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Original Paper

Macroeconomic factors influencing interest rates of microfinance institutions in the Latin America and the Caribbean

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Abstract: Agricultural output in developing countries still represents a substantial part of the GDP. This ratio has actually increased in some areas such as the Latin America. As such, there is an increasing importance of microfinance institutions (MFIs) focusing on the activities associated with agriculture and encouraging entrepreneurship in agriculture and in the rural communities in general. The contribution of microfinance institutions consists mainly in providing special-purpose loans, usually without collateral. However, questions exist as to the magnitude and the adequate level of risk of providing micro-credit loans in relation to the interest rates being charged. We review two main approaches to setting interest rates in the MFIs. One approach takes the view that interest rates should be set at a high level due to the excessive risk that these institutions undertake. The second approach is to convince the public of the possibility of reducing these rates through cost savings, increased efficiency, and sharing best practice, etc. Subsequently we econometrically analyse the impact of macroeconomic factors on the microfinance interest rates in Latin America and the Caribbean. We show that these results depend on the chosen indicator of interest rate.

Key words: microfinance, interest rate, macroeconomic factors, agriculture

Microfinance institutions (MFIs) are generally concentrated in developing countries (Srnec and Svobodová 2009) where they represent an effective remedy for people who are balancing on the poverty line and who would like to improve their standard of living by investing in their own business or education. Many of these "business" owners are poor farmers who would like to modernize/improve or expand their business in some way, but lack the needed financial resources.

Agricultural production has been the staple business for rural areas; however, traditionally there has been a low purchasing power of the population and a slow technological development. In these developing countries, the government authorities often do not provide enough finances for systemic structural reforms (Jeníček 2011) and their farmers have been left to themselves. However, rural poor people face a difficult problem when seeking credit. They have little collateral, thus posing extensive risks for the standard commercial banks. The MFIs seek to solve this problem by using various methods to cover repayments regardless of the amount of collateral. Among them, for example, is the use of social capital, which helps to solve the issue of asymmetric information, usually the adverse selection or moral hazard. This occurs in the form of group lending as well as preferring only one local person with the subsequent opportunity to participate in the management of debt and finally increasing the loan size with continued repayment. This helps to provide a dynamic inducement for borrowers to repay their loans (Morduch 1999).

Beyond the social advantage, microfinance has come to the forefront of investment funds (Janda and Svárovská 2010; Janda et al. forthcoming) and private investors' activities in the last few years (Srnec et al. 2011). An increased attention from these entities creates an opportunity for a more effective develop-

ment in the area of microfinance, but it may equally create an increased (and perhaps undue) pressure on the return on investment and thus disrupt the social impact of these institutions (Fouillet and Augsburk 2010). However, it is unsustainable and inefficient to provide loans to the poor only on the basis of grants and donations from governments and international organizations. Institutions should themselves achieve a balance between the financial and social efficiency, the so-called double bottom line (DBL).

The focus of this paper is an examination of the influence of macroeconomic factors on the microfinance market. Using the linear regression model (OLS), we investigate whether the key macroeconomic factors influence the interest rate policy of MFIs, and also whether the recent financial crisis has had a significant impact on this policy. Previous studies have not so far paid much attention to this; rather their research questions have been more focused on the analysis of efficiency in terms of internal costs and other internal factors related to the particular MFI and their impact on the profitability or final interest rates (Rosenberg et al. 2009; Janda and Turbat forthcoming), or examining the impact of macroeconomic variables on the actual performance of MFIs (Ahlin et al. 2011). However, this research seeks to verify whether macroeconomic variables have an impact on the crucial interest rate indicators. Put in other words: whether their high value is not only affected by the increased risk of the client and the relatively high ratio of the manual effort during the credit loan processing by the MFIs. The next few sections will cover the economic and social environment of the microfinance market in Latin America and sum up the current research findings and milestones in the area of the influence of internal and external factors on the formation of interest rates and the development of the MFIs. Subsequently, the selected macroeconomic variables upon which the hypotheses will be verified upon are described.

Our results show that the possible source of controversy about the impact of both macroeconomic factors and internal microeconomic characteristics of the MFIs on interest rates charged by the MFIs may be based on different indicators used to proxy the interest rates of the MFIs. Both of our specifications used in the empirical part of this paper clearly show that the average loan balance per borrower, the percent of female borrowers and the rural character of each considered country are the most significant determinants for the interest rates charged by the MFIs in Latin America and the Carribeans.

PATTERNS OF MICROFINANCE DEVELOPMENT IN LATIN AMERICA

Global outreach and performance

The overall development of microfinance has significantly improved over the past years. This development means not only the growth in the size and number of the MFIs, but also an improved quality of their services, control procedures (Bauer et al. 2012) and financial efficiency. From Table 1, it can clearly be seen that the defined regions Latin America and The Caribbean (LAC), and Africa lead the world in the creation of the MFIs with an average increase of 29 and 23 per year, respectably, between 2000 and 2009. Further, the LAC leads all regions in the total number of the MFIs with 382 in operation in 2011.

The indicator of Gross Loan Portfolio (GLP) to Total Assets (TA), usually used to measure the outreach of the MFIs, shows a low average annual change of 0.92% per year; the overall trend is stable without any significant fluctuations in the individual years. The average value is approximately 80%. One can conclude that this is most likely a result of stable sources of funding from the clients' deposits as well as from the donors and private investors, flexible cost policy and effective diversification of the loan portfolio (www.mixmarket.org). However, it is necessary to observe these factors in the context of the overall evolution of microfinance in LAC.

The evolution of microfinance in Latin America

It is generally recognized that modern microfinance began with the founding of the Grameen Bank in Bangladesh in 1970 by Muhammad Yunus. This experimental program focused on providing microfinance loans to females and was surprisingly successful. As a result of the success, many MFIs have been established around the world and have followed the same or similar business strategy, mostly with similar positive results. Although Asia is identified as one of the largest microfinance regions, as they have the highest number of clients and extensive markets, Latin America holds primacy as having the greatest expertise in the field of microfinance policy.

The development of microfinance in Latin America (Weiss and Montgomery 2005) began as an effort of the local governments to support the national economy and to reduce high levels of unemployment in some regions. In particular, smaller countries have been

Table 1. Geographical distribution of MFIs

Year	Eastern Europe and Central Asia		Africa		East Asia and the Pacific		LA and The Caribbean		Middle East and North Africa		South Asia	
	MFIs (count)	GLP to TA*	MFIs (count)	GLP to TA*	MFIs (count)	GLP to TA*	MFIs (count)	GLP to TA*	MFIs (count)	GLP to TA*	MFIs (count)	GLP to TA*
2000	33	28.17	54	69.81	17	36.04	68	74.13	13	45.46	22	78.10
2001	47	32.11	108	60.28	30	38.67	86	77.63	17	47.45	23	74.98
2002	82	46.38	162	63.58	46	43.40	107	77.55	22	50.81	81	70.89
2003	157	61.84	183	44.87	95	52.88	166	78.02	31	58.90	132	69.32
2004	190	65.79	182	45.83	119	57.39	220	78.38	38	67.25	196	72.07
2005	239	67.99	239	54.68	131	60.31	282	74.72	42	74.70	213	73.12
2006	259	67.07	253	52.72	159	63.87	305	78.44	49	79.69	206	73.17
2007	324	71.62	280	51.13	183	65.94	371	79.32	62	76.40	195	73.01
2008	312	74.92	251	55.56	172	84.66	380	78.97	68	76.03	209	74.14
2009	229	69.70	211	55.00	131	85.17	356	79.22	65	70.90	188	76.48
2010	250	83.34	329	61.36	188	76.93	413	80.52	71	77.88	254	82.70
2011	204	82.09	309	65.81	222	81.12	382	81.68	59	76.75	224	83.78
Average annual change	16	11.15	23	0.34	19	8.08	29	0.92	4	5.12	18	0.70

*weighted average (%)

Source: www.mixmarket.org

struggling with large proportions of their population living below the poverty line. Government credits were provided mainly to agricultural areas as the means to provide a stimulus to the economy. These "programs" of direct government support to farmers without any sophisticated business proposals soon lost momentum and a new model had to be found. This evolution led to the rise of the MFIs (NGO) in this region.

Large grants and soft loans from donors and governments led to the rapid development of these institutions. The success strategy – to provide small loans to women (eventually to poor micro-entrepreneurs) – along with the government grants created great opportunities for other types of the early MFIs (Rural bank, Credit union, etc.). However, the performance rate was significantly different among the individual countries.

Small and medium sized countries (Bolivia, El Salvador and Nicaragua) experienced a faster growth of the MFIs – mainly due to their governments' straightforward policy to support microfinance – compared to larger countries (Mexico, Argentina and Brazil). Commercialization, the transformation of these NGOs to profit-entities (Srnec et al. 2009) has been a deliberate and useful strategy for accel-

erating the development of microfinance in LAC. Simultaneously, these institutions have undergone a stricter supervision by the central banks or/and government organizations. A more thorough and standardized application process to qualify for loans has stimulated a greater confidence of investors and commercial banks making more capital available for the microfinance programs.

Many of the clients receiving loans became first time account holders. This has created a new era of financial literacy and has encouraged savings as well as investment in their business (Janda and Svárovská 2013; Janda et al. forthcoming). Several economic studies show that the MFIs in LAC could represent a higher average value of the Return of Assets (ROA) or the Return of Equity (ROE) than the commercial banks (Berger et al. 2006; Navajas and Tejerina 2006). However, the profitability was significantly affected by the financial crisis in 2008–2009, when the individual indicators of profitability fell to an average of 2% (ROA) and 6% (ROE) p.a. (www.mixmarket.org).

As the microfinance market grows, commercial banks are inevitably drawn into microfinance in one of two ways: (1) they invest some money into an MFI, or (2) they offer their own similar products – in other words, in a branch you can buy a microcredit,

micro-insurance, etc. This second feature is called downscaling. This downscaling model forms the third largest group of MFIs occurring in Latin America after the NGOs and the NGOs that have made the transition into financial institutions. Having three competing types of MFIs naturally contributes to a greater financial efficiency (Reille and Forster 2008) and creates a relatively less pressure on government resources.

In terms of maturity of microfinance in the region, it is also important to follow the scope of its social impact. In particular, social issues are often the subject of economic discussion, especially in the recent global financial crisis years. While ambiguity still persists as to the effect of microfinance to help the neediest, the social classes represented by the composition of the MFIs' portfolios and the integration of females into the MFIs' funding represents a considerable social progress.

Social performance in LAC

Overall, the regional poverty trend in LAC has significantly improved over the past few years. The report of the Economic Commission for Latin America and the Caribbean (ECLAC) and the corresponding Figure 1 show that this success has been caused particularly by an increase in the purchasing power of the local population through an increase in wages. A smaller share of the success can be attributed to the increased public spending from the LAC governments and international organizations contributing to improvements on this issue.

Figure 1 summarizes the overall regional poverty trend in the LAC during 1981–2008. At the time of the study, this was the most recent data available as publication of this data is not done on an annual basis. In 2002, the greatest increase in the number

of poor people living at just 1.25 USD per day occurred. This corresponded to an economic crisis in Argentina, which in turn affected other LAC countries, causing considerable financial difficulties in the region. Surprisingly, this long-term negative growth was interrupted in the coming years and overturned into a permanent decline in the number of poor. The graph shows that from the level of nearly 63% living on just 1.25 USD per day in 2002, that number fell to nearly 37% by 2008, with an even larger corresponding drop in the Poverty Headcount Ratio as a percent of population, this number falling from 11.9% in 2002 to only 6.5% in 2008.

According to the latest ECLAC report, 29.4% of Latin Americans were living under the poverty line in 2011, which is by 1.6% percentage point lower than in the 2010. Figure 2 shows a comparison between the developing countries, where the vast majority of them indicate an average long-term decline in the number of poor people. There are only a few exceptions where the LAC countries are failing to improve; the Dominican Republic is a prime example.

The successful performance of the MFIs has been cited in several economic studies as a leading cause in the achievement of declining poverty levels. Their success is reflected in not only the variety and quality of loan products offered, but also the right segment selection – women. Women represent the majority of clients in LAC. D'Espallier et al. (2011) show that women are more responsible in repaying debt and more effectively use the debt to improve the quality of life of their families, especially of their children. Women's roles, both in their homes and in their communities, are elevated when they are responsible for managing loans and savings. Poor women also tend to have better credit ratings than their men counterparts.

The balance between the financial and social responsibility of the MFIs lies in the interest rate. If the interest rate is disproportionately high in relation to
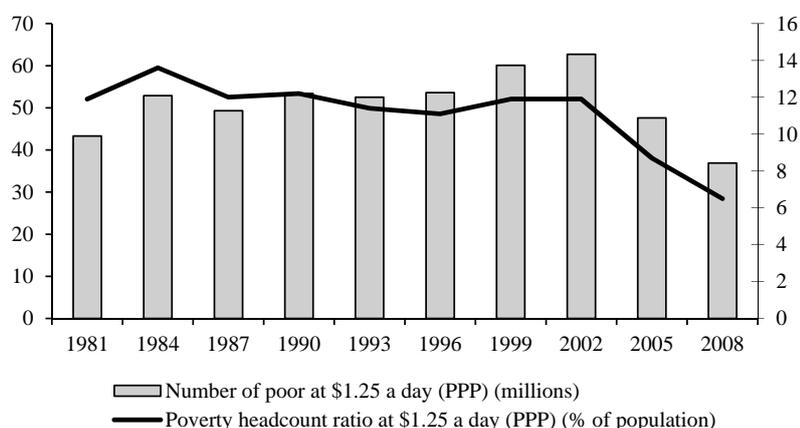
Figure 1. Regional poverty trend in Latin America & the Caribbean

Source: www.worldbank.org
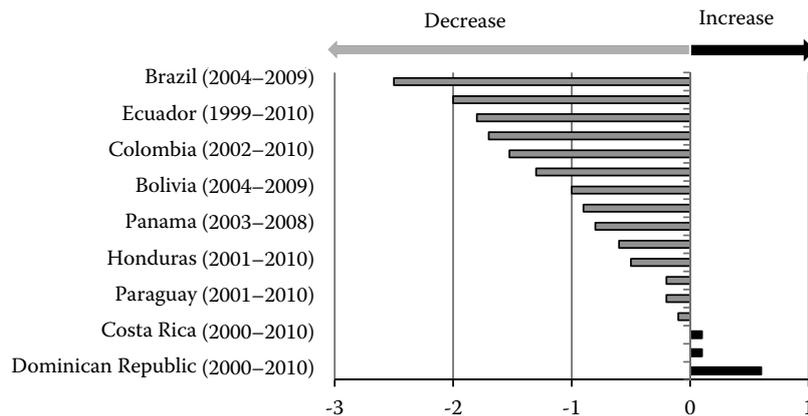
Figure 2. Average annual change in poverty headcount ratios (percentage points per year)

Source: www.worldbank.org

risk and operating costs, then it leads to inefficiency and puts the brakes on the support and development of the poor. In this case, poor people have no incentive to borrow from the MFIs, as high rates are viewed as usury and provide no ability to achieve a better tomorrow. Conversely, if the interest rate is low, in some countries artificially pushed down by the "interest rate ceilings", then there is inefficiency on the part of the MFIs. If interest rates are not allocated in an amount to cover the loan costs and a reasonable profit, then long-term competence and hence long-term success of microfinance institutions cannot be assured.

INTEREST RATE POLICY OF MFIS: THE DETERMINANTS

Factors affecting interest rates

The factors affecting microfinance interest rates for the MFIs can be classified into two general groups: (1) internal – the factors MFIs can influence: e.g. labour costs, technical support, inventions; or (2) external – political risks, macro factors, legislative risk, etc. Rosenberg et al. (2009) analyzed the internal factors. His study found four main components reflected in the microfinance interest rates: operating expenses cost of funds, loan loss expenses, and profit. Operating costs represent about 60% of the total MFI costs and usually depend on the loan size, age, location and the client's rating, etc. As to be expected, Rosenberg et al. (2009) found that the institutions with a longer history are able to control operating costs more effectively and therefore are able to charge lower interest rates.

Any change in interest rates will have a bigger effect on the low-income borrowers than on those with higher incomes. In addition, borrowers are more sensitive to a change in the length of the loan rather

than a change in the interest rate (Karlan and Zinman 2008). Similarly, a client's portfolio does not have an impact on the cost of the loan. Regression analyses do not confirm that a MFI with a higher number of borrowers would be better off spreading the fixed operational costs over their clients in comparison with a MFI managing a small portfolio of borrowers. Therefore, the latter mentioned MFIs can provide a lower interest rate. This is primarily due to the operating cost structure, where fixed costs are usually very low but variable costs may fluctuate considerably.

The second important factor to be considered is the cost of funds. In comparison with commercial banks, the MFIs tend to be less leveraged, even though they often seek alternative sources of funding (securitizations, bond issues, etc.) for the improvement of their financial services and a more rapid development (Jayadev and Rudra 2012). However, this direction is very difficult and depends on many determinants such as the size of institution, business place and the type of institution or risk rating. Moreover, Campion (2010) shows that many determinants on the cost of funds are outside the control of the MFIs, at least in the short run. Many of these institutions are primarily price takers and have no opportunity to negotiate better terms in the market.

Another important factor influencing interest rates is the desired profitability. This determinant can be greatly influenced by the management of the MFIs. However, its impact on microfinance or the interest rate policy is quite controversial. One strand of literature believes that a higher rate of profitability leads to an increased interest from investors and facilitates the development of the MFI. This can result in lower operating costs and simultaneously lower interest rates.

Another strand of literature claims that a higher rate of profitability and the resulting increase in interest from investors applies an upward pressure on inter-

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est rates. Investors try to influence the management to maximize their capital expenditures (Cull et al. 2009). Governments try to correct such behaviour by introducing interest rate ceilings. The main objective is to set an interest rate that cannot exceed a certain level. It may seem that such an approach is effective; however, economic studies have found that such ceilings lead to the rejection of those clients with a higher potential risk (Helms and Reille 2004). The final interest rate needs to reflect the risk of the entire loan portfolio and putting an artificial cap on it denies the institutions the ability to take into account the higher level of risk associated with some clients. Another reason is the proportion of the high cost to a low yield, which the interest rate ceilings may further increase. This negative effect mainly affects smaller MFIs with a higher proportion of manual procedures. Finally, clients are only able to accept interest rates to a certain level. If that level is exceeded, the demand for loans will begin to decline. Borrowers are not able to accept such a high debt burden.

Loan losses due to the borrower default have a relatively small effect on interest rates. Loan amounts are relatively low and therefore the potential losses are not very significant. In addition, the payment discipline of borrowers (especially women) is very high. Particularly, larger institutions are able to absorb such losses more easily.

The environment in which these institutions perform their activities can also affect profitability. A prevailing share of the industrial sector as a percentage in the GDP growth could have a negative impact on the microfinance market. The reason may be that the MFIs are usually more oriented to finance businesses in agriculture or the service sectors. However Ahlin et al. (2011) found that the macroeconomic environment is important but not crucial.

Málek et al. (2008, 2011, 2012) and Witzany (2011, 2012) provide a good general overview of quantitative methods of the financial analysis which may be used for a further analysis of the factors influencing interest rates. Detail descriptions of sophisticated approaches which may be used in the analysis of interest rates are provided by Teplý and Buzková (2012), Teplý et al. (2012) and Teplý (2012). In our analysis, we do not take into account the institutional factors and regulations, like for example Basel I, II, III, which obviously have an influence on the lending rates of banks (Šútorová and Teplý 2013) and subsequently on the lending rates of the microfinance institutions.

Macroeconomic determinants

In the previous section, the basic factors affecting the interest rate policy of the MFIs have been introduced. The last few years of empirical and theoretical studies have paid a considerable attention to macroeconomic factors as well. Overall, the macroeconomic environment is essential for the future performance of the MFIs (Ahlin and Lin 2006). Their concentration is more pronounced in the countries with higher inflation rates and a higher proportion of agriculture to the GDP (Vanroose 2007). The GDP growth contributes to the economic development and simultaneously leads to a higher profitability of the MFIs themselves. This interaction also applies vice versa, since these institutions also contribute to the growth of the GDP, in that credits from the MFIs to their clients support growth in the overall economy (Maksudova 2010). In addition, agriculture can be associated with substantial risks (natural, economic, etc...) representing for these institutions higher monitoring costs, lower funding sources for credits and subsequently higher interest rates.

Other important macroeconomic determinants are the unemployment rate and inflation. Higher MFI interest rates may be caused by the increase in poverty or by an unexpected increase of inflation (Kazi and Leonard 2012). In this regard, the MFIs might obviously react by raising interest rates because of the increased potential risk or operational costs.

The last factor to consider is the share of population living in rural areas. People concentrated in such areas represent high-risk borrowers with a considerable need for the credit support. The MFIs as well as the government organizations should carefully monitor their loan policy – especially in regions where the revenue growth, the increased consumption, and the increased investment is expected, which all lead to the accumulation of capital (Shimelles and Zahidul 2009).

DATA

The primary data source for the MFIs variables comes from the Microfinance Information Exchange (MIX), which compiles a unique and comprehensive database from the MFIs that are willing to report. Since the reporting of information is not obligated through the legislation, the data quality is evaluated according to the established four diamonds category. The institutions rated four-diamonds and higher have financial statements audited by third-party

accounting firms. This study includes all types of institutions, regardless of the assigned rating. This helps to maintain a sufficiently representative sample for the analysis as Maksudova (2010) found that narrowing the selection to only the four-diamond category reduced the sample size by 26%.

In all, 320 MFIs from 14 countries in Latin America and the Caribbean (Argentina, Bolivia, Brazil, Columbia, Costa Rica, Ecuador, Guatemala, Honduras, Chile, Mexico, Nicaragua, Paraguay, Peru and Venezuela) were evaluated for this study, each of them with 3–9 years of data. A further breakdown into the individual groups is listed in Table 2. The data covers the period from 2003 to 2011.

The final findings from scientific studies on the issue of interest rates are usually based on two types of data sources. One shows the real picture of interest rates based on proxy values derived from calculations using different indicators (Roberts 2013). This method is convenient for examining a larger sample of the MFIs. Its disadvantage is the need to remember that this is not the actual value of the interest rate. The second approach is based on real interest rates; the authors got a series of research projects or surveys. The contribution of this method is that it shows the real interest rates in the microfinance market. However, it generally represents only a few MFIs in the particular country. This second method was used rather in the earlier years, when the MFIs were reluctant to disclose information about their business.

We may consider two possible good proxies for interest rate as our dependent variable. In Table 2, yield on gross portfolio (real), is used instead of the real interest rate. The average interest rate is not reported but the yield on gross portfolio is. The yield on gross portfolio (real) is found using the following formula: (Yield on Gross Portfolio (nominal) – Inflation Rate) divided by (1 + Inflation Rate). The second variable in Table 2 is the Profit Margin, which is similarly used instead of the average interest rate so that we can find whether this indicator is influenced by macro variables or not. The variable profit margin represents the ratio of net operating income to the financial revenue.

Besides these indicators of interest rate, we will use other variables internal to each considered MFI in our regressions. We will consider the Average Loan Balance per borrower (ALB), the Gross Loan Portfolio (GLP), the Number of Active Borrowers (NAB), the Percent of Female Borrowers (Woman) and an indicator of profitability Return on Assets (ROA). Note that the first three variables have very similar meanings. This is confirmed by the correlation matrix in Table 4, especially between the GLP and NAB.

An increase in the number of borrowers usually causes an increase in the proportional size of the portfolio. However, we deliberately chose these indicators (GLP, NAB and ALB) because the decreasing number of borrowers can be offset by increasing the

Table 2. MFI Variable Descriptions

Variable	Description	Obs.	Mean	Std. dev.	Median	25th %ile	75th %ile
Y_R	Yield on gross portfolio (real) = (Yield on Gross Portfolio (nominal) – Inflation Rate)/ (1 + Inflation Rate)	1727	30.5%	20.0%	25.9%	17.3%	37.8%
Margin	Profit Margin = Net Operating Income/ Financial Revenue	1727	10.6%	20.2%	12.0%	3.5%	21.8%
ALB	Average loan balance per borrower = Gross Loan Portfolio/Number of Active Borrowers	1727	1.15	1.28	0.73	0.37	1.42
GLP	Gross Loan Portfolio – includes current, delinquent, and renegotiated loans, but not loans that have been written off	1727	0.38	0.96	0.06	0.02	0.26
NAB	Number of active borrowers – the number of individuals or entities who currently have an outstanding loan balance with the MFI or are primarily responsible for repaying any portion of the Loan Portfolio, Gross	1727	28.55	64.92	8.63	2.52	24.92
ROA	Return on assets = (Net Operating Income, less Taxes)/Assets, average	1727	2.6%	7.5%	2.8%	0.7%	5.8%
Woman	Percent of female borrowers = Number of Active Borrowers (women)/Number of Active Borrowers	1727	62.5%	20.6%	59.7%	47.3%	77.2%

Table 3. Description of macroeconomic variables

Variable	Description	Obs.	Mean	Std. dev..	Median	25th %ile	75th %ile
Unemp	unemployment total (% of total labour force)	1727	6.9%	2.4%	7.0%	4.9%	8.3%
Inflation	inflation consumer prices (annual %)	1727	5.6%	3.5%	4.9%	3.3%	7.4%
Rural	rural population (% of total population)	1727	32.7%	11.2%	33.0%	24.7%	40.0%
Agri	agriculture value added (% of GDP)	1727	9.2%	5.8%	7.0%	6.0%	12.0%
GDP	annual percentage growth rate of Gross Domestic Product	1727	4.5%	3.1%	4.6%	3.3%	6.7%
Interest_R	real lending interest rate	1727	9.4%	9.3%	7.5%	2.6%	13.9%

proportion of GLP. Actually one borrower may have several loans at the same time, from one or more MFIs (Janda and Zetek 2012).

This leads to the following three research questions. Firstly, can the growth in the number of clients (NAB) result in a change of the interest rate? This case is typical for the MFIs like those in Asia, where there is a growing trend in the number of the micro clients, but the amounts of deposits or credits are very small, so simultaneously there is usually a smaller average ratio of ALB indicating possible troubles with operating costs.

Secondly, can a growth in the GLP lead to a change in the interest rate policy, regardless of the number of borrowers? MFIs in Latin America are characterized by a smaller number of clients in relation to the size of the GLP. Their strategy is reflected in the effort to provide borrowers a higher amount of loans and so better allocate their operational costs per client.

The third question is whether the interest rates charged by the individual MFI are influenced just only by the number of clients (NAB) or just only by the growth of the gross loan portfolio (GLP), or whether the combined effects of both these factors

matter. This approach, which can be expected rather from the medium and large MFIs, will be analyzed via the indicator ALB.

We have to keep in mind that the panel data about microfinance are associated with several drawbacks that need to be taken into account in the final conclusions and findings. Firstly, all MFIs are not obliged to provide their information to the public. Although the MIX has installed regular controls on the quality of data released, the involvement of the MFI institutions remains voluntary. The second problem is described by Honohan (2004), Vanroose and D'Espallier (2009). They both found that 75% of all clients are served by the 30 biggest MFIs. Therefore, the panel data could be skewed towards the profit oriented MFIs, which are trying to increase their transparency for external funding.

The country level data is described in Table 3. The data for these variables are compiled from several sources. The first set comes from the World Development Indicators. The next data set includes unemployment and the real lending interest rate (Interest_R), which are taken from the World Economic Outlook Database. The choice of these

Table 4. Correlation matrix

		(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(0)	ALB	1										
(1)	GLP	0.32	1									
(2)	NAB	0.038	0.762	1								
(3)	Woman	−0.489	−0.215	−0.06	1							
(4)	ROA	0.017	0.028	0.087	0.064	1						
(5)	Unemp.	0.103	0.082	0.052	−0.226	0.001	1					
(6)	Inflation	0.016	−0.106	−0.103	−0.042	−0.004	−0.089	1				
(7)	Rural	−0.067	−0.115	−0.118	0.066	0.068	−0.353	0.233	1			
(8)	Agri	−0.103	−0.084	−0.076	−0.02	−0.008	−0.119	0.359	0.616	1		
(9)	GDP	0.054	0.101	0.067	−0.104	0.072	0.132	−0.033	−0.097	−0.061	1	
(10)	Interest_R	0.097	0.111	0.092	−0.193	0.123	0.102	−0.273	−0.168	−0.066	0.115	1

country-level macroeconomic variables is based on the previous studies discussed in Macroeconomic determinants, related to our research questions or including discussions about macroeconomic factors and their ability to influence the microfinance performance.

Unemployment is considered as reflecting the situation in the labour market and potentially having an impact on the demand for loans and the clients' risk. Note that this factor historically caused the microfinance industry to flourish – historically, in the vast majority of countries in LAC, the government authorities made an effort to reduce the extensive growth of unemployment by very generously subsidizing the microfinance projects. Similarly, the final interest rate could be affected by the uneven growth of inflation. Ahlin and Lin (2006) found that this indicator has a substantial impact on the overall profitability of MFIs.

As a proxy indicator to represent the competition between the microfinance and the commercial banking sector, we use the real lending interest rate, which the banks charge their clients for loan services. This proxy indicator helps to uncover whether the bank interest rate policy may influence the interest rates of the MFIs. According to Vanroose and D'Espallier (2013), the MFIs achieve a better profitability in the countries where the access to traditional banking products is lower, as the borrowers do not have as much choice whether to apply for a loan in a bank or in a MFI. The linear dependence among the variables considered in this study is described in the correlation matrix in Table 4.

HYPOTHESIS AND METHODOLOGY

The aim of our analysis is to test whether macroeconomic factors influence the interest rate policy of the MFIs. Similarly, it is verified, whether the variables chosen were affected by the world financial crisis in 2008. According to Dokulilova et al. (2009) and Srnec and Gutierrez (2010), the financial crisis caused an impairment in the credit portfolio quality of these institutions and increased the indebtedness of their clients, especially in cases when the borrowers had several loans in one or more MFIs. It follows, that these institutions could solve this problem by increasing the final interest rates. The above leads to two hypotheses, which will be tested:

H1: Macroeconomic factors do not influence the microfinance interest rates.

H2: The financial crisis did not have a significant impact on the microfinance interest rates.

In this paper, the Ordinary Least Squares (OLS) method for estimating β parameters in a linear regression model is used. A specific outcome of an MFI "*i*" is represented by "*Y*" for a period of time "*t*," relevant for a country "*c*." The control vector "*M*" covers all internal indicators of the MFIs included in Table 4. In addition, we have added a categorical variable *Outreach*, which determines the time aspect of these institutions. We use this dummy instead of the sustainability indicator (Fajonyomi 2012), which might capture a possibility to cover all present costs and the costs incurred in growth. We believe that a greater outreach (longer position on the market) could mean a better cost management and lower interest rates. This dummy variable attains values small, medium or large, where the dummies of *Outreach (S)* and *Outreach (M)* are included in our regression. The vector "*X*" contains a set of macroeconomic variables (Table 3) for the relevant country "*c*" at a time "*t*". Further, we use the indicator "I_{2009}" for testing the hypothesis H2. The indicator I_{2009} was factored into the equation as a dummy variable acquiring either value 0 if the year is less than 2009 or 1 if the year is greater or equal to 2009. This year was deliberately chosen because of the potential delay between the beginning of the crisis and the potential impact on the selected variables. The final model can be written as follow:

$$Y_{tic} = \alpha + \beta I_{2009} + \beta_M M_{ict} + \beta_X X_{tc} + \varepsilon_{tic} \qquad (1)$$

Finally, the data for missing observations were substituted by the arithmetic average of the remaining periods. In compiling the data, if there were missing records for a period of one year or less, than the missing data was estimated, if the data was absent for longer than one year, then the entire observation was removed. Likewise, the data had to be adjusted for a large number of outliers as they unduly distort the outcome of the analysis. It was mainly the profit margin, which showed in the histogram (Gruber's test) a significant amount of biased negative values.

RESULTS

This section describes the research results that were obtained from the analysis of robust regression in which we used the Heteroscedasticity Corrected

Covariance Matrix. Table 5 shows the results of our regressions using two alternative proxies for the interest rate of the MFIs – the profit margin and the real yield on gross portfolio. The numbers in parentheses show the White Heteroskedastic Consistent standard errors (commonly called "robust" standard errors).

Using this technique, it was found that the macroeconomic factors have, in most cases, a significant impact on the interest rate policy of the MFIs. However, the subsequent economic interpretation of our regression results depends on which proxy (profit margin or yield on gross portfolio) was used for our dependent variable.

Profit margin

Note that the indicator profit margin covers in the numerator item Net Operating Income (Equation 2), which includes both the Financial Revenue from credit products and other financial assets as the marginal costs associated with sources of funding and operational expenses (Equation 3). It follows that the final change in the interest rate will always depend on whether each explanatory variable (Table 2 and 3) affects more the expenses or the revenues side of the balance sheet.

$$\text{Profit margin} = \frac{\text{Net Operating Income}}{\text{Financial Revenue}} \qquad (2)$$

Net Operating Income =
    Financial Revenue – (Fnancial Expense +
    Operating Expense + Impairment Loss)   (3)

Adding the financial crisis dummy variables to the regression model leads to the finding that the financial crisis created a negative and quite significant impact on the overall profitability/interest rate policy at a significance level of 5 percent. This impact was caused by an overall impairment of the macroeconomic performance, the quality of the loan portfolio of the MFIs, and especially the deterioration of the borrowers' payment discipline, which led to a necessity to write off loans from the MFIs portfolios (Janda and Zetek 2012).

The indicator ALB has substantially increased in LAC over the past few years. This resulted from a high demand for loans by rural populations and also from an effort of the MFIs to maximize their profits. These two common factors generally push interest rates up. Table 5 confirms this relationship, where

this indicator is positively and highly significant in relation to the interest rate.

The ROA is specifically examined as an indicator to determine whether the final profit is the key determinant for the MFIs in offering lower interest rates. The findings indicate that an additional percentage point of the final profit growth is associated with a 2.218% higher interest rate. Therefore, it is found that an increase in the final profit does not bring about a lower interest rate, but actually a higher rate. This

Table 5. Robust OLS model

	Margin	Y_R
(Intercept)	0.005*	0.832***
	(0.021)	(0.044)
Dummy (2009)	−0.018**	0.002
	(0.006)	(0.009)
ALB	0.013***	−0.038***
	(0.003)	(0.005)
GLP	0.003	−0.025**
	(0.003)	(0.008)
NAB	−0.00006	0.0002*
	(0.00005)	(0.00009)
Woman	−0.055**	0.186***
	(0.019)	(0.028)
ROA	2.218***	−0.059
	(0.011)	(0.071)
Outreach (M)	−0.024***	−0.008
	(0.006)	(0.011)
Outreach (S)	−0.035***	−0.012
	(0.006)	(0.011)
Unemp.	0.038	−3.148***
	(0.118)	(0.184)
Inflation	−0.210**	−1.223***
	(0.072)	(0.119)
Rural	0.187***	−0.864***
	(0.033)	(0.049)
Agriculture	−0.128*	0.189*
	(0.052)	(0.081)
GDP	0.182*	−0.416**
	(0.088)	(0.134)
Interest_R	−0.003	−0.172***
	(0.030)	(0.045)
Adjusted *R*-squared	0.7426	0.5062

Significant level: *significant at 10%, **significant at 5%, **significant at 1%

problem is often discussed in relationship with the so-called mission drift when the MFIs are trying to push interest rates up and thus generate maximum profits regardless of the social efficiency for which they are established (Srnec et al. 2008).

The outreach is examined to determine if the length of time that an MFI has been operating in a market positively affects the lowering of interest rates. It was determined that the longer period an MFI has been in operation correlates to a better knowledge of how to manage costs and revenues and therefore allows an ability to reduce the final interest rate. This conclusion is consistent with the study by Rosenberg et al. (2009).

A long-term continuous rise in price levels is usually associated with a decline in the real value of the variables examined in this study. The resulting analysis revealed a negative and quite significant relation between inflation and the variables investigated. If inflation rises and a corresponding decline in the real wages results, an increased demand for loans can hardly be expected. In this (frequent) scenario borrowers would be paying a greater percentage of their wages toward the loan repayments due to the inflation. The MFIs should therefore respond to this drop in the demand for loans by offering their clients lower interest rates. However, similarly, the expense side of the MFI's can also be affected by the inflation. The inflation can result in a rise of expenses for the MFIs and thus make the cost of the funds available for lending higher. Here on the contrary, higher costs are often reflected in higher interest rates.

Another factor is the size of the rural population. An increase in the size of rural population means a positive signal towards a greater demand for loans and other deposit services for the MFIs. According to the last information from the MIX, the existing product portfolios of the vast majority of MFIs have contained a high number of rural loans and deposits during the last couple of years. In 2011, rural loans accounted for 34% of the total portfolio in South America, a high percentage compared to the rural/urban population. It follows that the local business policy of the MFIs is still tenaciously focused on rural populations. Any "demand shock" thus represents an opportunity to raise interest rates and to achieve a greater profitability either due to the growing demand for the products or increased costs of their processing and recording.

Although the correlation matrix in Table 4 shows a relatively strong positive correlation between the selected variables of agriculture and the rural population (0.616), their resulting impact on the interest rate policy is quite different. While a high percentage of loans to rural populations correlate to a rise in interest rates (significant level 1%), the growth in the agricultural sector to the total GDP has exactly the opposite effect at a significance level of 10%. This decline in interest rates can be linked to the constant growing competition in the microfinance market. As we have seen in Table 1, the number of newly established MFIs has been growing steadily ever since 2000. This puts pressure on both financial and social efficiency and the resulting decrease in interest rates. This fact is confirmed by the results of the MFIs in Latin America, where the overall long-term growth of the gross loan portfolio is associated with a rather decreasing trend in profitability.

As an indicator of economic advancement, increases in the GDP are usually associated with rising investment from both public and private entities. According to the standard Keynesian model for national income, the product growth (Y) is associated with an increased household consumption (C). Overall, it is quite logical to expect an increased demand for loans and the resulting rise in interest rates of the MFIs. Likewise, the growth in the GDP leads to a greater employment and the growth of real wages. This growth in real wages also results in additional labour costs and can be reflected in the interest rates that are offered to the clients (Cull et al. 2005).

Yield on gross portfolio

This variable, unlike the margin, generally represents only revenues from credit products (Equation 4 and 5). If there is a change in some variable (either macroeconomic or internal) the final impact will therefore be associated only with the MFI's revenues. Note that the regression results presented in Table 5 were significantly changed when the proxy variable Yield on Gross Portfolio was replaced with the margin. Since a large list of the factors is involved, findings only on the most interesting changes against the previous dependent variable are discussed.

Yield on Gross portfolio (real) =

$$\frac{\text{Yield on Gross portfolio (nominal)} - \text{Inflatin}}{1 + \text{Inflation}} \quad (4)$$

Yield on Gross portfolio (nominal) =

$$\frac{\text{Interest and fees on loan portfolio}}{\text{Average Gross Loan Portfolio}} \quad (5)$$

The indicator of the ALB per borrower can be used to represent the efficiency of reducing operational costs of the MFIs and the quality of their business strategy. The final value is negative and highly significant in relation to the interest rate. The greater the amounts of credit institutions are able to provide, the lower per unit cost for each loan they have and therefore, correspondingly, they have a lower interest rate. However, it is interesting that this assumption does not apply when the dependent variable of the profit margin is used (section Profit Margin).

The examination of the internal indicators GLP and NAB produces interesting findings. While the previous section describes these variables as insignificant in relation to the interest rate, when considering just the revenue side, they become relevant, especially in the case of the GLP. The GLP, when all other inputs remain unchanged, as an indicator exercises a quite significantly negative affect on interest rates. This shows that for the MFIs, strengthening their market position can lead to a decline in interest rates. This attribute could be a little different for smaller MFIs, as an indicator for the NAB applies an inverse relation between the size of the MFIs and interest rates. Considering the NAB, pressure would be created on a greater profitability in the case of rising demand for loans due to more expensive operating costs for human resources and other stuff.

The percent of female borrowers (Woman) is another significant indicator and therefore it has a measurable effect on the interest rate policy. A higher percentage of female borrowers was shown to be highly significant in relation to the interest rate, in that it caused the interest rate to be higher.

This study and others have concluded that women are "less risky" as they have been shown to be more responsible for paying their liabilities; therefore they have a better credit rating. But then why do women receive a higher interest rate? Here, two related explanations can be put forth. The first argues that women have better payment habits and therefore the MFIs deliberately increase interest rates with the knowledge that these loans will be repaid with a high probability, thus generating a greater profit. The second argument is based on the previous conclusion, where the growth of the NAB is associated with higher interest rates. In the desire to boost, the MFIs engage in discriminatory practices by charging women higher interest rates, knowing that these loans have a higher likelihood to be repaid than the loans to males.

The macroeconomic variable unemployment was found to have a highly significant effect in that higher unemployment rates caused the interest rates of the MFIs to decrease, with lower unemployment rates causing the opposite. Prolonged periods of high unemployment can lead to a decline in the rate of inflation, or stagnation, (the Phillips curve). The result is generally a decrease in demand for loans and a resulting decline in interest rates.

Any overall slowdown in the economy is also likely to cause repayment problems with respect to the already existing loans as the borrowers' payment habits may be impacted. Economic downturns require greater monitoring costs for the already existing loans. The MFIs have to examine whether the yield from the new loans will exceed or not exceed the costs associated with higher credit risk.

The following three indicators: rural population, agriculture and the GDP show entirely different conclusions with the change of the proxy investigated variable. When examining only the revenue side of the MFI operations, we see the results fully opposite to those obtained in the previous regression with the profit margin as a dependent variable. In particular, rural population is shown to have a highly significant impact on decreasing interest rates. Generally, the growth in the GDP and rural population would lead to an increased demand for the microfinance services and subsequently higher interest rates. However, the overall increase in competition among the MFIs apparently results in a decrease in interest rates.

Finally, the real lending interest rate offered by banking institutions (non MFIs) was examined. A change in the rates offered by commercial banks was found to be highly significant. It was found that an additional percentage point rise in the banking sector rates resulted in a 0.172 percentage point decrease in the final interest rate of the MFIs. The general rise of interest rates in the banking sector is generally associated with a decline of companies' investments and the household consumption. This situation generally causes the demand for microfinance loans to decrease and a reduction in the microfinance loan interest rates is found to result.

DISCUSSION AND CONCLUSIONS

The macroeconomic factors affecting the interest rate policy of the MFIs between 2007 and 2012 have been carefully analyzed in this study with the intention to verify whether the recent financial crisis that began in 2008, and continues to this day, led to a change in the variables investigated and thus a change in the

real interest rates. The overall analysis was performed using a linear regression model (OLS) on the real data of MFIs operating in selected countries of LAC.

A review of the relevant scholarly literature has shown that many of the economic studies focused their attention on examining the macroeconomic environment as a prerequisite for the future development of the microfinance market or the benefits of the MFIs for economic development in an individual country. The particular analysis of the impact of macroeconomic factors on the interest rate policy of the MFIs was performed by e.g. Ahlin et al. (2011), Mallick (2012) or Roberts (2013). However, their research used different proxy variables or focused on a specific sub-group (only the selected macroeconomic variable, state, etc.). The aim of this study was to create a model that captures most of the countries in LAC, those with the highest number of the MFIs that report relevant information about their business, and have been doing so for a longer time period. Similarly, the macroeconomic variables chosen for the investigation were those most likely to be associated with the determination of the interest rates of MFIs.

It was found that the final impact of macroeconomic factors on the interest rate policy of the MFIs is significantly influenced by the choice for a proxy for the interest rate. If we consider the profit margin as an indicator of interest rates, its susceptibility to changes in the macro variables is significant for the indicators of inflation, rural population, agriculture and GDP. On the contrary, we found the unemployment rate and the bank interest rates not to be significant determinants of the size of the profit margin.

For the second dependent variable investigated, the yield on gross portfolio, it appears to be highly significantly dependent on all macroeconomic factors considered in our regression model. This is primarily due to the variable structure that includes only the revenues and fees from loans. Any change in macroeconomic variables is thus associated only with the change in the revenues and not the expenses as for the profit margins.

Finally, the argument is put forth that the excess risk associated with the MFIs' borrowers or high administrative costs might not be the sole causes for high interest rates, but rather also that interest rates are affected by other key external macroeconomic factors. Thereby, the null hypothesis about the ineffectiveness of macroeconomic factors on the interest rate policy of the MFIs is rejected.

The hypothesis that the financial crisis has not had any impact on the microfinance interest rates is rejected when profit margins are considered, but it is not rejected in the case of the yield on gross portfolio. A possible recommendation for the subsequent analysis is to determine whether any change in the currency exchange rates affects the interest rate policy of the MFIs. Especially in the case of developing countries, where a high proportion of financial resources come from abroad or where the regression model can strictly distinguish between different types of the MFIs.

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