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Impact of Microfinance on Poverty Alleviation: A Global Analysis

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Abstract

This paper investigates the impact of microfinance on poverty alleviation by using the cross-country data of microfinance institutions in 96 countries. We find that such institutions significantly affect poverty alleviation and are an effective tool for economic and financial development. Our results also show that a higher proportion of female recipients of microfinance loans and a large number of active borrowers are likely to lead to a lower level of poverty. These results remain qualitatively the same with various poverty measures and in random-effect models and a fixed-effect model.

Keywords: Microfinance institutions, Poverty alleviation, Economic development, Global

JEL classification: O12, O16

1. Introduction

About 75% of people in developing countries live in extreme poverty in rural areas, mostly dependent on agriculture for their livelihood (World Bank, 2007).Despite large-scale efforts from the international community, there has been little impact on poverty. Formal financial institutions often hesitate to extend credit to people in developing countries due to high risks and costs. As a result, rural areas remain underdeveloped, mainly due to insufficient financial facilities. Thus, only financial institutions committed to local socioeconomic development and welfare take the risks of operating in rural areas. Microfinance has its roots in the 1970s with the work of Muhammad Yunus, a Bangladeshi economist, Nobel laureate and a founder of Grameen Bank in Bangladesh. According to Professor Yunus, 5% of Grameen Bank clients are able to exit the vicious cycle of poverty.[3] Under the concept of microfinance, small-scale financial services encompassing credit, savings, insurance, and repayment are provided to the poor. Doing so can empower them to become active participants in economic and entrepreneurial activities and enable them to cope with economic shocks (Ledgerwood, 1999).

A plethora of recent studies examined the impact of microfinance on income and poverty at the household or firm level (Berhane and Gardebroek 2011; Hulme and Mosley, 1996; Imai, Arun and Annim, 2010; Imai and Azam, 2012; Kaboski and Townsend, 2012; Khandeker, 2005; Mosley, 2001). These papers conclude that there is a positive relation between microfinance institutions (MFIs) and poverty alleviation. However, a research problem arises because limited data have led to only a handful of studies examining the impact of microfinance on poverty at the macro level (Ahlin, Lin, and Maio, 2011; Ahlin and Lin, 2006; Kai and Hamori, 2009).The objective of this paper is to examine the effect of microfinance on poverty alleviation at the macro level. The techniques used to conduct this research include panel studies and cross-sectional data at the country level. This study contributes to the literature.

First, we analyze the effect of the number of active borrowers and microenterprises financed and the percentage of female borrowers on the incidence, depth, and multidimensional measures of poverty, unlike other studies that examine the impact of a gross loan portfolio on the incidence and depth of poverty. We find that a country with more active microfinance activities has a lower incidence, depth and dimensionality of poverty.

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[3] "A Partial Marvel," The Economist, July 16, 2009.

Second, this study provides an authoritative account of the way in which institutional structure affects the effectiveness of microfinance. Traditional non-governmental organizations that engage in microfinance tend to transform into microfinance banks or other types of financial institutions. In order to achieve outreach and financial sustainability, a few countries are currently in the process of drafting regulations to convert their MFIs into banking institutions that can be regulated directly by their regulatory authorities. This study provides insight into how the development processes and outcomes of microfinance activities are affected when institutional structures are transformed.

The rest of the paper is organized as follows. Section 2 presents a review of the literature and Section 3 discusses our econometric methodology. Section 4 presents a brief description of the data of our study. The main findings and robustness checks are given in Section 5. Section 6 concludes with policy implications.

2. Related literature

The main aims of microfinance are to provide a variety of financial services to impoverished people through credit, savings, and insurance; sustain well-being; and improve incomes and living standards. The financial services provided can also be beneficial in strengthening health statuses, food consumption, education, female empowerment, and entrepreneurship in an attempt to have a comprehensive solution to poverty-related problems.[4]

Impoverished people are vulnerable to hazards and risks that stem from poor living conditions. A sluggish economy has a far-reaching impact on the economic stability of individual households, directly affecting their livelihoods and therefore their incomes and ability to access food. The distribution of wealth is uneven within the country, and the majority of poor people are situated in rural areas. The lives of the poor are distressing, particularly because unclean drinking water and poor ventilation and sanitation systems regularly expose them to chronic diseases. The poor typically do not own land, capital or have the means to learn skills to earn money. Due to social and legal inequality, females have a greater tendency to be victims of poverty compared to males. Thus, they need to beacceptedas microfinance clients despite their subordinate status in the home and in society. Microfinance aims to reach this empowerment of the poor and women, particularly because female empowerment was the main goal of microfinance when it was first conceived. Over the years, the empowerment of other underprivileged sectors of society was added to the goal. This paper aims look at microfinance from a global perspective, instead of the local outlook utilized by many previous researchers.

Microfinance is deemed an effective tool for development because it offers empowerment, rather than charity, to clients. Normally, microfinance recipients are self-employed entrepreneurs who, due to a shortage of capital, are unable to invest in their businesses and accordingly cannot escape intense poverty (Rai, 2011; Stewart, 1998; Elbers, 2003). Microfinance has been advanced as a long-term approach to the economic welfare development of the poor, implying that microfinance purveys financial facilities to improve the lives of the poor sustainably.[5]

There is a large debate about the impact of microfinance programs on poverty alleviation. Poverty is a social and economic issue that involves not only income levels but also health and living standards. Despite the doubts of some researchers about the effect of microfinance on poverty, a number of studies have proved that micro finance is successful, especially at the local community level. Studies on various MFIs demonstrate that the most common effects of these financial services are consumption smoothing and wealth redistribution for households.

One obvious impact, as shown by the previous studies on microfinance, is increased income levels. However, recent studies have revealed that the impact can vary by income group. Different segments of society benefit from different services provided by MFIs. Similarly, the levels of benefits achieved also differ in the different segments. Wealthy population gain greater benefits from microcredit programs as they require higher skill levels, good references, and a higher initial resource base. Low-income earners are more vulnerable and thus benefit more from micro savings and micro insurance programs.

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[4]Poverty is a situation wherein people are unable to fulfill the necessities of life. The causes of poverty include lack of education, large family size, poor economic access, gender discrimination, vulnerability to disastrous environmental conditions, and the deterioration and exploitation of natural resources (Jamal, 2009; Lok-Dessallien, 2002; Morduch, 1995; Ravallion, 2011).

[5] ADB (2008) defines microfinance as "the extension of comprehensive financial services such as loans, money transfers, payment services, deposits and insurance to low-income earning households and their microenterprises." Further, it implies that microfinance purveys financial facilities to improve the lives of the poor sustainably.

Studies have examined the impact of microfinance on poverty alleviation at the micro level using household survey data (Hulme and Mosley, 1996; Imai, Arun and Annim, 2010; Khandker, 2005; Mosley, 2001).[6]

Microfinance programs mainly involve female leadership, which is believed to help reduce gender inequity issues and empower women in society by providing opportunities to women in every area of employment (Goetz and Gupta, 1995). Microfinance is a recent and unique development tool that is instrumental in alleviating poverty, maintaining self-sustainability, empowering women (Pitt, Khandker and Cartwright, 2006; Khandker, 1998) and assisting poor people through group lending to increase community development (Osmani, 2007).MFIs not only help the poor by offering capital but also help grow their businesses, which successively improves personal income, family health, nutrition and education (Colman, 2005; Morduch, 2000).

Kaboski and Townsend (2012) investigate the impact of large-scale government micro financing on Thai villages. The primary technique used was a panel study, which found a positive impact on income growth, consumption, investment in agriculture, and credit but decreased asset growth. The micro financing also led to increased village-level wages, which can be used as evidence that microfinance can have benefits above the individual level as many had previously claimed.

Different studies examinein detail the effects of microfinance on poverty alleviation in different countries and regions. Ghalib, Malki, and Imai (2014) focused on Pakistani microfinance efforts and their results, while Khandker (2005) studied the Bangladeshi situation and Van Rooyen et al. (2012) dealt with socioeconomic development in sub-Saharan Africa resulting from MFIs. Al-mamun et al. (2014) also studied a positive association between microfinance and economic development. However, we see a lack of studies that synthesize these isolated results and focus on the gains from microfinance at a broader level.

Another category of literature in microfinance establishes a link with female empowerment (Hashemi et al, 1996; Steele et al, 1998; Rahman et al, 2009; Pitt et al, 2006; Garikipati, 2012) as the initial stagesof microfinance, focusing on funding to women to make them independent and economically stable. They also deal with the nature of microfinance evolved to include different services, both financial and nonfinancial, for all members of society.

3. Econometric models

To analyze empirically the effect of microfinance on the alleviation of poverty, we measure the activities of MFIs at the country level. MFIs in the form of banks and non-bank financial institutions may be more profit-oriented and efficient in providing financial services through loans to underprivileged populations. In addition, MFIs may be more helpful in reducing poverty in a specific region or income group. Hence, we run basic regressions for the institutional, regional, and income levels of the country to examine the impact of microfinance on a multidimensional poverty index as follows:

$$Y_{it} = \beta_0 + \beta_1 \log NMF_{it} + \beta_2 \log PFB_{it} + u_{it} \qquad (1)$$

where Y_{it} is the multidimensional poverty index at the institutional, regional, and country levels, NMF is the number of microenterprises financed, and PFB is the percentage of female borrowers.
We then estimate the effect of the number of active borrowers of MFIs and other microfinance activity measures on the poverty head count ratio, poverty gap or multidimensional poverty index for the period of 1998-2013 by employing pooled OLS as follows.

$$Y_{it} = \beta_0 + \beta_1 \log VI_{it} + \beta_2' \log X_{it} + \beta_3' Z_{it \in S} + u_{it}, \qquad (2)$$

Where Y_{it} is the poverty head count ratio, poverty gap or multidimensional poverty index for country i in year t.[7]VI_{it} are variables relating to microfinance activities. To examine the effect of microfinance activities on poverty, we use the number of active borrowers, which is measured by the number of individuals who currently have outstanding loans with MFIs in each country.

[6]For instance, Khandker (2005) concludes from a household-level investigation in Bangladesh that microfinance does reduce poverty.

[7] Appendix 2 describes how the multidimensional poverty index (MPI) is constructed: its dimension, indicators, deprivation thresholds, and weights.

Other variables in our model include the percentage of female borrowers, borrowing amounts, assets, borrower retention rate, the number of microenterprises financed, gross loan portfolio, GDP per capita, percentage of start-up microenterprises financed, and control variables.[8] X_{it} is a matrix of poverty control variables that capture the living standard, health status, and education of the country. The definitions of these variables and their rationales as explanatory variables for measuring poverty are presented in Appendix 1. Lastly, poverty is controlled by different unobservable regional factors such as natural disasters and social and economic shocks; for this, we use regional dummies. Z_{it} is a matrix of dummy variables at the regional level in which MFIs operate. There is an econometric concern in this regression equation that requires caution. If we omit some variables that affect poverty and are correlated with other explanatory variables, then the pooled OLS is possibly biased. Hence, weemploy random-effect and fixed-effect models to alleviate this problem.

A random-effect model assumes that an error term has no correlation with explanatory variables and controls for all unobserved heterogeneity effects, which can reduce the omitted variable bias(Hartarska,2005;Lensink and Mersl and, 2009). We also use the fixed-effect model as we have concerns about the omitted variable bias in the OLS estimation. A fixed-effect model can eliminate the effect of time–invariant characteristics so we can measure the net impact of the explanatory variables on the dependent variable. Hence, the estimated coefficients of this fixed model are unbiased due to omitted time-invariant characteristics.

We estimate the following random- and fixed-effect model regressions that control the unobserved specific effects of MFIs:

$$Y_{it} = \beta_0 + \beta_1 \log VI_{it} + \beta_2' \log X_{it} + \beta_3' Z_{it \in S} + \alpha_i + u_{it} \qquad (3)$$

where α_i is the unobserved specific fixed effect of the MFI. We cluster the standard errors to address potential heteroscedasticity in this study.

We then employ OLS to estimate the effect of microfinance on poverty alleviation. The purpose of the cross-sectional estimation is to apply the marginal effect of microfinance to poverty. We estimate the cross-section OLS model as follows.

$$Y_i = \beta_0 + \beta_1 \log VI_i + \beta_2' \log X_i + \beta_3' Z_{i \in S} + u_{it}. \qquad (4)$$

We use log variables for all models to estimate the impact of the percentage change of microfinance activity variables on poverty alleviation at the macro level. We use three different poverty measures and run the above equation on the region to verify the existence of regional characteristics in the impact of microfinance activities.

The number of active borrowers may be endogenous in the equation. The non-inclusion of the cost of enforcing a contract and the legal-origin variables may generate a correlation between active borrowers and an error term. This can lead to an endogeneity problem where an omitted variable bias and bi-causal relationship between active borrowers and multi-dimensional poverty at the country level make the coefficient inconsistent. This reverse causality from multi-dimensional poverty to active borrowers can arise if government support or other development programs offer more support to MFIs working in those countries.

It is difficult to find a valid instrument to satisfy the exclusion restriction that correlates with the number of active borrowers when there is no direct relationship with, or effect on, poverty. In this study, our unit of analysis is the district, in which we employ three types of instruments: legal origin; the cost of enforcing a contract; and the one-year lag in the number of active borrowers averaged by the number of MFIs for each country.

Legal origin helps define the cross-country differences in financial development. We used a dummy variable of legal origin in our model as an instrumental variable to find the exogenous elements of state control over the judiciary and legal system adaptability to examine the way in which legal origin affects financial development.[9]The decisions of microfinance investors, such as international organizations and donors, depend on national institutions: institutions with a low cost of enforcing contracts can enhance microfinance activities.[10]In this case, we can assume that the cost of enforcing a contract has a significant and negative correlation with the number of active borrowers.

[8] These microfinance activity measures aim to capture the supply side of MFIs, which can affect the lives of poor people.
[9] Following Beck, Demirgüç-Kun, and Levine (2003) and La Porta et al (1997; 1998), we use legal origin to measure the depth of financial development.
[10] Imai et al. (2012) use the cost of the enforcement contract as an instrument variable.

However, the effect on the cost of enforcing a contract with the poor may be weak, as a higher enforcement cost could exclude low-income people from formal services and maintain poverty in the short run. Finally, we also use a weighted one-year lag of the average number of active borrowers as a third instrument.

4. Data

Our focus is to analyze the impact of microfinance services rather than the performance of MFIs. Data of 490 MFIs from 96 countries are obtained from the Microfinance Information Exchange (MIX, 2014), the Global Multidimensional Poverty Index (MPI) Databank of the Oxford Poverty and Human Development Initiative (OPHI, 2014), and World Development Indicators (WDI, 2014) of the World Bank. MIX data provide reliable information on the funding sources, operational strategies, demand, stakeholders, performance, outreach, and sustainability of MFIs. The United Nations Conference on Trade and Development recommended the establishment of this database. OPHI, which is based at the University of Oxford and works toward the eradication of multidimensional poverty through the formulation of a systematic framework based on the experiences of the public, provides data on multidimensional poverty. WDI is a group of development indicators created by the World Bank. These indicators provide valid, accurate and the most current information for global, regional- and country-level estimations.

The MIX data include 17 years of institutional microfinance data, which cover descriptive statistics, financial indicators, and outreach.[11] MIX offers microfinance activity data on a large scale (Cull, Demirguc-Kunt and Morduch, 2011). However, there might be a concern about the reliability and validity of MIX data because it may have some issues regarding sample selection, complete information about MFIs, and measurement errors. MIX data are checked carefully, but it seems impossible to measure the extent of the errors in the dataset (Ahlin et al., 2011).[12]

The data include all regions, including Africa, Eastern Europe and Central Asia (EECA), East Asia and the Pacific (EAP), Latin America and the Caribbean (LAC), the Middle East and North Africa (MENA), and South Asia (SA). The list of countries and region by income levelused in our study is shown in Appendix 3. MFIs are also categorized in terms of their network associations, legal structure, and financial services–microfinance banks, credit unions and cooperatives, rural banks, non-bank financial institutions, and non-governmental organizations(Christen and Drake, 2002; Cull, Demirguc-Kunt, and Morduch, 2009).

The panel data are unbalanced as our analysis is based on annual data over the period of 1998-2013. Table 1 reports the number of MFIsin our sample. The data set comprises different types of MFIs operating in different regions of the world. The total number of MFIs is 2,218 in six different regions. In South Asia, the total number of MFIs is 403, which are distributed between banks (15), credit unions/cooperatives (37), non-bank financial institutions (104), non-governmental organizations (228), rural banks (11), and other institutions (8). The total number of MFIs in Latin America and the Caribbean is 531, which is greater than in all other regions, whereas the Middle East and North America stands lowest with 80 MFIs. In all regions, the total number of banks is 314; credit unions/cooperatives, 458; non-bank financial institutions, 636; non-governmental organizations, 607, rural banks, 154; and other institutions, 49. We select 490 MFIs from the 2,218 MFIs for our study due to data availability.[13]

Table 2 describes the basic summary statistics of the variables used in our study. The mean size of assets of MFIs is 177.8 million US dollars. The average and median number of active MFI borrowers is 2.58 million and 0.09 million. On average, the number of jobs created is15, 631. As far as poverty variables are concerned, the poverty head count ratio on average is 32.4%; the mean and median of the poverty gap are 9.3% and 6.8% and those of the multidimensional poverty index are 0.158 and 0.681, respectively.

[11] Descriptive statistics includes information regarding MFIs such as the fiscal year of formation, regulation, visions and goals, developmental strategies, products provided, sources of funding, operations, and opportunities for investment. MFI information provided by financial indicators includes the structure of finance, return on equity, assets, revenues, profit margin, portfolio risk, balance, and cost. Outreach data covers the communication between the clients and MFIs, including information on loans per borrower, savings per person, the number of active borrowers, percentage of financed microenterprises, percentage of microenterprises that are start-ups, and percentage of female borrowers.

[12]We compare the number of active borrowers of MFIs (from MIX data) with other variables, which are MFIs' branches and deposit and loan accounts at the country level. We find a positive and significant pair wise correlation between the variables, and thus assume that the MIX data constitute the real performance of MFIs aggregated at the country level.

[13] The full sets of data are not available for some MFIs, and many MFIs were established in the middle of our study period.

Table 3 represents the correlation matrix of the poverty and key microfinance variables. We see that there is a negative correlation between the poverty head count ratio and all microfinance activities, indicating that an increase in microfinance activities is associated with less poverty. In particular, the correlations of the borrower retention rate and the percentage of female borrowers with poverty are large (-0.888 and -0.707, respectively).

5. Empirical Results

Table 4estimates the impact of microfinance on multidimensional poverty by various criteria. Panel A reports that the number of microenterprises financed and the percentage of female borrowers has significant impact on multidimensional poverty in all regions. The results show that a higher percentage of female borrowers has a more significant impact on poverty alleviation than the number of microenterprises financed in East Asia and the Pacific, Eastern Europe and Central Asia, and Latin America and the Caribbean, while having less impact in Middle East and North America.

Panel B reports the impact of microfinance as measured by the number of microenterprises financed and the percentage of female borrowers on multidimensional poverty by different levels of country income: lower-income (27), lower-middle-income (32), upper-middle-income (28) and high-income countries (5). Our finding shows that microfinance activities have a significant impact on reducing poverty in all income levels. In general, the percentage of female borrowers has a larger impact on multidimensional poverty than the number of microenterprises financed. A larger impact of microfinance activities has been observed in the lower- and lower-middle-income countries than in the high-income and upper-middle countries.

Panel C measures the impact of microfinance on multidimensional poverty by types of MFIs. We divided the sample by the legal status of MFIs. The estimated coefficients are negative and statistically significant in all cases except one. The results suggest that the estimated coefficient showed that higher numbers of microenterprises and higher percentages of female borrowers could decrease multidimensional poverty regardless of MFI legal status. The results show that the number of enterprises financed has a higher impact on poverty alleviation in rural banks and credit unions/cooperatives than in banks, non-bank financial institutions and non-governmental organizations. In other words, microfinance plays larger roles in relationship-based institutions whose businesses are focused on rural areas and small communities.

In Table 5, we conduct pooled-OLS, random-effect and fixed-effect panel regressions. We use three different dependent variables: poverty head count ratio, poverty gap and multidimensional poverty index. The log of GDP per capita is negative and highly significant, and the coefficient indicates that a 1% increase in GDP per capita can decrease the poverty head count ratio and poverty gap by 0.1142% and 0.7149%. We also find that a 1% increase in the borrower retention rate reduces poverty head count ratio and poverty gap by 0.0485% and 0.0375% in the case of pooled OLS (Column 1). The estimated coefficients show that a 1% increase in the number of microenterprises financed can reduce the poverty head count ratio and poverty gap by 0.0447% and 0.0214%. Moreover, the percentage of female borrowers has a larger impact on the poverty head count ratio than other explanatory variables (0.0633% and 0.0501%, respectively). The other results of regressions of the multidimensional poverty index as a dependent variable and using random-effect and fixed-effect panel regressions remain qualitatively unchanged. In short, the number of microenterprises financed and percentage of female borrowers has been negatively correlated with poverty after controlling for the other explanatory variables and unobserved heterogeneity.

Tables6reports the impact of microfinance on poverty in terms of poverty head count ratio, poverty gap, and multidimensional poverty index considering the country effect and five-year average effect. We use random-effect panel regressions.[14]In all but a few specifications, microfinance activities are statistically significant in reducing poverty at the 5% significance level. The larger impact of the percentage of female borrowers has been observed for the country effect, which is 0.0217%.The results also show a negative and significant impact of the number of active borrowers and number of microenterprises financed by MFIs on poverty. An interesting feature is that if we consider the five-year average effect, the impact is relatively small. These results suggest that poor people begin benefiting from microfinance activities in terms of emerging from poverty, maintaining their lives, and growing their enterprises. Overall, our findings from the panel regression indicate that microfinance has a statistically significant impact on poverty.

[14] After running the Hausman test, we choose the random effect model over the fixed effect model.

In Table 7, we run the OLS to examine the impact of the percentage of female borrowers with and without regional dummies on poverty. In all models, we control for the living standard, health status and education. The number of active borrowers and percentage of female borrowers are shown to have negative, significant associations of 0.045% and 0.148% with the poverty head count ratio. In the regression of the multidimensional poverty index, a higher number of active borrowers and microenterprises financed have a negative, significant impact of 0.0398% and 0.0325% on multidimensional poverty. The higher impact of microfinance, measured as the percentage of female borrowers, is 1.8% without regional dummy variables and 1.3% with the dummies. However, the number of jobs created has an insignificant impact of 0.00004% on multidimensional poverty. The findings from the cross-section estimation imply strong evidence for the effect of microfinance on poverty alleviation at the macro level. To sum up, the percentage of female borrowers and number of active borrowers is negatively associated with the poverty head count ratio, poverty gap and multidimensional poverty index.

The cross-section estimation shows the positive impact of microfinance on poverty alleviation at the macro level. The larger impact of the percentage of female borrowers has been observed in multidimensional poverty. The impact of the number of active borrowers and gross loan portfolios is much higher than that of any other explanatory variable included in the analysis. We also find that the key variables of our analysis remain negative and statistically significant after including the regional dummy. Results for regional dummies show that East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, and the Middle East and North America have negative and statistically significant coefficients with reference to South Asia at a 5% level of significance. In the meantime, Africa has a positive coefficient although statistically insignificant, suggesting that in Africa, the effect of MFI activities on poverty is not great. Table 8 shows the impact of microfinance on poverty in terms of head count ratio and poverty gap using level data of explanatory variables instead of log variables. The different columns represent the estimation showing the microfinance activities effect with and without regional dummies on poverty. In all specifications, the results are statistically significant but magnitudes are relatively small. Table 9 shows the microfinance effect on three dimensions of poverty: living standard, health and education. We use a log-level model for this estimation. The cross-sectional regression shows a significant impact of microfinance activities on these three dimensions of poverty. Table 10 demonstrates the cross-sectional regression interaction between poverty and legal status of MFIs and region. The estimated coefficient shows that a higher number of female borrowers can decrease the poverty head count ratio. Table 12 shows the cross-sectional regression for instrumental variables used to remove the simultaneous equation problem from our model. Our main objective with the instrumental variable estimation is to remove or solve the problem of endogeneity of the microfinance activities and poverty incidence. The coefficient of the number of active borrowers is negatively and statistically significant at a 5% level, overcoming the heteroscedasticity with and without regional dummies. We conduct three tests: an F test for weak identification, Sargan's test for over-identification, and an under-identification test. We observe from these tests that we fail to reject the null hypothesis, which is that our instrument has no correlation with the error term. Table 11shows the validity of our instruments; if we use only one instrument - legal origin - we observe that poverty reduces the impact of the number of active borrowers.

We performed various tests to investigate the robustness of our findings. We run our regression to check whether our findings are robust for the panel and cross-sectional regressions. We include(1) different dependent variables, which are the poverty head count, poverty gap and multidimensional poverty index,(2) country effect, (3) five-year average effect, (4) level-level model for estimation, (5) interaction between the percentage of female borrowers and legal status of MFIs with the region, and (6) removal of the outliers (see Table 13).We obtain robust findings for the cross-sectional and panel analyses in that the percentage of female borrowers and number of active borrower are always negative and statistically significant in all estimations.

6. Conclusion and policy implications

This paper examines the microfinance effects on poverty alleviation by using a macro-level data set on a large scale, covering 490 MFIs in 96 countries. Poverty is examined through different measures, such as incidence, depth, and multidimensionality. This study provides evidence for the activities of MFIsalleviating poverty at the macro level. We find that the percentage of female borrowers and number of active borrowers of MFIs had a significant impact on poverty alleviation. By increasing the number of active borrowers, the multidimensional poverty index declines by 0.0398 percent. This result is robust and economically significant in pooled-OLS, random-effect, and fixed-effect panel regressions.

A series of tests have been conducted to check the robustness of our results. Our results also suggest that a higher number of microenterprises financed by MFIs lower the incidence and depth of poverty after controlling for the other factors. This study shows the impact of microfinance on poverty alleviation worldwide, providing significant policy implications for the role of microfinance activities in poverty alleviation. Our results verify that female borrowers can play a more significant role in alleviating poverty than male borrowers, suggesting that MFIs should focus on women, which might be more effective in poverty alleviation.

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Table 1. Types of microfinance institutions in different regions

	South Asia	Latin America and Caribbean	Eastern Europe and Central Asia	East Asia and Pacific	Middle East and North America	Africa	Total
Bank	15	41	142	14	5	97	314
Credit union/cooperatives	37	90	50	34	0	247	458
Non-bank financial institutions	104	175	229	47	11	70	636
Non-government organization	228	222	34	16	60	47	607
Rural banks	11	0	0	103	0	40	154
Others	8	3	8	18	4	8	49
Total	403	531	463	232	80	509	2218

Table 2. Summary statistics

	N	Mean	Q1	Q2	Q3	Std. dev.
Assets	1421	177833.30	1431.84	8978.67	39151.78	4013185
Borrower retention rate	1279	1.44	0	0	0.65	4.44
Gross loan portfolio	1226	145350.40	936.07	6407.20	29446.19	3298631
No. of active borrowers	1188	2.58	0.01	0.08	0.55	13.51
No. of job created	1265	15631.03	998.03	6702.22	30012.33	134447.20
No. of microenterprises financed	1171	24559.24	1122.22	7044.33	41143.40	141476.10
Percent of female borrowers	1187	6.36	1.02	3.14	6.92	12.38
Poverty head count ratio	387	32.44	17.70	30.60	45.40	17.51
Poverty gap	177	9.29				
Multidimensional Poverty Index						

Notes: Assets are the total of all net accounts measured in thousands of dollars. Borrower retention rate is (active borrowers at the end of the period) / (active borrowers at the beginning of the period + new borrowers during the period). Gross loan portfolio is all outstanding loans for clients that do not include written-off loans and are measured in hundreds of thousands of dollars. No. of active borrowers is defined as the number of individuals who currently have outstanding loans with MFIs. Percentage of female borrowers refers to the female clients of MFIs. No. of microenterprises financed is no. of financed start-up enterprises. Poverty head count ratio is the percentage of the population living below the national poverty line.

Source: Authors' compilation from MIX, Oxford Poverty, and Human Development Initiative (2014), Global Multidimensional Poverty Index (MPI) Databank. OPHI, University of Oxford, and WDI datasets.

Table3. Correlation matrix

Variables	Poverty head count ratio	Assets	Borrower retention rate	No. of jobs created	No. of microenterprises financed	No. of active borrowers	Percent of female borrowers
Poverty head count ratio	1						
Assets	-0.03	1					
Borrower retention rate	-0.88	0.03	1				
No. of jobs created	-0.09	0.07	0.32	1			
No. of microenterprises financed	-0.04	0.36	0.60	0.41	1		
No. of active borrowers	-0.16	0.26	0.32	0.18	0.38	1	
Percent of female borrowers	-0.70	0.64	0.31	0.17	0.23	0.68	1

Table 4. Regression results of poverty against the no. of microenterprises financed and percentage of female borrowers

Panel A. by nation's income level

	Dependent Variable: Multidimensional Poverty Index			
	Low income countries	Lower middle income countries	Upper middle income countries	High income countries
Log of no. microenterprises finance	-12.45*** (0.001)	-3.13*** (0.000)	-0.02 (0.016)	-0.005* (0.002)
Log of percentage of female borrowers	-10.33*** (0.001)	-14.85*** (0.021)	-1.86* (1.63)	-0.002* (0.001)
Constant	22.39*** (0.002)	97.55*** (0.148)	14.25*** (0.047)	45.23*** (0.115)
No. of observation	27	32	28	5
Adj. R^2	0.61	0.68	0.62	0.25

Notes: Robust cluster standard errors are in parentheses. ***p<0.01; **p<0.05; *p<0.10

Panel B. By types of microfinance institution

Dependent Variable:	Dependent Variable: Multidimensional Poverty Index				
	Banks	Credit union / cooperatives	Non-bank financial institutions	Non-government organization	Rural banks
Log of no. microenterprises finance	-1.33** (0.202)	-5.73* (2.614)	-2.14*** (0.002)	-3.01*** (0.915)	-9.21*** (0.001)
Log of percentage of female borrowers	-4.28** (1.865)	-9.44** (4.002)	-5.12* (2.96)	-7.21*** (0.001)	-11.34 (6.002)
Constant	7.96*** (0.000)	3.47*** (0.000)	4.25*** (0.000)	5.36*** (0.000)	3.87*** (0.001)
No. of observation	301	442	631	600	148
Adj. R^2	0.28	0.29	0.31	0.30	0.16

Notes: Robust cluster standard errors are in parentheses. *** p<0.01; ** p<0.05; * p<0.10

Panel C. Byregion

Dependent variable:	Dependent variable: Multidimensional poverty index					
	South Asia	Latin America and Caribbean	Eastern Europe and Central Asia	East Asia and Pacific	Middle East and North America	Africa
Log of no. microenterprises finance	-2.56*** (1.587)	-1.32* (0.732)	-1.98*** (0.000)	-1.22** (0.413)	-0.34* (0.190)	-0.09 (0.000)
Log of percentage of female borrowers	-4.33** (1.015)	-4.28** (1.865)	-3.001*** (0.000)	-2.78** (1.549)	-1.34* (0.702)	-1.02* (0.000)
Constant	1.82** (1.224)	1.98*** (0.000)	0.14*** (0.000)	0.51*** (0.000)	0.32*** (0.000)	0.32* (0.177)
No. of observation	391	512	454	221	76	482
Adj. R^2	0.16	0.19	0.25	0.21	0.11	0.21

Notes: Robust cluster standard errors are in parentheses. *** p<0.01; ** p<0.05; * p<0.10

Table 5. Regressions of various poverty measures

Dependent Variable	Poverty head count ratio			Poverty gap			Multidimensional poverty index		
	Pooled OLS	Random Effect	Fixed Effect	Pooled OLS	Random Effect	Fixed Effect	Pooled OLS	Random Effect	Fixed Effect
Log of gross loan portfolios per capita	-2.37*** (0.003)	-2.99** (1.260)	-1.25 (1.271)	-2.01** (1.001)	-1.99** (0.884)	-0.96** (0.312)	-2.33** (1.147)	-2.96** (1.440)	-1.99** (0.752)
Log of gross domestic product per capita	-11.42*** (0.002)	-13.95** (6.641)	-12.11** (6.000)	-7.14*** (0.001)	-9.47* (4..430)	-9.33** (4.211)	-10.88** (5.321)	-11.25** (5.313)	-14.75** (7.133)
Log of no. of active borrowers	-3.11** (1.241)	-3.79** (1.571)	-4.14** (1.915)	-2.79** (1.075)	-2.99** (1.137)	-1.27** (0.598)	-4.12** (1.912)	-4.77** (2.000)	-6.12** (2.947)
Log of assets	-3.01* (1.625)	-2.44** (1.001)	-3.75** (1.644)	-2.75** (1.115)	-1.79** (0.621)	-1.11** (0.321)	-3.19** (1.320)	-3.61** (1.540)	-3.85** (1.679)
Log of borrower retention rate	-4.85*** (0.002)	-3.78** (1.643)	-3.92** (1.429)	-3.75** (1.521)	-2.44** (1.012)	-2.12** (1.002)	-5.11** (2.026)	-5.33** (2.446)	-5.79** (2.435)
Log of no. of microenterprises financed	-4.47** (2.042)	-4.11** (1.991)	-4.01** (1.957)	-2.15** (1.052)	-2.09** (1.012)	-1.33* (0.773)	-4.71** (2.125)	-4.19** (1.995)	-4.32** (2.026)
Log of no. of jobs created	-0.12 (0.129)	-0.01 (0.013)	-0.009 (0.009)	-0.001 (0.003)	-0.005 (0.006)	-0.002 (0.002)	-.0015 (0.002)	-0.004 (0.004)	-0.009 (0.009)
Log of percentage of female borrowers	-6.33*** (0.002)	-6.25*** (0.001)	-5.17*** (0.000)	-5.01** (2.400)	-4.38** (2.081)	-4.11*** (0.000)	-7.33*** (0.000)	-7.96*** (0.000)	-7.10*** (0.000)
Log of percent of startup microenterprises financed	-1.75** (0.770)	-1.96** (0.660)	-1.11** (0.320)	-0.99** (0.294)	-0.78** (0.265)	-0.12* (0.080)	-1.25** (0.425)	-1.96** (0.073)	-1.08 (1.099)
Log of living standard	-3.12** (1.461)	-2.63** (1.264)	-2.01** (1.003)	-1.95** (0.645)	-1.45** (0.640)	-1.17* (0.630)	-4.36** (2.001)	-3.99** (1.883)	-3.10** (1.326)
Log of health status	-2.001** (1.000)	-1.95** (0.841)	-1.45** (0.521)	-1.21** (0.600)	-1.002** (0.410)	-0.81** (0.327)	-2.17** (1.053)	-2.007** (1.023)	-1.85** (0.711)
Log ofeducation	-5.12*** (0.000)	-4.81*** (0.000)	-4.21*** (0.000)	-3.005*** (0.000)	-2.15** (1.046)	-1.34** (0.702)	-6.94*** (0.000)	-5.71*** (0.000)	-4.35*** (0.000)
Africa	-0.009 (0.009)	-	-	-0.002* (0.002)	-	-	-0.001 (0.002)	-	-
East Asia and Pacific	-0.03* (0.019)	-	-	-0.01* (0.009)	-	-	-0.07** (0.034)	-	-
Eastern Europe and Central Asia	-14.25*** (0.000)	-	-	-7.33*** (0.001)	-	-	-15.96*** (0.000)	-	-
Latin America and Caribbean	-4.33** (2.003)	-	-	-2.79** (1.432)	-	-	-4.99** (2.312)	-	-
Middle East and North America	-13.68*** (0.013)	-	-	-8.25*** (0.000)	-	-	-15.23*** (0.000)	-	-
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	84.36*** (0.001)	101.25*** (0.002)	149.15*** (0.002)	42.35** (0.000)	39.21*** (0.002)	51.29*** (0.000)	103.69*** (0.001)	121.33*** (0.004)	101.49*** (0.008)
No. of observation	1121	1121	1121	1121	1121	1121	1122	1121	1121
Adj. R^2	0.79	0.71	0.65	0.79	0.71	0.65	0.79	0.75	0.66

Notes: The coefficients are obtained from pooled-OLS, random-effect, and fixed-effect panel regressions. The figures in parentheses are robust standard errors clustered at the MFI level. All variables are in natural logarithm.
Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. ***p<0.01; **p<0.05; *p<0.10.

Table 6. Regressions of various poverty measures (country and five-year average effect)

Dependent Variable:	Poverty head count ratio		Poverty gap		Multidimensional poverty index	
	Random Effect (Country Effect)	Random Effect (5-Year Average Effect)	Random Effect (Country Effect)	Random Effect (5-Year Average Effect)	Random Effect (Country Effect)	Random Effect (5-Year Average Effect)
Log of gross loan portfolios per capita	-1.09**	-1.31**	-0.75***	-0.99***	-1.59***	-1.75***
	(0.325)	(0.452)	(0.000)	(0.000)	(0.000)	(0.000)
Log of gross domestic product per capita	-17.37**	-19.01**	-13.33**	-15.21**	-18.51**	-21.36***
	(8.216)	(9.321)	(6.412)	(7.201)	(9.000)	(0.001)
Log of no. of active borrowers	-1.34**	-2.41**	-0.12**	-1.32**	-1.94**	-2.58**
	(0.000)	(1.006)	(0.043)	(0.400)	(0.921)	(1.101)
Constant	102.77***	93.15***	85.12***	35.65***	99.34***	73.25***
	(0.004)	(0.000)	(0.001)	(0.002)	(0.002)	(0.003)
No. of Observation	1021	551	1021	551	1021	551
Adj. R^2	0.76	0.66	0.76	0.66	0.76	0.66

Notes: The coefficients are obtained from random-effect and fixed-effect panel regressions. The figures in parentheses are robust standard errors clustered at the MFI level. All variables are in natural logarithm. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. We include regional dummies in our estimation***p<0.01; **p<0.05; *p<0.10

Table 7. Cross-sectional regressions of various poverty measures

Dependent Variable:	Poverty head count ratio		Poverty gap	Multidimensional poverty index		
	Without Regions	With Regions	Without Regions	With Regions	Without Regions	With Regions
Log of gross loan portfolios per capita	-3.11***	-2.01***	-1.55***	-0.69***	-4.73***	-1.71***
	(.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Log of gross domestic product per capita	-13.01**	-10.99**	-10.58**	-7.58*	-12.71**	-7.31**
	(6.486)	(5.3250)	(5.101)	(3.990)	(6.122)	(3.461)
Log of no. of active borrowers	-4.45**	-2.15**	-2.11**	-1.36**	-3.98**	-2.00**
	(2.175)	(1.055)	(1.020)	(0.581)	(1.930)	(0.993)
Log of assets	-3.69**	-2.11**	-1.25**	-0.12*	-2.11**	-1.001**
	(1.815)	(1.049)	(0.531)	(0.065)	(1.033)	(0.485)
Log ofborrower retention rate	-9.21***	-5.22***	-7.31***	-4.21**	-11.69***	-3.14***
	(0.000)	(0.000)	(0.001)	(2.000)	(0.001)	(0.000)
Log of no. of microenterprises financed	-2.79**	-1.31**	-1.02**	-0.10**	-3.25**	-1.69**
	(1.365)	(0.000)	(0.485)	(0.039)	(1.592)	(0.793)
Log of no. of jobs created	-1.02	-0.001*	-0.002	-0.00	-0.004	-0.00
	(1.066)	(0.663)	(0.003)	(0.001)	(0.005)	(0.000)
Log of percentage of female borrowers	-14.87***	-12.11***	-10.52***	-7.31***	-18.003***	-13.96***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log of percent of startup microenterprises financed	-1.54**	-0.16**	-0.11**	-0.001**	-2.71**	-0.001**
	(0.512)	(0.062)	(0.049)	(0.000)	(1.299)	(0.000)
Log of living standard	-1.02**	-1.003***	-0.81**	-0.61**	-1.98**	-1.009**
	(0.485)	(0.000)	(0.390)	(0.299)	(0.961)	(0.483)
Log of health status	-0.98**	-0.69**	-0.51**	-0.40**	-1.10**	-0.99**
	(0.441)	(0.339)	(0.241)	(0.199)	(0.532)	(0.472)
Log ofeducation	-1.99***	-1.35***	-1.47**	-1.09**	-2.36***	-2.01***
	(0.000)	(0.000)	(0.690)	(0.512)	(0.000)	(0.000)
Africa	-	13.69	-	9.14	-	15.00**
		(14.23)		(9.369)		(7.312)
East Asia and Pacific	-	-1.25**	-	-3.33**	-	-1.26**
		(0.425)		(1.532)		(0.582)
Eastern Europe and Central Asia	-	-12.35**	-	-6.14**	-	-13.75**
		(5.998)		(3.042)		(6.663)
Latin America and Caribbean	-	-17.01**	-	-9.32*	-	-19.08**
		(8.499)		(4.699)		(9.321)
Middle East and North America	-	-11.67***	-	-3.65***	-	-9.67***
		(0.001)		(0.000)		(0.001)
Constant	124.25***	90.87***	41.75***	29.22***	84.14***	61.21***
	(0.0041)	(0.005)	(0.003)	(0.001)	(0.003)	(0.002)
No. of Observation	421	421	421	421	421	421
Adj. R^2	0.70	0.81	0.71	0.73	0.81	0.87

Notes: The coefficients are obtained from multiple linear regressions. The figures in parentheses are robust standard errors clustered at the MFI level. All variables are in natural logarithm. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. We include regional dummies in our estimation***p<0.01; **p<0.05; *p<0.10

Table 8. Cross-sectional regression against level variables

Dependent Variable:	Poverty head count-ratio		Poverty gap	
	Without Regions	With Regions	Without Regions	With Regions
Gross loan portfolios per capita	-0.026***	-0.007***	-0.0012***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Gross domestic product per capita	-2.001**	-1.069**	-1.036***	-0.159**
	(1.000)	(0.483)	(0.000)	(0.066)
No. of active borrowers	-0.095**	-0.013**	-0.021**	-0.001**
	(0.038)	(0.005)	(0.010)	(0.000)
Assets	-0.066**	-0.010**	-0.001**	-0.000*
	(0.031)	(0.004)	(0.001)	(0.000)
Borrower retention rate	-1.002***	-0.126***	-1.000***	-0.013**
	(0.000)	(0.000)	(0.000)	(0.000)
No. of microenterprises financed	-0.366**	-0.013**	-0.003**	-0.001**
	(0.163)	(0.006)	(0.001)	(0.000)
No. of jobs created	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage of female borrowers	-2.016***	-2.003***	-1.003***	-0.063***
	(0.000)	(0.000)	(0.000)	(0.000)
Log of percent of startup microenterprises financed	-0.125**	-0.003**	-0.001**	-0.000**
	(0.059)	(0.001)	(0.000)	(0.000)
Living standard	-0.009**	-0.000**	-0.001**	-0.009***
	(0.004)	(0.000)	(0.000)	(0.000)
Health status	-0.003**	-0.000**	-0.001**	-0.000**
	(0.001)	(0.000)	(0.000)	(0.000)
Education	-0.198***	-0.013***	-0.003***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Africa	-	1.912	-	1.364
		(1.921)		(1.380)
East Asia and Pacific	-	-0.019**	-	-0.010**
		(0.008)		(0.004)
Eastern Europe and Central Asia	-	-0.105**	-	-0.021**
		(0.051)		(0.010)
Latin America and Caribbean	-	-1.079**	-	-1.005*
		(0.513)		(0.5121)
Middle East and North America	-	-1.963***	-	-1.005***
		(0.000)		(0.000)
Constant	163.36***	73.87***	39.42***	21.19***
	(0.002)	(0.001)	(0.001)	(0.001)
No. of Observation	475	475	475	475
Adj. R^2	0.701	0.824	0.641	0.735

Notes: The dependent variables are the poverty head count ratio and poverty gap. The figures in parentheses show robust standard errors clustered at the MFI level. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. Living standard, health and education, which are measured by improved sanitation, provision of electricity, drinking water, asset ownership, child mortality, nutrition, and years of schooling, are used as dependent variables. We include regional dummies in our estimation. ***p<0.01; **p<0.05; *p<0.10

Table 9. Cross-sectional regression for three dimensions of poverty

Dependent Variable:	Living standard	Education	Health status
Log of no. of active borrowers	2.65***	2.09**	1.91**
	(0.000)	(1.011)	(0.833)
Log of percent of female borrowers	4.05*	3.71**	2.00**
	(2.136)	(1.832)	(0.845)
Log of borrower retention rate	1.11**	2.31**	1.03**
	(0.445)	(1.102)	(0.356)
Log of no. of microenterprises financed	0.98*	1.91**	1.11**
	(0.523)	(0.943)	(0.439)
Log of gross loan portfolios per capita	1.03**	0.94**	0.63**
	(0.397)	(0.341)	(0.285)
Log of Gross domestic product per capita	9.07*	6.42**	5.36**
	(4.483)	(3.112)	(2.471)
Log of assets	1.45***	2.12**	1.86**
	(0.005)	(1.018)	(0.671)
Log of average deposit balance per depositor	1.72*	1.00*	0.72
	(0.912)	(0.571)	(0.822)
Log of loan loss rate	-3.02**	-4.13**	-3.70**
	(1.326)	(1.989)	(1.652)
Log of number of jobscreated	0.17	0.14	0.00
	(0.199)	(0.163)	(0.011)
Log of percent of startup microenterprises	1.03**	0.51**	0.76**
financed	(0.312)	(0.231)	(0.251)
Africa	-	-	-
East Asia and Pacific	-	-	-
Eastern Europe and Central Asia	-	-	-
Latin America and Caribbean	-	-	-
Middle East and North America	-	-	-
Constant	79.99***	41.01***	101.32***
	(0.010)	(0.013)	(0.003)
No. of observation	954	954	954
Adj. R^2	0.50	0.53	0.59

Notes: The coefficients are obtained from multiple linear regressions. The figures in parentheses are robust standard errors clustered at the MFI level. All variables are in natural logarithm. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients.

Living standard, health and education, which are measured by improved sanitation, provision of electricity, drinking water, asset ownership, child mortality, nutrition, and years of schooling, are used as dependent variables. Regional dummies are included in all regressions.*p<0.01; **p<0.05; ***p<0.10.

Table 10. Cross-sectional regression of poverty head count ratio with an interaction between poverty and the types of MFIs/region

Dependent Variable:	Poverty head countratio	
Log of no. of active borrowers	-1.61**	-2.02**
	(0.782)	(1.000)
Log of percent of female borrowers	-11.14***	-12.38***
	(0.001)	(0.001)
Log of borrower retention rate	-4.13***	-5.81***
	(0.001)	(0.000)
Log of no. of microenterprises financed	-0.84**	-1.86**
	(0.301)	(0.811)
Log of gross loan portfolio per capita	-1.71**	-1.91**
	(0.821)	(0.921)
Log of Gross domestic product per capita	-10.01**	-11.51**
	(4.991)	(5.651)
Log of assets	-1.73**	-2.19**
	(0.841)	(1.085)
Log of average deposit balance per depositor	-2.11***	-2.33***
	(0.001)	(0.003)
Log of loan loss rate	2.14**	2.64**
	(0.901)	(1.021)
Log of number of jobs created	-0.00	-0.00
	(0.322)	(0.000)
Log of percent of startup microenterprises financed	-0.09**	-0.27**
	(0.031)	(0.121)
Log of living standard	-0.87**	-1.03**
	(0.411)	(0.499)
Log of health status	-0.41**	-0.92**
	(0.199)	(0.381)
Log of education	-1.01***	-1.41***
	(0.000)	(0.000)
Africa	11.02*	12.39**
	(5.599)	(5.992)
East Asia and Pacific	-1.01**	-1.38**
	(0.492)	(0.572)
Eastern Europe and Central Asia	-10.01***	-10.31***
	(0.000)	(0.001)
Latin America and Caribbean	-15.33***	-15.79***
	(0.001)	(0.001)
Middle East and North America	-9.51**	-9.98**
	(4.641)	(4.793)
Bank	-0.15***	-0.12***
	(0.000)	(0.000)
Credit union/cooperatives	-0.66***	-0.45***
	(0.001)	(0.000)
Non-bank financial institutions	-0.09*	0.05*
	(0.049)	(0.001)
Non-government organizations	0.06*	0.04*
	(0.000)	(0.028)
Log of percent of female borrowers *Bank	-0.17**	
	(0.006)	
Log of percent of female borrowers *Credit union/cooperatives	-0.50**	
	(0.019)	
Log of percent of female borrowers *Non-bank financial institutions	-0.09**	
	(0..037)	
Log of percent of female borrowers *Non-government organizations	0.08*	
	(0.041)	
Log of percent of female borrowers *Africa		-0.21**
		(0.099)
Log of percent of female borrowers *East Asia and Pacific		-0.97**
		(0.462)
Log of percent of female borrowers *Eastern Europe and Central Asia		-0.13**
		(0.052)
Log of percent of female borrowers *Latin America and Caribbean		-0.28***
		(0.000)
Log of percent of female borrowers *Middle East and North America		-0.229**
		(0.113)
Constant	45.25***	43.66***
	(0..012)	(0..045)
No. of observation	384	384
Adj. R^2	0.631	0.657

Notes: The robust standard errors are in parentheses. The coefficients are obtained from multiple linear regressions. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. Living standard, health and education, which are measured by improved sanitation, provision of electricity, drinking water, asset ownership, child mortality, nutrition, and years of schooling, are used as control variables. Regional dummies are included in the estimation. ***p<0.01; **p<0.05; *p<0.10

Table 11. First-stage regression

Dependent Variable:	Number of Active Borrowers
Legal British	-0.08*
	(0.050)
Legal French	-0.02***
	(0.000)
Legal Socialist	-0.01**
	(0.003)
Legal German	-0.06**
	(0.011)
Legal Scandinavian	-0.05**
	(0.010)
Cost of contract enforcement	-0.94**
	(0.221)
Log of weighted 1-year lag of no. of active borrowers averaged by the no. of MFIs	1.63**
	(0.512)
Log of percent of female borrowers	-4.31**
	(1.891)
Log of borrower retention rate	-3.69**
	(1.318)
Log of no. of microenterprises financed	-0.091**
	(0.031)
Log of gross loan portfolio per capita	-0.31**
	(0.072)
Log of Gross domestic product per capita	-5.01**
	(2.011)
Log of assets	-0.912**
	(0.212)
Log of average deposit balance per depositor	-0.42***
	(0.000)
Log of loan loss rate	0.39***
	(0.001)
Log of number of jobs created	-0.000
	(0.021)
Log of percent of startup microenterprises financed	-0.009**
	(0.001)
Log of living standard	-0.712**
	(0.216)
Log of health status	-0.321**
	(0.099)
Log of education	-0.114**
	(0.029)
Africa	5.00
	(4.991)
East Asia and Pacific	-3.871**
	(1.445)
Eastern Europe and Central Asia	-7.229**
	(3.003)
Latin America and Caribbean	-9.79*
	(4.908)
Middle East and North America	-4.92***
	(0.025)
Constant	0.08***
	(0.006)
No. of Observation	390
Adj. R2	0.66

Notes: The dependent variables are the poverty head count ratio and poverty gap. Robust clustered standard errors at the country level are in parentheses. The coefficients are obtained from multiple linear regressions. . Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. . Living standard, health and education, which are measured by improved sanitation, provision of electricity, drinking water, asset ownership, child mortality, nutrition, and years of schooling, are used as control variables. Regional dummies are included in the estimation.*p<0.01; **p<0.05; ***p<0.10.

Table 12. Cross-sectional regression for instrumental variables

Dependent Variable:	Poverty head count-ratio		Poverty gap	
	IV		IV	
	Without Regions	With Regions	Without Regions	With Regions
Log of no. of active borrowers	-5.91**	-5.22**	-5.22**	-2.73**
	(2.432)	(2.330)	(2.330)	(1.021)
Log of percent of female borrowers	-16.01***	-15.31***	-15.31***	-13.51**
	(0.001)	(0.006)	(0.006)	(6.211)
Log of borrower retention rate	-10.15***	-10.02***	-10.02***	-6.72**
	(0.008)	(0.007)	(0.007)	(2.913)
Log of no. of microenterprises financed	-4.19**	-3.39**	-3.39**	-1.786**
	(1.632)	(1.208)	(1.208)	(0.523)
Log of gross loan portfolio per capita	-3.91**	-3.92**	-3.92**	-1.21**
	(1.604)	(1.665)	(1.665)	(0.304)
Log of Gross domestic product per capita	-14.26**	-14.35**	-14.35**	-11.98*
	(6.222)	(6.773)	(6.773)	(6.062)
Log of assets	-4.81**	-4.01**	-4.01**	-2.96*
	(1.966)	(1.733)	(1.733)	(1.557)
Log of average deposit balance per depositor	-4.79***	-3.84***	-3.42***	-3.39***
	(0.000)	(0.008)	(0.000)	(0.009)
Log of loan loss rate	5.09***	3.73**	4.01***	3.92**
	(0.000)	(1.689)	(0.000)	(1.812)
Log of number of jobs created	-2.39	-1.99*	-1.99*	-0.004
	(2.590)	(0.622)	(0.622)	(0.009)
Log of percent of startup microenterprises financed	-2.97**	-2.01**	-2.01**	-1.24**
	(1.100)	(0.823)	(0.823)	(0.445)
Log of living standard	-1.81**	-1.512**	-1.512**	-1.99**
	(0.700)	(0.511)	(0.511)	(0.451)
Log of health status	-1.716**	-1.13**	-1.13**	-1.53**
	(0.633)	(0.336)	(0.336)	(0.341)
Log of education	-2.313**	-2.712**	-2.712**	-1.911**
	(1.096)	(0.993)	(0.993)	(0.677)
Africa	-	-	-	14.00
				(5.331)
East Asia and Pacific	-	-	-	-2.72**
				(2.020)
Eastern Europe and Central Asia	-	-	-	-13.18**
				(6.045)
Latin America and Caribbean	-	-	-	-18.19*
				(9.915)
Middle East and North America	-	-	-	-13.36***
				(0.425)
Constant	117.33***	47.99***	47.99***	36.87***
	(9.801)	(5.215)	(5.215)	(4.171)
No. of observation	418	418	418	418
Adj. R^2	0.517	0.586	0.586	0.614
F-Statistic	8.13	16.85	16.85	25.22
Under Identification Test	9.63(0.012)	6.60(0.01)	6.60(0.01)	5.36(0.00)
Weak Identification Test	12.95(0.000)	11.96(0.00)	11.96(0.00)	13.52(0.00)
Over Identification Test	0.04(0.99)	0.17(0.91)	0.17(0.91)	0.44(0.89)
Hausman Test	7.63(0.24)	4.11(0.46)	4.11(0.46)	5.79(0.96)

Notes: The dependent variables are the poverty head count ratio and poverty gap. The figures in parentheses show robust standard errors clustered at the country level. All variables are in natural logarithm. The coefficients are obtained from multiple linear regressions. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. Living standard, health and education, which are measured by improved sanitation, provision of electricity, drinking water, asset ownership, child mortality, nutrition, and years of schooling, are used as control variables. We include regional dummies in our estimation. ***p<0.01; **p<0.05; *p<0.10

Table 13. Robustness checks for outliers

Dependent Variable:	Poverty head count ratio	Poverty gap	Multidimensional poverty index
	(1)	(2)	(3)
Log of no. of active borrowers	-2.81**	-2.18**	-3.91**
	(1.351)	(1.010)	(1.894)
Log of percent of female borrowers	-6.05*	-4.71**	-7.002**
	(3.036)	(2.175)	(3.410)
Log of borrower retention rate	-4.11**	-3.31**	-4.87**
	(1.992)	(1.451)	(2.412)
Log of no. of microenterprises financed	-4.12*	-1.921**	-4.11**
	(2.170)	(0.951)	(2.025)
Log of gross loan portfolio per capita	-2.01**	-1.85**	-1.94**
	(1.002)	(0.910)	(0.951)
Log of Gross domestic product per capita	-11.01*	-6.91**	-10.38**
	(5.322)	(3.421)	(5.110)
Log of assets	-2.65**	-2.24**	-3.01**
	(1.305)	(1.021)	(1.410)
Log of average deposit balance per depositor	-3.11***	-3.39***	-3.19***
	(0.008)	(0.009)	(0.008)
Log of loan loss rate	3.73**	3.24**	3.19**
	(1.791)	(1.49)	(1.412)
Log of number of jobs created	-0.100	-0.001	-0.001
	(0.111)	(0.125)	(0.012)
Log of percent of startup microenterprises financed	-1.14**	-0.73**	-1.01**
	(0.302)	(0.345)	(0.489)
Log of living standard	-2.81**	-1.71**	-4.00**
	(1.390)	(0.832)	(1.982)
Log of health status	-1.83**	-1.00**	-1.97**
	(0.891)	(0.471)	(0.956)
Log of education	-4.47*	-2.95*	-6.21*
	(2.240)	(1.480)	(3.115)
Africa	-0.00**	-0.00**	-0.00*
	(0.003)	(0.006)	(0.004)
East Asia and Pacific	-0.01**	-0.00**	-0.03**
	(0.004)	(0.007)	(0.009)
Eastern Europe and Central Asia	-13.42*	-6.91*	-15.31*
	(6.791)	(3.502)	(7.670)
Latin America and Caribbean	-3.83**	-2.17**	-4.11**
	(1.895)	(1.071)	(2.012)
Middle East and North America	-13.01*	-8.00*	-14.93**
	(6.512)	(4.101)	(7.421)
Constant	79.99***	41.01***	101.32***
	(0.010)	(0.013)	(0.003)
No. of observation	875	875	876
Adj. R^2	0.615	0.681	0.697

Notes: A few of the variables are in natural logarithm. Robust clustered standard errors at the country level are in parentheses. The coefficients are obtained from multiple linear regressions. Assets, gross loan portfolio and no. of active borrowers have been scaled by a factor of 1/1000 to facilitate easier reading of the coefficients. Regional dummies are included in the estimation. *p<0.01; **p<0.05; ***p<0.10

Appendix 1. Definition of variables

Variable	Definition	Rationale	Expected Sign	Data Source
Gross loan portfolio per capita	All outstanding principals due for all outstanding client loans. This includes current, delinquent, and renegotiated loans, but not loans that have been written off. It does not include interest receivable.	Captures the micro-credit outreach	-	Mix Market: (2014)
Gross domestic product per capita	A measure of the total output of a country that takes the gross domestic product (GDP) and divides it by the number of people in the country. The per capita GDP is especially useful when comparing one country to another because it shows the relative performance of the countries.	Measures the total output of the country	-	WDI (2014)
No. of active borrowers	The number of individuals or entities who currently have an outstanding loan balance with an MFI or are primarily responsible for repaying any portion of the gross loan portfolio relative to a million population aged between 15 and 64. Individuals who have multiple loans with an MFI should be counted as a single borrower.	Captures the microcredit outreach	-	Mix Market: (2014)
Assets	Total of all net asset accounts	Captures the microcredit outreach	-	Mix Market: (2014)
Borrower retention rate	End-of-period active borrowers / (beginning-of-period activeborrowers / new borrowers during the period).	Captures the microcredit outreach	-	Mix Market: (2014)
No. of microenterprises financed	Number of microenterprises financed by the institution.	Captures the microcredit outreach	-	Mix Market: (2014)
No. start-upmicro-enterprises financed	Number of microenterprises at an early stage in the life cycle of an enterprise.	Captures the microcredit outreach	-	Mix Market: (2014)
No. of jobs created	Employment creation non-enterprises	Captures the microcredit outreach	-	Mix Market: (2014)
Percentage of female borrowers	Number of active borrowers who are women / number of active borrowers.	Captures the microcredit outreach	-	Mix Market: (2014)
Average deposit balance per depositor / gross national income per capita	Average deposit balance per depositor / GNI per capita	Captures the microcredit outreach	-	Mix Market: (2014)
Loan loss rate	(Write-offs - value of loans recovered)/ gross loan portfolio	Captures the microcredit outreach	-	Mix Market: (2014)
Living standard	Measured by improved sanitation, drinking water, flooring, cooking fuel, and asset ownership.	Measures poverty		OPHI (2014)
Heath status	Measured by mortality and nutrition	Measures poverty		OPHI (2014)
Education	Measured by years of schooling and school attendance	Measures poverty		OPHI (2014)
Legal origin	Identifies the legal origin of the company law or commercial code of each country (English, French, Socialist, German, and Scandinavian).	Instrument variable		La Porta, et al. (1999).
Cost of contract enforcement	Measures the efficiency of the judicial system in resolving a commercial dispute. Cost is recorded as a percentage of the claim, assumed equivalent to 200% of income per capita. No bribes are recorded. Enforcement costs are all costs that the seller (plaintiff) must advance to enforce the judgment through a public sale of the buyer's movable assets, regardless of the final cost to the seller.	Instrument variable		World Bank Group(2014)

Appendix 2. Dimension, indicators, deprivation thresholds, and weights of multidimensional poverty index

Dimension	Indicators	Deprived if	Relative Weight
Education	Years of schooling	No household member has completed five years of schooling	1/6
	Child school attendance	Any school-aged child is not attending school up to class 8.	1/6
Health	Child mortality	Any child has died in the family	1/6
	Nutrition	Any adult or child for whom there is nutritional information is malnourished.	1/6
Living standard	Electricity	The household has no electricity.	1/18
	Improved sanitation	The household's sanitation facility is not improved (according to MDG guidelines), or is improved but shared with other households.	1/18
	Safe drinking water	The household does not have access to safe drinking water (according to MDG guidelines) or safe drinking water is more than a 30-minute walk from home, round trip.	1/18
	Flooring	The household has a dirt, sand, or dung floor.	1/18
	Cooking fuel	The household cooks with dung, wood or charcoal.	1/18
	Asset ownership	The household does not own more than one radio, TV, telephone, bike, motorbike, or refrigerator and does not own a car or truck.	1/18

Source: OPHI (2014)

Appendix 3. List of countries and region by income level

Low income		Lower middle income		Upper middle income		High income	
Country	Region	Country	Region	Country	Region	Country	Region
Afghanistan	SA	Armenia	EECA[¤]	Albania	EECA	Channel Islands	EECA
Bangladesh	SA	Bolivia	LAC[€]	Argentina	LAC	Chile	LAC
Benin	Africa	Cameroon	Africa	Azerbaijan	EECA	Poland	EECA
Burkina Faso	Africa	Congo, Rep.	Africa	Bosnia and Herzegovina	EECA	Russian Federation	EECA
Burundi	Africa	Egypt, Arab Rep.	MENA	Brazil	LAC	Trinidad and Tobago	LAC
Cambodia	EAP	El Salvador	LAC	Bulgaria	EECA		
Central African Republic	Africa	Georgia	EECA	China	EAP		
Chad	Africa	Ghana	Africa	Colombia	LAC		
Congo, Dem. Rep.	Africa	Guatemala	LAC	Costa Rica	LAC		
Gambia, The	Africa	Guyana	LAC	Dominican Republic	LAC		
Guinea	Africa	Honduras	LAC	Ecuador	LAC		
Haiti	LAC	India	SA	Jordan	MENA		
Kenya	Africa	Indonesia	EAP	Kazakhstan	EECA		
Madagascar	Africa	Kosovo	EECA	Lebanon	MENA		
Malawi	Africa	Kyrgyz Republic	EECA	Macedonia, FYR	EECA		
Mali	Africa	Moldova	EECA	Mexico	LAC		
Mozambique	Africa	Mongolia	EAP	Montenegro	EECA		
Myanmar	EAP	Morocco	MENA	Namibia	Africa		
Nepal	SA	Nicaragua	LAC	Panama	LAC		
Niger	Africa	Nigeria	Africa	Peru	LAC		
Rwanda	Africa	Pakistan	SA	Romania	EECA		
Sierra Leone	Africa	Papua New Guinea	EAP	St. Lucia	LAC		
Tajikistan	EECA	Paraguay	LAC	Serbia	EECA		
Tanzania	Africa	Philippines	EAP	South Africa	Africa		
Togo	Africa	Senegal	Africa	Thailand	EAP		
Uganda	Africa	Sri Lanka	SA	Tunisia	MENA		
Zimbabwe	Africa	Swaziland	Africa	Turkey	EECA		
		Syrian Arab Republic	MENA	Venezuela, RB	LAC		
		Ukraine	EECA				
		Uzbekistan	EECA				
		Vietnam	EAP				
		Yemen, Rep.	MENA				

Sources: OPHI (2014) and WDI datasets.SA indicates South Asia; EAP, East Asia and the Pacific; LAC, Latin America and the Caribbean; EECA, Eastern Europe and Central Asia; and MENA, the Middle East and North America.