

Mediation effect of interest rates on MFIs' financial performance

1. Introduction

The primary objective of MFIs is to alleviate poverty through a combination of small loans and other financial services, such as savings accounts, training, health services, networking, and peer support. This objective is what distinguishes MFIs from traditional banks (Anton, 2014; Microcredit Summit Campaign, 2017). To this end, initially, MFIs were mainly funded by donors and governments, with below market granted rates which were meant to reach the base of the pyramid (BOP) customers. At that time, given the fact that their main revenue was generated through donations and subsidies, cost control was not a significant concern (Louis, Seret, & Baesens, 2015). However, during the 90's, many donors began to worry about the continuous subsidies given to MFIs. This began a trend of only supporting new MFIs and not sustaining existing ones during their operational life (Morduch, 1999). This decision placed a concern on MFI managers to reach sustainability. At the same time, the environment in which MFIs operated became very competitive, which forced them to improve management (Pinz and Helmig, 2014).

This push for sustainability, among other factors, was the beginning of what we know as mission drift. In particular, MFIs started increasing margins and maximizing profit by charging higher interest rates to the poorest customers, which is known as the "poverty penalty" (Cuellar-Fernandez, Fuertes-Callén, Serrano-Cinca & Gutiérrez-Nieto, 2016; and Prahalad and Hammond, 2002). As an example of the poverty penalty, Appendix 1 shows the interest rate proxy of average nominal yield on gross loan portfolio, by region and country, from which we can see, for example, that in 2015 some MFIs, in Mexico, charged interest rates of up to 103%¹. These MFIs argue that because loans are small in the region, they incur higher costs to serve such a small segment of the population and that this is the main cause of high interest rates² (see Appendix 2); besides Ramirez, Cruz and Venegas (2015) found that, particularly in Mexico, a more competitive environment caused an increase in operating costs and this was reflected in interest rates since MFIs, specially the small ones, were not able to achieve economies of scale.

¹ Nominal yield on gross loan portfolio reported for Provident (Mexican MFI) in 2015. Statistic taken from the MIX Market Intelligence database. It is important to mention that MFIs do not voluntarily report the interest rates they charge so we took the yield on gross loan portfolio as a proxy of the interest rate.

² Facts based on a PRODESARROLLO study, (PRODESARROLLO Finanzas y Microempresa A. C. is a Mexican private association that gathers financial service providers whose objective is to contribute to social development).

Likewise, Dorfleitner and von Mosch (2011) suggest that the high interest rates charged by MFIs are triggered by high staff and operating costs and Mosley and Hulme (1998) found that those MFIs that set interest rates relatively higher, are more likely to survive in a competitive market, especially because high interest rates tend to deter borrowers with projects with lower rates of return. In particular, Bruton, Khavul & Chavez (2011) found that developed countries charge lower interest rates than those in developing economies, and MacFarquhar (2010) suggested that the high interest rates in Latin America essentially reflect the costs of reaching the poorest customers. However, Mazumder and Lu (2015), reinforce mission drift theory with their study of a sample of the rural population in Bangladesh which found that the interest rate for microcredits was the most important factor for improving the borrowers' quality of life.

According to Cuellar-Fernandez et al. (2016) and Prahalad et al. (2002), interest rates are driven by operating expenses, consequently the MFI's objective should be to reduce margins and lower interest rates to make them more accessible to the BOP borrowers. They also suggest that operating expenses should be addressed in order to reduce interest rates. Thus, the cost per borrower (measured as a percentage of the average loan per borrower) reaches 44% in some countries, while in other more developed countries, the cost per borrower accounts for only 9% (see Appendix 3).

Given the importance of interest rates on the financial performance of MFIs, and how interest rates can be a consequence of mission drift, in this study we analyze the effect of interest rates on financial performance. The difference between this study and previous studies of the relationship between interest rates and financial performance, is that while those studies analyze a direct relationship between these two variables, our study analyzes the indirect effect. Other studies have found that financial performance is the result of many different factors that interact both inside and outside MFIs (Gutierrez-Nieto, Serrano & Molinero, 2009). In addition, Ledgerwood (1999) states that financial performance is a combination of profitability and portfolio quality which depends on a combination of factors such as productivity, leverage and the external environment. We hypothesize that, some of these factors have first an effect on interest rates, and then on financial performance.

Based on Qian and Strahan (2007), who showed that the lowest interest rates were found in countries with better investors and creditor protection rights, we analyze interactions

between external environment factors and financial performance, with interest rates as a mediator variable. Also, based on Tchakoute-Tchuigoua (2014), who found that the institutional environment (corruption index, creditor rights index, financial sector development, and economic growth of the country capital structure) plays an important role as an external factor which impacts financial performance, we analyze the effect of the external environment on financial performance through interest rate as a mediator variable. Finally, and also based on previous studies, we analyze interest rates as a mediator variable between financial performance and the MFI's internal factors, like operational costs (Arnone et al, 2012; Tchakoute-Tchuigoua, 2010), MFI size (Cull, Demirgüç-kunt & Morduch 2011; Bogan, 2012) and MFI age (Cotler y Rodríguez, 2008; Hermes, Lensink & Meesters, 2011; Cull, Demirgüç-kunt & Morduch, 2014).

To that end, we use Structural Equation Modeling (SEM) to test whether capital structure, environment (corruption, rule of law and government inefficiency), operating efficiency and MFI size have an indirect effect on financial performance (measured as ROE, ROA and OSS), with interest rate as the mediator channel or variable. According to Gunzler, Chen, Wu & Zhang (2013), SEM is the most appropriate way to test complex multilevel mediation models, mainly due to the necessity of testing the dual role of the mediator variable, which acts as both cause and effect. Therefore, we believe that this paper contributes to the literature on MFIs in the following way: i) we use a methodology, SEM, that allows us to show not only direct but indirect effects, and also to measure reciprocal effects; ii) we built several measures of the dependent and independent variables (constructs) by using more than one variable and taking into account the literature on MFIs. The paper is structured as follows: first we present the data and methodology, then we present results, and last we offer some conclusions.

2. Data and methodology

The information used to test our hypothesis was obtained from the MIX Market Intelligence database, for 2015, which gives information from 545 MFIs from around the world (see Appendix 4). First, in order to get a full data sample and use a Structural Equation Model (SEM) to describe the relations between different variables that affect financial performance, we filter the information.³ In addition, to test whether the size of

³ For more on the Structural Equation Model (SEM) methodology and its benefits, see Ramírez, Cervantes and Bernal (2017).

the sample is sufficient to run the analysis, we use the Suhr (2006) criteria, which states that the sample should be at least five times the number of independent variables employed. This is met by our sample. In Appendix 5 we define the variables we use for our analysis.

When we wish to measure economic or social phenomena that are not observable, econometric analysis uses what is referred to as proxy variables to approximate these values. In SEM, phenomena that cannot be measured directly, but are indicated or inferred by other observable variables, are referred to as latent constructs. In order to build the constructs, we use the methodology of latent variables proposed by Jarvis, Mackenzie and Podsakoff (2003). The constructs that we built are: i) profitability, which is comprised of variables ROE, ROA and OSS. This mix was proposed by Gutiérrez-Goiria and Unceta in 2015; ii) environment, which has been included because according to Cull et al. (2011), both the regulatory environment and institutional development have an important impact on MFIs. As variables of this measure, we use the KKM indicators (Kaufmann, Kraay, and Mastruzzi, 2007) which include control of corruption, rule of law and government effectiveness; iii) capital structure, which includes equity and interest expenses. Although it is common practice to use the debt to equity ratio, Pati (2014) justifies the use of these indicators as capital structure measures, as they include interest expenses and equity book value; iv) size, which is comprised of employed staff and active borrowers. These variables were used by Cotler and Rodríguez (2008) and Cull et al. (2011), while Pati (2015) uses these variables as indicators of outreach; v) operating efficiency, which is made up of operating expenses, personal expenses and administrative expenses as a proportion of the credit portfolio. Finally, we included the real yield on gross loan portfolio as a proxy of the interest rate the MFI charges; this same approach was used by Cull, Demirgüç-kunt & Morduch (2007) and Bos and Millone (2015) among others who studied the relationship between operating expenses and interest rates. In order to verify the construction of the latent variables, we run an exploratory factor analysis (EFA). To that end, we use the methodology proposed by Jarvis et al. (2003). Results are shown in Table 1.

Table 1
Exploratory Factor Analysis

Items	Financial Performance	Environment	Capital Structure	Size	Operating Expenses	Interest Rates
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ROA		<i>.944</i>				
OSS		<i>.886</i>				
ROE		<i>.849</i>				
KKM5			<i>.939</i>			
KKM6			<i>.901</i>			
KKM3			<i>.878</i>			
COST_FUNDING				<i>.917</i>		
EQUITY				<i>.912</i>		
LogACTIVEBORR					<i>.931</i>	
LogPERSONNEL					<i>.927</i>	
OPEXP_PORT						<i>.971</i>
PERSEXP_PORT						<i>.909</i>
ADMEXP_PORT						<i>.883</i>
REAL_YIELD						<i>.964</i>
Cronbach's Alpha	<i>.739</i>	<i>.890</i>	<i>.705</i>	<i>.949</i>	<i>.885</i>	
KMO	<i>.704</i>	<i>.703</i>	<i>.500</i>	<i>.500</i>	<i>.476</i>	
Bartlett's chi-square	<i>1029.919***</i>	<i>1058.583***</i>	<i>718.542***</i>	<i>951.178***</i>	<i>2371.754***</i>	
% of explained variance	<i>82.43%</i>	<i>82.90%</i>	<i>92.84%</i>	<i>95.46%</i>	<i>88.77%</i>	
COMPLETE MODEL						
KMO	<i>.621</i>					
Bartlett's chi-square	<i>6922.075***</i>					
% of accumulated explained variance	<i>89.31%</i>					
Factor's share of explained variance	<i>19.24%</i>	<i>17.98%</i>	<i>17.83%</i>	<i>13.75%</i>	<i>13.38%</i>	<i>7.12%</i>

*** p < 0.01

Note: numbers in italics indicate factorial loads of each variable in the factor

Source: Author

As can be verified in Table 1, consistency was proved using Cronbach's alphas and Kaiser-Meyer-Olin (KMO) tests, according to Nunnally's (1978) methodology, and the results were positive for all factors. After this analysis, the measurement model must be confirmed and the correlations among variables in each factor should be tested. In this case, all correlations in each factor were significant at the 99% level and all factor loading were larger than 0.80, which indicates that a large proportion of the variance is captured in each construct.

As was previously mentioned, the spirit of this study is to analyze if interest rates are a second level mediator variable for environment, capital structure operating efficiency, size and financial performance. The purpose of this mediation analysis is to determine how or why interest rates and operating expenses affect financial performance. Although

the answer may seem logical, the approach using SEM shows the extent of the effect of the mediation on environment, size, and capital structure of the MFIs.

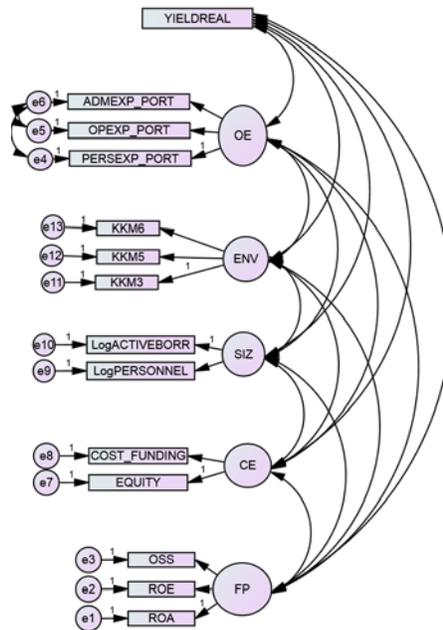


Figure 1. Measurement model, financial performance

Source: author, using AMOS software

Once we decided to use real yield on gross loan portfolio as a proxy measure of interest rates, we created the measurement model and verified its validity (see Figure 4). Following Lei and Wu (2007), we used the normed fit index (NFI) and comparative fit index (CFI) to test validity (see Table 2). In all three cases we obtained values above 0.90, which indicates that the measurement model is valid. It is important to note that although Hu and Bentler (1995) recommended testing using chi-square (which should be not significant) and its quotient divided by the degrees of freedom (which should be below 2), Lei and Wu (2007) responded by pointing out that these two methods may give false validity results if the sample size turns out to be bigger.

Table 2
Goodness of fit, financial performance

Items	AVE	CR
Financial performance	.745	.897
Capital structure	.857	.923
Size	.949	.973
Environment	.752	.900
Operating efficiency	.869	.952
Chi square (CMIN)	403.696***	

CMIN / DF	6.618
CFI	.955
GFI	.906
NFI	.947
RMSEA	.102

*** p < 0.01

Source: author

Also, in Table 2 we show the goodness of fit test (GFI), as suggested by Joreskog and Sorborn (1997), and the RMSEA according to Steiger and Lind (1980). The former must be over 0.9 and the latter under 0.8. Our model fits with the GFI, but not with the RMSEA. Feinian, Curran and Bollen (2008) conclude that using a single goodness-of-fit measure of a model is not appropriate and other supporting goodness-of-fit measures must be provided. In conclusion, our model seems to have an adequate goodness-of-fit.

Next, we verified convergent and discriminant validity using Orozco-Gomez's (2016) methodology. Thus, we extracted the average variance (AVE) of each variable in the constructs. As shown in Table 3, the results confirm that our model has convergent and discriminant validity.

Table 3

Discriminant validity

	FP	CE	SIZ	OE	ENV
Financial performance (FP)	0.745				
Capital structure (CE)	0.003	0.857			
Size (SIZ)	0.004	0.218	0.949		
Environment (ENV)	0.088	0.048	0.000	0.752	
Operating expenses (OE)	0.005	0.001	0.019	0.000	0.869

Source: author

3. Results

Finally, we wanted to include one variable that could reflect the outreach as a part of the equation and to test its effect on the financial performance of the MFIs. Average loan balance per borrower expressed as a percentage of GNI per capita has been used in many studies as an indicator of the depth of outreach of MFIs (Vanroose and D'Espallier, 2013) under the assumption that the smaller the loan is, the lower the population segment is that is served. Cull et al. (2007 and 2009) and Nwachukwu (2014) have tested its effect as an

independent variable that explains financial performance of the MFIs. Figure 5 shows the proposed model for evaluation.

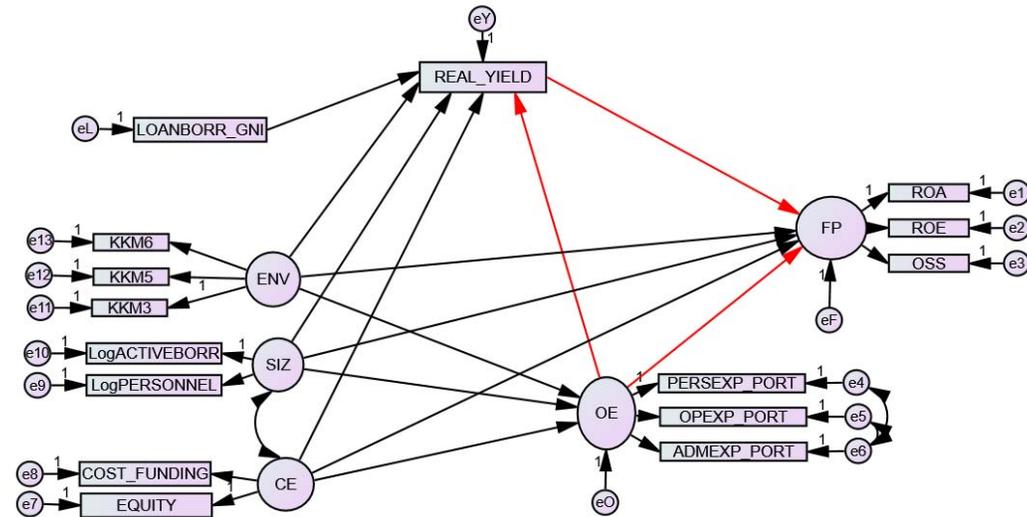


Figure 2. Structural model, financial performance

Source: author, using AMOS software

It is important to mention that in order to test multilevel mediation, it is suggested to obtain the direct effects of each variable on financial performance (Gunzler, et al. 2013). These authors suggest that the direct effect between the endogenous factors and the output is not significant until the mediator variable makes the total effect significant. When we tested the direct effects (see figure 6), we found that the only factors that are significant estimators of financial performance, are operating expenses and real yield. The first finding is consistent with the results found by Ramírez et al. (2017) and the second is consistent with the findings of Cull et al (2007, 2009 and 2014). In addition, this implies that our mediator variable, the interest rate proxy, has an effect on financial performance. However, this effect may be biased due to the lack of other factors such the environment, size, and capital structure of the MFI, which is why we do include them but as a cause of the mediator variables.

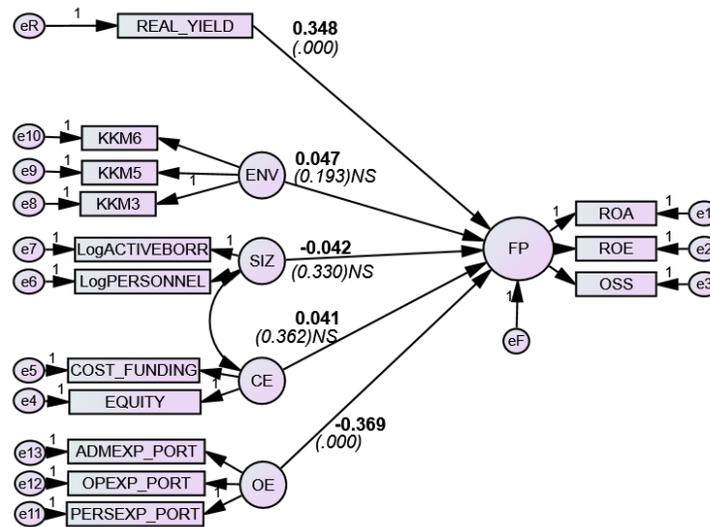


Figure 6. Direct effects, financial performance

Source: author, using AMOS software

Other direct effects that are relevant for our analysis are the effect of environment, size, and capital structure on interest rates and yield. Those effects are reflected in Table 4, where we also present the effect on operating expenses:

Table 4

Direct effects of the exogenous factor over mediator variables

	OP	REAL YIELD
Environment	-0.014 (0.739)NS	-0.064 (0.009)***
Size	-0.108 (0.005)***	0.065 (0.016)**
Capital Structure	-0.291 (0.000)***	0.019 (0.544)NS
Operating Expenses		0.828 (0.000)***
Average loan per borrower / GNI per capita		-0.084 (0.000)***

NS: not significant

** : significant at 95%, *** 99%

Source: author

In order to verify the change in the coefficients and their significance, we use the multilevel mediation analysis, employing the causal steps procedure proposed by Preacher and Hayes (2008). The methodology consists of testing each of the factors against one mediator variable/factor (OE and Real_Yield) at a time. We also tested the

mediation using a bootstrap analysis. According to Preacher and Hayes (2008), bootstrap analysis is superior because it is not affected by symmetry and normalcy of the sample, nor by the restrictions of residual covariances. The results of both analyses are in Table 5.

Table 5
Mediation effect on financial performance

Relations	Direct Effects	Relations	Total effect with mediation (Causal)	Indirect Effect (Bootstrap)	Result
ENV-FP	0.047 (0.193)NS	ENV-REAL YIELD-FP	0.104 (.004)***	-0.010 (0.012)**	Full mediation
		ENV-OE-FP	0.099 (.005)***	0.003 (0.025)**	Full mediation
SIZ-FP	-0.042 (0.330)NS	SIZ-REAL YIELD-FP	-0.082 (.064)*	0.006 (0.017)**	Full mediation
		SIZ-OE-FP	-0.073 (.098)*	-0.001 (0.511)NS	Partial mediation
CE-FP	0.041 (0.362)NS	CE-REAL YIELD-FP	0.005 (0.910)NS	0.000 (0.697)NS	No mediation
		CE-OE-FP	0.000 (0.994)NS	0.064 (0.008)***	Partial mediation
OE-FP	-0.369 (.000)***	OE-REAL YIELD-FP	-1.125 (.000)	0.437 (0.078)*	Partial mediation

*** Significant at 99%, ** significant at 95%, *significant at 90%

Source: author

As we can see, both variables, OE and Real Yield, were proved to have a mediation effect between environment and size and the financial performance of MFIs, but not on the effect of capital structure over financial performance. Regarding operating expenses, these results are in line with those found in Ramirez et al (2017) with one mediator variable. However, when we incorporate the yield on gross loan portfolio, we find that the effect of the MFI's environment and size on financial performance is also mediated through interest rates. This essentially allows us to confirm our initial hypothesis, which is that there is no direct relationship between environment and financial performance, nor between size and financial performance, however, these two factors seem to have an effect on operating expenses and interest rates, and both seem to determine the financial performance of MFIs.

In addition, there is a partial mediation effect between operating expenses and interest rates, which is consistent with the results found in literature stating that the main driver

of interest rates are operating expenses (Dorfleitner et al, 2013; Cuéllar-Fernández et al, 2016). Finally, when we test the relation between the average loan balance per borrower, measured as a portion of GNI per capita, and the real yield on gross loan portfolio, we found that this relationship is significant at a 99% confidence level, and that outreach has a negative effect on the interest rate (-0.065).

4. Conclusions

Using SEM and multilevel mediation analysis we conclude that there is a significant mediation effect of interest rates and operating expenses over financial performance. In other words, interest rates and operating expenses are the vehicles through which environment, capital structure, and the size of the MFI have an effect on the MFI's financial performance. In particular, we found that the effect of the environment on the financial performance is mainly through interest rates, and secondly through operating expenses. This actually implies that interest rates are affected by perceptions of government effectiveness, the application of rule of law, and by the control of corruption, which indirectly has an effect on the MFI's financial performance. Thus, we can conclude that the better the environment in which an MFI works, the better the financial performance, and thus, the lower the interest rates will be.

For the effect of the size of the MFI on financial performance, we found that it is mostly captured by interest rates and the final effect of the size on financial performance is negative. This actually means that the bigger the MFI is, the lower its financial performance, due to the size effect on interest rates and operating expenses. Meanwhile, we found that capital structure is not a relevant factor for financial performance, neither through the interaction with interest rates nor with operating expenses. However, this result may be biased due to the lack of other indicators that may more properly reflect the financial structure of MFIs. Unfortunately, the information provided by the MIX Market Database on the MFIs is incomplete in several cases.

Finally, the effect of operating expenses on financial performance is also through interest rates. This is actually consistent with previous literature; whose main conclusion is that interest rates tend to be higher due to the high operating costs, generated by small loans.

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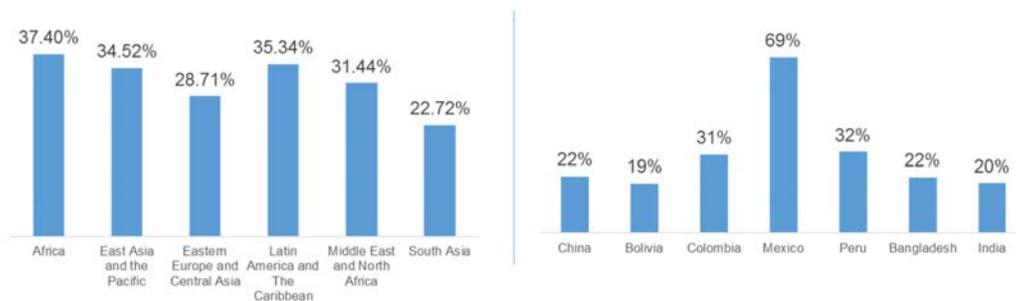
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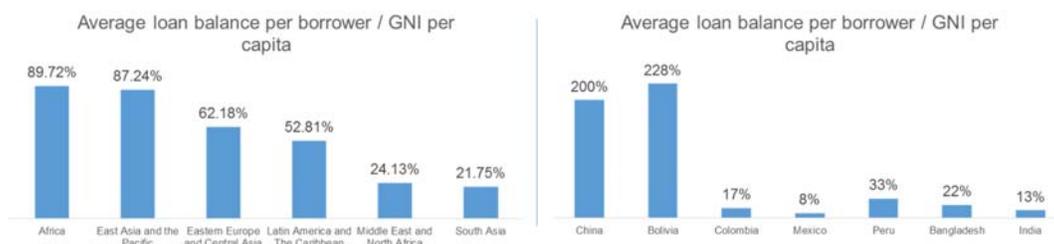
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Appendix 1. Average nominal yield on gross loan portfolio per region and country



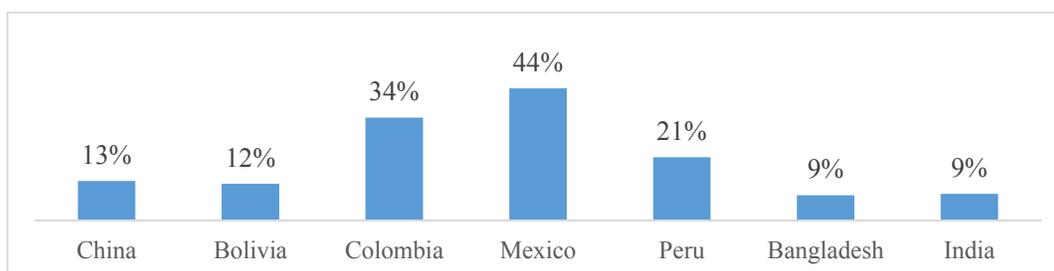
Source: Author, using MIX market information

Appendix 2. Average loan balance per borrower over GNI per capita per region and per country



Source: Author, using MIX market information

Appendix 3. Cost per borrower (as a % of the average loan per borrower) in representative countries



Source: Author, using MIX market information

Appendix 4. Sample distribution according to various indicators

By region	Profit or non profit	By age
	# IMF	# IMF
Eastern Europe and Central Asia	70	For profit 264
South Asia	123	Non profit 281
Africa	70	New: 1-4 years 21
Latin America and the Caribbean	179	Young:5-8 y 71
East Asia and the Pacific	89	Mature:>8 y 435
Middle East and North Africa	14	
By legal status	By size	
	# IMF	# IMF
Non-Bank Financial Institution	223	Small 103
Credit Union / Cooperative	68	Medium 111
NGO	161	Large 331
Bank	65	
Other	15	

Source: author's own using data from Mix Market

Appendix 5. Definitions of variables

Variable	Short name	Definition
Return on assets	ROA	$ROA = \frac{\text{Net operating profits}}{\text{Average of book value of assets}}$
Return on equity	ROE	$ROE = \frac{\text{Net operating profits}}{\text{verage of book value of equity}}$
Financial sustainability	OSS	$OSS = \frac{\text{total financial revenues}}{\text{financial expenses} + \text{operating expenses} + \text{Preserves for losses}}$
Government effectiveness	KKM3	Indicator published by The World Bank that captures the perception of population about quality of public services and central public institutions. Indicator that captures the perception of the population about quality of public services and public institutions and which also covers the credibility of policymakers.
Rule of law	KKM5	Indicator published by The World Bank about social norms, their applicability and the general justice system. Also covers perceptions about levels of violence and criminality.
Control of corruption	KKM6	Indicator published by The World Bank about perceptions of corruption in the public and private spheres.
Interest expense	COST_FUNDING	Expenses incurred by MFIs as part of servicing debts.
Equity	EQUITY	Book value of equity
Staff employed	LogPERSONNEL	Number of MFI employees.
Active borrowers	LogACTIVEBORR	Number of people that have received at least one credit from an MFI.
Administrative expenses	ADMEXP_PORT	Administrative expenses for the total credit portfolio
Operating expenses	OPEXP_PORT	Operating expenses for the total credit portfolio
Personal expenses	PERSEXP_PORT	Personal expenses for the total credit portfolio

Source: author, using data from Mix Market