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The drivers of the financial integration of microfinance Institutions: Do financial development, agency costs and microfinance performance matter?

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This analysis marks a preliminary endeavor to highlight how important financial integration in the microfinance sector is as a factor for the growth and sustainability of microfinance institutions.

Several studies have defined financial integration as internal financial connections and international financial connections. Our concern is focusing mainly on how microfinance institutions are financially integrated through interbank markets. What are the drivers that favor microfinance institutions' integration? The aim of this paper is to identify the drivers that could increase the financial integration of microfinance institutions with commercial banks. One advantage of financial integration through the interbank market is an increase in the amount and volume of loans granted at lower related costs. The main channels that impede these favorable financial transactions are an increase in competition to supply bank loans, a reduction in costs for external funding for banks and a great diversification of risks.

The sample set used to identify these drivers is the panel dataset of 953 MFIs from the MIX market dataset and country-level data from the World Bank dataset, both collected for the 2003-2016 period. To achieve our goals, we applied a panel quantile approach with nonadditive fixed effects, which helped to organize our microfinance institution sample into subgroups with similar financial integration levels. One of the advantages of estimating a quantile model is its technical ability to reveal distributional effects that can be significantly different across quantiles. This econometric approach is an innovative one applied for microfinance analyses.

The results reveal that an increase in financial development slows the financial integration of MFIs. However, by taking into consideration the transitory aspect of financial integration by each quantile, it appears that financial development positively impacts the financial integration of MFIs. The impact of financial development increases as the financial integration level increases. Similar results show a positive link between agency costs and financial integration. More financial interconnections with commercial banks justify the appearance of high agency costs due to an increased interest of commercial banks. The conflicting interests of commercial banks as loan providers will obstruct holders of internal funds. As a result, MFIs may have difficulty fulfilling their objectives by taking into account the role played by financial integration. Our results clearly show that MFIs with low profit levels will interact more with commercial banks by demanding loans. There is a significant and negative link between the profitability of MFIs and their financial integration. Moreover, increasing the average amount of loans, the burden of which is mainly borne by better-off clients, induces a significant increase in financial interactions between commercial banks and MFIs. Finally, an increase in the number of active borrowers significantly increases the degree of financial integration.

Keywords: financial integration, microfinance, financial development, agency costs.



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1. Introduction

Several studies have defined financial integration as internal financial connections (Nguyen et al., 2021) and international financial connections (Inekwe et al., 2018; Nguyen et al., 2021). Internal financial connections take place locally in the interbank market, which encourages the use of borrowing. International financial connections rely on financial markets functioning with a great facilitation of capital flows. Our concern will focus mainly on how microfinance institutions are financially integrated through interbank markets. What are the drivers that favour microfinance institutions' integration? In analysing financial integration, some challenges must be taken into consideration: bank default risk (Nguyen et al., 2021), credit risk (Bhattacharya et al., 2020) and systemic risk (Fecht et al., 2012). One advantage of financial integration through the interbank market is an increase in the amount and volume of loans granted at lower related costs (Popov & Ongena, 2011).

The main channels that impede these favourable financial transactions are an increase in competition to supply bank loans, a reduction in costs for external funding for banks and a great diversification of risks (Popov & Ongena, 2011). An increase in the various external funds providers (commercial banks, institutional investors and private investors) in the microfinance industry partly explains the rapid growth of some microfinance institutions (Ghosh et al., 2003). Financial development of the financial system favours multilevel financial networks that characterize the various tools used to improve a financial integration mechanism in the interbank market (Battiston et al., 2016; Fecht et al., 2012; Popov & Ongena, 2011). If the degree of financial development is low, only larger firms will be more financially integrated because they will be able to bear high market and contractual costs (Khanna & Palepu, 2000). The way components of the capital structure are used will determine the evolution of financial integration.

The capital structure of MFIs encompasses debt access (external funds), the mobilization of savings (internal funds) and the utilization of capital markets (equity). The pecking order theory helps to classify financial funds according to their importance (Myers, 1984; Myers & Majluf, 1984), with savings ranking first, followed by debt funds and equity. At this stage, we assume that the sustainable development of the microfinance sector could be achieved through a balanced use of savings and borrowing. External investors in the microfinance industry that promote borrowing include commercial banks, and those promoting equity include foreign banks, venture capitalists and private investors. External investors taking part in capital structure improve the diversification of MFI financing sources, liquidity risks, and credit risks and extend their ability to grant more loans to the poor (Ghosh & Van Tassel, 2011, 2013). Furthermore, having access to capital from any of these

external investors (local or international) enables MFIs to further broaden their client outreach and deepen both financial and nonfinancial services, with a great diversification of default risk (Nguyen et al., 2021). Therefore, an increase in the degree of financial integration would lower bank default risk in the financial sector. Thus, through an increase in the degree of financial integration in the microfinance sector, the MFIs would respond more effectively to demand services and better achieve their poverty reduction potential.

Moreover, those financial determinants are subject to asymmetric information that challenges financial lenders in the management of loan contracts. The loan contracts established to improve the financial connection of MFIs rely on the degree of proximity between local MFIs and commercial banks and determine the type of relationship established between the two financial players (McIntosh et al., 2005; Nguyen et al., 2021). As McIntosh et al. (2005) mentioned, in a context of high competition, financial interconnection between lenders and borrowers could lead to a moral hazard problem, with a Ponzi cycle as a consequence. Nguyen et al. (2021) mention the degree of proximity that favours effective monitoring to build a good-quality loan relationship. Combining the moral hazard problem and the peer monitoring process, the development of financial integration has to consider agency costs that could reshape the interest in financial interconnection between commercial banks and MFIs.

From the microfinance growth perspective, agency costs not only rely on the peer monitoring aspect but also reveal the existing conflict between managers' objectives and those of external financial providers. Therefore, managers should balance out the use of internal funds (deposits) and the demand for external funds (borrowing). We assume at this level a positive relationship between financial integration and the agency cost of MFIs. In other words, agency costs will increase with an increase in microfinance institutions' integration with commercial banks.

Within microfinance institutions, large MFIs with a greater commitment to commercial aspects of their activities may cause mission drifts in their clients' portfolios. They could increase moral hazard incentives that highlight the trade-off between financial performance and outreach. The purpose of considering trade-offs in microfinance explains their impact on financial integration. Therefore, in this study, we consider four main driving forces that can impact MFIs' financial integration: financial development, agency costs, financial performance and outreach.

The sample set used is the panel dataset of 953 MFIs from the MIX market dataset and country-level data from the World Bank dataset, both collected for the 2003-2016 period. To achieve our goals, we applied a panel quantile approach with nonadditive fixed effects, which helped to

organize our microfinance institution sample into subgroups with similar financial integration levels. The results reveal that an increase in financial development slows the financial integration of MFIs. However, by taking into consideration the transitory aspect of financial integration by each quantile, it appears that financial development positively impacts the financial integration of MFIs. The impact of financial development increases as the financial integration level increases. Similar results show a positive link between agency costs and financial integration. More financial interconnections with commercial banks justify the appearance of high agency costs due to an increased interest of commercial banks. The conflicting interests of commercial banks as loan providers will obstruct holders of internal funds. As a result, MFIs may have difficult

fulfilling their objectives by considering the role played by financial integration. Our results clearly show that MFIs with low profit levels will interact more with commercial banks by demanding loans. There is a significant and negative link between the profitability of MFIs and their financial integration. Moreover, increasing the average amount of loans, the burden of which is mainly borne by better-off clients, induces a significant increase in financial interactions between commercial banks and MFIs. Finally, an increase in the number of active borrowers significantly increases the degree of financial integration.

The remainder of the paper is organized as follows. The second section presents the data, model and estimation methods. The third section discusses the empirical results. The fourth section ends with important implications.

2. Materials and methods

2.1 Data description

The microfinance institution data are taken from MIX market, which is a microfinance database operated by MIX covering thousands of financial service providers. We use unbalanced panel data with a sample of 953 MFIs on average, with varied numbers of MFIs per year. Table 1 below provides a correlation analysis of the variables used. There is a positive and significant correlation between financial integration and financial development, agency cost and outreach (average loans per gross national income (GNI) and the number of active borrowers).

A negative and significant correlation exists between financial integration and financial performance. To consolidate our thoughts on the identification of the driving forces of the financial integration of microfinance institutions and make the results robust, we split our sample by differentiating four main MFI groups: (1) banks and rural banks, which represent 16% of the sample; (2) credit unions and cooperatives, which represent 17%; (3) nonbank financial institutions (NBFIs), which represent 34%; and (4) NGOs and others, representing 34%. This sample, similar to that of Vanroose and D'Espallier (2013), cannot be considered representative data for the whole microfinance sector. Our goal in building this database is to diversify the endogenous characteristics of microfinance institutions.

Table 2 provides the descriptive statistics.

To generate some explanatory variables to compare with the main dependent variable, financial integration (FI), we applied a logarithmic rule that ensures an upgrade of all values. The mean value of financial integration is equal to 0.086, with a maximum value of 0.983. There are some MFIs with zero financial integration in the first percentile. In other words, borrowing is not present in their

capital structure. In the highest percentile (p99), financial integration is higher, which indicates a high degree of interaction between commercial banks and MFIs through borrowing tools. When observing the value of financial development, for the first percentile, the level assigned is lower than that observed in the highest percentile (p99). The mean value of financial development in logarithmic terms is equal to 3.583. The average agency cost is a logarithm value equal to 0.512, with a low agency cost in the lowest percentile (0.03) and a high agency cost in the highest percentile (2.369).

This allows us to assume that the power of microfinance interest is highly present in the lowest percentile of MFIs, and in the highest percentile, external funders are more likely to influence the capital structure. Financial performance is lower in the first percentile than in the highest percentile, with an average value equal to 1.173. The average loan is small in the lowest percentile and larger in the highest percentile, with an average logarithmic value equal to 0.413. This could suggest that for the lowest percentile characterized by lower financial integration, MFIs ease access to credit for the poor through small loans. People at certain income levels cannot afford relatively large loan amounts. Furthermore, larger loans are granted in the microfinance sector more for commercial purposes (de Quidt et al., 2018; Hoque et al., 2011; Mersland & Strøm, 2010). Better-off clients can easily obtain access to larger loans. In the highest percentile, where there is a high level of financial integration, there is a large number of active borrowers. The average value of the number of active borrowers in logarithmic terms is equal to 8.855. There is no loan lost and a low portfolio at risk value less than 30 days for the lowest percentile. Then, in the highest percentile, the default risk is greater.

Table 1

→ Correlation analysis - Pairwise correlations

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Authors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) FI	1.000												
(2) lnFD	0.020* (0.035)	1.000											
(3) lnagencost	0.040* (0.000)	-0.028* (0.001)	1.000										
(4) FSS	-0.010 (0.305)	0.021* (0.026)	-0.258* (0.000)	1.000									
(5) lnavloan	0.107* (0.000)	-0.285* (0.000)	-0.104* (0.000)	0.066* (0.000)	1.000								
(6) lnacbor	0.341* (0.000)	0.189* (0.000)	0.037* (0.000)	-0.016 (0.068)	-0.260* (0.000)	1.000							
(7) lnassets	0.392* (0.000)	0.112* (0.000)	-0.058* (0.000)	0.005 (0.601)	0.185* (0.000)	0.749* (0.000)	1.000						
(8) loanloss	0.000 (0.967)	-0.015 (0.122)	-0.006 (0.506)	-0.024* (0.006)	0.006 (0.516)	-0.035* (0.000)	-0.031* (0.000)	1.000					
(9) par30	-0.045* (0.000)	-0.029* (0.001)	0.049* (0.000)	-0.095* (0.000)	0.005 (0.598)	-0.079* (0.000)	-0.041* (0.000)	0.052* (0.000)	1.000				
(10) lnremirec	-0.131* (0.000)	0.531* (0.000)	0.020* (0.017)	0.037* (0.000)	-0.367* (0.000)	0.271* (0.000)	0.111* (0.000)	-0.031* (0.001)	-0.050* (0.000)	1.000			
(11) lnaid	-0.066* (0.000)	0.145* (0.000)	0.007 (0.394)	0.001 (0.914)	-0.094* (0.000)	0.244* (0.000)	-0.003 (0.753)	-0.001 (0.933)	-0.007 (0.462)	0.266* (0.000)	1.000		
(12) lngdp	-0.035* (0.000)	0.068* (0.000)	-0.049* (0.000)	0.020* (0.028)	-0.083* (0.000)	0.026* (0.001)	-0.051* (0.000)	-0.010 (0.274)	0.018* (0.049)	0.019* (0.016)	0.145* (0.000)	1.000	
(13) lninfl	0.002 (0.844)	-0.094* (0.000)	0.038* (0.000)	0.015 (0.107)	0.046* (0.000)	-0.148* (0.000)	-0.202* (0.000)	0.021* (0.024)	0.015 (0.097)	-0.120* (0.000)	0.075* (0.000)	-0.027* (0.001)	1.000



Table 2

→ Summary statistics

	N	Mean	Std. Dev.	1st Perc.	Median	99th Perc.	min	max
FI	11926	0.086	0.168	0	0.011	0.793	0	0.983
lnFD**	13883	3.583	0.695	1.729	3.758	4.855	-6.342	5.345
Lnagencost**	14405	0.512	0.463	0.03	0.407	2.369	0	7.181
FSS	11895	1.173	0.56	0.246	1.124	2.693	-0.92	20.415
Lnavloan**	14870	0.413	0.479	0.017	0.255	2.336	0	8.25
Lnacbor**	15060	8.855	2.146	3.689	8.946	13.779	0	15.916
Lnassets**	15735	15.387	2.277	10.065	15.305	20.726	0	24.468
Loanloss**	11726	0.09	4.259	0	0.004	0.231	0	445.253
par30	12620	0.069	0.154	0	0.036	0.589	0	7.114
Lnremirec**	14261	21.356	2.062	16.202	21.594	24.971	8.706	24.977
Lnaid**	13971	20.256	1.047	17.307	20.283	22.137	14.771	23.817
Lngdp**	14457	10.959	2.544	6.187	10.89	17.141	4.527	17.403
Lninfl**	14008	1.932	0.763	-0.212	1.955	3.693	-1.517	5.227
mature	16397	0.61	0.488	0	1	1	0	1
young	16397	0.196	0.397	0	0	1	0	1
Region1*	16316	0.214	0.41	0	0	1	0	1
Region2*	16316	0.127	0.332	0	0	1	0	1
Region3*	16316	0.177	0.382	0	0	1	0	1
Region4*	16316	0.28	0.449	0	0	1	0	1
Region6*	16316	0.166	0.372	0	0	1	0	1
Banks and Rural Banks	16242	0.159	0.365	0	0	1	0	1
Cooperatives/ credit Unions	16242	0.163	0.37	0	0	1	0	1
NBFIs	16242	0.34	0.474	0	0	1	0	1
NGOs and Others	16242	0.338	0.473	0	0	1	0	1

*: Region1: Africa, Region2: East Asia and the Pacific, Region3: Eastern Europe and Central Asia, Region4: Latin America and the Caribbean, Region6: South Asia.

** : Logarithm of the variable included in the estimations.

Source: Authors

2.2 Models and estimation methods

To identify the driving forces of financial integration in the microfinance sector, we use a panel quantile regression approach. Previously, we plot a quantile graph (see Appendix) showing the shapes of financial integration related to financial development (Fig. 1), financial performance (Fig. 2), outreach (Figs. 3 and 4) and agency cost (Fig. 5). All these figures show specific trends, with interest paid to the lowest quantile, middle quantile and highest quantile of the financial integration degree. The lowest quantile included MFIs with fewer financial interconnections with commercial banks. In other words, the own interest of internal management is relatively important. For the highest quantile, there are MFIs that are highly interconnected with commercial banks. This means that there is more external financial pressure externally from commercial banks than internal financial pressure. The regression model in written form is as follows:

$$(1) \quad FI_{it} = \alpha_0 + \alpha_1 LnFD_{it} + \alpha_2 Lnagencost_{it} + \alpha_3 FSS_{it} + \alpha_4 Lnacbor_{it} + \alpha_5 Lnnavloan_{it} + \alpha_6 Lnassets_{it} + \alpha_7 PAR_{it} + \alpha_8 loanloss_{it} + \alpha_9 Mature_{it} + \alpha_{10} Young_{it} + \alpha_{11} lngdppc_{it} + \alpha_{12} lnremirec_{it} + \alpha_{13} lnaid_{it} + \alpha_{14} lninfla_{it} + \alpha_{15} subregions_dummies_{it} + \alpha_{16} legalstatus_dummies_{it} + c_i + u_{it}$$

The contracted form of equation (1) can be presented in a general form, as Arellano and Bonhomme (2011), Canay (2011) have given as follows:

$$(2) \quad Y_{it} = X'_{it} \beta(U_{it}) + \alpha_i + \sigma v_{it}$$

where Y_{it} is the dependent variable that represents the financial integration indicator and X'_{it} , which includes all the explanatory variables presented above in the specification, is a vector of regressors. Here, $t=1, \dots, T$ and $i=1, \dots, n$. $(Y_{it}; X_{it}) \in \mathbb{R}^* \times \mathbb{R}^k$ are observable variables, and $(U_{it}; \alpha_i) \in \mathbb{R}^* \times \mathbb{R}$ are unobservable variables. X_{it} includes a constant term, which means that $X'_{it} = (1; X_{it}^s)$ with $X_{it}^s \in \mathbb{R}^{k-1}$.

Moreover, empirical studies on microfinance apply methods such as ordinary least squares (OLS), general least squares (GLS) and generalized method of moments (GMM). Usually, conventional econometric models such as mean regression techniques give estimated coefficients analysed as the mean values applied to the entire distribution. One weakness of this approach is some missing information related to a diversity of characteristics that could enhance the understanding of some economic behaviour more (Bitler et al., 2004). The quantile model is specified by using panel data, and we considered a conditional quantile specification. A basic quantile approach was developed by Koenker and Bassett (1978) and highlights quantile parameter heterogeneity. One of the advantages of estimating a quantile model is its technical ability to reveal distributional effects that can be significantly different across quantiles (Powell & Wagner, 2014; Kendo & Tchakounte, 2022a and 2022b).

Moreover, we estimate panel quantile regression with nonadditive fixed effects. This econometric solution is

proposed by Graham et al. (2015) and Powell (2016) as an econometric solution to bias analysis of the estimated coefficients. To previously check the role that could play fixed effects, we developed a preliminary analysis associated with the panel quantile specification, we address the two issues, fixed effects (FE) versus random effects (RE), with a Hausman test (Hausman, 1978). The null hypothesis of the Hausman test is $H_0: E(u_{it}/x_{it})=0$. A rejection of the null hypothesis of the Hausman test suggests that the FE model is consistent. This new econometric specification assumes that the individual effects are an integral component of each explanatory variable. The inseparable component of individual effects observed in each subgroup of MFIs could explain why there are potential differences in the estimates. The econometric specification is redefined as

$$(3) \quad Y_{it} = X'_{it} \beta(U^*_{it}); \text{ with } U^*_{it} \sim U(0,1) \text{ and } U^*_{it} = f(\alpha_i; U_{it})$$

$$(4) \quad U^*_{it} | Z_i \sim U^*_{is} | Z_i$$

U^*_{it} is the nonseparable disturbance term, which represents the likelihood of the outcome (Doksum, 1974). U^*_{it} may be a function of several unobserved disturbance terms and summarizes these terms into ranked variables (Powell, 2016). Based on this compiled approach, the specification of our econometric analysis can be rewritten as follows:

$$(5) \quad FI_{it} = \alpha_1 LnFD_{it} + \alpha_2 Lnagencost_{it} + \alpha_3 FSS_{it} + \alpha_4 Lnacbor_{it} + \alpha_5 Lnnavloan_{it} + \alpha_6 Lnassets_{it} + \alpha_7 PAR_{it} + \alpha_8 loanloss_{it} + \alpha_9 Mature_{it} + \alpha_{10} Young_{it} + \alpha_{11} lngdppc_{it} + \alpha_{12} lnremirec_{it} + \alpha_{13} lnaid_{it} + \alpha_{14} lninfla_{it} + \alpha_{15} subregions_dummies_{it} + \alpha_{16} legalstatus_dummies_{it} + c_i + u_{it}$$

As Popov and Ongena (2011) additionally mentioned, financial integration in general and interbank market integration in particular can be defined using two broad criteria: the volume of transactions and the efficiency of markets (Obstfeld, 1986). According to the literature review of Prasad et al. (2007), Giannetti and Ongena (2009) and Popov and Ongena (2011), a proxy for financial integration is the borrowing level over the total financing sources (liabilities). The microfinance financial integration (FI) index is defined as follows (Kendo & Tchakounte, 2022b):

$$(6) \quad FI = \text{borrowing} / (\text{total liabilities})$$

Let us consider degree line below, which shows the different stages of financial integration of a microfinance institution. This line below shows the financial integration level measures as the ratio of borrowing to total funds. Our ratio shows the importance of the interbank market in the process of financial connection of microfinance institutions with other formal financial institutions.

The value of the financial integration indicator of microfinance institutions is between 0 and 1.

If $FI = 0$, there is no financial integration; in other words, there is no borrowing and no financial interconnections



between MFIs and commercial banks.

If $FI = 1$, there is full integration, with an increasing percentage of borrowing identified as the main additional component of the microfinance capital structure.

In the specifications (Eq 1 & Eq 5), financial integration is assumed to be a function of the financial development, agency cost, microfinance performance and some additional control variables of MFIs.

The financial development (FD) variable is measured by the logarithm of domestic credit provided to the financial sector ($\ln FD$) (e.g., King & Levine, 1993; Levine, 1997; Levine, 2005; Kpodar & Singh, 2011; Vanroose and D'Espallier (2013). We assume a positive link between financial integration and financial development.

Agency theory developed by Jensen and Meckling (1976) highlights the role of managerial decision rights and various external and internal monitoring (Ang et al., 2000). Agency cost is measured by the logarithm of operating expense over equity ($\ln agencost$) (Ang et al., 2000; Fleming et al., 2005; McKnight & Weir, 2009).

For microfinance performance, we have two main aspects: financial performance and outreach. Financial performance is measured by using financial self-sufficiency (FSS), which appears as a best measure financial performance of MFIs (Cull & Morduch, 2007; Cull et al., 2010, 2011; Kendo & Tchakounte, 2022a and 2022b).

In this study, we consider two indicators for outreach, i.e., the logarithm of the average loan size adjusted by GNI ($\ln avloan$) (Hulme & Mosley, 1996; Schreiner, 2002) as a proxy for the depth of outreach and the logarithm of the number of active borrowers as a proxy for the breadth of outreach ($\ln acbor$) (Quayes, 2012).

The control variables are the microfinance characteristics and the macroeconomic environment.

The variables for microfinance institution characteristics include:

- ➔ The size measured as the logarithmic of microfinance's total net assets ($\ln assets$).
- ➔ Credit risk which measured by the portfolio at risk > 30-day ratio (%) (PAR) and the loan loss ratio ($\ln loss$).
- ➔ Age given dummies for three categories: mature takes a value of 1 and 0 otherwise; young takes a value of 1 and 0 otherwise. New is considered as the reference for the definition of those two binary values.
- ➔ Subregions included as dummies taking value of 1 and 0 otherwise for: Sub-Saharan Africa (region 1), East Asia and the Pacific (region 2), Eastern Europe and Central Asia (region 3), Latin America and the Caribbean (region 4), and South Asia (region 6). The reference subregion is the Middle East and North Africa (region 5).

➔ legal status considered as dummies, bank, coop, nbfi and ngo take a value of 1 in the relevant formal status and 0 otherwise.

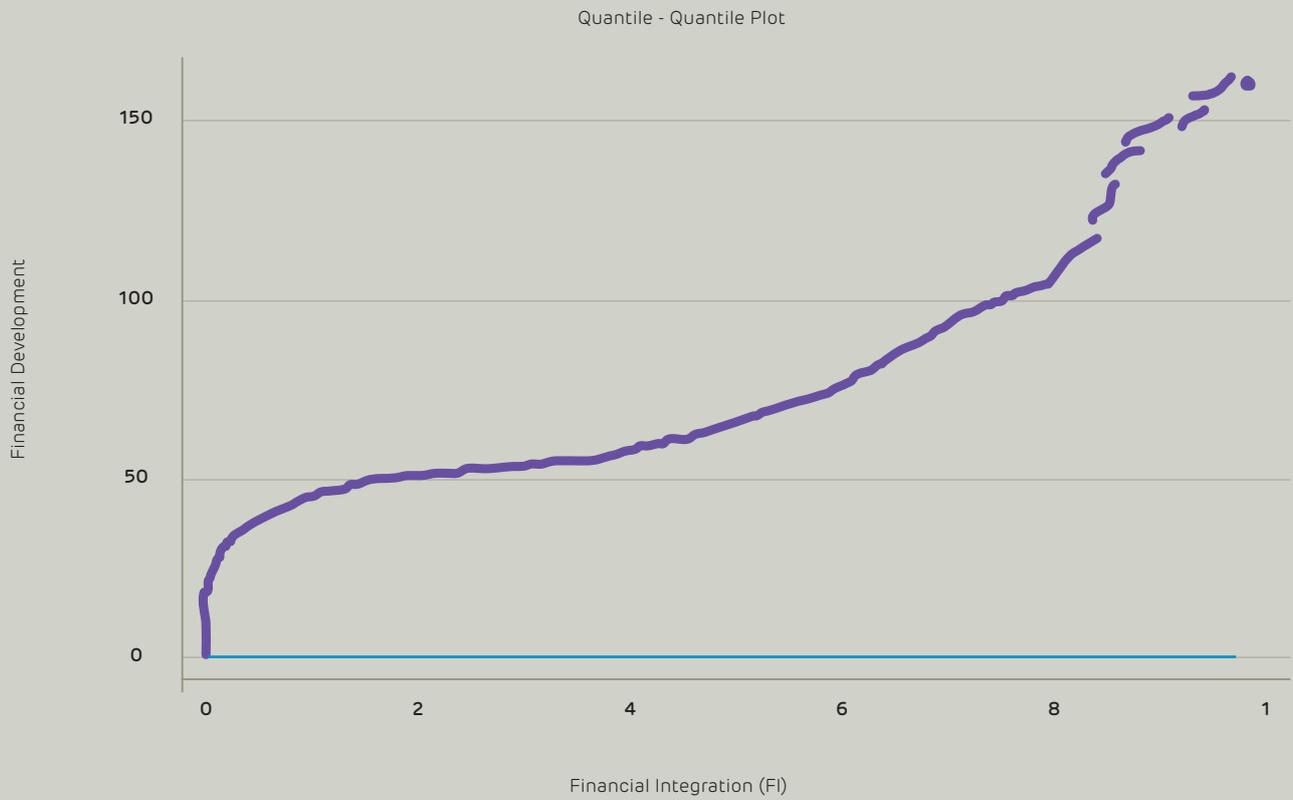
The macro variable includes a set of macroeconomic control variables specific to each country, the logarithm of GDP per capita growth ($\ln gdp$), the logarithm of remittances received ($\ln remirec$), the logarithm of aid received ($\ln aid$) and the logarithm of inflation ($\ln infla$).

As mentioned earlier, financial development explains how financial integration and financial development could also depend on how MFIs and commercial banks financially cooperate to create the impact of the banking sector. Moreover, an improvement in the profitability of MFIs could be induced by the improvement of financial integration.

By running the estimations, the exogeneity assumption could be violated because of a possible correlation between unobserved heterogeneity and regressors. Moreover, there is an endogeneity problem due to some the regressors that could be dependent on financial integration. To solve the endogeneity problem, the panel quantile data specification allows the use of instrumental variables, (Quayes 2015; Kendo & Tchakounte, 2022a and 2022b), incorporated in the Stata program `qregpd` developed by Powell (2016). We run the `qregpd` by clearly including instruments defined as lag values of initial regressors. The lag gap considered is the first lag for each regressor. The generalized quantile regressions are estimated using the Markov chain Monte Carlo (MCMC) method, which comprises a sequence of draws from the posterior distribution of the model's parameters (Arellano & Bonhomme, 2011).

Figure 1

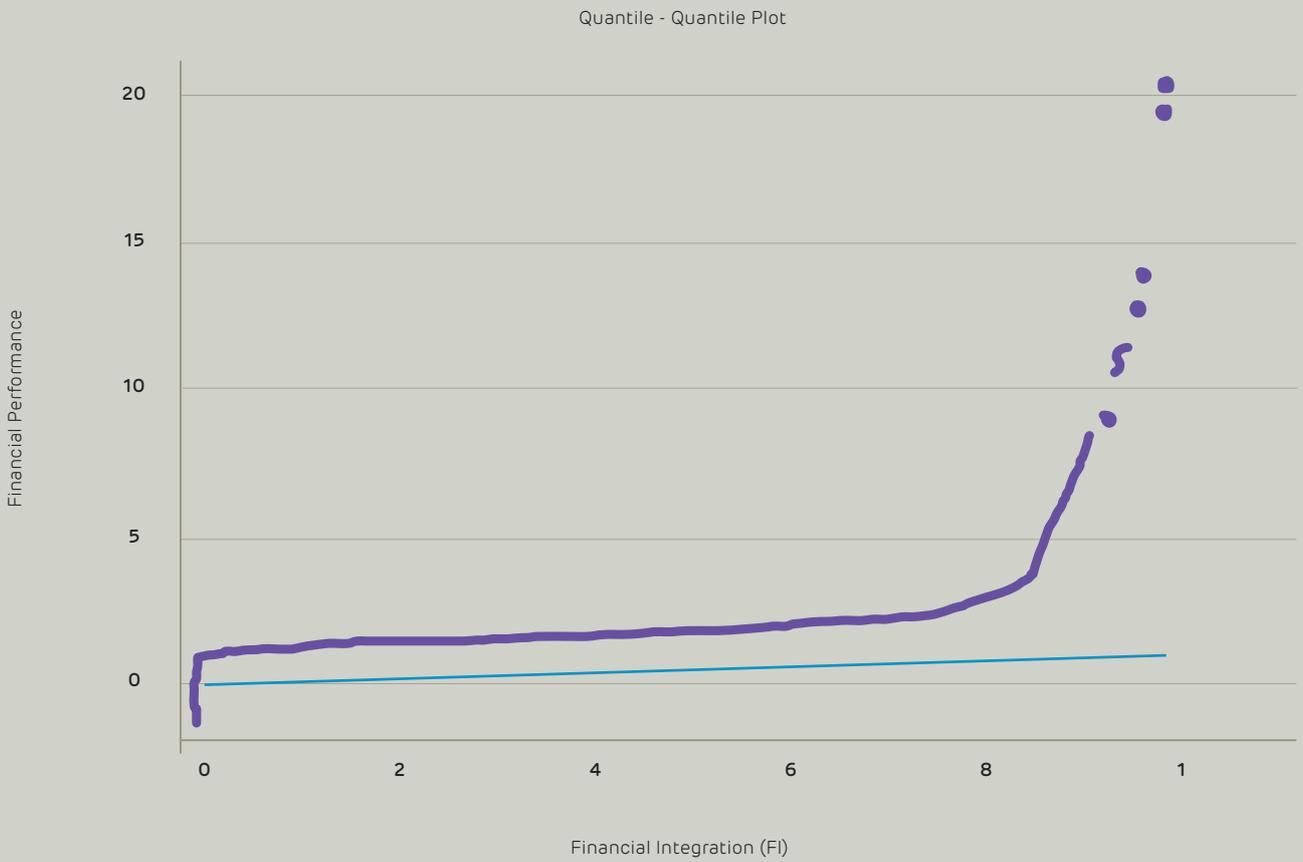
Quantile trend: Financial Integration and Financial Development



Source: Authors

Figure 2

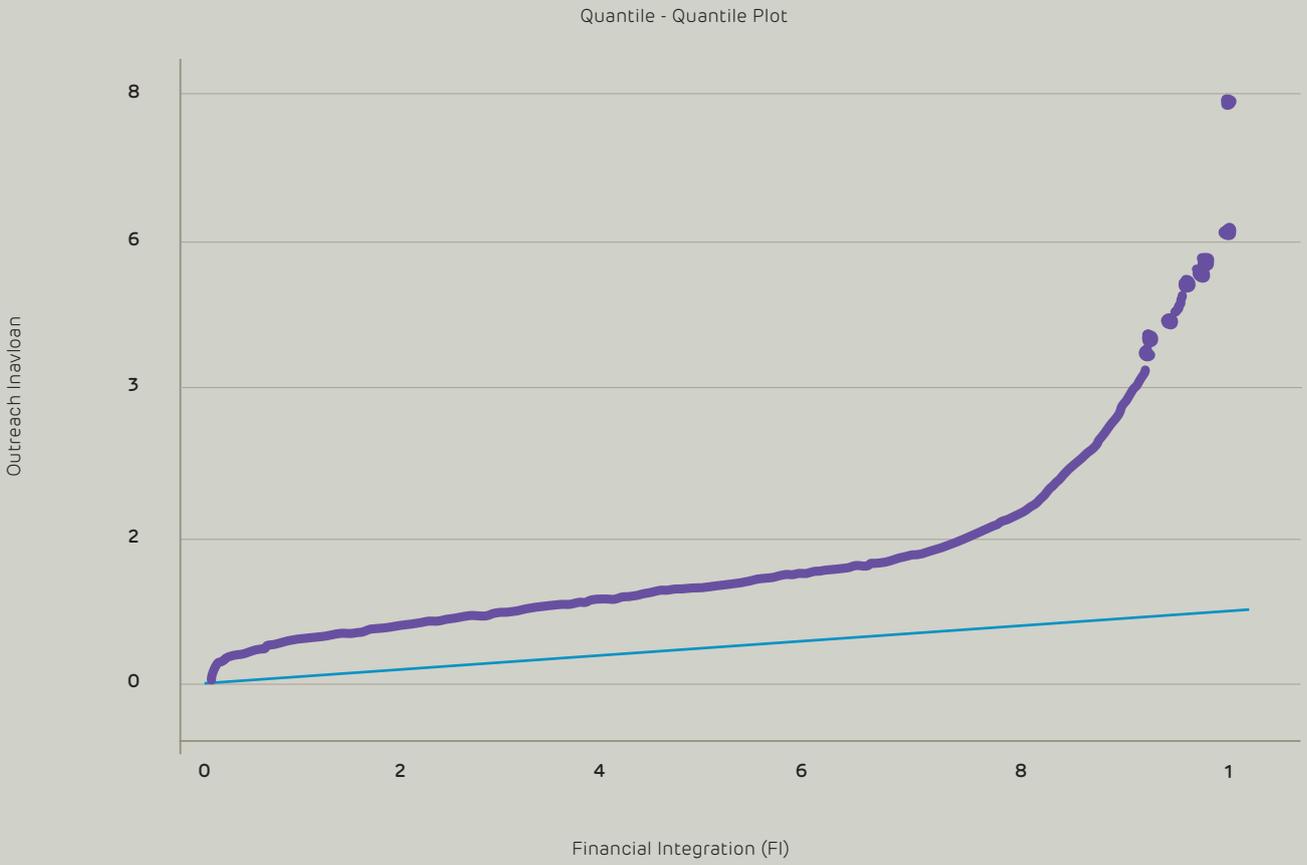
Quantile trend: Financial Integration and Financial Performance



Source: Authors

Figure 3

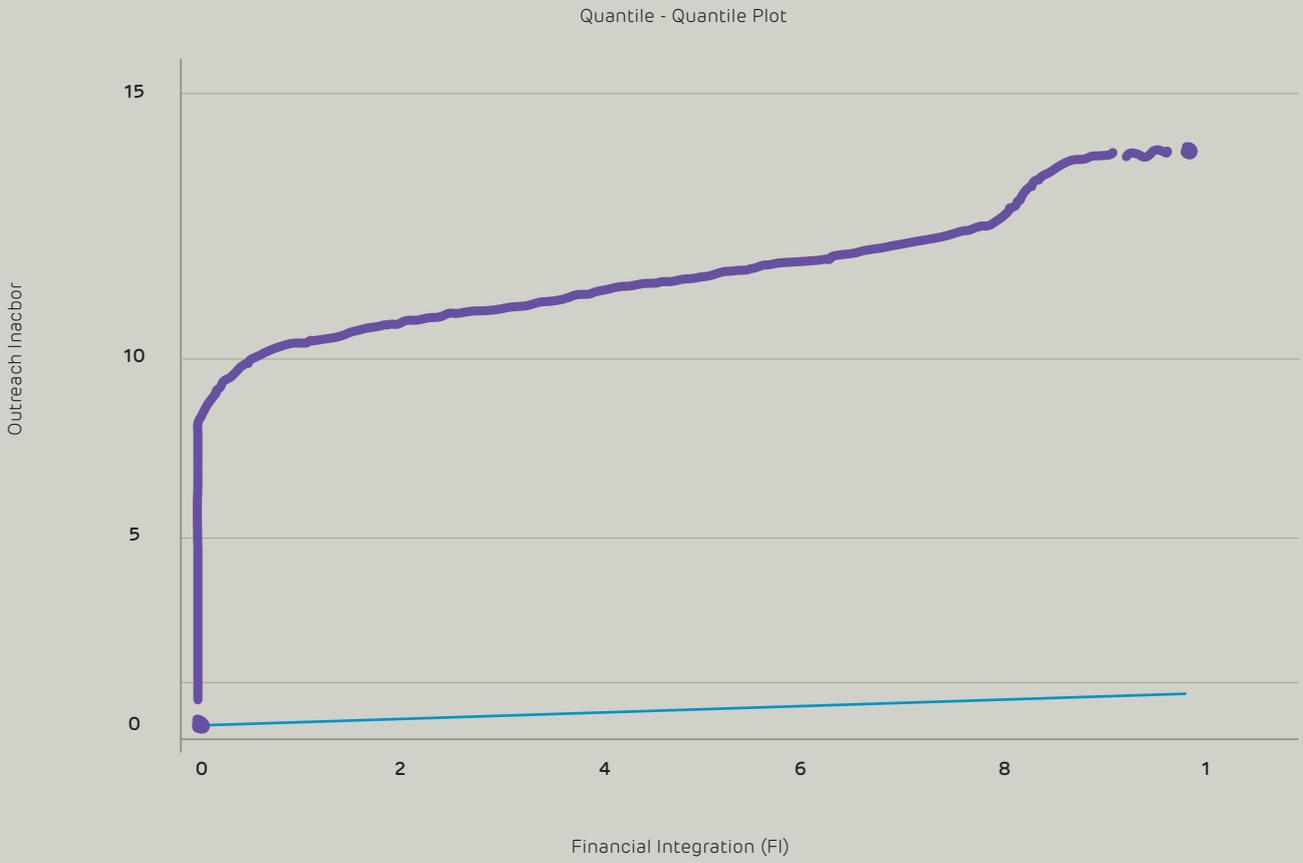
Quantile trend: Financial Integration and Depth of Outreach



Source: Authors

Figure 4

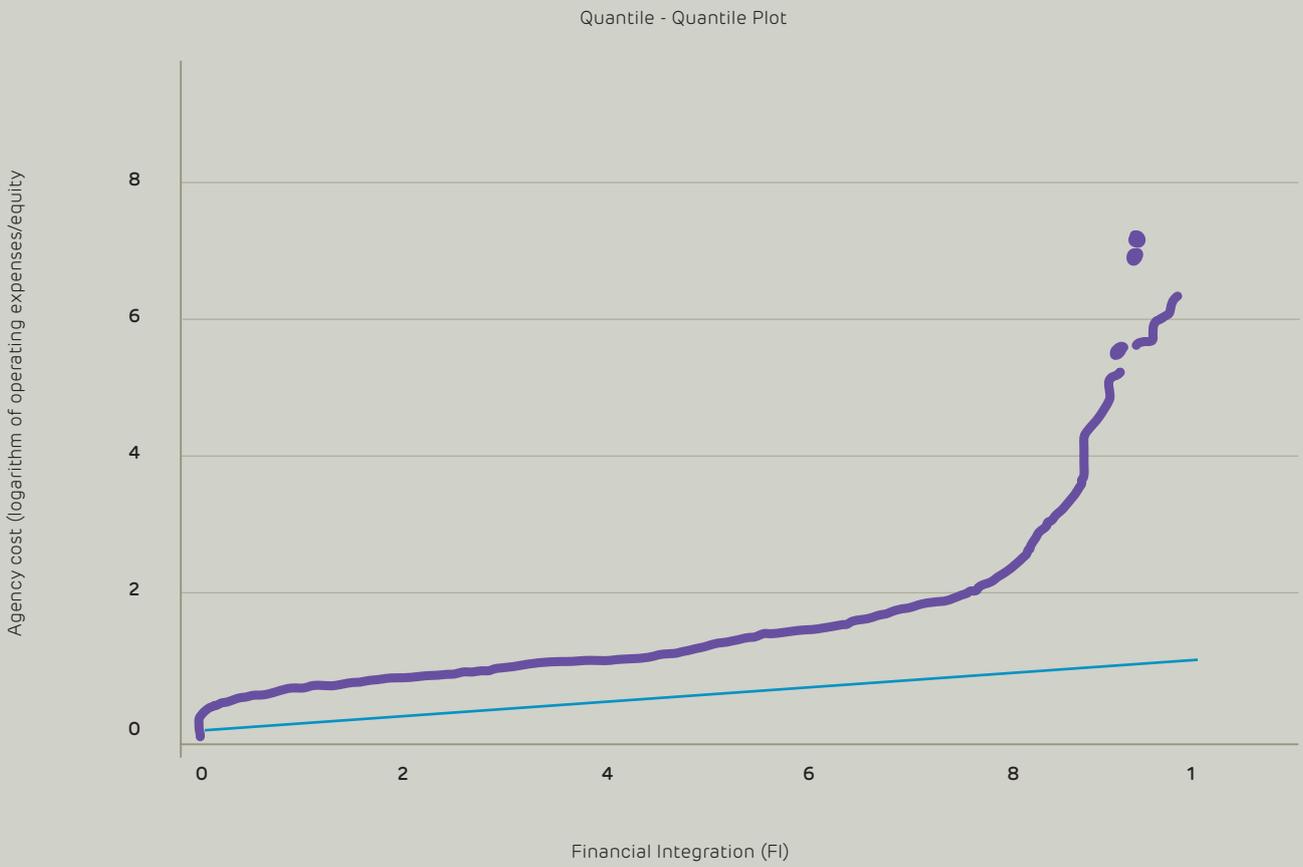
Quantile trend: Financial Integration and Breadth of Outreach



Source: Authors

Figure 5

Quantile trend: Financial Integration and Agency Cost



Source: Authors

3. Results

3.1 Description of the results

We now present and discuss the main results of our study. The Hausman test results applied using the whole linear model specified in equation (1) are summarized and presented in Table 3 below. The results reveal a probability value for the whole model equal to 0.000. This result suggests a rejection of the null hypothesis that the estimators of the RE model are important. Thus, the difference between the coefficients could be explained by the presence of individual effects observed across time periods and sub-region specificities. In other words, the impact of financial integration increases with

the number of years and becomes consistent over time and subregions.

We now analyse the empirical results by looking for the determinants of microfinance institutions' integration. As the Hausman test leads us to give some consideration to fixed effects, we estimate the fixed effects model and compare its results with those obtained from applying quantile regression with non-additive fixed effects. Remember that the average effects for each quantile are considered to be the marginal effects applied to MFIs that belong to the corresponding quantile.

3.2 Results and discussion

Table 4 provides the results regarding the impact of driving forces on the financial integration of MFIs. Column (1) reports the covariate for the fixed model estimated for the whole sample. Columns 2 to 6 report the movers' conditional quantile effect (QE) using the estimator introduced here for $\tau = 0.10, 0.25, 0.5, 0.75,$ and 0.90 . Standard errors are reported in parentheses. The estimations applied to the whole sample reveal a negative link with financial development. The few papers that have analysed the relationship between financial development and financial integration mentioned two possible impacts: a positive impact (Battiston et al., 2016; Fecht et al., 2012; Popov & Ongena, 2011) and a negative impact (Khanna & Palepu, 2000). Our results follow those of Khanna and Palepu (2000) for the whole sample, which suggests that because of the high segmentation of microfinance sector control by larger MFIs, financial integration will benefit larger MFIs. A 1% increase in financial development leads to a significant decrease in financial integration of 0.031%.

In the whole microfinance sector without differentiating the different levels of interconnection between commercial banks and MFIs, it seems that financial development would not promote such financial interconnection. However, by considering each quantile or subgroup of MFI integration in the interbank market, an improvement in financial development would favour all MFIs, regardless of their size. In the lowest quantile, where financial integration is weak (covariate value equal to 0.0006), the impact of financial development is also weak compared to the impact observed in the highest quantile (covariate value equal to 0.067). According to the heterogeneous effects, there is an increase in the impact of financial development as the degree of financial integration increases; this increase is significant at 1%.

There is a positive link between agency costs and financial integration both for the whole sample and for each quantile

considered. For the MFI group with low financial integration, there is a low agency cost to handle, and for those with a high financial integration level, the agency cost percentage is highly related to it. Our results for the microfinance sector are in line with those of Ang et al. (2000), which highlight that an agency cost indicator equal to zero or no agency cost means a 100% owner-managed firm. Conversely, a greater involvement of external financial actors such as commercial banks in financing firm activities will induce an increase in agency costs. Across the quantiles, when there is high borrowing in the capital structure, there is an increase in the impact of the agency cost of MFIs, with significant related covariates increasing. Agency problems will increasingly appear because of conflicts between the interests of MFIs and the interests of commercial banks that grant loans to those MFIs.

Almeida and Campello (2010) additionally underline the behaviour of profitable firms by observing the arbitrage between internal funds and debts. They highlight that firms with a high level of profit demand fewer external funds. Moreover, financially constrained firms may not reduce their demand for external funds (Almeida & Campello, 2010). The estimation results in Table 4 reveal a negative relationship between financial integration and profitability both for the whole sample and for each quantile subgroup. Financial integration involves attracting more MFIs with low profitability levels. This inverse relationship could be partly explained by the asymmetrical information highly present in the microfinance sector.

Granting a small amount of loans to MFIs induces an increase in financial integration for the whole sample. This is interesting because microfinance practices were made popular due to clients' easy access to small loans (Yunus & Jolis, 2003; Yunus & Weber, 2007). This success largely attracted several types of investors in the microfinance sector, including commercial banks, which helps us to better understand the trend that appears for the amount

of loans for each quantile. A progressive increase in the average amount of loans leads to an increase in financial interconnections between commercial banks and MFIs through borrowing. The increasingly commercial approach encouraging an increase in the amount of average loans granted by microfinance institutions (MFIs) enriches the debate in the microfinance literature. This commercial approach impeded by commercial bank participation in the microfinance sector implies that MFIs may abandon their social mission, as they focus more on financial performance (Louis et al., 2013). An increase in the amount of average loans will attract more better-off clients. Mission drift occurs when the size of average loans increases (Mersland & Strøm, 2009). Microfinance institutions will increasingly choose to target better-off clients as a reply to aggressive actions of banks in the market. Our results reveal that financial integration is an additional significant determinant of mission drift occurrence in client portfolios. This analysis of mission drift in client portfolios is completed the relying one of many active borrowers. There is a positive and significant link between the number of active borrowers and financial integration. Moreover, there are significant heterogeneous effects of the number of active borrowers, highlighting that as the number of borrowers increases, then the impact on financial integration becomes more positive.

Some MFI characteristics also impact the financial integration of microfinance institutions. Increasing asset size positively impacts the financial integration of MFIs.

The asset size impacts are strengthened by the default risk observed. Integration in the interbank market will allow more possibilities for financial institutions to reallocate the use of their funds and better share their liquidity risks (Popov & Ongena, 2011). Therefore, our results confirm a better sharing of liquidity risks from financial integration by the negative and significant relationship that is observed between financial integration and both the loan loss ratio and portfolio at risk. The low percentage of loan losses and portfolio at risk are explained by the regulation framework and all the financial restrictions imposed by commercial banks in their lending activity. Before granting loans, commercial banks require some guarantees (physical and financial guarantees) associated with a good and stable financial history and behaviour among borrowers. In the context of the highest financial integration, only larger MFIs will be tempted to take more financial risks with an important portfolio at risk.

Some macroeconomic variables, such as economic growth and inflation, encourage a better financial integration of MFIs. However, for microfinance institutions that receive more financial aid and more remittances, their financial integration process will be less important. Those two variables, aids and remittances, are awareness factors for commercial banks to also evaluate the type of internal funds of MFIs. One suggestion for thought is that MFIs relying on more than one kind of fund are more at risk of financial failure if they receive loans from commercial banks.

Table 3

➔ Hausman analysis: financial integration

	Fixed Effects (fe) FI	Random Effects (re) FI	Hausman-Taylor (fe – re)
InFD	-0.0312*** (0.00701)	-0.00367 (0.00452)	-0.027
Inagencost	0.0234*** (0.00472)	0.0225*** (0.00423)	0.001
FSS	-0.00831 (0.00458)	-0.00795 (0.00416)	-0.0004
Inavloan	-0.0329* (0.0135)	-0.00312 (0.00924)	-0.030
Inacbor	0.00502 (0.00480)	0.0146*** (0.00325)	-0.010
Inassets	0.0521*** (0.00478)	0.0265*** (0.00304)	0.026
loanloss	-0.00538 (0.0121)	-0.00786 (0.0106)	0.002
par30	-0.0128 (0.0100)	-0.0173 (0.00970)	0.005
Inremirec	-0.0279*** (0.00438)	-0.0217*** (0.00195)	-0.006
Inaid	-0.00106 (0.00304)	-0.00725** (0.00254)	0.006
Ingdp	-0.0920*** (0.0193)	0.000244 (0.00131)	-0.092
Ininfl	0.00326 (0.00230)	0.00817*** (0.00212)	-0.005
mature	-0.0184* (0.00743)	-0.0137* (0.00596)	-0.005
young	-0.0161** (0.00605)	-0.0113* (0.00543)	-0.005
N	6826	6826	6826
Prob>chi2	0	0	0
Hausman Test-Chi2	Chi2(14)= 123.37		

Standard errors in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: Authors

Table 4

 → Determinants of financial integration in the microfinance sector¹

	Whole sample FI	Q=0.10 FI	Q=0.25 FI	Q=0.50 FI	Q=0.75 FI	Q=0.9 FI
InFD	-0.0311*** (0.00704)	0.000605*** (0.0000517)	0.00222*** (0.0000399)	0.00981*** (0.000119)	0.0269*** (0.000127)	0.0668*** (0.000735)
Inagencost	0.0234*** (0.00472)	0.000862*** (0.000122)	0.00252*** (0.0000119)	0.00892*** (0.0000788)	0.0258*** (0.000161)	0.0485*** (0.000544)
FSS	-0.00837 (0.00458)	-0.000427 (0.000232)	-0.00224*** (0.0000168)	-0.00426*** (0.000188)	-0.00490*** (0.000224)	-0.00357*** (0.000498)
Inavloan	-0.0314* (0.0135)	0.00264*** (0.000423)	0.0100*** (0.0000578)	0.0302*** (0.0000529)	0.0538*** (0.000409)	0.0282*** (0.000864)
Inacbor	0.00518 (0.00480)	0.00123*** (0.0000642)	0.00338*** (0.0000175)	0.00942*** (0.0000210)	0.0178*** (0.000185)	0.0142*** (0.000247)
Inassets	0.0518*** (0.00479)	0.000700*** (0.000113)	0.00255*** (0.0000141)	0.00689*** (0.0000203)	0.0211*** (0.000144)	0.0534*** (0.000350)
loanloss	-0.00531 (0.0121)	0.000153 (0.000193)	-0.00136*** (0.0000388)	-0.00244*** (0.0000887)	-0.0120*** (0.000209)	-0.0307*** (0.000781)
par30	-0.0127 (0.0100)	-0.00144*** (0.000143)	-0.00549*** (0.000174)	-0.00485*** (0.000354)	-0.0183*** (0.000569)	0.00927*** (0.00172)
Inremirec	-0.0279*** (0.00439)	0.000369** (0.000118)	-0.00139*** (0.0000161)	-0.00671*** (0.0000102)	-0.0196*** (0.0000826)	-0.0454*** (0.000315)
Inaid	-0.00110 (0.00305)	-0.00154*** (0.000135)	-0.00280*** (0.0000787)	-0.00591*** (0.0000680)	-0.0120*** (0.0000772)	-0.0379*** (0.000583)
Ingdp	-0.0915*** (0.0194)	0.0000173 (0.0000220)	0.000126*** (0.0000101)	0.000663*** (0.0000148)	0.000572*** (0.0000231)	0.00241*** (0.0000444)
Ininfl	0.00328 (0.00231)	0.000657*** (0.0000285)	0.00199*** (0.0000142)	0.00426*** (0.0000906)	0.0102*** (0.000142)	0.0292*** (0.000613)
mature	-0.0184* (0.00744)	0.00118*** (0.000122)	0.00150*** (0.0000199)	0.00145*** (0.0000860)	-0.00525*** (0.000138)	-0.0302*** (0.000805)
young	-0.0160** (0.00605)	0.000334** (0.000119)	0.000366*** (0.0000237)	0.000776*** (0.0000477)	-0.00502*** (0.000187)	-0.0328*** (0.000679)
Region1	0 (.)	-0.000159 (0.000386)	-0.0120*** (0.0000894)	-0.147*** (0.000115)	-0.308*** (0.000745)	-0.221*** (0.00125)
Region2	0 (.)	-0.00166*** (0.000142)	-0.0105*** (0.0000308)	-0.144*** (0.000252)	-0.313*** (0.000631)	-0.278*** (0.000983)
Region3	0 (.)	0.00161*** (0.000315)	-0.00532*** (0.0000758)	-0.127*** (0.000183)	-0.275*** (0.000526)	-0.189*** (0.00174)
Region4	0 (.)	-0.000766* (0.000305)	-0.00968*** (0.0000454)	-0.144*** (0.000206)	-0.326*** (0.000445)	-0.313*** (0.00112)
Region6	0 (.)	-0.0000797 (0.000291)	-0.00911*** (0.0000541)	-0.141*** (0.000456)	-0.306*** (0.000666)	-0.225*** (0.00102)
Banks and Rural Banks		-0.0000951 (0.000329)	0.00416*** (0.0000724)	0.0119*** (0.0000759)	0.0472*** (0.000296)	0.0672*** (0.000982)
Cooperatives		-0.00207*** (0.000138)	-0.00708*** (0.0000285)	-0.0178*** (0.0000570)	-0.0366*** (0.000439)	-0.0708*** (0.000741)
NBFIs		-0.0000656 (0.000173)	-0.00137*** (0.0000523)	-0.00669*** (0.0000476)	-0.00891*** (0.000256)	0.0131*** (0.000936)
_cons	0.967*** (0.169)					
N	6799	6799	6799	6799	6799	6799

Standard errors in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: Authors

1. The definition of each variable can be easily found in the summary in Table D.

4. Conclusion

To conclude, this study analyses how MFIs financially interact with commercial banks and the driving forces that affect the increase in their financial integration. Four main driving forces were identified: agency costs, financial development, financial performance and outreach. This study provides two types of added value: empirical value and theoretical value. First, most current microfinance analyses use a panel data approach with a GLS method applied to measure fixed or random effects. Those methods highlight mean effects and do not consider distributional effects, highlighting the importance of the transitory development process of integration and/or various weighted impacts. Thus, the use of panel quantile regression considers those limits, which allows us to highlight different weighted effects of driving forces along the entire distribution of financial integration. In an empirical view of microfinance studies, this is the first contribution of the study. Therefore, in our sample of quantiles, we have two groups of observations: one group in which microfinance institutions are more financially integrated and another group in which they are less financially integrated. We observed different weighted impacts of driving forces along the quantiles and the role played by some microfinance institution characteristics in the financial integration process.

The second is a theoretical approach in which we also highlight the effect of those driving forces on financial integration. As we argue, the first assumption is a positive relationship between financial development and financial integration. The second is a positive relationship between agency costs and financial integration. The third is a negative link between profitability and financial integration. The fourth is a positive relationship between depth outreach (average loan size) and the breadth of outreach (number of active clients) with financial integration. Microfinance institutions that plan to increase their average loans with an increase in their number of active borrowers perform better in terms of financial integration.

The results first show that high financial development can easily improve the financial integration of microfinance institutions by increasing the ratio of external investors. Nevertheless, as show, high financial integration can also

occur when financial development is low. One reason is that only larger microfinance institutions with the highest market share can be easily financially integrated. An additional observation related to microfinance institution characteristics reveals that MFIs with low profitability will increase their demand for borrowing. Financial integration increases because of the increase in the financial needs of MFIs with low profits. One of the challenges of those MFIs is to strengthen their financial resources by diversifying their capital structure. By doing so, those MFIs allow themselves some new opportunities to reduce their liquidity risk and enhance the value of their firm and profit levels. For microfinance institutions, increasing their financial performance slows their financial integration.

In summary, factors that encourage an increase in the financial integration of MFIs are a high level of financial development, an increased demand for borrowing among microfinance institutions with low profits, an increase in loans and an increase in the number of active borrowers. One great challenge that MFIs face in this financial integration process is the agency problem, which is amplified by the increasing interest of commercial banks in the internal management of MFIs. For developing countries, an environmental context in which microfinance institutions can easily borrow will improve the development of the whole financial sector. Less financially integrated microfinance institutions need the support of policy makers. External investors have to manage two problems associated with less financially integrated microfinance institutions: adverse selection and moral hazard. Policy makers could help microfinance institutions serve as lenders of last resort, which will increase confidence in microfinance institutions' financial abilities and decrease the negative effects of moral hazard. One way to do this would be more commercial banks raising the percentage of their capital reserves to finance microfinance institutions through more borrowing. Policy makers could also ease the formal environment to facilitate the microfinance sector. This will encourage commercial banks to choose efficient microfinance projects to invest in. Thus, it will lessen the adverse selection problem managed by external investors.

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