Microfinance Institutions, Productivity and Growth

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Abstract

Does the relative size of microfinance sector expand or contract with economic growth? Our results show that the impact of microfinance on factor productivity growth is more important than the effect on capital growth. Specifically, it explains why the growth effects of microfinance revolution appear to be largely permanent, not temporary. This permanent microfinance expansion effect can be attributed to the role microfinance sector plays in capital market and banking sector development, and to the change in the quality of institution environment. There is also some indirect evidence of higher investment efficiency post-liberalization. But we find the fragility of microfinance business by documenting threshold effects: countries that are more micro financial developed or have higher quality of institutions experience larger productivity growth responses. Finally, we show that the growth boost from micro financial inclusion outweighs the detrimental loss in growth from global or regional poverty.

Keywords: Microfinance, factor productivity, GDP growth.

JEL Classification: G21, D24, O47.

1. Introduction

The term "microfinance" refers to a range of financial services for low-income people, including credit, saving, insurance, and money transfers. Microfinance has been one of the boom sectors in development cooperation over the past years. Today, the microfinance sector accounts for a large share of economic activity in developing countries[1]. Research on the causes of microfinance institutions (Copestake, 2002) indicates that a major reason for the popularity and growth of the industry is its "market friendly" nature which is characterised by flexible lending mechanisms. Yet as the microfinance sector continues to expand, some have asked whether this phenomenon could in fact be associated with economic growth. This study addresses an important knowledge gap by empirically investigating the impact of microfinance sector size on the economic dynamism of low and middle, and high-income countries.

If microfinance is the provision of financial services to micro entrepreneurs and poor households (Helms, 2006), within the academic community, some authors claim that, "*microenterprises hold the potential for income growth which will be spurred by capital investment*" (De Mel, McKenzie and Woodruff, 2008). There is growing recognition that microfinance loans are a key form of production and organization in all countries, which contribute greatly to income and employment opportunities (Armendáriz de Aghion and Morduch, 2010).

[1] It is generally recognized that modern microfinance began with the founding of the Grameen Bank in Bangladesh in 1970 by Muhammad Yunus.

As the microfinance institutions continue to work, however, certain experts and policymakers are considering whether microfinance could in fact be a lifeboat for poor people and therefore improved macroeconomic growth (Banerjee et al., 2013).

This discussion nevertheless raises a problem. In the standard neoclassical model, capital market liberalization lowers the cost of capital, thereby inducing additional investment, enrollment, and production, and a temporary growth response. However, the decrease in the cost of capital appears rather modest, and the associated increase in investment is small relative to the large production growth increment (Benoit-Calderón, 2006; Dullien, 2011). Of course, microfinance activities may also directly affect factor productivity, for example, by spurring financial development, inducing a high rate of entry among marginally productive entrepreneurs, promoting better corporate governance, or increasing the capital/labor demand and output (Maksudova, 2010). Buera, Kaboski and Shin (2012) argue that examining the productivity effects of micro financial integration is far more important than considering its investment growth effects, as the latter have little chance of helping countries close the development gap. This is what we set out to do in this article.

Our first task is to decompose the per capita output growth effect into two channels: changes in factor productivity and investment growth. We find that factor productivity is the more important channel. The article thereby fills a large gap in the literature regarding the determinants of factor productivity growth. Much of the extant literature focuses on the beneficial effects of financial development (Tchakounté, Nourou and Mbondo, 2013), but part of that link may really be due to micro financial markets (see Imai et al., 2011 for a related argument).

Our results also complement the results in Armendáriz de Aghion and Morduch (2010), Ahlin, Lin and Maio (2011), which document that microfinance improve factor productivity and economic growth. We also examine directly what part of the growth response is temporary and what part is permanent. To shed more light on the sources of the permanent effect, we examine the effects of microfinance institution on future financial development and the quality of institutions. We find that microfinance enhances the development and efficiency of the assets market, the quality of institutions, and macroeconomic policies, but the results are not fully robust across specifications.

A simple mechanism for microfinance institutions to affect productivity is that it improves domestic allocative efficiency. For example, in Batbekh and Blackburn's (2008) model, microfinance allows agents to more efficiently share risk and invest in the higher return, riskier projects. Again, the existing literature has focused on financial development, (see Wurgler, 2000; and Fisman and Love, 2004), but not on financial markets. Galindo, Schiantarelli and Weiss (2007) demonstrate that domestic financial liberalization improves the efficiency of investment allocation. Our results suggest that investment is more sensitive to global growth opportunities in countries that are open to all investors. We are able to generalize the results in, for instance, Hermes, Lensink and Meesters (2009), Ahlin, Lin and Maio (2011), who show that firm-specific investment in a representative sample of institutions is correlated with changes in growth opportunities after microfinance intervention.

We then go on to conduct an extensive interaction analysis examining what local conditions lead to the largest investment growth and/or factor productivity growth responses. This evidence provides a new perspective on the existing work on the threshold effects in the relation between microfinance institutions and growth (Ravallion, 2001; Beck, Demirgüç-Kunt and Maksimovic, 2004).We find that both financial development and the quality of institutions produce positive interaction effects.

Finally, one often hears the argument that: "*there is a good deal of skepticism about microcredit as a tool of poverty reduction*" (Quibria, 2012), or that "*the microfinance model that arrived in Latin America in the 1970s has proven, as elsewhere around the world, to be an almost wholly destructive economic and social policy intervention*" (Bateman, 2013). We therefore directly examine the interaction between poverty and microfinance prevalence. Wichterich (2012) argue that poverty and social exclusion, improved by the financial crisis in 2007, may be the price to pay for the longer term benefits of microfinance revolution. We find that microfinance does not significantly increase the incidence of poverty and that the output loss of poverty is far outweighed by the output gain of microfinance evolution.

The paper is organized as follows. In the second section, we introduce the econometric methods and the data used in the study. We then present evidence on the link between microfinance sector and economic growth, decomposing the growth effect into investment growth and factor productivity in Section 3.

Section 4 investigates threshold effects. Section 5 focuses on the interaction between poverty and microfinance sector. Some concluding remarks are offered in the final section.

2. Output Growths and the Microfinance Sector

Econometric Framework

In the model show below, we define $y_{i,t}$ as the log growth rate in per capita real gross domestic product (GDP), capital stock, or total factor productivity (TFP) for time *t* (*t* = 1,2,…,*T*) and for country *i* (i = 1, 2,…, *N*) ; where *T* is the time range, *N* is the number of countries in our sample. Our main panel regression is specified as:

$$(1) \qquad y_{i,t+5,t} = \alpha Q_{i,start} + \gamma' X_{i,t} + \beta micro_{i,t} + \varepsilon_{i,t+5,5},$$

where $y_{i,t+5,t}$, the dependent variable, is growth over five years: $y_{i,t+5,5} = \frac{1}{5}\sum_{j=1}^{5} y_{i,t+j}$; $Q_{i,start}$ represents the logarithm of initial per capita real GDP, reset at 5-year intervals (1985, 1990, etc.). The $Q_{i,start}$variable functions as initial GDP and α is the conditional convergence coefficient which is expected to be negative. In the standard neo-classical point of view, the $X_{i,t}$ variables control for steady state per capita GDP levels, which may differ across countries. $micro_{i,t}$ is the size of microfinance sector in terms of number of clients or volume of credits. The coefficient β is expected to be negative. $\varepsilon_{i,t+5,5}$ is the stochastic term of errors.

When steady-state GDP is raised (e.g. through policy reforms) above initial GDP, the country will converge towards the higher per capita GDP level. To maximize the time-series content in our regression, we use overlapping data. We also use a pooled OLS estimate but the reported standard errors reflect group wise heteroskedasticity, SUR effects, and a Newey and West -test for adjustment with four lags for serial correlation.

We assume that here are two (direct through saving and indirect by loans) channels through which microfinance movement can affect growth. First, the flow of saving from informal finance sector to formal finance sector lowers the real interest rate, increases capital and investment, and spurs growth. Angeletos and Panousi (2011) suggest that many developing countries are not particularly capital scarce and that this effect only leads to faster convergence to a too low steady-state per capita GDP. Second, the finance literature suggests that open credit markets reduce the borrow risk premium[2]. As the cost of capital decreases, more investment and recruitment projects should have positive net present value. This should spur investment that is financed either locally or by foreign capital. The increased investment leads to increased output growth. From the perspective of the neo-classical model, this improved risk sharing and entrepreneurship presence in domestic capital markets is bound to raise the steady state level of GDP. If this is the case, accounting for microfinance sector growth should imply that the regression framework should control for the true steady state GDP and the convergence coefficient should increase a hypothesis we test below. Nevertheless, the growth spurt remains temporary within the neo-classical framework.

One standard critique of a regression framework such as equation (1) is the possibility of reverse causality: countries "accept" microfinance because they are experiencing favorable growth opportunities. This criticism is largely unfounded. First, it is simply implausible that governments would correctly identify such favorable growth opportunities and perfectly time the microfinance penetration accordingly. Research on the causes of microfinance (see Ray**,** 1998) mostly find that they must cover the cost of funds, operating costs, loan write-offs and inflation with the income it receives from fees and interest. Second, Ahlin, Lin and Maio (2011) control for growth opportunities by adding an exogenous growth opportunity measure to the growth regressions. The measure employs the ratio of revenues to costs to capture the growth opportunities of the industry mix in which the microfinance's country specializes. Our results, later reported in Tables 2 and 3, remain robust to the addition of this growth opportunities measure.

Dataset Sources

We calibrate data to our econometric model. In this study, we use countries-level secondary data on institutional level (Mix Market, Table 1) and country level (World Development Indicators) collected on 90 countries spanning the 1985-2014 period, to investigate the relationship between microfinance institutions and growth. It is important to account for how we measure our variables.

[2] Because of improved risk sharing.

Determining the size of microfinance system and documenting trends in microloans is no easy task. On the basis of a broad-based definition of microfinance organization that covers different "varieties of microfinance", this study documents substantial cross country variations and persistent microfinance rates among a selection of countries in Africa, America, Asia, and Europe. An important achievement of microfinance is its success in providing uncollateralized loans with relatively low default rates. Microloans are, almost by definition, small and relatively short-term (i.e., one year or shorter), and have high repayment rates. A broad vision of the structure of microcredit can be gleaned from the microfinance information exchange dataset[3], which provides comparable data over 1,834 microfinance institutions in 115 countries, totalling 43.8 billion dollars in gross loan portfolio, 23.7 billion dollars in deposits, and 81.4 million borrowers in 2010. The average loan balance per borrower is 593.1 dollars in 2010, but because loans are typically in poor countries, they are equivalent on average to one-fifth of per-capita gross national income. Moreover, since microfinance is often targeted toward the poorer segments of the economy, the average loan amounts to a substantially larger fraction of the income of actual borrowers.

Two measures of microfinance services are used: "operational self-sufficiency" and "loan portfolio growth". First, operational self-sufficiency, the ratio of annual financial revenue to annual total expense, which equals financial expense plus loan loss provision expense plus operating expense, can be decomposed into three components: financial revenues and costs, losses due to default, and operating costs. These decompositions allow us in some cases to identify the channel through which a given macroeconomic variable affects micro-financial sustainability. Second, to measure microfinance portfolio growth, we use an extensive growth variable: the number of borrowers. We consider an additional measure for intensive growth, the average loan size, to explore the robustness of our measured effects to the dating of micro-financial availability.

Concerning macroeconomic data available for all countries, GDP refers to the measure of real "GDP per capita" from World Bank Development Indicators. For the initial measure, we take the logarithm of its average. Real per capita GDP is available for all countries. As a crude measure of growth, we use the log of GDP per capita adjusted for purchasing power parity which is provided by the World Bank. "Credit to private sector" (divided by GDP) refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. For some countries these claims include credit to public enterprises. "Services value added" (divided by GDP) include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.

Also available for all countries, the others set of control variables are: (i) the "workforce participation rate", which is the proportion of the population ages 15 and older that is economically active: all people who supply labor for the production of goods and services during a specified period ; (ii) "inflation" as GDP deflator (annual %) , which is inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency; (iii) Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. The terms and conditions attached to lending rates differ by country, however, limiting their comparability.

We combine two poverty measures: the "poverty" headcount ratio and the "Gini index". First, poverty headcount ratio at national poverty lines (% of population) is the percentage of the population living below the national poverty lines. National estimates are based on population-weighted subgroup estimates from household surveys. Second, Gini index (World Bank estimate) measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

[3] See Mix Market: *www.mixmarket.org.*

A number of variables intended to capture aspects of the "institutional/political environment" are also included. The Kaufmann, Kraay and Mastruzzi (2009, WGI**)** governance indicators aggregate and normalize a number of existing country ratings along several institutional dimensions. They produce six annual series, in all of which a higher number reflects a more ideal institutional outcome: control of corruption, rule of law, regulatory quality, government effectiveness, political stability/lack of violence, and voice/accountability.

Data on poverty and quality of institutions are characterized by a large amount of missing observations. In some countries, for the period between 1985 and 2000, only a little observation is available, and data are complete only for few countries. To have a balanced database, we decided to fill-in the gaps by eliminating theses 25 countries from dataset.

While most variables do not require further explanation here, it is important to account for how we measure capital stock and factor productivity growth. The growth in the capital stock is equal to aggregate real investment less depreciation in the capital stock divided by the previous year's capital stock. We build per capita physical capital stocks using the method described in Berlemann and Wesselhöft (2014). We derive an initial estimate of the capital stock for 1960, assuming each country is at its steady state capital-output ratio at that time. Then, we use the aggregate real investment series and the perpetual inventory method with a depreciation rate of 7% to compute the capital stock in later years. TFP growth is constructed as in Cette, Kocoglu and Mairesse (2009). Assuming a capital share of 0.3 for all countries, we calculate productivity growth as the difference between the GDP growth rate and 0.3 times the capital stock growth rate.

3. Decomposing the Growth Effect of Microfinance Sector

The Decomposition

Table 2 presents the impact of both operational self-sufficiency (the ratio of revenues to costs) and loan portfolio growth on real per capita GDP, capital stock, and TFP[4]growth. Each regression includes year indicator variables (though these coefficients are not reported). We include, in addition to initial per capita GDP, seventh standard control variables: workforce participation rate (i.e. labor force/population aged 15+), services value added as percentage of GDP (commercial system), private credit to GDP (financial development/microfinance), poverty and inequality, quality of institutions (governance indicators), and inflation (annual percent change in GDP deflator) and interest rates.

We begin with an exploration of the GDP growth effects in the left most column of each group in Table 2. While we concentrate our discussion on the coefficients associated with the microfinance sector variables, the signs on the other coefficients are consistent with the previous literature (Woolley, 2008; Gubert and Roubaud, 2011). The coefficients on initial GDP are negative and highly significant, which is precisely what one would expect from a conditional convergence interpretation (Barro, 1997). The coefficients for all the other variables have the expected sign and are also statistically significant. Turning to micro financial development, the coefficients on operational self-sufficiency and loan portfolio growth are 1% and 5%, respectively. Both coefficients are highly statistically significant. This result may be surprising to some given the fact that some research, such as Ahlin, Lin and Maio (2011), have found lower growth effect associated with microfinance. However, as both Imai et al. (2011) and Janda and Zetek (2013) discuss, Ahlin, Lin and Maio result's reflects that they do not take account endogeneity of key explanatory variables, including the variables on capital stock and productivity factors of the IMF indicator, which is too coarse to be a meaningful gauge of the degree of capital market deepness. Table 2 helps resolve the mixed evidence regarding the growth effects of micro-financing reported by survey articles. These surveys give undue weight to empirical studies which use a problematic measure of microfinance operations.

Table 2 also shows the capital stock and factor productivity growth effects in the two other sets of columns. We find that capital stock growth is significantly associated with both operational self-sufficiency and loan portfolio growth, even in the presence of a banking development variable (private credit divided by GDP). In both sets of regressions, banking development itself is positively and significantly associated with higher capital stock growth. These results are inconsistent with the results in Beck, Levine and Loayza (2000), who fail to find a direct effect of financial development on capital stock growth.

[4] Note that our factor productivity growth measure does not account for human capital accumulation. Including workforce participation as an independent variable is therefore particularly important.

It is reasonable to expect that microfinance prevalence raises factor productivity. Given that the closing of the development gap requires significant improvements in factor productivity, it is important to test the link between factor productivity and availability directly. The remaining columns in Table 2 confirm that the effects of operational self-sufficiency and loan portfolio on factor productivity growth are indeed both large and statistically significant. Decomposing the measured GDP growth effect into the capital stock and TFP growth effects, nearly two-thirds of the overall GDP growth effect is attributable to TFP for both measures of microfinance schemes. Our results suggest that factor productivity cannot be ignored when examining microfinance institutions and growth.

In Table 2, we explore the robustness of the micro-financing effects on GDP, capital stock, and TFP growth. In the first two regressions, we examine the implications of introducing country-fixed effects. Here, we also include a contemporaneous measure of world GDP growth to control for temporal effects, but do not include other control variables. For our full 90 country sample, the inclusion of both country and time indicators leads to a poorly behaved variance-covariance matrix given the dimensionality of the system. For this reason, we employ instead world GDP growth as an alternative control variable for temporal effects. In both cases, the microfinance effects remain large and statistically significant. Again, the bulk of the effect is due to factor productivity gains, and indeed the decomposition provides evidence in favor of a factor productivity channel that is even stronger when country fixed effects are included. In the last two regressions reported in Table 3, we report the results for our alternative (intensive) measure of loan portfolio growth talked above. The first regression repeats the country-fixed effect specification and the second regression repeats the specification including the standard control variable set employed in Table 2. The results, quite similar to but somewhat weaker than the loan portfolio growth effects, buttress the argument that there exists an important effect for loan portfolio on growth, particularly for TFP.

Exploring the Neo-Classical Channels

In the neo-classical model, financial integration does not generate a permanent growth effect. Table 4 presents results where we break up the microfinance expansion effects into two pieces: years 1 through 5, and years 6 and beyond. We explore these effects for both operational self-sufficiency and loan portfolio growth. While the loan portfolio date is known, the date of operational self-sufficiency is not. To identify the operational self-sufficiency date, we define an expansion event as an upward increment of 0.5 or larger in operational self-sufficiency measure that results in the measure then exceeding 1 or 100%[5]. For both sets of expansion dates, fully prevalence countries are associated with the permanent effect as they are indeed prevalence, by definition, and have been so for some time. “Closed” countries are associated with neither a temporary nor a permanent effect, and receive a zero.

We report the temporary and permanent effects with both standard controls as employed in Table 2 and an alternative specification that includes country fixed effects as in Table 3. Across all four specifications, the GDP growth results suggest that the microfinance intervention effect, either the operational self-sufficiency or the loan portfolio growth, is not a purely temporary phenomenon. The coefficients on the variable representing years 6 and beyond, denoted the permanent effect, is always positive and significantly different from zero. The effects for capital stock growth are not uniformly significant across every specification. Somewhat surprisingly, the temporary capital stock growth effect is not uniformly stronger than the permanent effect, but it is for loan portfolio growth where identifying permanent and temporary intervention effect is easier. The permanent factor productivity growth effect is statistically significant in every case, ranging between 49 and 147 basis points per annum.

Another implication of the neo-classical model is that controlling for liberalization should entail a larger conditional convergence coefficient (in absolute terms). That is, once we control for the effect of microfinance institutions on steady-state per capita GDP, we should observe stronger conditional convergence (the coefficient on the initial GDP level). This is indeed what we find. To provide a sense of the evidence, the convergence coefficient is -0.009 for a specification without operational self-sufficiency that is otherwise identical to one we report in Table 2. The conditional convergence coefficient reported in Table 2 is -0.023, substantially larger in absolute magnitude.

[5] Hence, a number greater than 100% indicates that the microfinance has sufficient revenue to cover its costs, including cost of funds, default losses, and operating expenses.

The difference is significant at the 5% level, suggesting the inclusion of the operational self-sufficiency measure is associated with stronger conditional convergence everything else equal. We observe similar effects for our (intensive) loan portfolio growth variables.

Sources of Improved Factor Productivity

The regressions we run are predictive; that is, for the independent variable (a development indicator), we use 5-year averages between *t* and *t*+5. The potential determinants, including microfinance development, are measured at time *t*. These regressions face a number of challenges. First, the independent variables are very persistent, so we include the lagged dependent variable in each specification. Second, we include time effects to potentially control for a general trend towards financial and economic development. For some of the variables, we lose a number of countries so that time effects do exhaust many degrees of freedom. We therefore also comment on an alternative specification replacing time effects by one control variable, world GDP growth. The first specification, including these two sets of controls, is reported in the left-hand side of Table 5.

The specification reported on the right adds a control variable that should assuage concerns about reverse causality and simultaneity. Microfinance sector may happen in countries with lower developed financial systems and institutions or coincide with reforms directly targeting domestic financial development and institutions. Given that we do not have detailed information on reforms, we employ a panel probit on the microfinance success variables, linking them contemporaneously to private credit to GDP, the WGI governance indicators and measurements of the business environment by Doing Business. The loan portfolio growth can be a dummy variable constructed above from Ahlin, Lin and Maio (2011) measure, and we also take the dummy operational self-sufficiency variable. In both versions of the probit specification, we found positive significant coefficients for all four variables, suggesting that the "probability of microfinance revolution" is indeed directly related to other reforms. We then use the estimated probit to compute a probability of microfinance expansion for each country at each point in time, and use that as an additional control variable. Hence, the coefficient on microfinance revolution in the right-hand side of Table 5 can now be interpreted as the effect of the "exogenous" component of microfinance, not linked to pure cross-sectional differences in current levels of development or institutional quality (macro-institutional environment).

We now discuss the results in Table 5. The asterisks on the coefficients in Table 5 indicate that the variable in question is significant at the 5% level in a more parsimonious specification where the time effects are replaced by world GDP growth. First, microfinance loans improve traditional financial markets liquidity, as measured by the financial returns (assets/equity). The coefficients across all specifications are negative but lack strong statistical significance. However, they become highly significant when world GDP growth replaces time effects. This is true for almost all the credit market development measures. Given it is conceivable that there is a general trend towards better developed markets, not necessarily associated with financial performance, we should be cautious in interpreting these results. The microfinance effect on turnover is positive as expected, but loses statistical significance once we focus on the exogenous component of the microfinance revolution. The size of the financial market (measured as the financial expense rate) also increases but not significantly, and once "endogenous" microfinance revolution is controlled for, the effect weakens further. The operating expense ratio[6] (OER) measure for the rest of the financial system deteriorates after micro financial openness. While the OER measure should be inversely related to operation/market efficiency, Hermes, Lensink. And Meesters (2011) discuss how time-variation in the OER measure is sometimes difficult to interpret. For example, it is conceivable that the OER does not include the financial expenses or risk costs (loan loss provisions and write off expenses) incurred by a microfinance. The <8% operating expense ratios of some of the large microfinance might be seen as "best practice" ratios for microfinance; transaction costs relative to loan sizes in microfinance are well known to be substantially higher. A key determinant of the operating expense ratio is the small loan size. As microfinance stabilize in terms of growth and become older institutions, their OER declines as the costs of growth (training staff, opening new branches, reaching new geographical areas) are more limited while their average loan size increases as the number of clients getting the fourth or fifth repeat loan becomes quite high.

Turning to banking sector development, microfinance loans have a positive and significant effect on private credit to GDP.

[6] The operating expense ratio measures the total of these expenses as a proportion of average outstanding portfolio over a one year period.

The results here confirm some disparate results in the literature. Ibrahim Badr-El-Din and Faris Arbab **(**2006**)** also found a significant relationship between financial/commercial market liberalization and microfinance development (both banking and capital market development), and did not find evidence for the reverse link (that is, microfinance development did not necessarily predict financial market liberalization). Ahlin and Jiang (2008) find a link between broad capital market openness and measures of microfinance development in a regression framework that is similar to our first specification with some additional controls.

Concerning institutional quality measures, microfinance does not have a robust effect on our measures of both law and order or the quality of institutions when the world growth variable is used as a control. However, when we use time effects, the coefficients are statistically significant and mostly survive controlling for "endogenous" microfinance operation decisions. While not definitive, this does suggest that the mere presence of informal investors may have wider beneficial effects on the institutions of a country (Finnegan and Singh, 2004). A microfinance activity also appears to significantly predict improvements in the investment profile, which is narrowly associated with law and regulations benefitting investment. The effect disappears for 'exogenous' loan portfolio growth. Finally, microfinance robustly and significantly associated with improved macro-policies using both of our measures, perhaps reflecting a disciplining effect of informal investment. The one exception again is that the effect disappears for 'exogenous' loan portfolio growth for the first "macroeconomic environment" measure.

One interesting hypothesis to help interpret the significant factor productivity growth effects associated with microfinance business is that microfinance may be part of a great reversal Armendáriz De Aghion and Morduch (2010) within countries, leading to generally better policies and institutions. Our results appear consistent with this hypothesis. We not only find direct, "exogenous" positive effects of microfinance movement, but the coefficients on the probability of microfinance revolution are typically also significant, and that variable may indirectly proxy for simultaneous reforms.

As an additional test, we examine whether factor productivity growth increases through an improved efficiency of capital allocation. In the debate about how microfinance development contributes to economic growth, Wurgler (2000) and Fisman and Love (2004)'s work strongly suggest that microfinance development may improve capital allocation. Twaha and Rashid (2012) demonstrate that factor productivity is positively related to the exogenous component of microfinance development. However, Maksudova (2010) show that microfinance sector helps align exogenously available growth opportunities (GO) with actual growth, and that microfinance is more important than either microfinance development or the absence of financing constraints, stressed by Quibria (2012) and Bateman (2013). The Bekaert, Harvey, Lundblad and Siegel (2007) measure of exogenous growth opportunities essentially uses global price to earnings ratios for the industries in which a country specializes, and strongly predicts actual GDP growth. We add depth to their framework to test whether the response of (aggregate) investment (from t to $t + 5$) to growth opportunities (measured at time t) is different in financially open economies. Hence, we are testing an interaction effect: improved domestic allocative efficiency would imply that investment growth responds more strongly to growth opportunities post-revolution.

Table 6 reports the results. We consider three specifications each for operational self-sufficiency (top panel) and loan portfolio growth (bottom panel). The specification on the left is parsimonious. Our regressors include the GO measure, the microfinance institutions measure, and their interaction, in addition to time effects. In this regression, we find that there is no independent microfinance effect on capital stock growth. Microfinance primarily serves to make countries respond better to growth opportunities: the interaction coefficients are positive and statistically significant. In the second specification, we also control for country fixed effects. The interaction effects remain significant, but there is now also an independent effect of loan portfolio on growth. In the third specification, we replace the country fixed effects by the same initial GDP per capita measure used in Table 2, and the effects remain robust, with now intensive portfolio growth also generating independent effects. Adding more control variables does not change these conclusions. Not surprisingly, in all specifications, investment growth in closed countries fails to respond to the global growth opportunities available to their industries.

4. Threshold Effect

Microfinance sector is associated with both capital stock and factor productivity growth. However, we only measure an average effect. It is important to examine the heterogeneity of the effect across different countries.

Ahlin, Lin and Maio (2011) document strong threshold effects in the overall GDP growth response to loan portfolio growth. Here we look at the potential for heterogeneity in the effects associated with the individual growth channels. Table 7 presents the analysis of the microfinance revolution effects on capital stock growth and TFP growth separated by country characteristics. Panel A focuses on the operational self-sufficiency measure and Panel B on the loan portfolio growth.

We measure the heterogeneity across countries in the microfinance institutions effect by breaking up the indicator variable into two pieces:

$$(2) \qquad y_{i,t+5,t} = \alpha Q_{i,start} + \gamma' X_{i,t} + \beta_h micro_{i,t}^{high} + \beta_l micro_{i,t}^{low} + \delta Z_{i,t} + \varepsilon_{i,t+5,5},$$

where $micro_{i,t}^{high}$ denotes the microfinance variable for countries that falls above the median value for certain country characteristics, and $micro_{i,t}^{low}$ is the analogous definition for countries that fall above the median value. The regression also includes the "own-effect" of the characteristic, which is denoted by $Z_{i,t}$. We report the coefficients on the high and low characteristic indicators as well as a Wald test of the null hypothesis that the coefficients are not significantly different from one another. We also report the coefficient on the own effect.

We consider two categories of interaction variables: financial sector variables (private credit/GDP, gross loan portfolio, loan portfolio growth, and the OER measure) and quality of institutions variables (quality of institutions measure, investment profile, law and order, and country credit rating).

We focus the discussion on the operational self-sufficiency measure. The regressions suggest significant heterogeneity in the capital growth regressions with respect to seven of the eight variables considered. The countries with a "high" level of the characteristic (better than average microfinance development and better quality institutions) have a significantly higher capital growth response to microfinance revolution than the countries with a "low" level of the characteristic. For example, the quality of institutions is important for capital stock growth in both "low" and "high" quality of institutions countries. However, the coefficient is **six** times larger for countries that have high quality institutions. While this is perhaps not surprising, it is definitely conceivable that countries with poor institutions and microfinance development may experience the largest drop in the cost of capital and generate large investment responses. In six out of eight cases, the direct effect is positive and statistically significant.

The TFP regressions are also suggestive of heterogeneity; however, the evidence is somewhat weaker. Similar to the results for capital stock growth, the coefficients on the "high" level of the variable are generally greater than the coefficients on the "low" level of the variable, and the high-level coefficients are always statistically significant. However, the difference between the two coefficients is now only significant in **six** cases and significant at the 1% level in only three cases. For example, for quality of institutions, the coefficient in the "low" countries is not significantly different from zero. The coefficient for the "high" countries is significant and 10 times greater than the point estimate for the "low" countries, but the difference is only significant at the 10% level. The results in Panel B for loan portfolio growth are qualitatively similar, but statistically slightly weaker.

Our analysis shows that the particular characteristics of a country often determine the capital stock and factor productivity response to microfinance liberalization. Much more work is needed to disentangle how such interaction effects really arise. Ahlin, Lin and Maio (2011) provide some perspective on the positive interaction effect with financial development for loan portfolio growth using industry data. They find that microfinance revolution relaxes financing constraints and stimulates the creation of new firms only in countries that are relatively well financially developed. They also provide some direct evidence that regulatory barriers and institutional frictions prevent certain firms to take full advantage of microfinance revolution.

5. Microfinance Institutions and Poverty Reduction

An often-heard critique of microfinance institutions is that it increases the macro-economic vulnerability of countries and has no discerning effect on the probability of being below the poverty line (Zaman, 2000; Karlan and Zinman, 2009). An extensive literature on the effects of microfinance development on poverty and inequality finds mixed results (Woolcock, 1999; Hulme, 2000; Ravallion, 2001; Chowdhury, 2009), although the bulk of the evidence does not support a strong increase in real poverty post microfinance liberalization. Here, we focus on the interaction between microfinance and poverty alleviation.

While such poverty reduction may not certainly lead to a permanent output loss (see Ledgerwood, 1998, Chowdhury, 2009, and Armendáriz de Aghion and Morduch, 2010, for an interesting discussion on the effect of microfinance on productivity and long-term growth), they often lead to a dramatic temporary output/income loss (Banerjee et al., 2013).

If microfinance affected poverty, its effects would go through two possible transmission channels. The first refers to its direct effect on economic growth through the poverty headcount ratio at 2 dollars a day (PPP) (% of population living under 2 dollars per day). Indeed, if the development of microfinance services leads to higher economic growth, the latter would imply a uniform increase in income for all the population of a country. The second channel refers to the effect of microfinance on income distribution. If the latter was pro-poor, then income inequality and poverty would fall. Our results are summarized in Table 8.

The first exercise we conduct is to simply include the poverty headcount ratio contemporaneously with the dependent variable in our standard growth regression from Table 2. In Panel A, the poverty coefficient indicates the average annual loss in GDP growth during a crisis year. The estimates are around 1% of GDP per year. The inclusion of this variable does not significantly affect the coefficients associated with microfinance institutions. This is inconsistent with the critique that microfinance systems may take place in areas where poverty is high and hence that the growth effect is biased because of endogeneity effect (Hermes, 2014).

However, the causal relationship between the intensity of microfinance and poverty is bidirectional. It is still possible that microfinance sector interacts with poverty in other ways. The second set of results also includes an interaction effect between poverty and microfinance systems. Interestingly, the results suggest that the output cost of poverty measure with Gini index is larger in less developing. The effect is largest for operational self-sufficiency (estimated to be around **1.5**%) but only borderline significant. For loan portfolio growth, the effect is not significant. Nevertheless, it does appear that there may be a cost to microfinance revolution in the form of high poverty. However, it is important to realize that the temporary output loss due to poverty is outweighed in our sample by the positive growth effects of microfinance revolution. The poverty rates are defined as the as the share of individuals with equivalent disposal income less than 50% of the median for the entire population, so the estimate of the total output loss of poverty in a financially excluded country varies between 10% (operational self-sufficiency) and 5% (loan portfolio growth). However, the output gain of microfinance revolution is to a certain extent permanent. A temporary growth spurt after microfinance revolution of about one year with the per annum effects reported in Table 8 would suffice to offset the output loss induced by poverty.

These results already suggest that scores of poverty happened before microfinance revolution. A case in point is the **S**outh-East Asian economic and poverty crisis that happened many years after microfinance experiences in a number of countries. This raises the possibility that microfinance revolution cause or help cause poverty. In Panel B, we report the results of a panel probit analysis. The left hand side variable is a dummy variable that takes on the value of one if the poverty rate is less than 50%. The independent variables are measured at the beginning of the 5-year period. We only include closed or liberalizing countries in this sample, and the independent variables are the ones employed in the regressions reported in Table 2 plus the political stability index.

We find a number of significant predictors of a poverty decline. First, larger levels of initial per capita GDP, workforce participation, services value added are all strongly associated with a reduced probability of poverty in the self-sufficiency specification, but in the loan portfolio specification only initial GDP remains significant among these variables. Second, larger scores for political stability index (where larger numbers denote higher levels of safety) are also significantly associated with reduced poverty and inequality probabilities. The second column provides an interpretation of the economic significance of the effects by reporting two specific predicted poverty and inequality probabilities. In particular, we evaluate all the variables at their medians except the variable in question, which is evaluated at, respectively, the **25**% and **75**% percentiles in its overall distribution. Clearly, of the explanatory variables discussed so far, economic development, measured using initial GDP per capita, generates the largest spread in poverty and inequality probabilities.

There are two sets of surprising results that are of considerable interest. First, there is no reliably significant relationship between microfinance and the probability of being below the poverty line. The point estimates for both measures are negative. For operational self-sufficiency, the coefficient is more than one standard error below zero. An alternative way to state the result is that the size controls are capturing some effects of persistent macroeconomic growth. If well managed, programs that target the very poor can also become financially sustainable.

The burden is therefore on other microfinance to develop products and services that will meet the needs of the very poorest if the social mission of microfinance is to be achieved. Microfinance therefore needs to improve their depth and breadth of outreach. Simanowitz and Walter (2002) suggested that microfinance must design appropriate products based on the needs of the poorest and they must ensure such products are delivered in a cost-effective manner.

Second, there is a significantly positive relationship between the private credit to GDP ratio and the probability of being below the poverty line, which is economically very important as well. In unreported results, we further explore this positive relation. We split up the private credit to GDP observations into three bins using the full cross-sectional and time-series distribution: observations below the 25th percentile, between the 25th and 75th percentiles, and observations greater than the 75th percentile. In the lowest private credit to GDP group, the sign is negative but not significant. It makes sense that countries with little or no banking are unlikely to experience a poverty state. Both the middle and highest private credit to GDP variables have positive and significant coefficients. Interestingly, the coefficient on the highest banking intensity is double that of the medium intensity. This suggests a strong non-linear effect. Excessive credit growth may lead to an increased probability of being below the poverty line.

Microfinance fails to set the basics for an economy to reach development as a whole through globalization? The current upheaval of global financial markets and world-wide recession beckons the blame game and at the top of the list is globalization. Our results provide an alternative perspective. Microfinance alone is not an important predictor in our poverty probability report. However, our evidence points to a non-linear role for the size of private credit. When we re-estimate our model in Table 5 with a quadratic term on private credit to GDP, it is strongly significant.

6. Conclusion

In this paper, we study the relation between microfinance institutions, productivity and economic growth. Two channels of growth are distinguished: capital stock growth and TFP growth. We have presented some empirical evidence consistent with the predictions. We find that microfinance sector positively impacts both of these channels, but has a greater impact on factor productivity than investment. Hence, we are able to reconcile the relatively large GDP growth response to microfinance sector and the relatively modest increase in investment.

We investigate whether the growth effects are permanent or temporary. The neoclassical model of growth suggests a temporary effect. Our estimations show both temporary and permanent effects both in the growth of the capital stock and TFP. We provide some insights into the channels of these permanent effects, showing that microfinance sector is associated with future improvements in finance development, institutional quality and macroeconomic policies. These results are mostly, but not always, robust to controlling for simultaneous reforms, but are somewhat sensitive to how we control for time effects. This insight seems particularly useful to policy makers considering regulatory reforms.

We also show that both capital stock and productivity growth display heterogeneous effects. Intuitively, it does not make sense that all countries respond in the same fashion to an microfinance revolution – whether in the self-sufficiency or the loan portfolio. Our analysis shows that the initial country-specific characteristics of the microfinance sector and the quality of institutions significantly drive the size of the growth response in both capital stock and factor productivity. The pre-existing environment into which reforms are introduced is critical.

Finally, we address the currently relevant question of whether microfinance prevalence is worth it if it renders a country more sensitive to poverty and inequality. When we control for poverty, the microfinance effect in our growth regression remains robust. This establishes that recovery from poverty is not somehow inducing a spurious relation between microfinance institutions and growth. More importantly, a panel probit analysis shows that microfinance does not significantly influence the probability of being below the poverty line (and the point estimates are, in fact, negative). Indeed, our probability of poverty model points to the leverage that the banking sector itself employs as a critical determinant of poverty. We find a strong non-linear relation between poverty and the size of the banking sector. When the level of private credit becomes exceptionally large as compared to GDP (presumably via leverage), this greatly increases the probability of being below the poverty line.

Our work, together with the mounting micro-oriented evidence is consistent with the notion that microfinance institutions have indeed improved growth prospects for most countries. Ultimately, firm-specific evidence should yield more powerful tests and finer detail on how productivity is enhanced through microfinance.

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TABLES

Table 1: Description of the panel, number of countries (total observations)

	Low income	**Middle income**	**High income**	**Total**
East Asia and the Pacific	4 (54)	6 (93)	-	10 (147)
Europe and Central Asia	3 (40)	15 (225)	2 (26)	19 (291)
Latin America and the Caribbean	3 (13)	16 (239)	1 (13)	18 (266)
Middle East and North Africa	1 (13)	6 (94)	-	7 (107)
South Asia	1 (53)	2 (26)	-	5 (79)
Sub-Saharan Africa	25 (371)	6 (93)	-	31 (465)
Total	37 (544)	51 (772)	3 (39)	90 (1355)

Notes: The primary data source for microfinance variables comes from the Microfinance Information eXchange (MIX): http://www.mixmarket.org/Data_Review_Process. The database contains indicators by institutions, for the country-level analysis. We construct a panel taking time averages of 1355 microfinance pooling them to 90 countries.

Table 2: Microfinance institutions and growth components

	Operational self-sufficiency			**Loan portfolio growth**		
	GDP growth	Capital stock growth	TFP	GDP growth	Capital stock growth	TFP
Constant	-0.440 (2.137)	-0.447 (0.131)	-0.788 (0.913)	-0.660 (0.504)	-0.265 (0.443)	-0.004 (0.613)
Initial GDP	-0.023 (0.691)	-0.033 (0.427)	-0.041 (0.728)	-0.033 (0.119)	-0.074 (0.765)	-0.002 (0.745)
Workforce participation rate	0.003 (0.378)	-0.006 (0.210)	0.001 (0.630)	-0.003 (0.900)	0.003 (0.449)	0.002 (0.954)
Services value added	0.052 (0.371)	0.012 (0.451)	0.061 (0.554)	-0.024 (0.499)	0.093 (0.972)	0.073 (0.953)
Inflation rate	0.016 (0.136)	0.072 (0.121)	0.105 (0.066)	0.068 (0.880)	0.0769 (0.713)	0.091 (1.790)
Interest rate	0.005 (0.199)	0.002 (0.105)	0.0042 (0.017)	0.001 (0.042)	0.009 (0.241)	0.001 (0.237)
Private credit/GDP	0.011 (0.060)	0.025 (0.134)	0.0141 (0.099)	0.044 (0.271)	0.022 (0.074)	0.008 (0.126)
Size of microfinance	0.179 (0.427)	0.138 (0.331)	0.094 (0.310)	0.074 (0.263)	0.072 (0.120)	0.042 (0.249)
Contribution to growth	-	31.7%	63.4%	-	35.9%	60.1%

Notes: The dependent variables are the overlapping five-year average growth rate of real per capita GDP, the growth rate of the real capital stock, and TFP growth. We report coefficient estimates from pooled OLS regressions. All standard errors (in parentheses) provide a correction for cross-sectional heteroskedasticity and account for the overlapping nature of the data. We also include a percentage decomposition of the microfinance effect on GDP growth into capital stock accumulation and TFP (it does not sum to 100% due to rounding). The capital stock component is calculated as 0.3, the assumed capital share, multiplied by the reported microfinance effect for capital stock growth. The TFP component is the reported microfinance effect in the factor productivity regression.

Table 3: Microfinance institutions and growth components: robustness

	GDP growth	Capital stock growth	TFP
Operational self-sufficiency (fixed effects)	0.012 (0.096)	0.014 (0.079)	0.002 (0.011)
Contribution to growth	-	15.3%	80.7%
Loan portfolio growth – 1st measure (fixed Effects)	0.011 (0.034)	0.013 (0.030)	0.012 (0.067)
Contribution to growth	-	8.5%	91.5%
Loan portfolio growth – 2nd measure (fixed Effects)	0.003 (0.068)	-0.002 (0.084)	0.001 (0.021)
Contribution to growth	-	-2.3%	99.3%
Loan portfolio growth – 2nd measure (standard controls)	0.017 (0.035)	0.012 (0.062)	0.026 (0.081)
Contribution to growth	-	28.5%	72.5%

Notes: We consider robustness of the effects reported in Table 2 to specifications that instead include country fixed effects and contemporaneous world GDP growth. To explore robustness to alternative measures of microfinance, we also consider the identical specifications employed in Table 2 for loan portfolio. Given data limitations, the operational self-sufficiency regressions include 73 countries and the loan portfolio growth regressions include 90 countries.

Table 4: Microfinance institutions and growth components: temporary versus permanent effects

	GDP growth	Capital stock growth	TFP
Operational self-sufficiency (standard controls)			
Temporary effect	0.031 (0.056)	-0.029 (0.027)	0.044 (0.090)
Permanent effect	0.003 (0.026)	0.005 (0.006)	0.001 (0.008)
Operational self-sufficiency (fixed effect)			
Temporary effect	0.031 (0.098)	0.073 (0.073)	0.079 (0.027)
Permanent effect	0.003 (0.078)	0.009 (0.034)	0.012 (0.011)
Loan portfolio growth (standard controls)			
Temporary effect	0.023 (0.085)	0.072 (0.031)	0.077 (0.059)
Permanent effect	0.052 (0.038)	0.033 (0.092)	0.078 (0.082)
Loan portfolio growth (fixed effect)			
Temporary effect	0.055 (0.002)	0.005 (0.094)	0.002 (0.002)
Permanent effect	0.029 (0.059)	0.006 (0.004)	0.025 (0.038)

Notes: The dependent variables are the overlapping five-year average growth rate of real per capita GDP, the growth rate of the real capital stock, and TFP growth. We report temporary and permanent effects from microfinance defined as the first five years after an availability event and the six plus years beyond, respectively. We report the effects with standard controls and time effects and country fixed effects and the contemporaneous world GDP growth rate.

Table 5: The effect of Microfinance institutions on financial development, institutions, and macroeconomic policies

	Operational self-sufficiency	**Loan portfolio growth**	**Operational self-sufficiency**	**Loan portfolio growth**
Financial market development				
Financial returns	-0.057* (0.054)	-0.047* (0.035)	-0.069* (0.064)	-0.063* (0.060)
	-	-	0.092 (0.053)	-0.046 (0.052)
	42	44	41	44
Gross loan	0.062* (0.041)	0.072* (0.025)	0.058* (0.042)	0.024* (0.094)
	-	-	0.028 (0.031)	0.027 (0.022)
	53	56	52	55
Operating expense	0.095* (0.052)	0.038* (0.001)	0.031* (0.082)	-0.008* (0.070)
	-	-	0.190 (0.027)	0.104 (0.028)
	61	66	57	63
Banking development				
Private credit	0.090* (0.010)	0.055* (0.002)	0.036* (0.013)	0.033* (0.009)
	-	-	-0.007 (0.046)	0.006 (0.007)
	74	89	66	75
Institutions / Corporate governance				
Quality of institutions	0.091* (0.012)	0.035* (0.010)	0.048 (0.052)	0.064 (0.009)
	-	-	0.083 (0.015)	0.276 (0.023)
	68	89	66	75
Investment profile	0.016* (0.020)	0.040* (0.013)	0.047* (0.016)	-0.002* (0.008)
	-	-	0.098 (0.020)	0.154 (0.083)
	68	89	66	75
Law and order	0.030 (0.007)	0.017 (0.006)	0.016 (0.001)	0.030 (0.003)
	-		0.009 (0.007)	0.063 (0.005)
	68	89	66	75
Macroeconomic environment	0.067* (0.033)	0.067* (0.009)	0.095* (0.030)	0.010* (0.004)
	-	-	0.070 (0.013)	0.010 (0.013)
	68	89	66	75
Country credit rating	0.094* (0.009)	0.043* (0.008)	0.047* (0.006)	0.001* (0.009)
	-	-	0.037 (0.004)	0.099 (0.006)
	68	89	66	75
Cost / Procedures to start business	0.121 (0.025)	0.011 (0.016)	0.128 (0.073)	0.040 (0.036)
	-	-	0.035 (0.010)	0.135 (0.007)
	69	89	66	75

Note: The variables of interest are separated into measures of finance market development, banking development, and institutions / corporate governance. As controls, we employ the lagged dependent variable, year effects, and in the right most columns the predicted probability. An asterisk (*) indicates that the coefficient is statistically significant in the alternative regression where time effects are replaced by contemporaneous world GDP growth.

Table 6: Microfinance institutions and allocative efficiency

	Year effect	**Year and country effects**	**Year and initial GDP**
Global growth opportunities	-0.033 (0.017)	-0.006 (0.008)	-0.037 (0.013)
Global growth opportunities * Operational self-sufficiency	0.030 (0.011)	0.077 (0.009)	0.027 (0.010)
Operational self-sufficiency	-0.007 (0.002)	0.011 (0.004)	0.020 (0.004)
Global growth opportunities	-0.053 (0.011)	-0.002 (0.006)	-0.001 (0.008)
Global growth opportunities * Loan portfolio growth	0.061 (0.007)	0.015 (0.004)	0.015 (0.008)
Loan portfolio growth	0.002 (0.001)	-0.001 (0.009)	0.006 (0.002)

Notes: The dependent variable is the overlapping five-year average growth rate of real per capita capital stock growth. We report the coefficients on exogenous growth opportunities available to each country, microfinance, and their interaction. In column (1), unreported year effects are also included. In column (2), unreported year and country fixed effects are also included. Finally, in column (3) unreported year effects and the initial level of GDP are also included.

Table 7: Heterogeneity of the capital stock and TFP growth effects

Panel A: Operational self-sufficiency

	Number of countries	**Capital stock growth**			**TFP**		
		From low level	From high level	Direct effect	From low level	From high level	Direct effect
Financial sector							
Private credit/GDP	73	0.011 (0.002)	0.088 (0.003)	0.010 (0.008)	0.005 (0.002)	0.035 (0.008)	0.001 (0.008)
Financial returns	61	-0.001 (0.005)	0.027 (0.009)	0.009 (0.002)	0.008 (0.007)	0.060 (0.003)	0.033 (0.007)
Gross loan	60	0.013 (0.005)	0.018 (0.004)	0.007 (0.006)	0.090 (0.003)	0.002 (0.038)	-0.005 (0.009)
Operating expense	44	-0.003 (0.004)	0.012 (0.009)	-0.004 (0.003)	0.084 (0.008)	0.091 (0.003)	0.011 (0.007)
Quality of institutions							
Quality of Institutions	68	0.009 (0.002)	0.022 (0.003)	0.090 (0.004)	0.010 (0.031)	0.012 (0.004)	0.013 (0.004)
Investment profile	68	-0.007 (0.002)	0.012 (0.007)	0.035 (0.039)	-0.008 (0.002)	0.015 (0.003)	0.034 (0.007)
Law and order	67	0.009 (0.002)	0.018 (0.003)	0.077 (0.033)	0.0011 (0.003)	0.008 (0.004)	0.011 (0.030)
Country credit rating	69	-0.004 (0.008)	0.011 (0.006)	0.019 (0.001)	0.001 (0.007)	0.018 (0.003)	0.025 (0.003)

Notes: For each interaction variable, we separately conduct regressions that have the five -year average growth rate of the real capital stock and TFP as the dependent variables. We include in the regressions the same control variables presented in Table 2. We estimate interaction effects between microfinance and the financial sector and quality of institutions variables. We report the associated impact of growth from microfinance for a country with a low level (below the median of the associated interaction variable) and with a high level (above the median of the associated interaction variable). We also allow for a direct effect on growth associated with the interaction variable. Last, we provide the significance of a Wald test, for which the null hypothesis is that the high -low effects are equivalent.

Panel B: Loan portfolio growth

	Number of countries	**Capital stock growth**			**TFP**		
		From low level	From high level	Direct effect	From low level	From high level	Direct effect
Financial sector							
Private credit/GDP	89	0.010 (0.002)	0.011 (0.002)	0.001 (0.008)	0.001 (0.002)	0.010 (0.001)	-0.003 (0.006)
Financial returns	68	0.006 (0.001)	0.011 (0.002)	0.013 (0.002)	0.005 (0.001)	0.008 (0.009)	0.004 (0.007)
Gross loan	68	0.009 (0.001)	0.008 (0.020)	0.005 (0.002)	0.006 (0.004)	0.005 (0.008)	-0.006 (0.008)
Operating expense	44	0.007 (0.005)	0.015 (0.002)	-0.050 (0.002)	0.001 (0.002)	0.006 (0.001)	0.009 (0.003)
Quality of institutions							
Quality of institutions	80	0.003 (0.002)	0.013 (0.003)	0.003 (0.004)	0.001 (0.002)	0.006 (0.004)	0.064 (0.004)
Investment profile	81	0.001 (0.011)	0.019 (0.003)	0.027 (0.004)	-0.003 (0.001)	0.008 (0.005)	0.015 (0.003)
Law and order	80	0.009 (0.002)	0.015 (0.007)	0.034 (0.003)	0.003 (0.002)	0.006 (0.007)	0.016 (0.003)
Country credit rating	67	-0.004 (0.008)	0.013 (0.002)	0.0213 (0.0014)	-0.027 (0.001)	0.004 (0.020)	0.006 (0.008)

Table 8: Microfinance institutions and poverty

Panel A: Crises/growth effects of poverty (5-year GDP growth)

	Operational self-sufficiency	**Loan portfolio growth**
	68	83
Poverty	-0.039 (0.002)	-0.044 (0.020)
Microfinance size	0.043 (0.009)	0.008 (0.004)
Poverty	-0.002 (0.005)	-0.033 (0.005)
Microfinance size	0.057 (0.008)	0.010 (0.002)
Interaction	-0.015 (0.006)	-0.005 (0.006)

Panel B: Does microfinance institutions reduce poverty? (Panel probit on 5-year poverty indicator)

	Operational self-sufficiency		**Loan portfolio growth**	
	68		83	
	Coefficients	25th / 75th percentiles	Coefficients	25th / 75th percentiles
Constant	-9.169 (5.338)	-	0.334 (3.536)	-
Initial GDP	-0.558 (0.205)	0.080 0.002	-0.504 (0.171)	0.097 0.004
Workforce participation rate	-1.592 (0.434)	0.020 0.005	-0.612 (0.444)	0.040 0.017
Services value added	3.308 (1.894)	0.006 0.050	0.021 (0.493)	0.513 0.022
Inflation rate	0.168 (0.307)	0.027 0.029	-0.055 (0.275)	0.029 0.079
Interest rate	2.781 (0.383)	0.008 0.874	2.493 (0.367)	0.010 0.763
Private credit/GDP	-2.035 (0.711)	0.044 0.031	-2.009 (0.766)	0.051 0.014
Microfinance size	-0.356 (0.300)	0.023 0.014	-0.046 (0.128)	0.025 0.054