Financial permeation as a role of microfinance : has microfinance actually been helpful to the poor?

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Financial Permeation As a Role of Microfinance: Has Microfinance Actually been Helpful to the Poor?

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Abstract

This article is distinct in its application of the logit transformation to the poverty ratio for the purpose of empirically examining whether the financial sector helps improve standards of living for low-income people. We propose the term *financial permeation* to describe how financial networks expand to spread money among the poor. We measure financial permeation by three indicators related to microfinance institutions (MFIs) and then examine its effect on poverty reduction at the macro level using panel data for 90 developing countries from 1995 to 2008. We find that financial permeation has a statistically significant and robust effect on decreasing the poverty ratio.

Keywords: Financial Permeation, Microfinance, Panel Data, Poverty Reduction
JEL classification: G21, O16, O50

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I. Introduction

Much existing literature empirically analyzes the close relationship between financial development and economic growth (e.g., King and Levine 1993; Demetriades and Hussein 1996; Luintel and Khan 1999; Kirkpatrick 2000; Bhattacharya and Sivasubramanian 2003; Apergis, Filippidis, and Economidou 2007).[1] Most of these studies conclude that financial intermediaries contribute to economic growth through various channels, and that the two variables generally have a positive bi-directional relationship. On the basis of this close relationship between financial development and economic growth, several studies have postulated a positive correlation between poverty reduction and increased access to financial services, citing an elimination of credit constraints on the poor and an increase in their productive assets and productivity (World Bank 2000 and Jalilian and Kirkpatrick 2002). Indeed, the recent results of econometric studies suggest that financial sector development helps reduce poverty both directly and indirectly through its effect on economic growth (e.g., Honohan 2004; Jalilian and Kirkpatrick 2005; Beck, Demirgüç-Kunt, and Levine 2007; Jeanneney and Kpodar 2008; Quartey 2008; Odhiambo 2009, 2010; Inoue and Hamori 2010).

In the above-mentioned studies, financial sector development is generally defined as an increase in the proportion of the financial sector to the real sector in a country. This "financial deepening" is measured by the ratio of monetary aggregates, banking sector assets, and credit and/or deposits to the country's GDP. This paper is distinguished from the previous studies in that it examines the effect of financial sector development, especially non-collateral loans, on standards of living for low-income

[1] Arestis and Demetriades (1997), Levine and Zervos (1998), Ram (1999), Shan and Morris (2002), and Bloch and Tang (2003) are also among the related literature on financial development and economic growth.

people. We propose a concept called *financial permeation* to describe the impact of an expanding financial network on the poor; just as water permeates through the sand, an increase in financial sector activity spreads more money amongst the poor. The idea of financial permeation is best embodied by the expansion of microfinance activities in developing countries.

Beginning with small-scale, non-collateral credit in the late 1970s, microfinance programs have increasingly serviced the poor in developing countries and are now used as pivotal tools for financial growth. The increased presence of microfinance institutions (MFIs) has resulted in a body of empirical literature devoted to their activities from a variety of viewpoints. These studies can be categorized broadly into two groups. The first group aims to discover what determines the successful performance of an MFI in terms of financial sustainability and outreach to the clients. Within this group, some studies stress that MFI performance is mostly explained by corporate organizational structure, such as the CEO's expertise and compensation, the board composition and its independence, and the lending methodology (e.g., Hartarska2005; Hartarska and Nadolnyak 2007; Cull, Demirgüç-Kunt, and Morduch 2007; Kyereboah-Coleman and Osei 2008; Mersland and Strøm 2008, 2009). In evaluating the successful performance of an MFI, other studies in this group point out the importance of the macroeconomic environment in which the MFIs are situated, which includes, for example, economic growth, price stability, degree of financial development, and level of formalization and industrialization of the economy (e.g., Ahlin and Lin 2006; Gonzalez 2007; Vanroose 2008; Vanroose and D'Espallier 2009; Ahlin, Lin, and Maio 2011).

Meanwhile, another group of relevant literature consists of the studies that

analyze the impact of microfinance activities on the well-being of the poor. Most of these are based on case-study analyses using sample survey data, as represented by Hulme and Mosley (1996), Pitt and Khandker (1998), Coleman (1999), Morduch (1999), Mosley (2001), Khandker (2005), and Roodman and Morduch (2009). Owing to differences in selected regions, types of data collected, and empirical techniques, however, a general consensus on this topic has not yet been reached. In view of this, a few very recent empirical analyses, such as those of Kai and Hamori (2009) and Imai et al. (2010), have begun to examine the effect of microfinance on conditions of poverty and income inequality from a macro perspective. Among the literature referenced, this second group of studies, especially the research of Kai and Hamori and Imai et al., is most closely related to our analysis. The main difference of our study from those of Kai and Hamori and Imai et al. is that we examine the poverty reduction effect of microfinance intensity using the more comprehensive panel dataset, as opposed to cross-section data, to incorporate the time dimension.

More specifically, by using unbalanced panel data for 90 developing countries from 1995 to 2008, we estimate models in which the poverty headcount ratio is explained by each indicator of financial permeation and the control variables GDP, international openness, and inflation rates. Since MFIs are now recognized as the main providers of financial services for poor populations in most developing countries, we measure the degree of financial permeation by the alternative indicators of microfinance intensity, that is, the number of MFIs (*MFI*), the ratio of *MFI* to per capita real GDP (*MFIRATIO*), and the logarithms of gross loan portfolio of MFIs (*LGLOAN*). With regard to the control variable, in order to measure the degree of international openness, we use both the ratio of exports and imports to GDP and the ratio of foreign direct

investment to GDP.

From the two-stage panel EGLS estimation, three main findings emerge. First, financial permeation has a statistically significant negative effect on the poverty ratio. This result holds regardless of the indicator of financial permeation that is used. Second, concerning the control variables, inflation has an adverse effect on poverty alleviation, while per capita real GDP has the effect of reducing poverty. Third, unlike the other control variables, international openness is not statistically significant in any case. All these findings hold for both cases of the dependent variable—namely, the poverty ratio and its value of logit transformation—which strengthens the robustness of the results.

This paper is organized as follows. The next section briefly reviews the relevant literature on microfinance, especially its effect on poverty and income inequality at the macro level. Section III explains the definitions, sources, and properties of the data, and Section IV presents the models. The fifth section shows the empirical results; the sixth and final section summarizes the main findings of this study and discusses several interpretations.

II. Literature Review

For the last few decades, numerous empirical studies have attempted to shed light on the impact of microfinance activities on the well-being of the poor, mainly by using sample survey data at the village level. Owing to differences in selected regions, types and amount of data collected, and empirical methods, however, opinion remains divided among these micro-level analyses on the impact of microfinance on poverty reduction. For example, Hulme and Mosley (1996), Pitt and Khandker (1998), Mosley

(2001), and Khandker (2005) observe that microcredit actually increases income and/or consumption of poor borrowers, whereas Coleman (1999), Morduch (1999), and Roodman and Morduch (2009) do not find such results. Therefore, from these micro-level case studies, it is not obvious whether microfinance does in fact improve the general welfare of poor people in developing countries.

Against this background, empirical analysis, albeit still limited in approach, has tried to investigate the effect of microfinance expansion on poverty incidence and income inequality from a macro viewpoint. For example, Kai and Hamori (2009) examine the impact of microfinance intensity on income inequality using the cross-section data for 61 developing countries. They measure the degree of microfinance intensity by both the number of MFIs and the number of borrowers from MFIs. By regressing the Gini coefficient on microfinance intensity and a set of control variables including real GDP per capita and its square, they find that microfinance intensity in terms of the number of MFIs or borrowers from MFIs has a significant negative relationship to income inequality. They also find that per capita GDP is estimated to be significantly positive and that its square term is estimated to be significantly negative, which supports Kuznets' inverted-U hypothesis. On the basis of this evidence, Kai and Hamori conclude that poor countries should focus more on the equalizing effect of microfinance since economic growth increases inequality before a country's income reaches a certain level.

Imai et al. (2010) analyzed the poverty reducing effect of microfinance using cross-section data for 99 developing countries in 2007. In their empirical models, the poverty headcount ratio is explained in terms of an MFI's gross loan portfolio (a proxy for microfinance expansion) and control variables such as real GDP, GDP deflator, and

regional dummies. In order to solve the issue of potential endogeneity, they estimate the models by applying IV method, as well as OLS, and find that the gross loan portfolio of microfinance has a statistically significant negative relationship to poverty incidence, and that the poverty reducing effect of microfinance tends to be larger in sub-Saharan African countries. Consequently, Imai et al. underscore the role of microfinance in poverty reduction from a macro perspective and support the increase in investment in microfinance loans.

This paper differs from the cited studies in the following ways. First, we suggest a new concept of financial development termed *financial permeation* and empirically analyze its effect on poverty in developing countries. Considering the important role of MFIs in developing countries, we assume that the expansion of microfinance activities acts as a proxy for financial permeation and measure it by either the number of MFIs, the number of MFIs relative to per capita real GDP, or the logarithms of gross loan portfolio of MFIs. Second, as the dependent variable, we use the poverty ratio—namely, the percentage of people below the poverty line set in each country—and its value of the logit transformation. By the logit transformation, the poverty ratio, which is usually restricted to values between 0 and 1, is transformed to yield values from minus infinity to plus infinity, thereby satisfying one of the assumptions of standard regression analysis. To the best of our knowledge, this is the first study to apply this transformation method to the poverty ratio. Finally, unlike the relevant studies using the cross-country dataset, we use the panel data for 90 developing countries from 1995 to 2008, which has the advantage of incorporating the time dimension. Furthermore, in estimating the model, we apply the two-stage EGLS estimation to the panel data and adjust the issue of potential endogeneity in the

equation.

III. Empirical Models

We perform a panel analysis of 90 countries over the period from 1995 to 2008 with annual frequency. The explained variable is the poverty rate. The explanatory variables include the measure of microfinance intensity, the measure of openness, inflation rates, and the logarithms of per capita income. We use the following two types of models for empirical analysis:

$$POV_{it} = \beta_0 + \beta_1 MI_{it} + \beta_2 OPEN_{it} + \beta_3 INF_{it} + \beta_4 LGDP_{it} + u_{it} \quad i = 1, 2, \cdots, N; t = 1, 2, \cdots, T \tag{1}$$

and

$$\ln\left(\frac{POV_{it}}{1 - POV_{it}}\right) = \beta_0 + \beta_1 MI_{it} + \beta_2 OPEN_{it} + \beta_3 INF_{it} + \beta_4 LGDP_{it} + u_{it} \quad i = 1, 2, \cdots, N; t = 1, 2, \cdots, T \tag{2}$$

.

$\beta_i \ (i = 0,1,..,4)$ is the regression coefficient; POV_{it} is the poverty rate in country i at time t; MI_{it} is the measure of microfinance intensity in country i at time t; $OPEN_{it}$ is the measure of international openness in country i at time t; INF_{it} is inflation rates in country i at time t; $LGDP_{it}$ is the logarithms of per capita income in country i at time t; and u_{it} is the error term in country i at time t.

Note that the poverty rate takes values from 0 to 1. We encounter a serious problem when we apply standard regression models. This is mainly because standard

regression analysis assumes that the explained variable takes values from minus infinity to plus infinity. In order to solve this problem, we use the logit transformation of the poverty rate as follows:[2]

$$(3) \qquad y_{it} = \ln\left(\frac{POV_{it}}{1 - POV_{it}}\right).$$

If y_{it} approaches 0, then the value of POV_{it} approaches minus infinity. If POV_{it} approaches 1, then the value of y_{it} approaches plus infinity. The transformed value takes values from minus infinity to plus infinity, and thus, there is no contradiction with the standard assumption of regression. We use both of them for empirical analysis.

We empirically analyze the effect of a change in microfinance intensity on the poverty rate. For empirical analysis, we control for the effects of the measure of openness, inflation rates, and per capita real income on poverty rates. In order to address the problem of endogeneity, we use the instrumental variable method to estimate each parameter. As the instrumental variables, we use a constant term and the lagged value of each explanatory variable.

IV. Data

A. Explained Variable

We use the poverty rate as the explained variable for empirical analysis. This is

[2] Logistic regression has been applied to various fields of statistical analysis. See, for example, Hosmer and Lemeshow (2000) and Kleinbaum and Klein (2010).

the poverty headcount ratio at national poverty line (% of population). We obtained data on poverty rates from the World Development Indicators of the World Bank. In this paper, we use the poverty rate and the transformed value of poverty rate for empirical analysis.

B. Explanatory Variables

The measure of microfinance intensity is the most important explanatory variable. We also control for the measure of international openness, inflation rates, and per capita real income.

Degree of Microfinance Intensity

The degree of microfinance intensity is included in order to assess the impact of microfinance on the poverty rate. We employ the number of microfinance institutions (MFI), the ratio of microfinance institutions to per capita real GDP ($MFIRATIO$), and the logarithms of gross loan portfolio ($LGLOAN$). We may expect that a rise in microfinance intensity eases the credit constraints on the poor, thus decreasing poverty rates. These data are obtained from the Microfinance Information eXchange (MIX).

Degree of International Openness

We control for the degree of international openness. Two alternative measures are used for empirical analysis. One is the ratio of imports and exports to GDP

($OPEN1$) and the other is the ratio of foreign direct investment to GDP ($OPEN2$). These data are obtained from the World Development Indicators of the World Bank.

Inflation Rates

We also control for inflation rates (INF). This value is calculated as the log difference of the consumer price index, where the value of the year 2005 is standardized to 100. The source of the CPI is the World Development Indicators of the World Bank.

Per Capita Real GDP

Finally, we use the logarithms of per capita real GDP ($LGDP$), which is measured in constant 2000 U.S. dollars. These data are obtained from the World Development Indicators of the World Bank.

V. Empirical Results

We estimate each model using the instrumental method to adjust for the endogeneity problem. We use a constant term and the lagged value of each explanatory variable as instruments.

Table 1 and Table 2 indicate the empirical results for the cases using the poverty rate and its logit transformation, respectively. These tables show coefficient estimates with standard errors in parentheses below each estimate. Hausman test results are used to select either a fixed- or random-effect model. As shown in each table, the

results of the Hausman test support the random-effect model for both cases.

Let us start with the empirical results shown in Table 1, which uses the poverty rate as the explained variable. As is clear from Table 1, the coefficient of microfinance intensity is estimated to be –0.877 and –0.884 for MFIRATIO, –0.002 for MFI, and –0.006 for LGLOAN, and is statistically significant. Thus, an increase in the degree of microfinance intensity significantly reduces the poverty rate. These results are robust to the choice of the measure of microfinance intensity and model specifications.

The coefficient of international openness is estimated to be –0.064, –0.061, and 0.007 for OPEN1, and 0.270, 0.093, and 0.265 for OPEN2. However, these estimates are not statistically significant. Thus, a rise in the degree of international openness does not have a significant effect on the poverty rate. This result is robust to the choice of the measure of openness.

The coefficient of inflation rates is estimated to be in the range of 0.181 to 0.215, and is statistically significant. Thus, an increase in inflation rates leads to a rise in the poverty rate.

The coefficient of per capita real income is estimated to be in the range of –0.079 to –0.099, and is statistically significant. Thus, an increase in output leads to a decrease in the poverty rate.

Next, we move on to examine the empirical results shown in Table 2, where the logit transformation of the poverty rate is used as the explained variable. As is clear from Table 2, the coefficient of microfinance intensity is estimated to be –3.701 and –3.694 for MFIRATIO, –0.008 for MFI, and –0.027 and –0.026 for LGLOAN, and is statistically significant. Thus, an increase in the degree of microfinance intensity significantly reduces the poverty rate. These results are robust to the choice of the

measure of microfinance intensity and model specifications.

The coefficient of international openness is estimated to be –0.263, –0.248, and 0.050 for OPEN1, and 0.616, –0.209, and 0.544 for OPEN2. However, these estimates are not statistically significant. Thus, changes in the degree of international openness do not have any significant effect on the poverty rate. This result is robust to the choice of the measure of openness.

The coefficient of inflation rates is estimated to be in the range of 1.118 to 1.276, and is statistically significant. Thus, a rise in inflation rates leads to an increase in the poverty rate.

The coefficient of per capita real income is estimated to be in the range of –0.396 to –0.481, and is statistically significant. Thus, an increase in output leads to a decrease in the poverty rate.

It is clear that the empirical results obtained in Table 2 are consistent with the empirical results obtained in Table 1.

VI. Conclusion

To date, the role of the financial sector in an economy has received much attention and has been analyzed in the literature from both theoretical and empirical viewpoints. The relevant empirical studies generally define financial development as a proportional increase in the financial sector in relation to the real sector in a country. Studies seeking causal links between financial sector development and economic growth, poverty conditions, and income inequality usually measure it by the ratio of monetary aggregates, banking sector assets, and credit and/or deposits to the country's

GDP.

In particular, in the last few decades, the microfinance sector has registered significant growth and has been increasingly considered the most effective tool for stimulating financial development in less developed countries. Therefore, in this paper, we focus on investigating whether microfinance actually alleviates poverty across the world. Since the development of the microfinance sector is thought to benefit poor clients by expanding the microfinance network within each country and by making more money available to poor people, we think of this phenomenon as financial permeation, offering the metaphor of water permeating sand to explain this process. We measure financial permeation using a set of alternative indicators, namely, the number of MFIs, the ratio of the number of MFIs to per capita real GDP, and the gross loan portfolio from MFIs. Then, using unbalanced panel data for 90 developing countries from 1995 to 2008, we estimate the models in which the poverty ratio is explained by each indicator of financial permeation as well as the control variables GDP, economic openness, and inflation rates. From the two-stage panel EGLS estimation, we obtain the findings outlined below.

First, financial permeation has a significant effect on decreasing the poverty ratio. This result holds true no matter which indicator of financial permeation is used. As such, while existing micro-level analyses have not yet reached a consensus on the effect of microfinance on poverty reduction, this paper indicates that the expansion of microfinance activities contributes to alleviating poverty at the macro level. Second, concerning the control variables, the coefficient of the inflation rate has a significant positive value, while the coefficient of per capita real GDP has a significant negative value. These findings suggest that a stable macroeconomic environment, determined by

low inflation rates and/or high economic growth, is at the least a necessary condition for poverty reduction. Third, unlike our results for inflation rates and GDP, international openness does not have a statistically significant relationship to the poverty ratio. When international openness is measured in terms of either the ratio of trade (exports and imports) to GDP or the ratio of foreign direct investment to GDP, the same result is produced. Given this outcome, it is not clear how international openness affects the livelihoods of poor people in developing countries. Importantly, our findings are obtained in both cases of the dependent variable, i.e., the poverty ratio and its logit transformation, which enforces the robustness of the empirical results.

In sum, our empirical evidence indicates that financial permeation, as it is measured by the number of MFIs and their portfolio loans, indeed contributes to a reduction in poverty throughout the world. While some recent empirical studies have already corroborated that the development of the formal financial sector, especially banking, improves living standards in a large sample of poor countries, this paper presents some of the first evidence on the positive effect of microfinance expansion on poverty reduction using the worldwide panel dataset. Therefore, we conclude that microfinance should be exploited by policymakers and practitioners in developing countries as a promising instrument for realizing overall poverty reduction.

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Table 1 Empirical Results

$$POV_{it} = \beta_0 + \beta_1 MI_{it} + \beta_2 OPEN_{it} + \beta_3 INF_{it} + \beta_4 LGDP_{it} + u_{it},\ i = 1, 2, \cdots, N; t = 1, 2, \cdots, T$$

	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
MFIRATIO	-0.877	(0.418)**	-0.884	(0.428)**								
MFI					-0.002	(0.001)***	-0.002	(0.001)***				
LGLOAN									-0.006	(0.003)**	-0.006	(0.003)**
OPEN1	-0.064	(0.074)			-0.061	(0.070)			0.007	(0.065)		
OPEN2			0.270	(0.554)			0.093	(0.559)			0.265	(0.676)
INF	0.213	(0.083)**	0.212	(0.087)**	0.181	(0.072)**	0.182	(0.080)**	0.213	(0.110)*	0.215	(0.114)*
LGDP	-0.098	(0.018)***	-0.099	(0.016)***	-0.085	(0.018)***	-0.085	(0.017)***	-0.079	(0.014)***	-0.080	(0.014)***
Constant	1.089	(0.111)***	1.040	(0.122)***	1.005	(0.108)***	0.957	(0.122)***	1.007	(0.092)***	1.005	(0.109)***
Hausman Test	2.379	[0.606]	4.355	[0.360]	2.830	[0.587]	4.927	[0.295]	4.650	[0.325]	5.094	[0.278]
Number of Observations		87.000		87.000		87.000		87.000		102.000		101.000

Note:
SE indicates the standard error, which is calculated using the White cross-section standard errors and covariance.
Numbers in parentheses represent the standard error.
Numbers in brackets represent the p-values of the Hausman test.
***, (**), and [*] indicate the statistical significance at the 1, (5), and [10] percent levels.

Table 2 Empirical Results

$$\ln\left(\frac{POV_{it}}{1-POV_{it}}\right)=\beta_0+\beta_1 MI_{it}+\beta_2 OPEN_{it}+\beta_3 INF_{it}+\beta_4 LGDP_{it}+u_{it},\ i=1,2,\cdots,N;t=1,2,\cdots,T$$

	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
MFIRATIO	-3.701	(1.752)**	-3.694	(1.737)**								
MFI					-0.008	(0.003)***	-0.008	(0.003)***				
LGLOAN									-0.027	(0.012)**	-0.026	(0.012)**
OPEN1	-0.263	(0.341)			-0.248	(0.323)			0.050	(0.282)		
OPEN2			0.616	(2.470)			-0.209	(2.455)			0.544	(3.025)
INF	1.245	(0.419)***	1.251	(0.429)***	1.118	(0.378)***	1.125	(0.409)***	1.265	(0.546)**	1.276	(0.552)**
LGDP	-0.479	(0.078)***	-0.481	(0.069)***	-0.425	(0.080)***	-0.423	(0.072)***	-0.396	(0.064)***	-0.396	(0.060)***
Constant	2.830	(0.491)***	2.633	(0.513)***	2.463	(0.487)***	2.276	(0.520)***	2.447	(0.400)***	2.438	(0.456)***
Hausman Test	2.536	[0.638]	4.226	[0.376]	3.198	[0.525]	4.889	[0.299]	5.931	[0.204]	5.297	[0.258]
Number of Observations		87.000		87.000		87.000		87.000		102.000		101.000

Note:
SE indicates the standard error, which is calculated using the White cross-section standard errors and covariance.
Numbers in parentheses represent the standard error.
Numbers in brackets represent the p-values of the Hausman test.
***, (**), and [*] indicate the statistical significance at the 1, (5), and [10] percent levels.