countries to

promote microfinance as a channel for providing small credits to the low-income class. Nevertheless, microfinance is not a panacea for poverty. As many studies have shown, the efficacy of microfinance depends on the context of poverty and the characteristics of the target.

Using panel data from Bangladesh, Khandker (2005) finds a positive impact of microcredit on poverty reduction among poor borrowers, especially for female borrowers. Imai, Arun and Annim (2010) also find a remarkable role of microfinance on poverty alleviation by utilizing cross-sectional data from a national household survey in 2005 of 5260 Indian households. Li, Gan, and Hu (2011b) use both pre-program data and post-program data to investigate the impact of a microcredit program in China. They find an increase in annual income and annual consumption of borrowers. In contrast, little to no influence of microfinance is found in some studies. Coleman (2006) only finds statistical impacts of a microcredit program in Thailand on household welfare for committee members, while improvement is nonsignificant for rank-and-file members. Banerjee, Duflo, Glennester and Kinnan (2015) also indicate that household consumption neither increases in the short term nor in the longer term by applying a randomized controlled trial conducted in Hyderabad, India from 2005 to 2010. Reduction in consumption and savings are observed in Augsburg, De Haas, Harmgart, and Meghir (2015). However, to the best of our knowledge, these results did not elucidate the effect of microfinance on the ethnic minority poor, who have absolute disadvantages in accessing fundamental economic elements such as market information, productive land, mobility, educational opportunity and financial opportunity[1].

The purpose of this paper is to examine the impact of microfinance programs on low-income ethnic minorities in Vietnam. According to Vietnamese General Statistical Office (GSO) reports, there was a dramatic reduction in the poverty rate, from 58.1% in 1993 to 8.2% in 2014, but high poverty rates are still present in upland regions, including the Northern region and parts of the Central Highland, where 75% of ethnic minorities live. Ethnic minorities account for only 15% of the population, but they make up 50 % of the impoverished population[2]. In addition, there exists a substantial and widening gap in the poverty rate between the Kinh majority and ethnic minorities[3]. If this trend continues, poverty will become overwhelmingly an issue of ethnicity.

The microcredit from VBSP is considered as one of the key initiatives to improve the welfare of low-income classes, especially poor ethnic minorities. In August 1995, the Vietnam Bank for the Poor (VBP) was established and operated under the management of the Vietnam Bank for

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[1] See World Bank (2009).
[2] Vietnam has 54 ethnic groups. The "Kinh" ethnic is the largest group, accounting for 85 percent of the population. See also World Bank (2012).
[3] In 1993, ethnic minorities made up only 20 percent of poor households, but this proportion had increased to 29 percent and 47 percent in 1998 and 2010, respectively (World Bank, 2012). Moreover, poverty gaps between ethnic minorities and the Kinh ethnic majority was only 1.6-fold in 1993, but this had risen to 5.1-fold by 2010 (World Bank, 2012).

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Agriculture and Rural Development (VBARD). Thereafter, VBSP was established based on restructuring VBP in 2002 to achieve poverty alleviation targets and to separate policy credit from commercial credit. VBSP is now the biggest microfinance provider in Vietnam as well as the most common credit channel for ethnic minorities. There are few empirical studies evaluating the impact of microfinance programs in Vietnam and financing ethnic minority community members. Thus, this paper provides new empirical evidence of microcredit programs from VBSP for ethnic minorities.

The paper is organized as follows. Section 2 presents the study sites and data collection. Section 3 explains methods for data analysis. The results are presented and discussed in section 4, and section 5 concludes the paper.

2. Study sites and data collection

2.1. Study site

The household survey was conducted in two communes, namely, Thanh Van commune and Mai Lap commune, Cho Moi district, Bac Kan province in September 2015. Bac Kan province is located in the Northern mountainous region of Vietnam, 170 km from Hanoi capital to its center. The total provincial area is 485,941 ha and the total provincial population is 308,300 people in 2014, including seven ethnic communities (BKEIP, 2014). Ethnic minorities account for more than 80% of the population (BKEIP, 2014). The poverty rate in Bac Kan province was 18.5% in 2013, compared with only 9.9% in the entire country. This province consists of 1 city and 7 districts with a total of 122 communes (BKEIP, 2014).

There are two main reasons for selecting Thanh Van and Mai Lap communes. First, they are listed as specially disadvantaged communes according to Decision 2405/QĐ-TTg, dated 10/12/2013 by the Prime Minister. As a result, all local people are eligible to borrow money from VBSP. Second, the two communes have similar demographic and geographic characteristics. Therefore, participants and non-participants might face the same economic incentives that can drive their participation decision. In both communes, forest lands cover more than 90 percent of the natural area, and households use a large part of them for timber plantations. Regarding agriculture, rice is the main crop with two harvests per year, while main crops include corn and cassava. As a result of developmental projects, banana cultivation is very popular in both communes. Livestock husbandry is also one of the main income sources in this area. Households often raise pigs, poultry, and buffalo. Ethnic minorities make up more than 90% of the population. They have their own languages. Currently, young generations can speak both a common language and their language while older generations can often only speak their own language. Most of the dwellers in the study sites identify their ethnicity as "Tay". Their traditional house is the "San" house, made from wood and palm leaves. They often do not follow any religion; they mainly worship their ancestors. The

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Tet holiday and ghost festival are the two biggest festivals in a year. Ethnic minorities in Thanh Van and Mai Lap communes have difficulties accessing market information, productive land, mobility, educational opportunity and financial opportunity.

2.2. Sample collection

In this study, selected households were divided into two groups: a treatment group and a control group. The treatment group included households which had borrowed from VBSP program. Meanwhile, the control group contained households that had never taken a formal loan from VBSP or any other microfinance institution.

A stratified random sampling technique was applied to sample the households. Based on the borrower lists[4] provided by commune committee officers, 204 borrowers and 85 non-borrowers were randomly selected. Overall, a total of 289 households participated in face-to-face interviews using structured questionnaires. A total of 263 households of the 289 interviewed households belonged to ethnic minorities.

Among indicators for household welfare, household income and expenditure are popularly used. However, households are often reluctant to reliably report their income sources. Moreover, it is common that rural income fluctuates substantially from year to year, thus it does not accurately reflect the long-term economic status of the household. Therefore, this study mainly focused on expenditure perspective, which is less sensitive to the above issues. This study not only analyzed total annual household expenditure per capita index but also decomposed its components, such as food expenditure per capita, education expenditure per student and health expenditure per capita. This research also used a total annual household cash income from selling products to the market. Specific definitions and descriptive statistics of each outcome variable and each covariate are described in the appendix.

3. Methodology

Propensity score matching (PSM) is applied to estimate impacts (as average treatment effects on the treated - ATT) of the microfinance loan on total cash income per capita, food expenditure per capita, health expenditure per capita, educational expenditure per student, and total expenditure per capita. As an alternative estimation method, a regression-adjusted matching is adopted to check the robustness of estimations. **3.1. Propensity score matching**

The PSM approach can capture different dimensional characteristics of each household into a single index known as the propensity score, which is defined as the probability of a household becoming a treated household, given a set of observable covariates. Then, potential outcomes of treated households are compared to those of control households based on their propensity scores.

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[4] This list includes name of borrowers, name of lending group, maturity date of their loans, the principal debt balances, and the amount of savings in VBSP.

Compared with simple regression, PSM has some important contributions. It only compares treated households to control households whose propensity scores are similar. In other words, if treated households and control households are very different, they will not be matched, but the regression still gives results. PSM does not impose any particular functional form on the data; thus, homogeneous treatment effects and heterogeneous treatment effects on the treated are accorded (Chemin, 2008). However, PSM is only beneficial if the data satisfies two assumptions: conditional independence and common support (Rosenbaum & Rubin, 1983). The conditional independence assumption (CIA) is represented as follows:

$$Y_1, Y_0 \perp T \mid P(X). \tag{1}$$

Y_1 and Y_0 represent potential outcomes of participants and non-participants, respectively. This assumption implies that given a propensity score *P(X)* calculated by a set of observable covariates *X* which are not affected by treatment *T*, and potential outcomes *Y* are independent of treatment assignment *T*. In other words, decisions of households on participating in a microfinance program is entirely dependent on observed features or unobservable features, which cannot affect the household's decision.

A common support assumption is described as follows:

$$0 < P(T = 1 \mid X) < 1. \tag{2}$$

This assumption implies that households that have same characteristics have a positive probability of being both participants and non-participants.

There are four main steps utilized in this study to estimate the impact of the microfinance program as ATTs on poverty reduction with PSM[5]: (1) propensity score estimation, (2) identifying regions of common support and checking balancing test, (3) ATT estimation using four types of matching and (4) checking matching quality.

3.1.1. Propensity score estimation

In this step, we will calculate the propensity score, which is the probability of a household becoming a treated household, given a set of observable covariates. Here, the dependent variable is a binary variable: participation or non-participation. Therefore, probit or logit models are preferable to the linear probability model. Furthermore, the probit model and logit model usually provide similar results when estimating the binary outcome (Caliendo & Kopeinig, 2005). This study utilizes the probit model to estimate the propensity score, which is adapted from the work of Imai, Thankom and Samuel (2010).

$$P(T_i = 1 \mid X_i) = \Phi(\beta X_i). \tag{3}$$

T_i denotes a binary variable.

$T_i = 1$ if a household is a member of VBSP

$T_i = 0$ if a household is a non-member of VBSP or another microfinance institution

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[5] See (Caliendo & Kopeinig, 2005)

X_i is a vector of a household's characteristics

Φ represents the standard normal cumulative distribution function.

3.1.2. Identifying region of common support and checking balancing test

To identify the range of common support, visual analysis based on graphing propensity score distribution of both groups is the most common method. Some control households whose propensity scores are outside the overlap region should be excluded. However, we should consider this assumption carefully because the results can be biased if we drop many untreated observations. Balancing in PSM can be defined as follows (Becker & Ichino, 2002)

$$T \perp X | P(X). \tag{4}$$

The balancing condition implies that, given a propensity score, treatment T is a random assignment.

3.1.3. ATT estimation using four types of matching

If CIA assumption, common support and balancing tests are satisfied, the average treatment effect on the treated can be defined as follows (Heckman, Ichimura, & Todd, 1997)

$$ATT_{PSM} = \frac{1}{N_T} \left[\sum_{i \in T} Y_i^T - \sum_{j \in C} \omega(i,j) Y_j^C \right]. \tag{5}$$

T and C are the treatment group and control group, respectively. i and j also denote treatment household and control household, respectively. Therefore, Y_i^T and Y_j^C are potential outcomes of treatment household i and potential outcomes of control household j.

N_T is the number of treatment households, and $\omega(i,j)$ is the weight used to aggregate potential outcomes of matched control households.

There are four popular matching methods used to estimate ATT: nearest-neighbor matching, caliper/radius matching, kernel matching and stratification matching. This study utilized these four types of matching methods to confirm the robustness of ATT estimation.

3.1.4. Checking matching quality

We cannot control all covariates in the probit model and ATT results often depend on the set of covariates X, so it is necessary to assess the matching quality. The basic idea is to check the balance of distribution of selected covariates in the Probit model in the treatment group and control group by comparing the status before and after matching. In this study, indicators such as t-Test, standardized bias, standardized difference, joint significance and pseudo-R^2 are used.

- **t-Test**

The t-Test is applied for each selected covariate in the probit model in order to examine whether treatment households and matched control households have similar characteristics by testing the difference in covariate means of both groups (Rosenbaum & Rubin, 1985b). Before matching, significant differences are acceptable but after matching, significant differences should not exist

(Caliendo & Kopeinig, 2005).

- **Standardized bias or standardized difference**

For each covariate, standardized bias is defined as the difference of sample means in the treated and non-treated (full or matched) subsamples as a percentage of the square root of the average of the sample variances in both the treated and non-treated groups. (Rosenbaum & Rubin, 1985b) The standardized bias before and after matching are written as follows:

$$SB(before) = 100. \frac{(\overline{x_1} - \overline{x_{0R}})}{\sqrt{\frac{s_1^2 + s_{0R}^2}{2}}}, \tag{6}$$

$$SB(after) = 100. \frac{(\overline{x_1} - \overline{x_{0M}})}{\sqrt{\frac{s_1^2 + s_{0R}^2}{2}}}. \tag{7}$$

SB(before) and *SB(after)* are the standardized bias before and after matching. $\overline{x_1}$ is the sample mean in the treatment group. $\overline{x_{0R}}$ and $\overline{x_{0M}}$ are sample means in the full control group and the matched control group, respectively. s_1^2 is the sample variance in the treatment group and s_{0R}^2 is the sample variance in the full control group.

An average standardized bias close to 0 is preferred because it implies a small difference between the treatment group and matched control group.

- **Joint significance and pseudo-R^2**

This indicator comes from the probit model and is used to estimate participation probability of households. It indicates how well the selected covariates explain the participation probability (Sianesi, 2004). Joint significance and pseudo-R^2 indicators should be lower after matching than before matching because the distribution of selected covariates should be balanced in treatment and matched control groups after the matching process.

3.2. Regression-adjusted matching

According to Rubin (1973), using regression-adjusted matched data can give us the least biased estimation. Either association between covariates and treatment assignment can be eliminated effectively by using PSM, or we use regression to successfully control for other causes of the outcome that are correlated with treatment. After the matching procedure, we run a simple regression on matched samples with all the same covariates used in matching. Because the regression-adjusted matching approach can be only applied for 1:1 matching, we only utilize this approach after nearest neighbor matching and caliper matching.

4. Results and discussion

4.1. Results of Probit model on the determinants of access to VBSP microcredit

The results of the Probit estimation was provided in Table 1. The household's accessibility to

VBSP microcredit was significantly explained by the age of the household head (Age_head), informal loans (Informal_loan) and commune characteristics (Loca_dum).

The negative significant sign on age of household head indicated that probability of participating in VBSP microcredit program of an old household head was lower than that of a young household head, because young household heads were often active and they seize opportunities well. Therefore, they had a higher demand for loans than old household heads. Bao Duong and Izumida (2002) also found a negative sign of age head when they estimated the determinants of borrowing of households in Vietnam. The accessibility to informal credit sources might lead to the reduction in participating in a microcredit program because poor households tended to utilize informal credits due to low transaction costs, simple documents required and flexible loan contracts (Vaessen, 2001). Thus, the negative significant sign on informal loan variables was seen. This result was also consistent with (Li, Gan, & Hu, 2011a). The estimated coefficient of the commune dummy was negative and significant, which implied that probability of participating in the VBSP microcredit program of households living in Thanh Van commune was lower than that of households living in Mai Lap commune. Because the poverty rate in the Mai Lap commune was higher than the poverty rate in the Thanh Van commune, the Mai Lap commune had greater demand for loans by poor people. This finding reflected the target of microcredit programs on the poorer commune.

4.2. Results of matching estimation

Table 2 showed the ATT estimation results of different matching algorithms which were nearest neighbor matching, caliper matching within 0.01, kernel matching and stratification matching. For caliper matching, 10 observations were excluded because they were outside of the radius level (0.01).

The positive and significant coefficient was seen in total expenditure per capita in both the nearest neighbor matching and caliper matching. This indicated that total expenditure per capita of member households who obtained microcredit was higher than that of non-member households. Cuong (2008) also found a positive and significant impact of VBSP on expenditure per capita when utilizing data from Vietnam Household Living Standard Surveys (VHLSS). The change in per-capita consumption for different ethnic groups in Vietnam from 1998 to 2010 reported by the World Bank (2012) showed that both the median and distribution of expenditure per capita improved for all ethnic groups. Microfinancing might contribute to some of this improvement.

Table 1. Results of probit model on the determinants of access to VBSP microcredit

Covariates	Coefficient	SE	Z	p>|z|
Constant	1.89	0.50	3.79	0.00

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Household head traits				
Age_head	-0.02**	0.01	-2.48	0.01
Edu_head	-0.03	0.03	-0.95	0.34
Household characteristics				
Num_gov_staff	-0.11	0.18	-0.65	0.52
Informal_loan	-0.40*	0.24	-1.64	0.10
Geo-economic factor				
Loca_dum	-0.28*	0.16	-1.71	0.09

Note: *** Significant at the 1 percent level.

     ** Significant at the 5 percent level.

      * Significant at the 10 percent level.

Table 2: Average treatment effect on the treated (ATT) results (Million VND)

Outcomes	Nearest Neighbor		Caliper 0.01 (OFF:10)		Kernel[6]		Stratification[7]	
	ATT	t-stat	ATT	t-stat	ATT	t-stat	ATT	t-stat
Cash_inc_cap	2.1	1.04	2.11	1.05	-1.2	-0.57	-0.86	-0.49
Tot_exp_cap	1.79*	1.78	1.86*	1.85	1.04	1.2	0.79	0.90
Health_exp_cap	0.16	0.47	0.2	0.61	0.23	0.81	0.27	1.09
Edu_exp_stu	2.14**	2.59	1.98**	2.4	1.49*	1.95	1.44*	1.95
Food_exp_cap	-0.2	-0.47	-0.17	-0.41	-0.28	-0.81	-0.36	-1.20

Note: *** Significant at the 1 percent level.

     ** Significant at the 5 percent level.

      * Significant at the 10 percent level.

By decomposing the household's expenditure, robust and positive ATT estimation in education expenditure per student was observed in all matching methods. This indicated that participating households tend to spend more money on children's education than non-participating households. Investing in education could be the key determinant of improving the welfare of the next

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[6] The default bandwidth (0.06) was applied for Kernel matching.
[7] I used five strata for Stratification matching. Cochran and Chambers (1965) determined that five strata were often enough to remove 95% of the bias associated with one single covariate.

generation and could break the poverty trap in developing countries (Jorge H Maldonado, Claudio González-vega, 2005). This finding was consistent with the findings of Takahashi, Higashikata, & Tsukada (2010).

However, the impact of microcredit on cash income per capita was still ambiguous. This may be because the participating households need sufficient time to generate profit, especially if they invest in forestry activity. Forest area covered a large part of the study site and forest plantation became one of the main income sources in this area. It took farmers at least five years to harvest their timber products. Households could spend their loans on non-productive purposes such as medical treatments, purchasing furniture and children's education. Traditionally, the role of microcredit on poverty reduction was tied primarily to the productive loan invested in a microenterprise. People living in disadvantaged regions, nevertheless, often have limited investment opportunities, while their other needs are more urgent (Ledgerwood. J. and Gibson. A., 2013). Finally, asking about income is a sensitive topic, and thus, households could have hidden some aspects of their income.

4.3. Results of regression-adjusted matching

The regression coefficient of treatment in Table 3 and Table 4 represented the average treatment effect (ATE) estimations of regression-adjusted matching approach. The highly positive relationship between participating in microfinance programs and both education expenditure and total expenditure of a household was seen. These findings were consistent with the PSM results.

5. Conclusion and policy implications

The main goal of this study is to evaluate the impact of the VBSP microcredit program on household welfare of ethnic minorities living in the Northern mountainous area in Vietnam. A household survey was conducted in 2015 in Bac Kan province, a typical northern mountainous region where ethnic minorities account for more than 80% of the population. Both treatment households and control households were selected from the villages where VBSP microcredit programs occurred in order to reduce the program placement bias. Selection bias was also minimized by utilizing the propensity score matching method. It was found that VBSP microcredit increased household expenditure, but the impact on household income was still ambiguous. By decomposing household consumption, this study found a positive and robust effect of the microcredit program on education expenditure. Essentially, the poor and less educated people exhibited less demand on schooling for their children, and thus, retained their poor status. The increase in education expenditure could be a good signal to break the poverty trap and improve welfare of the next generation.

Table 3: Results of regression-adjusted matching with outcome variable is education expenditure per student

Variables	Nearest neighbor matching			Caliper matching (0.01)		
Outcome: Edu_exp_stu	Coefficient	SE.	p>|t|	Coefficient	SE	p>|t|
Treatment: MF_status	2.08***	0.6	0.001	1.92***	0.62	0.002
Loca_dum	1.73***	0.6	0.004	1.66***	0.62	0.008
Age_head	0.06*	0.03	0.08	0.06	0.03	0.103
Edu_head	0.01	0.12	0.907	0	0.12	0.991
Num_gov_staff	1.2	0.73	0.102	1.08	0.76	0.156
Informal_loan	0.28	1.01	0.783	-0.13	1.05	0.899
Constant	-2.46	1.96	0.211	-2.18	2.07	0.292

Note: *** Significant at the 1 percent level.

     ** Significant at the 5 percent level.

      * Significant at the 10 percent level.

Table 4: Results of regression-adjusted matching with outcome variable is total expenditure per capita

Variables	Nearest neighbor matching			Caliper matching (0.01)		
Outcome: Tot_exp_cap	Coefficient	SE	p>|t|	Coefficient	SE	p>|t|
Treatment: MF_status	1.97***	0.69	0.005	2.01***	0.72	0.006
Loca_dum	0.42	0.7	0.543	0.35	0.73	0.631
Age_head	0.09**	0.04	0.015	0.09**	0.04	0.019
Edu_head	0.42***	0.14	0.003	0.41***	0.15	0.005
Num_gov_staff	1.93**	0.84	0.023	0.41**	0.89	0.03
Informal_loan	3.7***	1.17	0.002	3.26***	1.25	0.009
Constant	-1.16	2.27	0.608	-1.13	2.43	0.642

Note: *** Significant at the 1 percent level.

     ** Significant at the 5 percent level.

      * Significant at the 10 percent level.   Policy makers should consider human capital as a key determinant in efforts to reduce poverty. It is necessary to measure the impact of microcredit on children's education to implement the long-term policies.

The results of the probit model indicated the determinants of participating in VBSP microcredit program. A young household head was likely to join the microcredit program, while the

accessibility to informal credit sources might lead to a reduction in participating in the program. The geo-economic factor of household location also drove the choice of household.

- **Limitations of this study**

Despite exhaustive attempts to reduce selection bias and program placement bias, this study still had some limitations. First, the household survey was conducted after program implementation, so pre-program characteristics of households were not observed. As a result, pre-program covariates were not included in the probit model. Second, propensity score matching is only useful when the conditional independence assumption is satisfied. It is a strict assumption and it cannot be tested directly. Nonetheless, with sample size being sufficiently large, the results of different matching methods, and regression-adjusted matching showing robustness, the results can still be reliable.

Reference

Augsburg, B., De Haas, R., Harmgart, H., & Meghir, C. (2015). The impacts of microcredit: Evidence from Bosnia and Herzegovina. *American Economic Journal: Applied Economics*, *7*(1), 183–203. http://doi.org/10.1257/app.20130272

Banerjee, a, Duflo, E., Glennester, R., & Kinnan, C. (2015). The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, *7*(1), 22–53. http://doi.org/10.1257/app.20130533

Bao Duong, P., & Izumida, Y. (2002). Rural development finance in Vietnam: A microeconometric analysis of household surveys. *World Development*, *30*(2), 319–335. http://doi.org/10.1016/S0305-750X(01)00112-7

Becker, S. O., & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The Stata Journal*, *2*(4), 358–377. http://doi.org/The Stata Journal

BKEIP (2014). Bac Kan Electronic Information port. http://www.backan.gov.vn, accessed 15, August, 2016.

Caliendo, M., & Kopeinig, S. (2005). Some Practical Guidance for the Implementation of Propensity Score Matching, *22*(1588), 31–72.

Chemin, M. (2008). The Benefits and Costs of Microfinance: Evidence from Bangladesh. *The Journal of Development Studies*, *44*(June 2012), 463–484. http://doi.org/10.1080/00220380701846735

Coleman, B. E. (2006). Microfinance in Northeast Thailand: Who benefits and how much? *World Development*, *34*(9), 1612–1638. http://doi.org/10.1016/j.worlddev.2006.01.006

Cuong, N. V. (2008). Is a governmental micro-credit program for the poor really pro-poor? Evidence from Vietnam. *Developing Economies*, *46*(June), 151–187. http://doi.org/10.1111/j.1746-1049.2008.00061.x

Government of Vietnam (GOV). (2013). Decision 2405/QĐ-TTg dated 10/12/2013.

GSO (2014). General Statistics Office of Vietnam. https://www.gso.gov.vn, accessed 20, June, 2016.

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Heckman, J. J., Ichimura, H., & Todd, P. E. (1997). Matching Evidence Job As An Econometric Estimator: Evidence from Evaluating a Job Training Programme. *Review of Economic Studies*, *64*(4), 605–654. http://doi.org/10.1111/1467-937X.00044

Imai, K. S., Arun, T., & Annim, S. K. (2010). Microfinance and Household Poverty Reduction: New Evidence from India. *World Development*, *38*(12), 1760–1774. http://doi.org/10.1016/j.worlddev.2010.04.006

Jorge H Maldonado, Claudio González-vega, V. R. (2005). The Influence of Microfinance on the Education Decisions of Rural Households: Evidence from Bolivia. *Microfinance Gateway, Document to CEDE*, *46*(August), 1–38.

Khandker, S. R. (2005). Microfinance and poverty: Evidence using panel data from Bangladesh. *World Bank Economic Review*, *19*(2), 263–286. http://doi.org/10.1093/wber/lhi008

Ledgerwood. J. and Gibson. A. (2013). *The Evolving Financial Landscape*. *The New Microfinance Handbook*. http://doi.org/10.1596/978-0-8213-8927-0

Li, X., Gan, C., & Hu, B. (2011a). Accessibility to microcredit by Chinese rural households. *Journal of Asian Economics*, *22*(3), 235–246. http://doi.org/10.1016/j.asieco.2011.01.004

Li, X., Gan, C., & Hu, B. (2011b). The welfare impact of microcredit on rural households in China. *Journal of Socio-Economics*, *40*(4), 404–411. http://doi.org/10.1016/j.socec.2011.04.012

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41–55. http://doi.org/10.1093/biomet/70.1.41

Rosenbaum, P. R., & Rubin, D. B. (1985a). Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score. *The American Statistician*. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00031305.1985.10479383

Rosenbaum, P. R., & Rubin, D. B. (1985b). Constructing a Control Group Using Multivariate Matched Sampling Models That Incorporate the Propensity Score. *American Statistician*, *39*, 33. Retrieved from

http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=5025595&site=ehost-live

Sianesi, B. (2004). An Evaluation of the Swedish System of Active Labor Market Programs in the 1990s. *Review of Economics and Statistics*, *86*(1), 133–155. http://doi.org/10.1162/003465304323023723

Takahashi, K., Higashikata, T., & Tsukada, K. (2010). The short-term poverty impact of small-scale, collateral-free microcredit in indonesia: A matching estimator approach. *Developing Economies*, *48*(1), 128–155. http://doi.org/10.1111/j.1746-1049.2010.00101.x

Vaessen, J. (2001). Accessibility of rural credit in northern Nicaragua: The importance of networks of information and recommendation. *Savings and Development*, *25*, 5–32.

W. G. Cochran, S. P. C. (1965). The Planning of Observational Studies of Human Populations. *Journal of the Royal Statistical Society, Series A*, *128*(2), 234–266.

World Bank. (2009). Country Social Analysis Ethnicity and Development in Vietnam.

World Bank. (2012). Well Begun, Not Yet Done: Vietnam's Remarkable Progress on Poverty Reduction and the Emerging Challenges.

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Appendix

Table A1: Definition and descriptive statistic of outcome variables (Million VND)

Outcomes	Description	Member			Non-member			T-test	
		Obs	Mean	SD	Obs	Mean	SD	Mean difference	t-value
Cash_inc_cap (Total cash income per capita)	Income from selling forestry productions, crops, livestock, fishery productions and income from salaries, wages, pensions, self-business, scholarships, remittances, subsidies, compensations and renting land in 2014.	204	16.4	0.98	85	18.5	1.67	-2.1	-1.13
Tot_exp_cap (Total expenditure per capita)	Food expenditure and non-food expenditure within household in 2014. Non-food expenditure comprises expenditure on education, health-care, clothes, house maintenance and social relations such as wedding gift, funeral money.	199	8.59	8.94	81	7.97	4.81	0.62	0.59
Health_exp_cap (Health expenditure per capita)	Consumption on all heath goods and services for example medicines, treatment, medical check and so on in 2014.	203	1.13	2.65	85	0.94	1.73	0.19	0.61
Edu_exp_stu (Education expenditure per student)	Tuition fees, admission fees, books, stationary for all students and cost of living for students who must stay in a different area to study in 2014.	201	3.33	8.02	81	1.89	4.14	1.44	1.53
Food_exp_cap (Food expenditure per capita)	Foods that households bought from markets in 2014, including staples such as meat and fish, and excluding self-consumption.	203	3.1	2.46	85	3.66	2.52	-0.56	-1.75*

Note. *** Significant at the 1 percent level.

    ** Significant at the 5 percent level.

    * Significant at the 10 percent level.

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Table A2: Definition and descriptive statistic of covariates

Covariates	Descriptions	Member			Non-mem			T-test	
		Obs	Mean	SD	Obs	Mean	SD	Mean difference	t-value
Household head features									
Age_head	Age of household's head in 2014	204	41.8	10.48	85	45.01	9.73	-3.21**	-2.42
Sex_head	Gender of household's head in 2014, 1=Male, 0=female	204	0.94	0.24	85	0.94	0.24	0.00	-0.16
Edu_head	Education year of household's head in 2014	204	7.13	2.91	85	7.24	2.81	-0.10	-0.28
Famsize	Number of family members in 2014	204	4.08	1.16	85	4.28	1.48	-0.20	-1.25
Forest	Forestry area in 2014 (ha)	204	4.56	3.88	85	5.30	4.73	-0.74	-1.39
Crop	Crop area in 2014 (ha)	204	0.24	0.30	85	0.26	0.21	-0.23	-0.64
Household characteristics									
Num_gov_staff	Number of workers in public sector in 2014	204	0.20	0.43	85	0.28	0.53	-0.09	-1.45
Informal_loan	Whether household has any loans from friends and relatives, 1=Yes, 0= No	204	0.10	0.30	85	0.15	0.36	-0.05	-1.34
Depend_rat	Ratio of number of dependent people (age <15, >60)/Family size in HH in 2014	204	0.30	0.22	85	0.26	0.21	0.04	1.45
Geo-economic factors									
Loca_dum	Dummy variable of commune, 1=Thanh Van, 0=Mai Lap	204	0.55	0.50	85	0.66	0.48	-0.10*	-1.65

Note: *** Significant at the 1 percent level.

    ** Significant at the 5 percent level.

     * Significant at the 10 percent level.

Table A3: Checking matching quality of caliper matching

Variable	Sample	Mean		Standardized bias (%bias)	% bias reduced	t-Test	
		Treated	Control			t	p>|t|
Age_head	Unmatched	41.95	44.63	-26.4	93.4	-1.96	0.05
	Matched	42.03	41.85	1.7		0.17	0.87
Edu_head	Unmatched	7.14	7.2	-2	-358.4	-0.15	0.88
	Matched	7.18	7.45	-9.2		-0.91	0.36
Num_gov_staff	Unmatched	0.2	0.29	-18.9	88.6	-1.49	0.14
	Matched	0.2	0.21	-2.1		-0.23	0.82
Informal_loan	Unmatched	0.1	0.14	-12.2	73.6	-0.95	0.34
	Matched	0.1	0.11	-3.2		-0.33	0.74
Loca_dum	Unmatched	0.55	0.66	-22.7	71.7	-1.69	0.09
	Matched	0.56	0.53	6.4		0.62	0.54

Sample	Pseudo R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.03	9.97	0.076	16.4	18.9	42.5*	1.08	33
Matched	0.003	1.55	0.907	4.5	3.2	12.7	1.25	0

* if B>25%, R outside [0.5; 2]

Figure-A1: Region of common support