ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 5, Issue, 11, pp. 6094-6098, November, 2015

International Journal of
DEVELOPMENT RESEARCH

Full Length Research Article

IMPACT OF MICROFINANCE SERVICES ON HOUSEHOLD INCOME: THE CASE OF DIGAF MICRO FINANCING COMPANY, ADDIS ABABA, ETHIOPIA

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ARTICLE INFO

Article History:
Received 18th August, 2015
Received in revised form
13th September, 2015
Accepted 26th October, 2015
Published online 30th November, 2015

Key Words:
Microfinance,
Household income,
Propensity score matching,
Ethiopia

ABSTRACT

The study evaluates impacts of microfinance interventions on household income. For quantitative analysis both frequent clients and pipeline client respondents were drawn and cross-sectional survey data were collected from 180 households in Gulele sub city of Addis Ababa city administration. Propensity score matching method was employed to analyze the impact of the microfinance services quantitatively. This method was checked for covariate balancing with a standardized bias, t-ratio, and joint significance level tests. Furthermore, sensitivity analysis of the estimated participation effect to unobserved selection bias was checked using the Rosenbaum bounds procedure. Results show that participation in microfinance services has a significant, positive and robust impact on the outcome variables measured using different indicators. In addition to the above points, participation in microfinance services was positively related to household income, indicating that the probability of improvement in income increases with the increase in program participation. The coefficient was statistically significant at 1% significant level. It implies that frequent participants show higher income improvement than pipeline clients.

INTRODUCTION

Ethiopia, with the population of about 73.9 million, is one of the poorest and most heavily indebted countries of the world (CSA 2007). Ethiopia is characterized by extreme levels of poverty and vulnerability, exacerbated by the fragmented and underdeveloped state of agriculture, the primary source of livelihood for most Ethiopians. About 23% of Ethiopians live on less than US$1 per day (PPP adjusted), while 76% live on less than US$2 per day (UNDP, 2008). About 44% of the population lives below the nationally defined poverty line of 1075 Birr (UNDP, 2008). Similar to the economy as a whole, the financial sector is also underdeveloped. Accordingly, the Ethiopian government has made poverty reduction in rural and urban areas as one of its primary concerns among various development plans. In Ethiopia, urban centers which are characterized by lack of adequate employment opportunities, inadequate income, social and political instability etc, are the government's priority intervention areas in the poverty reduction. As a result, different urban based development participants are taking place throughout the nation; one among these is microfinance service in urban areas (Wolday, 2006).

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As part of this initiation, the National Bank of Ethiopia issued the proclamation number 40\1996 and revised the proclamation 626/2009 aiming to provide licensing and supervision of microfinance business (Gebrehiwot and Mulat, 2005). Microfinance is created in response to the missing credit market for the poor. In the developing countries, most recently for instance, governments are also incorporating microfinance in their strategies towards achieving the Millennium Development Goals that involves halving extreme poverty by the target date, which is 2015. Given the complex nature of poverty together with the current microfinance intermediation approach, it is however, becoming increasingly difficult to judge whether such participants should be advocated as a means of poverty alleviation.

Digaf Microfinance institution Share Company is a micro financing institution, licensed in 2005, to give out small loans to the economically active poor people without collateral in Ethiopia. The primary objective of Digaf Microfinance institution is to help the poor, particularly women and youth, help themselves by creating access to financial services. However no major assessment has been made on the impact of the microfinance services in its operational area particularly on the life of poor clients. Hence, the overall aim of the study is to explore the impact of Digaf microfinance on household's income.

That is, how microfinance has affected the household income, consumption levels and expenditure on children education and health for participating households.

MATERIALS AND METHODS

Study area

Gulele sub city is purposively selected based on the number of clients, outstanding loan, and long years of operation in the study area. Gulele is one of the ten sub cities of Addis Ababa city administration located in the West of the city center. Its neighbors are; Arada and Addis Ketema in the South, Kolfe Keranio in the West, Yeka sub cities in the East and Oromiya Regional State in the North. The total population of the sub city is 267,381 consisting of 48.3% male and 51.7% female which ranks 5th in population size in the city and land area of 30.18 square kilometer (CSA, 2007).

Sampling techniques and the data

Two stage sampling technique was used. At the first stage, four sample kebele`s were selected using random sampling techniques among the existing nine operational kebele`s. At the second stage, sample households were selected using simple random sampling technique proportional to the number of household in the kebele. From the total sample size 80 frequent clients were used as experimental group and 100 pipeline clients were used as control group. Experimental group is composed of frequent clients who are users of microfinance services at least for three years, while control group is composed of clients in pipeline or incoming clients who are ready to get services from Digaf MFI in the near future but not yet received services. This is done to see whether the improvements in the income of the clients could easily be achieved without joining the participations. Analysis was made at a household level because households could reveal the reality more than any level of analysis. Sample respondents are randomly selected from the list of frequent active clients who were in service at least for the last three years since impact is a long term process. Simple random sampling technique was applied to select the respondents from the target population. The sample frame of the study is the entire household found in the list of Digaf microfinance institution for participant households and list of waiting (incoming or pipeline) clients for non participant households.

Both primary and secondary sources of data were used. The primary data was obtained from questionnaires, and focus group discussions. Direct observation was made to observe the real impacts of the intervention on resource poor clients. Structured questionnaire was pre tested by using pilot test to refine and finalize the questionnaire for validity before applying it. The questionnaire comprises of background questions about age, gender, education, health, number of family members, asset ownership, incomes and questions related to income, expenditures. Focus group discussions were held with key informants at group meeting to assess the satisfaction level and to strengthen and supplement the data obtained from questionnaires. Secondary data was collected from documents, reports, proceedings, bulletin, internet, periodicals and Government and Non-governmental organizations.

Methods of Data Analysis

This study applied the propensity-score matching method to match each frequent client with pipeline who had (almost) the same probability of joining microfinance participant. A group of pipeline client was selected in this way can then serve as an accurate control group to correct for selection bias. The propensity score model is expressed as:

$$p(x) = \Pr\{D = 1 / X_i\} = E\{D / X_i\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where D = (1, 0) the indicators of improvement in income, it is the binary variable whether a participating households income improve (improvement in income, 1= yes, 0 = otherwise) χ_i = is a vector of pre treatment covariate propensity score ensure that matching estimation is done on subject to that are similar as possible for effective comparison. As a result given a population of units denoted by (*i*) if the propensity score $P(x_i)$ is known as average effect of treatment (AET) can be estimated as

$$\text{AET} = E\{Y_{1i} - Y_{Oi} / D_i = 1\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$= \{E\{Y_{1i} - Y_{0i} / D_I = 1, P(xi)\}\}$$

$$= E\{E\{Y_{1i} / D_I = 1, P(x_i)\} - E\{Y_{0i} / D_i = 0, P(xi\}/ D_i = 1\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where AET is the average effect of treatment

Y_{1i} and Y_{0i} are the potential outcome for the two counter factual situations of the frequent client household and pipeline client household respectively.

$P(x_i)$ is propensity score, D is households variable, where D= 1 if participated and 0 otherwise

This model works under two assumptions

The balancing assumption: States that participation is shaped by pre participation characteristics or that the balancing of participants and control is through the propensity score. Therefore, if $P(x_i)$ is the propensity score then

$$D \perp X_i / P_{(X)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$\perp$ represents independence. i.e. exposure to the program participant (D) is shaped by the pre participation covariates (X_i) the balancing assumption is thus is the propensity score $P(D) = 1$, $X_i = P(x_i)$.

Conditional independence assumption: Assume that selection is biased on observable covariate of the subject and treat all the covariates that influence participation and potential outcomes are simultaneously observed. It is expressed as

$$Y_1, Y_0 \perp D / P(xi) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where Y_1, Y_0 are potential outcomes with and without the program
D_i is participation variable, *P(x)* is propensity score

In other words for a given propensity score exposure to program is random and therefore participant and control household should be on average observationally identical (Caliendo and Kopeinig, 2008). A logit model was used to estimate propensity scores using a composite of pre-participation characteristics of the sampled households (Rosenbaum and Robin, 1983) and matching will then be performed using propensity scores of each observation. In estimating the logit model, the dependent variable is participation, which takes the value of 1 if a household participates in microfinance service and 0 otherwise. The mathematical formulation of logit model is as follows:

$$p_i = \frac{e^{z_i}}{1 + e^{z_i}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where, P_i is the probability of a household to participate in microfinance services,

$$z_i = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \chi_i + u_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where i = 1, 2, 3 …n
α_0 = intercept
α_i = regression coefficients to be estimated
X_i= pre-participation characteristics and
u_i = a disturbance term,

The probability that a household belongs to non participant is:

$$1 - p = \frac{1}{1 + e^{zi}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

The mean impact of participation in microfinance on income is given by

$$I = \sum_{J=1}^{P} (y_{ij1} - \sum_{I=1}^{NP} y_{ij0}) \Big/ P \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where, Y_{ij1} is the post intervention income level of beneficiary j, Y_{ij0} is the income level of the i^{th} non-beneficiary matched to the j^{th} beneficiary, P is the total number of participant, NP is the total number of non-participant and I is income level in birr.

RESULTS AND DISCUSSION

The study shows 60.6% of the respondents had secured initial capital for their businesses from their close relatives or husbands. Additionally, 68.9 % indicated that they had to consult their husbands or wife on the decision to join the program. The majority of the respondents expressed that program participation had a positive impact and thus enhanced their empowerment. The mean difference in income level between the frequent client and the pipeline clients is 379.52 birr. To test if the mean difference is statistically significant we compare the significance value to alpha, which is usually 0.05. As the decision rule is reject H_0 if the significance value is less than alpha and do not reject it if it is greater than alpha, and 0.008 is less than 0.05, we reject the null hypothesis. Therefore, we can say that there is a significant difference between the income of frequent and pipeline groups, i.e. participation in the microfinance program has brought about increase in incomes of the clients. One of the primary objectives of the Digaf MF is to improve the income of the participating household through the provision of financial services as a business startup and/or expansion loans. At household level, the income of 97.5% of the respondents has increased due to services from Digaf MFI, while the average annual income increased from Birr 429 to Birr 808. The increase in income that resulted from the microfinance service was observed to be significant at 5%. The mean difference of annual income earned by the participants after being member of Digaf was significantly greater than what used to be previously obtained, thus underlining the fact that repeated access to micro-finance increases household's income.

Table 1. Description of variables and their expected hypothesis

Notation	Variables Description	Measurement	Expected Sign	
Demographic Characteristic				
FEMALE	Female Household head	Dummy	+	
AGEH	Age of the head of the HH	Years	+	
FAMSIZE	Total family Size	Number	-	
Socio-economic Characteristic				
EDUS	Educational Status	Years	+	
DEPR	Dependency Ratio	Number	_	
OCCUP	Occupation	Number	+	
Institutional Services				
HLTH	Health Status	Number	+	
ABSV	Ability to save	Number	+	
WPRW	Working Premises	Dummy	+	+

Table 2. Logit results of household program participation

Variables	Coefficients	Robust Standard Error	Z-values	P-value
AGEH	- 0.050178	0.036040	-1.39	0.164
SEXH	0.707825	0.675916	1.05	0.295
MARS	0.542136	0.328144	1.65*	0.099
EDUS	- 0.239522	0.101332	-2.36**	0.018
FMSZ	1.171057	0.301555	3.88***	0.000
DEPR	- 1.990777	0.541530	-3.68***	0.000
OCCUP	0.837857	0.775685	1.08	0.280
ECED	1.228488	0.741477	1.66*	0.098
WPRM	1.243301	0.708323	1.76*	0.079
HHIN	0.014582	0.002996	4.87***	0.000
HLTH	0.001598	0.003798	0.42	0.674
_cons	- 10.39519	2.347114	-4.43	0.000

Number of obs = 180, Wald chi2 (11) = 55.10, Prob > chi2= 0.0000, Pseudo R2 = 0.2062, Log pseudo likelihood = -29.07527
***, ** and * means significant at 1%, 5% and 10% probability level respectively. Source: Model Result, 2011

The logistic regression model was used to estimate propensity score matching for frequent and pipeline client households. As, indicated earlier, the dependent variable is binary that indicate households' participation decision in the microfinance services. Results presented in Table 2 shows the estimated model appears to perform well for the intended matching exercise. Table 2: The results are generally unsurprising and reveal a number of significant covariates of program participation.
The probability of a household participating in microfinance tends to increase with sex being female, marital status, household size and adequate working premises, and decrease

with the age, education and dependency ratio. Microfinance participants are also relatively more likely to be female headed households. The coefficient for female is greater in both the magnitude and statistical significance relative to the male. Looking into the estimated coefficients (Table 2), the results indicate that participation in microfinance is significantly influenced by seven explanatory variables. Marital status, family size, expenditure on child education, working premises, and household income, are found to have strong and positive relationship with household participation in the microfinance. By contrast, household educational level and dependency ratio has a strong and negative effect on household microfinance participation. This corroborates with the microfinance objective, which states that the program is targeted to disadvantaged and inaccessible households. Contrary to expectation, the effect of household educational level on the dependent variable is negative and statistically significant.

Figure 1 below reveals the distribution of the household with respect to the estimated propensity scores. In case of frequent client households, most of them are found in the middle and at the right side of the distribution. On the other hand, most of the pipeline households are found in the center and in the left side of the distribution. Variance inflation factor (VIF) was applied to test for the presence of strong multicolinearity problem among the explanatory variables before estimating the model. There was no explanatory variable dropped from the estimation model since no serious problem of multicollinearity was detected from the VIF results. Robust standard errors were estimated to tackle heteroscedasticity problem in the data. Kernel matching associates the outcome of the treated household with the matched outcome that is given by a kernel-weighted average of all control groups improvement in household's income. Since the weighted averages of all microfinance interventions in the control group are used to construct the counterfactual outcome, kernel matching has an advantage of lower variance because more information is used (Heckman *et al.,* 1998).

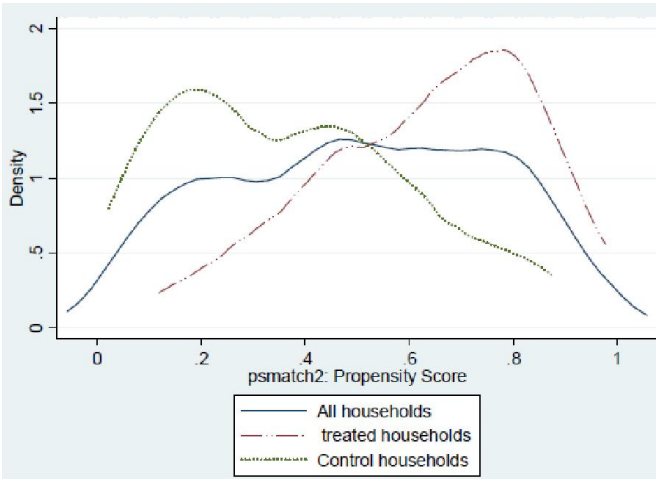

Figure 1. Density of propensity score distribution

A positive value of Average Treatment Effect on the Treated (ATT) indicates that the households' income have been improved as a result of microfinance program intervention in the study area. After controlling for pre-intervention differences in demographic, and asset endowment characteristics of the frequent and new/pipeline households, it has been found out that the program has increased income of the participating households within the range of Birr 427.39 and Birr 446.87, depending on the matching estimator chosen. This is in line with the objective of MFI, which is improving income level at the household level. The difference in the mean value of income between the MFI frequent client household and the non-MFI beneficiary households was positive and significant. Statistically, this was found to be significant at 5 % significance level based on stratification (ATT=432.35, t = 11.49 and NN (ATT = 446.87, t = 10.50), at 1 % significance level based on Radius (ATT = 444.64, t = 7.688), and 10 % significant level based on Kernel matching estimators (ATT= 427.69, t = 0.204) with bootstrapped standard error. This result is in concurrence to the finding of Tesfaye A (2003). After controlling for pre-intervention differences in demographic, location, and asset endowment characteristics of the microfinance frequent and pipeline client households, it has been found that, on average, the program has increased income level of households of the participating households by 375 Birr. Stated in other words, the program has increased income of the participating households nearly 47%.

A multiple regression model was fitted. The result is explained as follows.

Table 3. Multiple linear regression results of treatment effect

Variables	Coefficient	Std. Err.	t - value
AGEH	- 0.0018588	0.0023307	-0.80
SEXH	0.0121947	0.0464612	0.26
MARS	0.047981	0.0321266	1.49*
EDUS	- 0.0143907	0.0058705	-2.45**
FMSZ	0.0724651	0.0155838	4.65***
DEPR	- 0.1059842	0.0252036	-4.21***
OCCUP	0.0426829	0.0428018	1.00
ECED	0.0732744	0.0444147	1.65
HHIN	0.001345	0.0001066	12.61***
HLTH	0.0004242	0.0002069	2.05**
WPRM	0.032964	0.0422055	0.78
cons	- 0.5732702	0.1345008	-4.26

Number of observation =180, F (11, 168)=41.04, R-squared=0.7288, Adj R-squared=0.7110. ***, ** and * means significant at 1%, 5% and 10% probability level respectively

Conclusion and Policy Implication

Results identified that the probability of microfinance participation increases with sex being a female headed household, household size, married individuals, adequate and secured working premises, and employed as a casual worker or self employed, and decreases with age, education level and dependency ratio. With respect to household income improvement, microfinance program participation definitely has a positive impact for all low-income households. Household incomes are significantly higher (46.6%) on average for participants of microfinance than for observationally identical nonparticipants. The intervention of microfinance in the study area did not produce the intended impact, which is improving household income. From the survey, it was possible to learn that the clients have used the loan for intended purpose that is doing profitable business. In the study area, respondents from the frequent borrower category were found to register an increasing trend in their

income for the last three years in comparison with the control group. Good business skill attained through training and good market situations were factors for the increasing trends in income for the respondents. In addition, more than half of the respondents reported that the increase in their income was due to good business skill.

On the other hand, a good number of the respondents singled out undertaking a new business as the most important variable for the increase in their income. In addition, conducting a new business was the very important factor for most of the clients to show increment in their income. Participation in microfinance services was positively related to household income, indicating that the probability of improvement in income increases with the increase in program participation. The coefficient was statistically significant at 1% significant level. It implies that frequent participants show higher income improvement than pipeline clients.

There is urgent need to streamline the procedure for applying, seeking and releasing of creating access to financial services to low income financially disadvantaged group of a society. The procedural difficulties are one of the major obstacles in microfinance service provision, which have denied low income earners from the financial benefits of the microfinance. Therefore, the procedure for accessing financial services to low income households should be made more easy and simple. Furthermore, it would be ideal for future research to conduct exploratory analyses to identify the impacts of microfinance on other household outcomes (except income), or impacts at higher levels such as communities and regions. Policy makers need to recognize the potential of micro financial services to low income households to support micro and small enterprise investment and growth in key economic sectors at household level and hence to contribute significantly to national economic growth. Finally, it should be noted that, extending credit alone is not sufficient condition to reduce poverty and improve productivity and income.

Therefore, additional intervention that goes hand in hand with micro financing services should be implemented, i.e. securing work place for informal operators, markets for their products, health and educational services, training and skill development, how to develop effective and efficient business etc are needed

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