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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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Abstract

The aim of this paper is to identify the drivers that could increase the financial integration of microfinance institutions with commercial banks. Importantly, financial integration ensures the sustainable growth of microfinance institutions through the provision of more financial resources, if needed. To identify these drivers, we used a panel dataset of 953 microfinance institutions (MFIs) from the MIX market dataset and country-level data from the World Bank for the 2003-2016 period. We applied a panel quantile approach with nonadditive fixed effects. Our results reveal that an increase in financial development slows the financial integration of MFIs. However, considering 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. There is a significant and negative link between the profitability of MFIs and their financial integration. Moreover, the results reveal that financial integration is a significant determinant of mission drift occurrence in client portfolios.

Keywords: financial integration, microfinance, financial development, agency costs, financial performance and outreach

Classification codes: G21; G24; G32; O50

Abbreviations

FD: Financial Development

FI: Financial Integration

FSS: Financial Self-sufficiency

GNI : Gross National Income

MIX Market: Microfinance Information Exchange Market

MFIs : Microfinance Institutions

NBFIs : Nonbank Financial Institutions

Introduction

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. 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). 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? 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).

During the past two decades, the microfinance sector has faced great success, which is partly explained by the commercialization of its activities and a more diversified source of funds. Commercial banks play an important role in funding microfinance institutions and thereby developing microfinance activities (Galema et al., 2011). Moreover, in financing microfinance institutions, institutional investors and private investors focus more on the commercial aspects that lead to high financial performance (Galema et al., 2011). Thus, some consideration has been given to the trade-off analysis between financial performance and outreach and how financial

integration increases the trade-off or complementarity between financial performance and outreach.

The increase in these various external funds (commercial banks, institutional investors and private investors) in the microfinance industry partly explains the rapid growth of some microfinance institutions (Ghosh et al., 2003).¹ The cost of external funds attributable to their origins (domestic and international) settles the efficiency of microfinance institutions. The efficiency of microfinance institutions is characterized by Hartarska and Mersland (2012) as their ability to reach many poor clients. Therefore, cheap external funds lead to low loan costs that expand microfinance activity and allow a favourable financial environment integrating more poor clients. Adverse selection effects could occur with the entry of inefficient MFIs² that benefit from cheap external funding (Ghosh & Van Tassel, 2011). Because of competition for access to external funds and favourable financial conditions that attract inefficient MFIs, adverse selection effects are therefore characterized by an increase in the loan interest rate (Ghosh & Van Tassel, 2011).

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

¹ The success of microfinance also relies on the improvement of the financial inclusion of the poor in less developed countries (Hartarska & Nadolnyak, 2008; Littlefield et al., 2003; Rai & Ravi, 2011). Some pessimistic views argue there is no real effect or that the effect of microfinance on poverty is not clear (Bateman, 2010; Duflo, 2010; Morris & Barnes, 2005).

² Inefficient MFIs are those who rely mainly on the implicit subsidy to cover its high operating costs (Ghosh & Van Tassel, 2011).

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 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 take into account 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 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.

The remainder of the paper is organized as follows. The second section presents a review of the literature linking financial integration with financial development, agency costs, financial performance and outreach. The third section presents the data, model and estimation methods. The fourth section discusses the empirical results. The fifth section ends with important implications.

Literature review

2.1 Financial integration and financial development

Financial development has an important role in improving financial services in an economy. Financial development includes the ability of the financial system to mobilize private savings, effectively allocate resources, increase liquidity risk diversification, reduce information asymmetries and transaction costs, and improve alternative funds through individuals' household savings and undistributed corporate profits (Ang & McKibbin, 2007). The development of the financial system favours multilevel financial networks that characterize the various tools³ 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 markets and contractual costs (Khanna & Palepu, 2000). Ahmed (2016), by focusing on international financial integration and favourable economic conditions, shows a positive relationship between financial integration and financial development. Masten et al. (2008) highlight that the benefit of financial integration is significant in the financial system if the system's level of financial development is relatively high. Akbari et al. (2021) mentioned two important forces that could explain financial integration: financial development and the percentage of investment riskiness. Low financial development and a high level of investment riskiness can slow down the transitory process of financial integration.

A well-developed financial sector appears mostly in developed countries in which there is a good ability to collect savings and better develop investment (Hassan et al., 2011). This is less the case in developing countries, where we predominately observe low financial development. Low financial development could weaken financial links between microfinance institutions and

³ Those tools of financial integration or financial interconnection encompass debt access, the mobilization of savings as well as the utilization of capital markets.

external investors. Additionally, in the financial sector of developing countries, a large gap in market share exists between microfinance institutions and commercial banks (Vanroose & D'Espallier, 2013). One solution to better sustain the development of microfinance institutions is to improve financial sources of microfinance by encouraging new financial opportunities (Bogan, 2012; Hoque et al., 2011; Kyereboah-Coleman, 2007; Tchuigoua, 2014, 2015). Therefore, financial integration induced by financial development raises the financial inclusion rate through an increase in savings, better access to clients and more customized financial products. An increase in external funds flows lessens the cost of capital and increases microfinance institutions' savings (Prasad et al., 2007). External investors with a good arbitrage strategy between risk and returns will easily manage microfinance institutions' risks. Similarly, microfinance institutions share their experience with external investors by teaching them how to access and finance poor clients and small and precarious entrepreneurs in the financial sector. Financial development will increase due to financial proximity at this stage by also increasing the additional transfer of know-how, technology and skills from banking practices to microfinance practices.

Combining the advantages of microfinance practices and banking practices, external investors taking part in microfinance capital could gain some extra returns from social advantages and the improvement of risk management and financial intermediary actions (Ghosh et al., 2003; Ghosh & Van Tassel, 2011, 2013; Nguyen et al., 2021). External investors' inclusion in the capital structure improves the diversification of MFIs' financing sources and increases their ability to grant more loans to the poor (Ghosh & Van Tassel, 2011, 2013). Financial development that favours more consolidated micro financial and banking practices induces external investors to grant more funds to poor, small and medium firms by enabling a

great deal of diversification of bank default risk (Nguyen et al., 2021). External investors will be more confident about microfinance institutions' capabilities and skills. They will have high incentives to diversify their portfolios with some new financial and social investment. Based on this, let us assume that financial development positively impacts the financial integration of microfinance institutions; we define this assumption as H1.

2.2 Financial integration and agency costs

Financial institutions face agency costs when they decide to open their capital structure to external investors. Agency costs highlight some conflicts between the manager and shareholders. Agency costs in the microfinance activity growth process are the conflict between managers' objectives and pressure from external investors. External investors can put pressure to guide loans granted, thus increasing borrowers' default risk. As the agency cost theory mentions, the internal organization depends on institutional characteristics' value of capital (Berger & di Patti, 2006; Williamson, 2000). A low capital value or a high leverage ratio lessens agency costs and increases firm value, especially if external investors can easily encourage or constrain managers' decisions to act more in their interests (Berger & di Patti, 2006). Therefore, the existing link between financial integration and the leverage ratio is positive. As microfinance institutions financially integrate, agency costs increase with a strong diversification of risk and improvement of the leverage ratio.

Sometimes, a high leverage ratio can mitigate conflicts between external providers and managers about specific points. These points are investment strategies (Myers, 1977), risk (Jensen & Meckling, 1976; Williamson, 1988), liquidation conditions and dividend policy (Stulz, 1990). Later, Kar (2012) analysed the impact of capital and financing structure on microfinance

institutions' performance. He empirically confirmed agency cost theory by specifying an increase in leverage that raises profit efficiency (Kar, 2012). He argued that capital and assets are negatively linked to financial performance. There is a nonlinear relationship between capital over assets and the financial performance of microfinance institutions. An increase in debt over equity is associated with a decrease in profitability (Kar, 2012).

Indeed, an important point that appears clearly in those studies is that the well-diversified capital of financial institutions is characterized by high agency costs. Therefore, we assume at this stage that there is a positive relationship between agency costs and the degree of financial integration; we define this assumption as H2.

2.3 Financial integration and the trade-off between financial performance and outreach

Financial integration is part of financial development and is characterized mainly by an increase in the financial inclusion rate among less developed countries. To ensure the sustainable financial integration of microfinance institutions, it is important to consider their financing ability and social strategies. In addition, an improvement in financial intermediation in the microfinance sector appears with good regulation and supervision frameworks. These frameworks that encourage financial development will impact the financial integration process between commercial banks and MFIs. A few papers have developed analyses on how microfinance institutions' performance impacts financial integration.

Almeida and Campello (2010) additionally underlined the behaviour of profitable firms by observing the arbitrage between internal funds and debts. They highlighted that more profitable firms demand less external funds. Moreover, financially constrained firms may not

reduce their demand for external funds (Almeida & Campello, 2010). Therefore, we propose H3: there is a negative link between financial integration and microfinance institutions' profitability.

No study directly discusses how the social targets, depth of outreach and breadth of outreach for MFIs impact the financial integration process of MFIs. A good or weak macroeconomic environment impacts microfinance institutions' growth (Ahlin et al., 2011; Gonzalez, 2007; Krauss & Walter, 2009), which will in turn impact the financial integration of microfinance institutions. In less developed financial sectors, microfinance institutions target more poor clients and raise the rate of financial inclusion (Vanroose & D'Espallier, 2013). In well-developed financial sectors, microfinance institutions will compete with banks that could easily adapt their loan contracts. This competition pressure can lead to mission drift in microfinance institutions' client portfolios. 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 response to the aggressive actions of banks in the market. The existence of mission drift is also determined by microfinance institutions' experience (Mersland & Strøm, 2009), the maturity of their clients (Cull et al., 2009) and their efficiency (Hermes et al., 2009).

By considering these facts, high mission drift is positively linked to a high level of financial development and indirectly to a high level of financial integration. In this case, an aim of microfinance institutions is to diversify their client portfolios by targeting better-off clients. A high mission drift also highlights a trade-off between financial performance and outreach. Therefore, MFIs increase their financial performance by diversifying their client portfolios by targeting better-off clients. Thus, we propose H4: there is a positive link between financial integration and outreach.

Materials and methods

3.1 Data

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 A in the Appendix 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.

Table 1 gives more details about the dataset in terms of numbers of MFIs per year and per type of MFI. The full sample consists of 18,102 observations from 234 countries over a period of 19 years (1999-2017). However, because of considerable missing data observed from 1999 to 2002 and 2017 for the estimations run, we considered unbalanced panel data for a period of 14 years (2003-2016).

Table 1. Description of the panel (number of year observations per type of MFI)

Year	Banks and Rural Banks	Credit Unions/ Cooperatives	NBFIs	NGOs and others	Total
1999	30	11	55	54	150
2000	44	21	71	81	217
2001	46	64	99	116	325
2002	71	86	146	215	518
2003	135	128	219	311	793
2004	156	142	280	392	970
2005	198	196	344	431	1169
2006	221	208	384	432	1245
2007	231	272	424	435	1362
2008	229	266	463	461	1419
2009	266	245	503	500	1514
2010	255	271	500	521	1547

2011	241	300	505	528	1574
2012	156	246	465	412	1279
2013	139	178	397	319	1033
2014	139	193	424	356	1112
2015	140	143	429	330	1042
2016	127	90	342	228	787
2017	10	2	18	16	46
Total	2834	3062	6068	6138	18102
Percentage (%)	15.7	16.9	33.5	33.9	100

Source: Authors

To consolidate our thoughts on the identification of the driving forces of the financial integration of microfinance institutions and make our results robust, we split our sample by differentiating four main MFI groups: (1) banks and rural banks, which represent 16% of our sample; (2) credit unions and cooperatives, which represent 17%; (3) nonbank financial institutions (NBFIs)⁴, 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

⁴ An NBFIs is an institution that provides similar services to those of a bank but is licenced under a separate category. The separate licence may be due to lower capital requirements, to limitations on financial service offerings, or to supervision under a different state agency. In some countries, this corresponds to a special category created for microfinance institutions.

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).

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
Lnnavloan**	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

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.

3.2 Variables

3.2.1 Dependent variable: Financial integration

The degree of financial openness measures financial integration. Prasad et al. (2007) identified two indexes. The first is that official controls on capital flows are considered binary indicators that directly measure capital controls but do not capture differences in the intensity of these

controls. Capital account controls highlight some constrained measures taken to control capital flow. The second is to estimate gross stocks of foreign assets and liabilities as a share of gross domestic product (GDP). Both measures value the financial openness of an economy. 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).

Giannetti and Ongena (2009) evaluated the impact of financial integration on firm performance by considering the rate foreign lending in the gross loan portfolio. For the financial integration measure, they used the percentage of foreign lending, which is the ratio of foreign bank loans to total bank loans. In the MIX market database, we cannot distinguish foreign loans from domestic loans in the growing loan portfolio. However, according to the literature review above, a proxy for financial integration is the borrowing level over the total financing sources (liabilities).

For example, an analysis of the Kenyan microfinance sector shows the importance of the debt funds rate to deposits and compulsory savings⁵. We have identified five components of capital sources: domestic debt, international debt, compulsory savings, deposits collected and equity.

The annual reports on Kenyan microfinance institutions for 2012, 2013 and 2014 help us to observe that microfinance institutions that have only credit activities are mainly financed by

⁵ The study case for financial integration analysis is the Kenyan microfinance sector, which is examined through the reports of 22 MFIs, among which the 3 largest have 80% of the total market share. Among those MFIs, 13 are considered as only giving credits, 6 are microfinance banks that collect deposits and give credit, and 3 are banks.

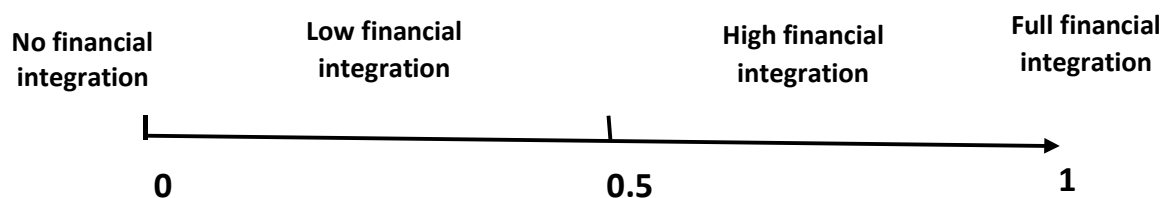
borrowing, and others that have both deposits and credit activities are broadly financed by borrowing, deposits and equity. If we exclude banks, only two important sources remain: deposits and borrowing. Between 2012 and 2014, liabilities increased for all Kenyan microfinance institutions.

The success of the financial integration of these institutions ensures an equilibrium between external funds, domestic savings and equity. This specific observation allows us to consider the percentage of borrowing to total liabilities as the main variable used to measure financial integration, that is, the ratio of total borrowing to total liabilities. The total liabilities encompass total deposits, total equity and total borrowing. The equity or net worth of MFIs is the difference between assets and liabilities, included on the liabilities side to support the financial activity of MFIs. The microfinance financial integration index is defined as follows:

$$FI = \frac{\textit{borrowing}}{\textit{total liabilities}}$$

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.

3.2.2 Variables of interest

3.2.2.1 Financial development

The financial development (FD) variable measures the extent of financial development at the country level, *i.e.*, the development level of the financial sector, including economic growth and poverty reduction (e.g., King & Levine, 1993; Kpodar & Singh, 2011; Levine, 2005). Financial development is measured as the domestic credit provided by the financial sector, including all credits to various sectors. Sound financial development is characterized by a high rate of collected deposits, an increase in the entry ratio for foreign financial institutions and a suitable allocation of capital to productive investments (King & Levine, 1993; Levine, 1997). Vanroose and D'Espallier (2013) analysed the role of financial development in MFIs' activities by using both domestic credit provided by the financial sector, including all credits to various sectors, and the spread rate. In our study, we use the logarithm of domestic credit provided to the financial sector ($\ln FD$). We assume a positive link between financial integration and financial development.

3.2.2.2 Agency cost effects

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). To measure agency costs, the empirical literature suggests taking into consideration operating expenses over sales (Ang et al., 2000; Fleming et al., 2005; McKnight & Weir, 2009). In our case study, we will consider operating expenses over the equity ratio. Equity provides some information about the implications of own management in the development of financial institutions. An agency cost indicator equal to zero or no agency cost means a 100% owner-managed firm (Ang et al., 2000). Such firms with zero agency costs are 100 percent owned by firm managers. Agency costs will have an impact if operating expenses increase as the equity of owner-managers declines. The logarithm of operating expense over equity (*Inagencost*) is a proxy used to measure the agency costs of MFIs.

3.2.2.3 Financial performance

Financial performance includes two targets: improving profit and reducing cost. To measure financial performance, three main indicators are usually used: return on equity (ROE), return on assets (ROA) and financial self-sufficiency (FSS). Recent literature on profitability agrees that financial self-sufficiency is the best among the three to measure financial performance (Cull & Morduch, 2007; Cull et al., 2010, 2011; Kendo & Tchakounte, 2021). One reason for this finding is that financial self-sufficiency gives not only information about the level of profit but also information on the ability of MFIs to generate revenue to cover their costs (cost management target). Therefore, in our study, we prefer to use FSS rather than the other indicators.

Outreach (*OUT*) is the other main dependent variable that measures the social benefits of microfinance for poor clients. Outreach is measured by two indicators, i.e., the depth and the

breadth of outreach. The depth of outreach is the value that society attaches to the net gain of a given client (Schreiner, 2002). The value of the client represents its weight in a social welfare function. Thus, depending on the main objective of an MFI, if it decides to target the poor, then one of the best depth of outreach indicators is the average loan size (Hulme & Mosley, 1996). The breadth of outreach is measured by the number of active borrowers (Quayes, 2012). In our study, we consider two indicators for outreach, i.e., the logarithm of the average loan size adjusted by GNI (*Inavloan*) 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 (*Inachor*).

3.2.3 Control variables

3.2.3.1 Microfinance institution control variables

The variables for microfinance institution characteristics include the size, credit risk, age, capital cost, leverage ratio and legal status.

The variable *assets* describe MFIs' size.⁶ It is measured as the logarithmic value of MFIs' total net assets. According to the "big bank" principle, first developed in the banking sector (Demsetz & Strahan, 1997; Kishan & Opiela, 2000), banks that are able to increase their assets tend to benefit from increased efficiency and economies of scale and scope (Kishan & Opiela, 2000), which positively impacts their financial performance (e.g., Bakare, 2011; Berger et al., 1999; Mogboyin et al., 2012; Obasan & Arikewuyo, 2012). However, the increase in banks'

⁶ Appendix B provides further details on asset size from our sample. In particular, Fig. 3 shows the quantile normal function of MFIs' assets.

assets is often associated with a decline in the fraction of small clients, *i.e.*, decreased outreach breadth.

Full financial integration does not automatically lead to great financial stability because of random issues due to financial crises such as bankruptcy, contagion effects and systemic risks (Stiglitz, 2010). For financial integration, there is some credit risk sharing that could be biased due to financial crises (Stiglitz, 2010). In the case of microfinance institutions, credit risk analysis takes into consideration the values of the portfolio at risk > 30-day ratio (%) (*PAR*) and the loan loss ratio (*loanloss*). Portfolio at risk is the value of all loans outstanding for which one or more installments of principal have been due for more than 30 days. This calculation includes the entire unpaid principal balance, including both past due and future instalments, but not accrued interest. The calculation also includes loans that have been restructured or rescheduled. The loan loss rate is the loan loss reserve divided by the gross loan portfolio. The loan loss reserve is the portion of the gross loan portfolio that has been expensed (provisioned for) in anticipation of losses due to default. We expect an increase in financial risk to reduce the level of profitability.

As presented by MIX market, the information on the age of MFIs is given as new, young or mature. Indeed, in this study, age modalities are split into two binary variables: *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.

For legal status dummies, *bank*, *coop*, *nbfi* and *ngo* take a value of 1 in the relevant formal status and 0 otherwise. Nongovernmental organizations (NGOs) and credit and savings cooperative MFIs tend to target outreach more than their financial performance (Helms, 2006).

Instead, commercial MFIs tend to improve their financial performance more than their outreach (Cull et al., 2007; Hermes et al., 2011).

3.2.3.2 Macroeconomic environment

The *macro* variable includes a set of macroeconomic control variables specific to each country, the logarithm of GDP per capita growth⁷ (*lngdppc*), the logarithm of remittances received⁸ (*lnremirec*), the logarithm of aid received⁹ (*lnaid*) and the logarithm of inflation (*lninfla*).

We include *region dummies* in our specification, defined according to the subregions in which financial integration in the microfinance sector can behave with some change in its shape. The five subregions considered are Sub-Saharan Africa, East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, and South Asia; dummies for these regions take a value of 1 for the relevant region and 0 otherwise. The reference subregion is the Middle East and North Africa.

⁷ In this study, we use the logarithm of GDP per capita as the gross domestic product divided by the midyear population.

⁸ In this study, we use the logarithmic value of the total remittances received divided by gross national income per capita in constant 2005 U.S. dollars (*lnremirec*). Remittances include personal transfers and employee compensation.

⁹ This represents aid flows (net of repayments) from official donors to countries and territories. Official aid is provided under terms and conditions similar to those for official development assistance (ODA). Data on official aid and other sources are in constant 2012 U.S. dollars. In this study, we use the log value (*lnaid*).

3.3 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:

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

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

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

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 $i = 1, \dots, n$. $(Y_{it}; X_{it}) \in \mathbb{R} * \mathbb{R}^k$ are observable variables, and

$(U_{it}; \alpha_i) \in \mathbb{R} * \mathbb{R}$ are unobservable variables. X_{it} includes a constant term, which means that $X'_{it} = (1; X^S_{it})$ with $X^S_{it} \in \mathbb{R}^{k-1}$.

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., 2006). 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, 2021).

Moreover, panel data raise some related questions about time-varying effects or fixed effects. As 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). A critical assumption in the error component regression model is that $E(u_{it}/x_{it}) = 0$ (Baltagi, 2008). 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.

By estimating whether FE effects or RE effects are appropriate for our study, the results will show all the estimates related to explanatory variables and the constant term representing the additive fixed effect. Econometrically, the specification that integrates the independence hypothesis is defined as

$$Y_{it} = X'_{it}\beta(U_{it}) + \alpha_i\gamma(U_{it}) \quad (3)$$

where U_{it} is the rank of the error of v_{it} . Thus, $U_{it} | X_{i1}; X_{i2}; \dots; X_{iT}; \alpha_i \sim U(0,1)$. $\beta(U)$ and $\gamma(U)$ are non-parametric functions. α_i is the additive fixed effect term, which refers to a possible existing gap $Y_{it} - \alpha_i$. It is possible to have at the bottom of the Y_{it} distribution some observations with a large difference, $Y_{it} - \alpha_i$. In other words, certain features or fixed effects of MFIs could predominantly appear in a specified subgroup of financial integration levels as triggers that bias the estimates. This will thus induce a bias in the analysis of the results.

An econometric solution to this specification and bias analysis of the estimated coefficients is proposed by Graham et al. (2015) and (Powell, 2016). Their approach allows an econometric model to be specified without clearly distinguishing a fixed coefficient that illustrates the individual effects. As a result, 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

$$Y_{it} = X'_{it}\beta(U_{it}^*); \text{ with } U_{it}^* \sim U(0,1) \text{ and } U_{it}^* = f(\alpha_i; U_{it}) \quad (4)$$

$$U_{it}^* | Z_i \sim U_{is}^* | Z_i \quad (5)$$

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:

$$\begin{aligned}
FI_{it} = & \alpha_1 LnFD_{it} + \alpha_2 Lnagencost_{it} + \alpha_3 FSS_{it} + \alpha_4 lnacbor_{it} + \alpha_5 lnavloan_{it} + \\
& \alpha_6 lnassets_{it} + \alpha_7 PAR_{it} + \alpha_8 loanloss_{it} + \alpha_9 Mature_{it} + \alpha_{10} Young_{it} + \alpha_{11} lngdppc_{it} + \\
& \alpha_{12} lnremirec_{it} + \alpha_{13} lnaid_{it} + \alpha_{14} lninfla_{it} + \alpha_{15} subregions_dummies_{it} + c_i + u_{it}
\end{aligned}
\tag{6}$$

In both specifications above, financial integration is assumed to be a function of the financial development and profitability of MFIs. 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.

This reveals a possible endogeneity between financial integration and both financial development and profitability in the empirical analysis, as stated by Ahmed (2016), Akbari et al. (2021), and Masten et al. (2008). Moreover, the exogeneity assumption could also be violated because of a possible correlation between unobserved heterogeneity and regressors. Thus, there is an endogeneity problem because all the regressors could also be dependent on financial integration. To solve the endogeneity problem, Quayes (2012) proposed a three-stage least squares regression applied on a logit model. For the panel data model, Quayes (2015) proposed instrumental variables and two least squares as econometric solutions. For our econometric approach, the panel quantile data specification allows the use of instrumental variables, as we did in one of our previous study (Kendo & Tchakounte, 2021), 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 *qregpd* is a special case of a generalized quantile estimator. 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).

Results

4.1 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.

Table 3. Hausman analysis: financial integration

	Fixed Effects (fe)	Random Effects (re)	Hausman-Taylor
	FI	FI	(fe – re)
lnFD	-0.0312*** (0.00701)	-0.00367 (0.00452)	-0.027
lnagencost	0.0234*** (0.00472)	0.0225*** (0.00423)	0.001
FSS	-0.00831 (0.00458)	-0.00795 (0.00416)	-0.0004
lnavloan	-0.0329* (0.0135)	-0.00312 (0.00924)	-0.030
lnacbor	0.00502 (0.00480)	0.0146*** (0.00325)	-0.010
lnassets	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
lnremirec	-0.0279*** (0.00438)	-0.0217*** (0.00195)	-0.006

lnaid	-0.00106 (0.00304)	-0.00725** (0.00254)	0.006
lngdp	-0.0920*** (0.0193)	0.000244 (0.00131)	-0.092
lninfl	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
<i>N</i>	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

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.

The cross-data summaries in Tables B and C present some descriptive statistics organized by subregion and microfinance institutions' status. On average, for the whole sample, the financial integration degree is low, with a convergence value close to 0. This gives some information about the extent of financial interconnection between MFIs and commercial banks.

By considering each subregion, there are some differences in the levels of values. The greatest value is observed in the Middle East in North Africa, and the lowest value is observed in South Asia. Moreover, by looking at the behaviour of financial integration across different statuses, banks and rural banks seem to interact more with commercial banks in interbank markets. The less financially integrated banks include credit unions and cooperatives.

Quantile graph analysis (see Appendix) reveals links between financial integration and driving forces, including financial development (Fig. 1), profitability (Fig. 2), outreach (Figs. 3 and 4) and agency costs (Fig. 5). The mean curve of financial development shows a positive link with financial integration. However, in some areas of the curve, there is a slowdown in the transitory process between financial development and financial integration. The agency cost curve shows a slow takeoff of the trend with financial integration and then increases with a relatively constant trend at the end of the curve. Similar behaviour is also observed for the profitability level. According to the curves of outreach (breadth and depth), the two curves increase with some breakdown reshaping point at which the growth process slightly changes.

4.2 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.

Table 4. Determinants of financial integration in the microfinance sector¹⁰

¹⁰ The definition of each variable can be easily found in the summary in Table D.

	Whole sample FI	Q=0.10 FI	Q=0.25 FI	Q=0.50 FI	Q=0.75 FI	Q=0.9 FI
lnFD	-0.0311*** (0.00704)	0.000605*** (0.0000517)	0.00222*** (0.0000399)	0.00981*** (0.000119)	0.0269*** (0.000127)	0.0668*** (0.000735)
lnagencost	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)
lnavloan	-0.0314* (0.0135)	0.00264*** (0.000423)	0.0100*** (0.0000578)	0.0302*** (0.0000529)	0.0538*** (0.000409)	0.0282*** (0.000864)
lnacbor	0.00518 (0.00480)	0.00123*** (0.0000642)	0.00338*** (0.0000175)	0.00942*** (0.0000210)	0.0178*** (0.000185)	0.0142*** (0.000247)
lnassets	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)
lnremirec	-0.0279*** (0.00439)	0.000369** (0.000118)	-0.00139*** (0.0000161)	-0.00671*** (0.0000102)	-0.0196*** (0.0000826)	-0.0454*** (0.000315)
lnaid	-0.00110 (0.00305)	-0.00154*** (0.000135)	-0.00280*** (0.00000787)	-0.00591*** (0.0000680)	-0.0120*** (0.0000772)	-0.0379*** (0.000583)
lngdp	-0.0915*** (0.0194)	0.0000173 (0.0000220)	0.000126*** (0.0000101)	0.000663*** (0.0000148)	0.000572*** (0.0000231)	0.00241*** (0.0000444)
lninfl	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)					
<i>N</i>	6799	6799	6799	6799	6799	6799

Standard errors in parentheses.

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

Source: Authors

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). The negative impact is explained by the fact that in a system with low financial development, only relatively large firms will be able to be more integrated because of their

willingness to bear high market and contractual costs. 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%.

Agency cost theory discusses the use of different types of funds and the importance given to each. Pecking order theory helps to identify the three main sources of funding: internal funds, debt and equity (Myers, 1984; Myers & Majluf, 1984). 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. The existence of mission drift is also determined by profitability (Cull et al., 2010; Hermes et al., 2011; Mersland & Strøm, 2009), microfinance institutions' experience (Mersland & Strøm, 2009), the maturity of their clients (Cull et al., 2009) and their efficiency (Hermes et al., 2009). In this study, the results reveal that financial integration is a significant determinant of mission drift occurrence in client portfolios.

This analysis of mission drift in client portfolios is completed by 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.

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.

Appendix

Table A. Correlation analysis - Pairwise correlations

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

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

Source: Authors

Table B. Mean financial integration and financial development by subregion in developing countries

Regions	N	mean	sd	p50	min	max
Africa	2044	0.082	0.155	0.010	0	0.960
East Asia and the Pacific	1537	0.074	0.156	0.007	0	0.896
Eastern Europe and Central Asia	2035	0.104	0.193	0.008	0	0.955
Latin America and the Caribbean	3890	0.079	0.158	0.013	0	0.983
Middle East and North Africa	422	0.183	0.229	0.062	0	0.981
South Asia	1996	0.073	0.157	0.012	0	0.935
Total	11924	0.086	0.168	0.011	0	0.983

Source: Authors

Table C. Mean financial integration by the status of MFIs

Status	N	mean	sd	p50	min	max
Banks and Rural Banks	1924	0.156	0.201	0.057	0	0.983
Credit Unions and Cooperatives	1810	0.032	0.091	0.002	0	0.842
NBFIs	4205	0.088	0.175	0.014	0	0.955
NGOs and Others	3908	0.074	0.159	0.010	0	0.981
	1184					
Total	7	0.086	0.168	0.011	0	0.983

Source: Authors

Table D. Variables and definitions

Variable	Acronym	Definition
1. Financial Integration (Dependent variable)		
Borrowing ratio	FI	The ratio of total borrowing to total liabilities.
2. Main Drivers		
Financial Development	lnFD	The concentration ratio (CR) is the market share of the four largest MFIs measured by considering the gross loan portfolio (GLP).
Agency Cost	lnagencost	The logarithm of operating expenses over equity.
Profitability	FSS	Total operating revenues divided by total administrative and financial expenses, adjusted for low-interest loans and inflation. In a microfinance context, an institution is financially self-sufficient when it has enough revenue to pay for all administrative costs, loan losses, potential losses and funds.
Average loan balance per borrower/GNI per capita	lnavloan	The logarithm of the average loan size adjusted by GNI as a proxy for the depth of outreach.
Active borrowers	lnacbor	The logarithm of the number of active borrowers as a proxy for the breadth of outreach.
3. Microfinance institution characteristics		
Microfinance institution size	Lnass	Microfinance institution size is measured by the total of all net asset accounts. We use the natural logarithm of assets.
Default risk	loanloss	Loan loss reserve is the portion of the gross loan portfolio that has been expensed (provisioned for) in anticipation of losses due to default. The loan loss ratio is loan loss reserve/gross loan portfolio.
Default risk	Par30	The value of all loans outstanding that have one or more installments of principal past due more than 30 days. This ratio is portfolio at risk > 30 days/gross loan portfolio.
4. Other variables		
GDP Per Capita Growth (annual %)	Lngdp	GDP per capita is the gross domestic product divided by the midyear population. The natural logarithm of GDP per capita is used.
Inflation, consumer prices (annual %)	Lninfl	Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.
Remittances	lnremirec	The logarithmic value of the total remittances received divided by gross national income per capita in constant 2005 U.S. dollars. Remittances include personal transfers and employee compensation.

Financial aids	Inaid	This represents aid flows (net of repayments) from official donors to countries and territories. Official aid is provided under terms and conditions similar to those for official development assistance (ODA). Data on official aid and other sources are in constant 2012 U.S. dollars. In this study, we use the log value.
Dummy variables	Region	Region1: Africa, Region2: East Asia and the Pacific, Region3: Eastern Europe and Central Asia, Region4: Latin America and the Caribbean, Region5: Middle East and North Africa, Region6: South Asia.
Dummy variables	Microfinance institution status	Type1: Banks and Rural Banks, Type2: Cooperatives and Credit Unions, Type3: Nonbank Financial Institutions, Type4: NGOs and Others.

Source: Authors

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Data availability

Open access to MIX market data base.

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Figure captions

Fig. 1. Quantile Trend: Financial Integration and Financial Development

Source: Authors

Fig. 2. Quantile Trend: Financial Integration and Financial Performance

Source: Authors

Fig. 3. Quantile Trend: Financial Integration and Depth of Outreach

Source: Authors

Fig. 4. Quantile Trend: Financial Integration and Breadth of Outreach

Source: Authors

Fig. 5. Quantile Trend: Financial Integration and Agency Cost

Source: Authors

Figures

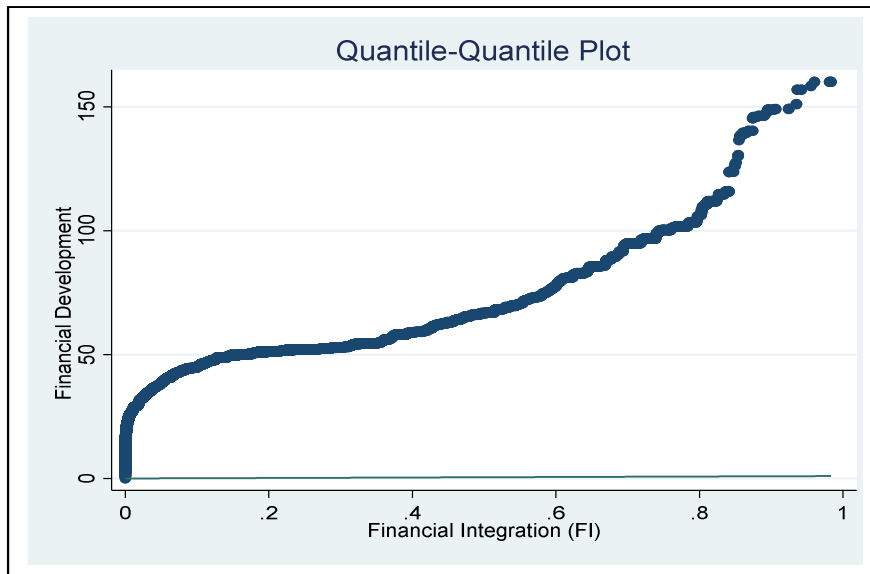


Fig. 1

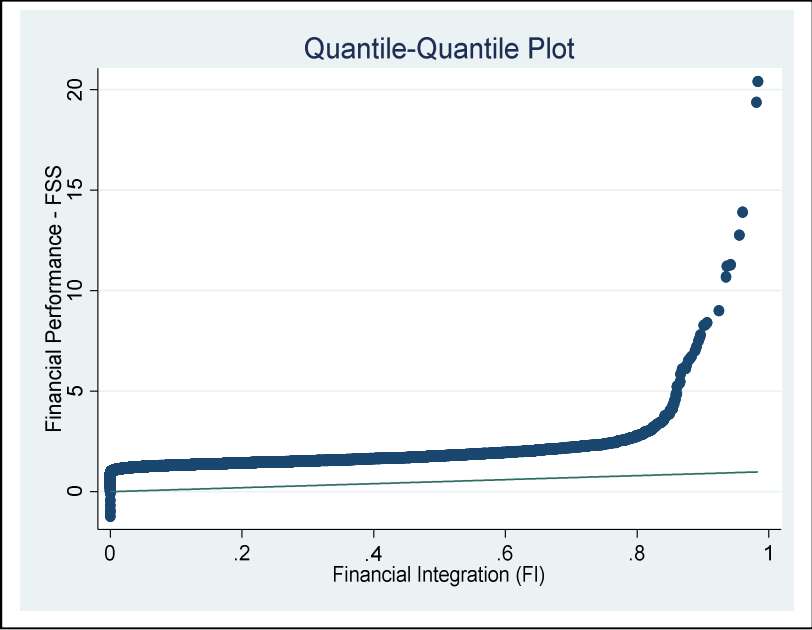


Fig. 2

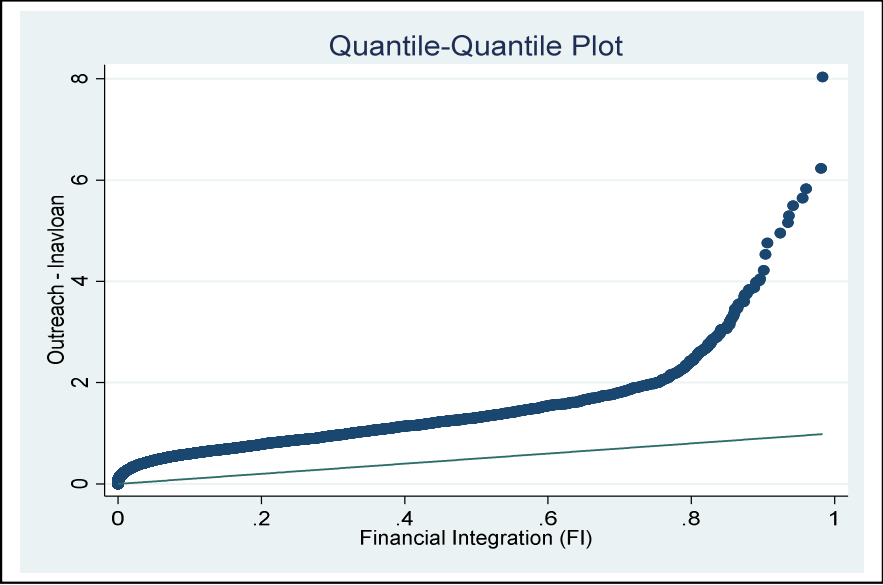


Fig. 3

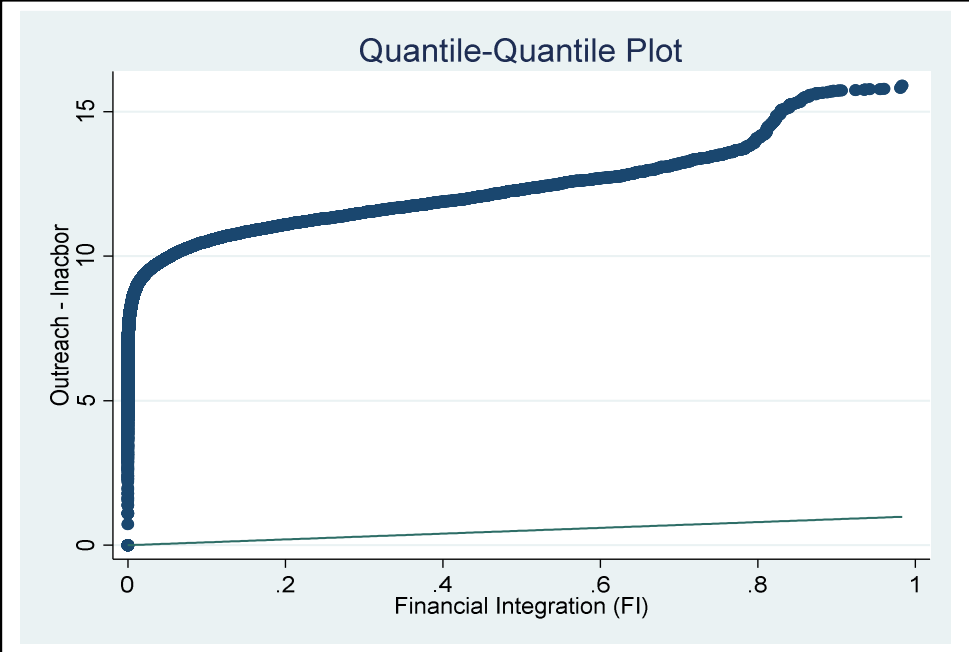


Fig. 4

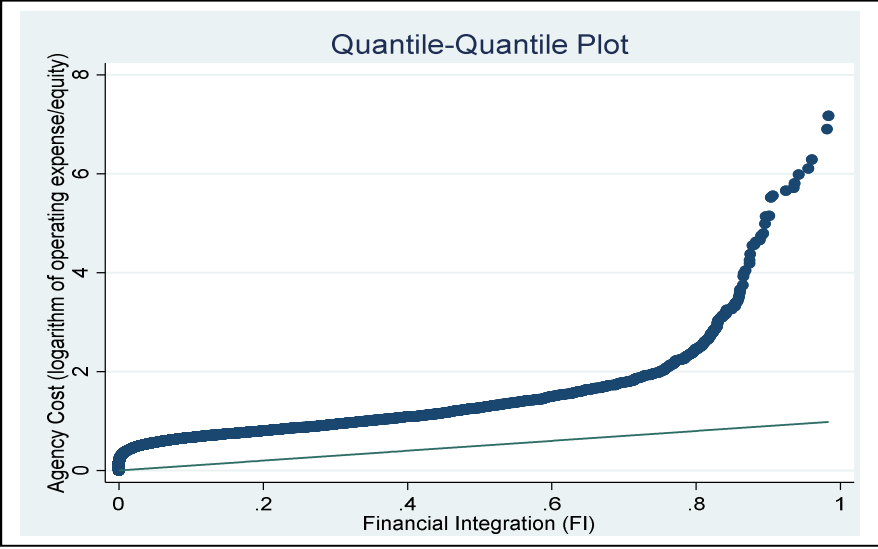


Fig. 5