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Risk Management and Efficiency of Microfinance Institutions

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Preface

Risk management and efficiency are very crucial for the survival of every organization. “Indeed, better risk management may be the only truly necessary element of success in banking” (Alan Greenspan) and “the obvious rule of efficiency is you don’t want to spend more time organizing than it’s worth” (Daniel Levitin). In microfinance, risk management and efficiency are important for the achievement of both the financial and social objectives of microfinance institutions, which aim primarily to provide financial services to the unbanked populations in the world. Giving uncollaterized loans to vulnerable borrowers is risky yet that is what microfinance institutions do. In this dissertation, I examine what could be a good business model in microfinance as far as general institutional sustainability is concerned.

The dissertation comprises four empirical studies. The first study investigates whether geographic diversification is beneficial to the microfinance institution (MFI) from the perspective of risk management. The relationship between geographic diversification and risk has been the focus of much attention in the mainstream banking industry but not in the microfinance industry, even though observers recommend that MFIs diversify geographically. Using data from institutional rating reports, I found that geographic diversification is not beneficial to MFIs in terms of risk reduction.

The second study is related to the first one. In this study, I broadened the scope of diversification to include revenue. Revenue diversification is about having other sources of revenue aside from interest revenue, which is the main source of income in banking. Using the same dataset, I found that, unlike geographic diversification, revenue diversification is beneficial for the sustainability of MFIs.

The third study similarly investigates the institutional outcomes of providing nonfinancial services to poor people alongside the core financial services. Again, the research question is whether it is beneficial to the MFI to provide these “extra” services (e.g., vocational skill training, health services, literacy training). The general finding from the same dataset used in the first two studies is that such a combined approach neither improves nor diminishes

the financial performance of MFIs. However, the results show that the combined approach may improve the asset quality as well as the social performance of MFIs.

The final study concerns the link between efficiency and risk in microfinance. In general, loan default rates are lower in the global microfinance industry than in regular banking. On the other hand, cost efficiency is lower in microfinance than in banking. Thus, MFIs seem to be successful in asset quality but not in operational efficiency. This study therefore examines a possible tradeoff between efficiency and risk. The results suggest a nonlinear (U-shaped) relationship between cost efficiency and credit risk in MFIs, a finding that is contrary to the linear relationship found in banking studies.

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I owe Professor Roy Mersland, my main supervisor, a great deal of gratitude for his kind guidance throughout my PhD journey. I got to know him in 2013 when I was a master's student at the University of Agder. After a lecture on international marketing by Professor Andreas Falkenberg, Prof. Falkenberg asked me what I wanted to do with my life and I told him I wanted to teach as a professor in a university. After a discussion of my research interests, he suggested that I contact Roy, who eventually became the supervisor of my master's thesis. While he was supervising me I told him I wanted to do a PhD and he was instrumental in getting me into the PhD program and securing funding for me. Roy has been a great supervisor who has always shown his kindness, patience, availability, and generosity. He introduced me to some of his microfinance coauthors, like Robert Lensink (who later became my coauthor too), Reidar Øystein Strøm, Aljar Meesters, and Valentina Hartarska, and these connections have expanded my academic network. It has been a pleasure to collaborate with these friends during the past few years.

I am equally grateful to Professor Leif Atle Beisland, my other supervisor, for his kind and credible guidance in the write-up of this thesis. I got to know him in 2012 as a student in his graduate course and as his teaching assistant the following year. He provided me with important comments that Roy probably would not have thought of. He made time to read each and every sentence of my work and gave me constructive feedback. Overall, it was a privilege to have two such "referees" to use as sounding boards for my PhD work. I have learned a lot from them.

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My final thanks go to my parents Paul and Fabiana, my siblings, and Auntie Mary Paula Dery for their love and support. To my wife Monica and my son Caleb Ngmenmaaloo, thank you for your love, prayers, and encouragement during my PhD journey. I love you all.

Stephen Zamore

August 2018

Kristiansand, Norway

List of studies

This dissertation consists of the following four studies.

1. Zamore, S., Beisland, L. A., & Mersland, R. Geographic diversification and credit risk in microfinance. Under second review in *Journal of Banking and Finance.*

2. Zamore, S. (2017). Should microfinance institutions diversify or focus? A global analysis. Forthcoming in *Research in International Business and Finance*. doi.10.1016/j.ribaf.2017.12.001

3. Lensink, R., Mersland, R., Vu, N.T.H, & Zamore, S. (2018). Do microfinance institutions benefit from integrating financial and nonfinancial services? *Applied Economics*, 50(21): 2386–2401.

4. Zamore, S., Beisland, L. A., & Mersland, R. Excessive focus on risk? Non-performing loans and efficiency of microfinance institutions.

Other studies not included in the dissertation

While conducting the four studies to be included in my PhD dissertation, I also joined forces with other people to carry out the following studies.

Zamore, S., Djan, K.O., Alon, A., & Hobdari, B. (2018). Credit risk research: Review and agenda. *Emerging Markets Finance and Trade*, 54 (4): 811–835.

Ibrahim, S., Appiah, K.O., & Zamore, S. (2018). Antecedents and short-run causal relationship between foreign direct investment and infrastructure development in Ghana. *International Journal of Financial Services Management*, 9(2): 119–139.

Agana, J. A., Mohammed, A., & Zamore, S. (2018). International transfer pricing and income shifting in developing countries: Evidence from Ghana. Forthcoming in *International Journal of Emerging Markets.*

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Overview of the Dissertation:

Risk Management and Efficiency of Microfinance Institutions

1.Introduction

Microfinance emerged in the 1970s as a solution to problems faced by state-initiated credit programs (Hulme & Mosley, 1996; Morduch, 1999). Since then, microfinance has been applauded by many observers worldwide for achieving its main objective of financial inclusion (Biosca, Lenton, & Mosley, 2014; Cull, Demirgüç-Kunt, & Morduch, 2009) and the resulting positive impact on development (Hermes, 2014; Lopatta & Tchikov, 2016). However, more knowledge is needed on how to advance the frontiers of microfinance as far as its double bottom-line objectives are concerned. In this regard, this dissertation examines how the credit risk of microfinance institutions (MFIs) can be managed. High defaults of microcredit can jeopardize the microfinance industry. For instance, the high number of loan defaults between 1996 and 2000 in the Bolivian microfinance industry affected not only the industry but the economy as a whole (Vogelgesang, 2003).

Similarly, since the sustainability of the industry depends, in part, on the operational efficiency of MFIs, this dissertation also explores the cost efficiency of MFIs. Microfinance is a high-cost business (Gonzalez, 2007; Hardy, Holden, & Prokopenko, 2003); hence, studying the efficiency of MFIs is warranted. Overall, the operational efficiency of the microfinance industry is in poor condition. In Mersland and Strøm (2009) study, operating costs in the industry were about 31 percent of the loan portfolio, which is 20 times more than the norm in efficient banking markets like the Nordic ones (Berg, Førsund, Hjalmarsson, & Suominen, 1993). This dissertation examines the relationship between loan defaults and cost efficiency of MFIs. It also examines some existing strategies of MFIs (i.e., geographic and revenue diversification, the provision of both financial and nonfinancial services) to determine whether they are beneficial to MFIs in terms of risk reduction and financial sustainability. This examination can be viewed as a way of finding out whether these strategies are good business models for MFIs.

Microfinance is the provision of financial services to poor people and microenterprises that have been excluded from mainstream banking markets (Ledgerwood, 1999; Schreiner, 2002). As mentioned above, microfinance has been successful in achieving this objective and as a result has been admired by many since its inception. Notable events marking the success of MFIs include the United Nations' proclamation of 2005 as the year of microcredit in celebration of the microfinance industry's success in achieving poverty reduction and the awarding of the Nobel Peace Prize to Mohammad Yunus and the Grameen Bank in 2006.

The success of microfinance relates to its unique lending models. First, the provision of smaller loans makes it possible to reach out to many poor borrowers. Second, the introduction of group and progressive loans helps to mitigate screening and repayment problems (Armendáriz & Morduch, 2010; Hulme & Mosley, 1996). Under group lending, a person in a group of 4 to 6 people is given a loan by an MFI but all the other members are jointly liable for its repayment. Progressive lending is a step-wise method where subsequent loan size increases only if previous loans have been paid (Armendáriz & Morduch, 2010).

MFIs are mostly funded by donations (Ghosh & Van Tassel, 2013). Other funding sources are commercial debt and equity financing as well as microfinance investment vehicles (MIVs). MIVs are private impact investment funds that channel capital from private investors in developed economies (who are interested in both a financial return and a social return) to MFIs in developing economies. MFIs take different organizational forms, including nongovernmental organizations, cooperatives and credit unions (member-based organizations), banks, and nonbank financial institutions (Mersland, 2009).

The microfinance industry is growing rapidly. For instance, the Microcredit Summit Campaign reported in 2015 that over 211 million borrowers worldwide had been served by MFIs as of December 31, 2013, an improvement on the previous year's number of borrowers (204 million) (Reed, 2015). Despite the growth in microfinance outreach efforts, a large proportion of the world's unbanked population remains unserved. According to the 2018 Global Financial Inclusion report of the World Bank, about 33 percent of the world's adult population do not have an account with a financial institution (World Bank, 2018). This shows that there is still a huge supply gap and hence more knowledge is needed on how to enhance the performance of MFIs. Therefore, an investigation of the sustainability-related issues faced by MFIs is warranted.

The remaining part of this introductory chapter is organized as follows. Section 2 presents a review of the literature on risk management and efficiency in the microfinance industry. Section 3 presents the relevant theories. Section 4 describes the dataset. Section 5 discusses the research design and Section 6 summarizes the four studies.

2. Overview of Risk and Efficiency Literature in Microfinance

In finance, credit risk has three main elements: default risk, credit spread risk, and downgrade risk (Anson, Fabozzi, & Choudhry, 2000; Bielecki & Rutkowski, 2004). Default risk is defined as the risk that a party to a financial contract will not honor his/her obligation. Credit spread risk is about variation in the spread between risky and risk-free bonds after buying the risky bond. Downgrade risk concerns deterioration in credit ratings. For a detailed understanding of these types of credit risk and how they are related to each other as well as how credit risk is measured, see Zamore, Djan, Alon, and Hobdari (2018). Credit risk can be analyzed on three levels: borrower, bank and country (i.e., systemic credit risk). This dissertation focuses on the second level: the quality of MFIs' loan portfolios. Poor loan portfolio quality can bankrupt an MFI by rendering it unable to honor its deposits and other debts.

Credit risk comprises several dimensions and this dissertation does not touch on all of them. Of the different dimensions of credit risk researched since the 1980s, gender is dominant. Several studies explore the relationship between gender and loan repayment in microfinance. For instance, Hossain (1988), Hulme (1991), Kevane and Wydick (2001) and D'Espallier et al. (2011) find that credit risk is lower among women than men, while Bhatt and Tang (2002), Brehanu and Fufa (2008), Godquin (2004) show otherwise.

Since group lending is an innovation by microfinance (Hulme & Mosley, 1996; Sharma & Zeller, 1997), the next important dimension of credit risk research is the relationship between the lending method and the default rate. For example, Bratton (1986) and Jahangir and Zeller (1995) find that credit risk is lower among group loans than individual loans. Similarly, Sharma and Zeller (1997) find that repayment rates of group loans in microfinance are higher than those in traditional banking. However, Giné and Karlan (2014) and Beck and Behr (2017) do not find any significant effect of group lending on repayment compared to individual lending.

Other dimensions of credit risk in microfinance include, but are not limited to, competition and over-indebtedness (McIntosh, De Janvry, & Sadoulet, 2005), social ties and sanctions (Ahlin & Townsend, 2007; Karlan, 2007), repayment frequencies (Barboni, 2017; Field & Pande, 2008), grace periods (Field et al. 2013), loan officer (Agier, 2012; van den Berg, Lensink, & Servin, 2015), borrower runs and contagion effects (Bond & Rai, 2009; Goedecke, forthcoming), capital structure (Chakravarty & Pylypiv, 2015), organizational status (Chakravarty & Pylypiv, 2015) and loan size (Chikalipah, 2018).

This dissertation contributes to the literature on credit risk in microfinance in three ways. First, it examines the relationship between geographic diversification and credit risk (Study 1) and the relationship between revenue diversification and financial sustainability (Study 2). In the banking literature, geographic diversification is found to be an important determinant of credit risk (Booth & Martikainen, 1999; Fang & Lelyveld, 2014; Winton, 1999). While the banking literature has long been concerned with the influence of geographic diversification on risk, I am not aware of any study using microfinance data. This research gap is unfortunate, especially considering the growth of the microfinance industry and the recommendations by industry players that MFIs should diversify geographically (Steinwand, 2000).

Second, the dissertation contributes to the literature on credit risk in microfinance also by investigating the effect of microfinance plus on loan asset quality as well as on other performance dimensions of MFIs (Study 3). Introduced in the early days of microfinance (1970s) (Goldmark, 2006; Hulme & Mosley, 1996), microfinance plus is the provision of nonfinancial services in addition to core financial services. The main argument is that "microcredit, by itself, is usually not enough" (Reed, 2011, p. 1). For instance, FINCA International, a microfinance organization that operates in Africa, Asia, Latin America, and the Middle East, provides business development training, health care, and social empowerment services to its clients (Maes & Foose, 2006). This dissertation investigates empirically whether microfinance plus improves the portfolio quality of MFIs, which would support the claim that business development training improves the repayment ability of borrowers (Biosca et al., 2014).

Finally, the dissertation contributes to the literature on credit risk in microfinance by examining the link between loan default rates and the efficiency of MFIs (Study 4). To present an overview of efficiency related research in microfinance, I used "efficiency" and "microfinance" and searched in the ISI Web of Science database over the period 1945–2018 as of July). The search reveals that Hermes, Lensink, and Meesters (2011) is the most-cited study (131 citations), followed by Mersland and Strøm (2010) (122 citations) .

Hermes et al. (2011) examine the tradeoff between the social impact and efficiency of MFIs. Using a global sample of 435 MFIs observed over an eleven-year period, they find that microfinance outreach is negatively related to the efficiency of the institution. This finding is supported by Hartarska, Shen, and Mersland (2013) and Abate, Borzaga, and Getnet (2014). Indeed, serving the poor at the expense of maintaining the institution's sustainability has been identified as the main challenge before

microfinance (Rhyne, 1998). However, Annim (2012), Louis, Seret, and Baesens (2013) and others find a positive relationship between outreach and efficiency.

In a similar investigation, Mersland and Strøm (2010) test whether MFIs are drifting from their social mission for the sake of financial sustainability. Using a cross-country sample of 379 MFIs within an eleven-year period (1998–2008), they do not find evidence to support claims of mission drift in microfinance. The next study on the list of efficiency/sustainability publications in terms of citations is by Hermes and Lensink (2011) (73 citations) who review the outreach-sustainability tradeoff studies including those of Hermes et al. (2011) and Hudon and Traca (2011).

Hudon and Traca (2011) (58 citations) examine whether subsidies compromise the efficiency of MFIs. Using a sample of 100 rated MFIs, they find that subsidy intensity and efficiency are positively related. However, this positive relationship has a limit beyond which the efficiency of MFIs is compromised. Similarly, Caudill, Gropper, and Hartarska (2009) (49 citations) find that efficient MFIs are those with fewer subsidies and larger deposits.

Gutierrez-Nieto, Serrano-Cinca, and Molinero (2007) (72 citations) offer a methodological approach to analyzing the efficiency of MFIs. Using data from 30 Latin American MFIs, they show that efficiency can be assessed from four angles: overall efficiency, NGO status, choice of inputs, and choice of output. That is, the efficiency of an MFI is based on the angle employed.

Other elements relating to efficiency research include, but are not limited to, ownership (Abate et al., 2014; Servin, Lensink, & van den Berg, 2012), governance (Hartarska & Mersland, 2012), size of MFI (Hartarska et al., 2013; Kumar & Sensarma, 2017; Mia & Soltane, 2016; Mahinda Wijesiri, Yaron, & Meoli, 2017), capital structure (Bogan, 2012; Kumar & Sensarma, 2017; Mahinda Wijesiri, Viganò, & Meoli, 2015), managerial capabilities (Chan, 2010; Mersland & Strøm, 2009; Mia & Chandran, 2016), gender of CEO (Hartarska, Nadolnyak, & Mersland, 2014), and age of MFI (Kumar & Sensarma, 2017; Mahinda Wijesiri et al., 2017).

This dissertation responds to calls for more efficiency-related studies in microfinance (Mersland & Strøm, 2010) by examining the link between default risk and efficiency of MFIs. In the banking literature, scholars such as Hughes and Mester (1993) and Berger and DeYoung (1997) show that loan default and operational efficiency are related, but to the best of my knowledge the relationship has never been tested in the microfinance industry.

3. Applicable Theories

3.1Portfolio Diversification Theory

A portfolio is a collection of investments in financial assets (e.g., stocks and bonds) and physical assets (e.g., real estate and commodities). Modern portfolio theory, developed by Nobel Prize-winning economist Harry Markowitz (Markowitz, 1952), assumes that there is a tradeoff between risk and return: the higher the risk an investor is willing to take, the higher the financial return, and vice versa. The theory also assumes that returns from different asset classes are imperfectly correlated. That is, market conditions vary from one asset class to the next. An efficient portfolio is a set of investments that maximize returns for a given level of risk. It is difficult to set up an efficient frontier in real life; however, diversification provides a way out.

Portfolio diversification is similar to common behavior, as expressed in the saying "Don't put all your eggs in one basket" (Watson & Head, 2007, p. 210). For instance, Opportunity Albania, a member of the international microfinance network Opportunity International, lends to borrowers in different sectors, including agriculture, manufacturing, trade, and service. Thus, diversification is practiced not only at the investor level but also at the bank, or in this case the MFI, level. To maximize returns at the lowest possible risk, an investor has to diversify across different asset classes (e.g., risk-free and risky securities) in different markets and locations. Portfolio diversification is common in the banking industry since it helps to reduce default risk and increase returns (Emmons, Gilbert, & Yeager, 2004). It allows financial institutions to diversify across different revenue sources as well as geographic locations through branch networks. Geographic diversification is therefore a type of diversification reflecting the degree to which a firm's operations are spread across different regions or states or countries (Larsen, Leatham, Mjelde, & Wolfley, 2008). This dissertation applies the concept of diversification to study (1) the link between geographic expansion and credit risk in microfinance (Study1) and (2) the link between holding multiple revenue sources and the financial sustainability of MFIs (Study 2).

3.2Agency Theory

Agency theory emerged from the study of agency relationships, which are viewed as one of the most common and oldest types of social interactions (Ross, 1973). According to Ross (1973), an agency relationship occurs when two (or more) individuals enter into a relationship where one individual, known as the principal, appoints the other individual, known as the agent, to act on his behalf or represent him in matters of

decision-making. Examples of agency relationships include shareholders (Principal, P) and management (Agent, A), employer (P) and employee (A), and debtholders (P) and shareholders (A) (Eisenhardt, 1989a; Ross, 1973; Thomson & Conyon, 2012).

In most agency relationships, the agent has a knowledge of the business superior to that of the principal. As a result, the principal delegates decision-making authority to the agent (Jensen & Meckling, 1976), who applies his knowledge and skills to act on the principal's behalf. For example, in the shareholder-manager agency relationship, the shareholders delegate decision-making authority to the management on condition that the management puts their money to good use and delivers returns. By controlling the daily affairs of the firm, managers have access to information, including management accounting data and financial reports (Watson & Head, 2007). Shareholders learn what is happening in the firm only by reading published annual reports and attending annual general meetings. Thus, there is an information asymmetry problem in agency relationships.

This asymmetry of information creates room for some managers to behave opportunistically since their actions are often not observable (Fahlenbrach & Stulz, 2009). Furthermore, from an economic perspective, if both the shareholders and the managers are utility maximizers, it is expected that the managers will act contrary to the interests of the shareholders (Jensen & Meckling, 1976). Overall, an agency problem arises when the agent does not act in the best interest of the principal.

Agency theory has been applied in microfinance research mostly in the context of corporate governance (Hartarska, 2005; Mersland & Strøm, 2009; Strøm, D'Espallier, & Mersland, 2014) and ownership studies (Galema, Lensink, & Mersland, 2012; Mersland, 2009; Servin et al., 2012), but also in other fields like international business (Mersland, Randøy, & Strøm, 2011). This dissertation applies agency theory in the context of geographic diversification and the risk-taking behavior of the management of MFIs (Study 1). Lessons from the banking industry (Bandelj, 2016; Goetz, Laeven, & Levine, 2012) suggest that branch managers of MFIs are likely to be self-interest-seeking at the expense of the institution's goal. Moreover, Winton (1999) argues that the monitoring ability of the head office diminishes as a bank diversifies geographically. This implies that, based on agency theory, geographic diversification can increase the risk profile of MFIs.

3.3 Microfinance Plus

Microfinance plus is an integrated approach to poverty alleviation in microfinance. It involves the provision of both financial and nonfinancial services to the poor. Nonfinancial services are any services other than finance (Goldmark, 2006) and they are meant to enhance the well-being of poor families (e.g., through nutrition services and health care services) and their microenterprises (e.g., through business development training). Khandker (2005) argues that since poverty has many different dimensions, microfinance services should be more comprehensive.

Thus, poor families and their microenterprises can benefit if services other than credit are provided alongside lending (Armendariz & Szafarz, 2011). Moreover, other proponents of the microfinance plus view (Angelucci, Karlan, & Zinman, 2015; Banerjee, Duflo, Glennerster, & Kinnan, 2015) argue that access to credit for the poor has been overemphasized. The bottom line is that the microfinance plus model should enhance the social impact of MFIs (Dunford, 2001). However, the model may also influence the financial performance (e.g., portfolio quality) of the institution (Sievers & Vandenberg, 2007). Study 3 of this dissertation focuses on the latter.

3.4 Efficiency and Risk Relationship

The theoretical arguments of Hughes and Mester (1993) and Berger and DeYoung (1997) are often used to show the relationship between efficiency and risk. The skimping hypothesis of Berger and DeYoung (1997), introduced by Hughes and Mester (1993), maintains that a bank can postpone resource deployment in order to look efficient today. The effect of this skimping is that loan defaults are likely to be high in the future since fewer resources are allocated to the screening process. To control the nonperforming loans induced by skimping, extra resources are required; hence, both efficiency and asset quality decline. Thus, efficiency and credit risk are related.

Berger and DeYoung (1997) further argue that when unexpected external factors (e.g., floods) occur at the borrower's end, a bank may experience more nonperforming loans. When nonperforming loans increase, the bank needs to exert extra effort in terms of monitoring and renegotiation in order to avert the situation. This again illustrates that efficiency and risk are related. The third argument is the bad management hypothesis (Berger & DeYoung, 1997), which assumes that poor management practices result in low efficiency and poor asset quality. For instance, bad managers care less about monitoring daily activities and maintaining loan portfolios. Moreover, poorly skilled

managers are less adept at screening loan applicants, which leads to a higher number of nonperforming loans.

Study 4 of this dissertation applies the above arguments to study the relationship between nonperforming loans and the efficiency of MFIs. In general, MFIs often have lower loan default rates than regular banks (Rosenberg, Gonzalez, & Narain, 2009; Sievers & Vandenberg, 2007), but at the same time they appear to be less inefficient than banks. Operating costs are generally high in microfinance (Gonzalez 2007; Hardy et al. 2003) due to the provision of small loans (Helms & Reille, 2004) and the poor institutional environments in which MFIs operate (Kirkpatrick & Maimbo, 2002). In addition, overemphasis on risk can also contribute to high operating costs. Thus, the question Study 4 seeks to answer is whether MFIs are overly concerned with asset quality at the expense of their operational efficiency.

4. Data Sources

This dissertation uses an unbalanced global panel sample of 607 microfinance institutions in 87 countries over the period 1998–2015 (Study 3 uses 478 MFIs in 77 countries over the period 1998–2012). The dataset is compiled based on rating reports from five specialized microfinance rating agencies (MicroRate, Microfinanza, Planet Rating, Crisil, and M-Cril), hand-collected from either the rating agencies or www.ratingfund2.org. All these agencies have been approved by the Rating Fund of the Consultative Group to Assist the Poor (C-GAP), the microfinance branch of the World Bank. The length of the reports range from ten to over forty pages and each report provides information on governance, management, social performance, financial performance, and operations. All entries in the dataset are based on yearly observations and local currencies have been converted to US dollars according to official exchange rates. The methodologies applied by the rating agencies indicate that the variables included in the dataset are assessed similarly.

Table 1 provides a distribution of MFIs (or observations) per year; it ranges from a minimum of 6 MFIs per year (in 1998) to a maximum of 370 MFIs per year (2006). Overall, the majority of the data (3296) are taken from the period 2001–2012, with observations ranging from 100 (2012) to 370 (2006) per year. The years before 2006 and those after 2012 have less than 100 observations.

Table 1: Distribution of MFIs by year

Year	Frequency (# of MFIs)	Percent
1998	6	0.18
1999	29	0.88
2000	78	2.37
2001	148	4.49
2002	199	6.04
2003	270	8.19
2004	331	10.04
2005	366	11.1
2006	370	11.23
2007	345	10.47
2008	294	8.92
2009	276	8.37
2010	232	7.04
2011	165	5.01
2012	100	3.03
2013	52	1.58
2014	27	0.82
2015	8	0.24
Total	**3296 (MFI-year)**	**100**

This dataset is an updated version of an earlier version used in many published articles, e.g., Galema et al. (2012), Randøy et al. (2015), Hartarska and Mersland (2012), Strøm et al. (2014), D'Espallier et al. (2011), and Pascal et al. (2017) . The dataset is frequently updated. When I started my PhD in 2015, the dataset had 299 variables and 2311 firm-year observations (478 MFIs were observed between 1998 and 2012). To help me to understand the data and expand the dataset, I joined forces with other PhD colleagues and research assistants under the guidance of Professor Roy Mersland, who originally designed the dataset and owns it. Currently, the dataset has 313 variables and 3296 firm-year observations (607 MFIs were observed between 1998 and 2015). Indeed, the dataset is very large and other data not used in this dissertation could be used in post-doctoral research I hope to undertake.

Finally, this dissertation also draws on data from the World Bank's World Development and Worldwide Governance databases to control for country differences across MFIs. For instance, gross domestic product (GDP) per capita, retrieved from the World Development database, is used to control for differences in economic development across the countries in which the MFIs operate.

5. Research Design

A doctoral dissertation is a scientific piece of writing and the candidate adopts a philosophical approach in the writing process. Thus, assumptions about the existence of things in the world (ontology) as well as the way a researcher views the creation of scientific knowledge (epistemology) inspire the choice of a research design. This section presents the philosophical foundation I used and, relatedly, the methods I applied.

5.1 Philosophical Position

There are different schools of thought concerning the philosophy of science. Figure 1 illustrates three main philosophical traditions. At one end is positivism (objectivism/empiricism) and at the other end is constructivism (subjectivism); critical realism is within the continuum.

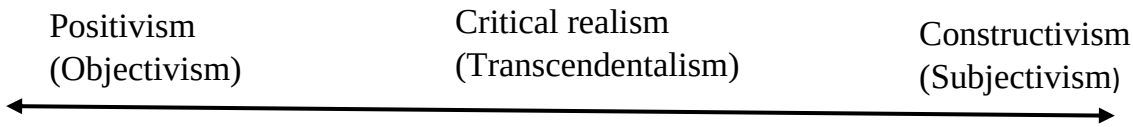

Figure 1: Philosophical traditions in social sciences (Piekkari, 2016).

The dominant philosophical position in the social sciences is positivism (Piekkari, Welch, & Paavilainen-Mäntymäki, 2009). The positivists believe that there is one truth (reality) independent of the observer (Yin, 2014). This view is variable-oriented (Ragin 1992), where relationships between variables are explained by universal causal rules; context is not taken into consideration (Piekkari et al., 2009). Thus, the positivist's goal is "the development of testable hypotheses and theory which are generalizable across settings" (Eisenhardt, 1989b, p. 546). A major advantage of the positivist position is that it is objective and theories and findings are generalizable. A shortcoming is that it does not take into account the research context. In other words, unobserved phenomena are not discussed in the process of creating scientific knowledge.

As seen in Figure 1, constructivism is the complete opposite of positivism. This view puts the human mind at the center of the creation of scientific knowledge. To the constructivist, scientific knowledge is socially and culturally created by "interpreting perceptual experiences of the external world" (Jonassen, 1991, p. 10). Thus, to create a piece of scientific knowledge, the researcher needs to interact with the unit of analysis. A major advantage of this view is that it allows the researcher to conduct an in-depth

exploration of the phenomenon under investigation. A limitation of the constructivist position is that it is subjective and the findings are often specific to the context.

Critical realism resides between these two philosophical extremes. This position was introduced by Roy Bhaskar (Bhaskar, 2008). Critical realism has two main basic assumptions about the creation of scientific knowledge. First, a realist believes in the existence of the real world. The second assumption is that the real world is not influenced by scientific investigation.

Bhaskar (2008) divides the world into three parts: real, actual, and empirical. The real component concerns "objects and structures with inherent causal powers and liabilities which result in mechanisms that may not be visible" (Zachariadis et al. 2013, p.3). The actual aspect "refers to what happens if and when those powers are activated, to what they do and what eventuates what they do" (Sayer, 2000, p. 12). The third, empirical component concerns entities that can be experienced or observed. To summarize the world according to Bhaskar, the *real* component contains the mechanisms of nature, which generate actions in the *actual* world, but these actions are observed in the *empirical* world.

The bottom line of critical realism is that scientific inquiry should combine the features of positivism and constructivism. Thus, critical realism concerns "ideologically deformed reality which calls for critique consisting of mediation and advancement of understating through a moment of explanation" (Delanty & Strydom, 2003, p. 210). This is the approach adopted in this dissertation.

5.2 Analytical Approaches

Since the dataset is quantitative in nature, this dissertation adopts a quantitative analytical approach. Specifically, panel-data techniques (random effects, fixed effects, Hausman and Taylor, generalized method of moments (GMM), and stochastic frontier analysis) are employed. Compared to cross-sectional data, panel data has many advantages including (i) the ability to account for unit heterogeneity, (ii) the ability to control for unobserved fixed effects (omitted-variable bias), and (iii) the availability of more information, variability, degrees of freedom, efficiency, and fewer multicollinearity problems (Baltagi, 2013). However, for robustness checks, this dissertation also uses the ordinary least squares (OLS) estimator in some of the studies.

6. Summary of Studies and Conclusion

This dissertation comprises four related studies and all of them share a similar structure. Encouraged by my PhD advisors, I presented my studies in many academic fora in order to get constructive feedback and improve their quality. Thus, all four studies were presented and discussed in at least two academic conferences and most of them went through blind peer-review processes. At present, two of the four studies have been accepted for publication in international journals, one is under second review, and the other is under first review.

The first two studies are concerned with whether diversification is beneficial in achieving the financial sustainability objective of MFIs. MFIs are hybrid organizations with two objectives: social and financial. In particular, Study 1, **"Geographic Diversification and Credit Risk in Microfinance,"** which is under second review at the *Journal of Banking and Finance*, investigates whether diversifying geographically can reduce the credit risk of MFIs. The results show that geographic diversification instead increases credit risk. A further organizational comparative analysis indicates that the positive relationship is likely to be more pronounced among non-shareholder-owned MFIs compared to shareholder-owned MFIs. Thus, for nonprofit MFIs, it is better to remain geographically focused, since there are no owners to effectively monitor them as they diversify. However, from a risk perspective, shareholder-owned MFIs may find it beneficial to diversify geographically.

Study 2, "**Should Microfinance Institutions Diversify or Focus? A Global Analysis,"** published in *Research in International Business and Finance*, grew out of Study 1. If geographic diversification is not beneficial in terms of risk, what about revenue diversification? To answer this, the study examines whether revenue diversification is beneficial in achieving the financial objective of microfinance. The finding in this study is that revenue diversification enhances the financial performance of MFIs in terms of operational sustainability and profitability. The study concludes that revenue diversification can contribute to the achievement of the financial objective of MFI, which in turn can enable MFIs to reach out to more poor people.

The findings of Study 2 motivate Study 3. Thus, Study 3, **"Do Microfinance Institutions Benefit from Integrating Financial and Nonfinancial Services?,"** published in *Applied Economics*, examines further financial sustainability avenues for MFIs. This study investigates whether the microfinance plus model is beneficial to MFIs. Though the empirical investigation includes comprehensive coverage of both social and financial performance, its focus is on the financial: the sustainability aspect.

The general finding is that the provision of nonfinancial services neither reduces nor increases the financial performance of MFIs. However, in terms of credit risk management, the microfinance plus strategy improves the loan portfolio quality of MFIs. The study thus concludes that MFIs that offer nonfinancial services are not less sustainable than MFIs that don't offer such services. On the contrary, MFIs struggling with loan defaults can find this strategy beneficial.

Study 4, **"Excessive Focus on Risk? Nonperforming Loans and Efficiency of Microfinance Institutions,"** draws its inspiration from the findings of Study 3. If economies of scope (the combination of financial and nonfinancial services) do not improve the efficiency of MFIs, what other factors might explain efficiency in microfinance? Banking research shows that defaults and operating costs are related. Therefore, in this study I draw on lessons learned in regular banking to understand the phenomenon in microfinance. The findings indicate a nonlinear relationship between default rates and costs. Specifically, an increase in loan default rates results in higher cost efficiency up to a certain threshold beyond which a further increase in loan default rates results in lower cost efficiency. The study concludes that each MFI needs to search for its own balancing point between asset quality and operational efficiency.

To conclude, the findings in this dissertation suggest that from the perspective of risk, geographic diversification is not beneficial to all types of MFIs. Non-shareholder-owned MFIs (NGOs and cooperatives) may find it useful to stay focused on a few geographical areas while shareholder-owned MFIs (banks and nonbank financial institutions) may have their overall credit risk reduced if they diversify geographically. In terms of overall financial sustainability, MFIs that rely solely on interest income may find it advantageous to have other revenue-generating activities. The findings further indicate that the financial sustainability of MFIs that provide both financial and nonfinancial services is neither diminished nor improved. In fact, such MFIs stand to gain in terms of lower credit risk. Finally, for efficiency reasons, each MFI is recommended to search for a reasonable tradeoff between loan defaults and operating costs.

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Study 1:

Geographic Diversification and Credit Risk in Microfinance

Geographic Diversification and Credit Risk in Microfinance[1]

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Abstract

This paper examines the relation between geographic diversification and credit risk in microfinance. The empirical findings from the banking industry are mixed and inconclusive. This study extends the discussion into a new international setting: the global microfinance industry with lenders having both social and financial objectives. Using a large global sample of microfinance institutions (MFIs), we find that geographic diversification comes with more credit risks. However, this finding is more pronounced among non-shareholder MFIs like NGOs and cooperatives, compared to shareholder-owned MFIs. Moreover, the results show that MFIs can mitigate the effect of geographic diversification on risk by means of better governance and group lending methods.

Keywords: microfinance, geographic diversification, credit risk, portfolio at risk, loan-loss provisions, nonperforming loans.

JEL: G21, G23, G24, L31, O16

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1.Introduction

This study examines the relationship between geographic diversification and credit risk in microfinance institutions (MFIs). The long-standing question of whether financial institutions and banks should diversify their operations has yet to be answered clearly. There is a growing body of scholarly literature on whether geographic diversification (or "diversification" for short) increases or decreases bank risk, but there is no consensus to date in the banking industry. Despite the importance of the debate, it appears that the issue has never been tested in the microfinance industry. This is unfortunate because industry insiders often recommend that MFIs diversify geographically as a means of reducing loan portfolio risk (Steinwand, 2000). For example, in reports from specialized external microfinance rating agencies, the source of data used in this study, it is frequently recommended that MFIs should diversify geographically as a means of reducing risk. Moreover, the findings from the banking industry may or may not be applicable to the microfinance industry. After all, MFIs pursue the double bottom-line objectives of financial sustainability and social outreach and hence differ from commercial banks. Credit risk and diversification potentially affect both financial performance and MFIs' ability to fulfil their social objective of reaching out to more low-income customers.

Increasingly, MFIs face banking regulation and oversight, similar to mainstream banks (Ledgerwood, 1999). Such regulation and supervision may create incentives for either diversification or specialization (Acharya, Hasan, & Saunders, 2006; Allen N. Berger, Hasan, & Zhou, 2010; Hayden, Porath, & Westernhagen, 2007). Thus, the present study is of potential interest to policymakers who are concerned whether diversification is beneficial to financial institutions such as MFIs (Bandelj, 2016).

Credit risk can also be related to the recent criticism of the microfinance industry for its high interest rates and heavy-handed collection methods (Bateman, 2010). A particularly dramatic incident was the suicide crisis that occurred in India in 2010 (Bandyopadhyay & Shankar, 2014). This suicide crisis was attributed to the heavy-handed collection of defaulted microcredit and showed that a good credit risk strategy is fundamental for MFI managers. Thus, the present study is of potential interest also to microfinance practitioners and stakeholders, particularly managers, donors, investors, and regulators.

Although there are empirical studies on the effect of diversification on bank risk, scholars have yet to arrive at a consensus (Bandelj, 2016). Empirical findings consistent with modern portfolio theory suggest that banks should diversify across regions to eliminate region-specific credit risk and thereby reduce their overall risk level. For instance, Fang and Lelyveld (2014) find that international diversification is beneficial to banks because their credit risk level is reduced. Similarly, following the introduction of the US Riegel–Neal Act of 1994, banks that expanded beyond their home states benefited from a reduction in credit risk (Akhigbea & Whyte, 2003) and deposit risk (Aguirregabiria, Clark, & Wang, 2016). Deng and Elyasiani (2008) also find that diversification is associated with a reduction in bank risk. Their findings suggest that banks can increase their customer portfolios through diversification to reduce bank failure.

By contrast, studies based on agency theory suggest that banks should avoid diversification because it is difficult to monitor remote operations. As a result of poor

monitoring, branch managers of banks may pursue their personal goals at the expense of the bank's goals (Bandelj, 2016; Goetz, Laeven, & Levine, 2012). Moreover, diversification increases the complexity of bank operations, thereby making it difficult for headquarters to monitor loans and control risk (Acharya et al., 2006; Winton, 1999). Gulamhussen, Pinheiro, and Pozzolo (2014) find that, contrary to the above-mentioned results of Fang and Lelyveld (2014), international diversification increases bank risk.

To date, scholars have paid little attention to the issue of diversification versus focus (i.e., non-diversification) in the rapidly growing microfinance industry. This lack of research is unfortunate in a banking industry where, for instance, MFIs provided a total of US$102 billion in loans to 132 million poor borrowers worldwide in 2016 (Convergences, 2017). Our novel research applies a sample of 607 MFIs in 87 countries over the period 1998–2015 to provide initial international evidence on the issue of diversification in the microfinance industry.

The findings suggest that diversification and credit risk are positively related: geographic diversification comes with more credit risks. This risk can be attributed to the difficulty of monitoring remote operations. It can also be attributed to the fact that institutions tend to expand into similar economic areas with the same underlying systematic factors and therefore gain few diversification benefits. For these reasons, the net effect of geographic diversification in microfinance is higher credit risk.

The results further show that the positive relation is more pronounced among MFIs without owners (i.e., non-governmental organizations (NGOs) and member-based cooperatives) compared to shareholder MFIs (i.e., banks and non-bank financial institutions). Because shareholder entities in general are expected to have governance structures superior to those of non-shareholder entities, this finding strengthens the claim that the increased risk is driven primarily by monitoring challenges. In line with this monitoring argument, the results further indicate that the positive effect of diversification on risk can be mitigated by having an internal auditor report to the board and/or by practicing group lending rather than individual lending. Overall, the findings should encourage further research and guide microfinance practitioners and policymakers about which type of MFI might potentially benefit from diversification.

The rest of the paper is organized as follows. Section 2 presents the theory and reviews the literature. Section 3 describes the data and variables. Section 4 describes the econometric model. Section 5 presents and discusses the empirical findings, and Section 6 concludes.

2. Theory and Related Literature

2.1 Theory of Risk Diversification

MFIs, like other financial institutions, are exposed to different types of risk, including credit, interest rate, market, currency, liquidity, operational, and country risks. Among these risks, credit risk is typically the most important for MFIs because their main service is the provision of microcredit (Armendáriz & Morduch, 2010). Saunders and Cornett (2011, p. 186) define credit risk as the "risk that the promised cash flows from loans and securities held by financial institutions may not be paid in full." Credit risk has great implications for the survival of banks. This was dramatically illustrated by the global financial crisis. Thus, credit risk causes bank failure (Fang & Lelyveld, 2014),

and MFIs are not immune to its effects because microfinance is simply banking in small quantities. Moreover, credit risk in microfinance is normally higher than that in regular banking because of the shorter repayment periods that are typically around 12 months. Hence, MFIs may face serious problems within a few weeks if loan repayments are delayed. Moreover, repayment problems among a few microfinance clients may rapidly spread to many clients (Bond & Rai, 2009). This may lead to serious problems for the MFIs as well as the overall microfinance sector in a country. For instance, between 1996 and 2000, Bolivian MFIs faced many repayment problems, which precipitated an economic crisis (Vogelgesang, 2003).

Diversification in finance involves holding many different investments to reduce the risk of financial loss. The concept of diversification is fundamental to the portfolio theory developed by Markowitz (1952). The theory assumes imperfect correlations between asset returns. This allows for lower portfolio risk compared to the sum of individual investment risks. Through diversification, a bank can reduce default risk on the loan portfolio without decreasing the expected returns (Emmons, Gilbert, & Yeager, 2004). Geographic diversification is one type of diversification where a bank's activities are dispersed in different locations (within/across cities, regions, and countries).

Therefore, drawing on portfolio theory, MFIs can potentially reduce risk by geographic diversification. Specifically, the diversification strategy can limit MFIs' likelihood of insolvency by reducing credit and liquidity risk (Liang & Rhoades, 1988). Applying portfolio theory to the credit risk of MFIs, one can assume that this type of risk is reduced when loans are spread among many borrowers in different geographic locations. The logic of this line of reasoning is straightforward: a farming-related crisis such as a drought might be limited to a specific geographic area, a factory closure might hit borrowers in a certain locale, a natural disaster might befall cities and villages in a limited region, and so on. With regard to liquidity risk, diversification can be particularly important for deposit-taking MFIs because it reduces the standard deviation of deposit flows (Liang & Rhoades, 1988).

Agency theory, by contrast, suggests that diversification may not be beneficial to a firm because managers may have improved opportunities to extract private benefits at the expense of owners' value (Goetz, Laeven, & Levine, 2016). More diversified entities are potentially more complex than other entities, which can reduce monitoring effectiveness. Empire building by managers is one possible consequence of reduced monitoring (Jensen, 1986). Effective monitoring may be particularly challenging in non-governmental organizations (NGOs) because these organizations do not have owners with pecuniary incentives (Hansmann, 2000). Many MFIs are incorporated as NGOs (47 percent in our sample; see below), thus potentially making the predictions of agency theory more relevant in microfinance than in traditional banking.

If we disentangle the discussion from both portfolio theory and agency theory and apply a more practical lens to the issue, we are left with little doubt that the increased complexity diversification brings can pose a challenge to MFIs. For instance, according to Winton (1999), diversification complicates client monitoring. Thus, diversification can lead to an increase in MFIs' credit risk due to an inability to monitor multiple branches and distant borrowers.

2.2 Institutional Background of MFIs

Microfinance institutions are hybrid organizations with two competing logics, namely, social and financial logics (Battilana & Dorado, 2010). The first logic relates to the provision of financial services to the unbanked populations in the world. MFIs aim at providing uncollateralized microcredit to economically poor people, who have little or no collateral to qualify for loans from commercial banks. Social logic refers to the social outreach goal of MFIs.

The second logic concerns the financial sustainability of the MFIs themselves. Thus, in providing financial services to poor people and microenterprises, the institutions aim to be profitable or at least break even. To achieve this goal, MFIs charge interest on microcredit and fees for other financial services much as commercial banks do. Hence, MFIs follow a financial logic. Morduch (1999) describes this combination of social and financial logics as the "win-win" promise of microfinance.

MFIs are normally registered either as shareholder firms (banks and non-bank financial institutions) or as non-profit organizations (cooperatives and non-governmental organizations or NGOs) (Mersland, 2009). Cooperatives (and so-called "credit unions," which are similar to cooperatives) are member-based organizations and are therefore funded by the members. That is, cooperatives are controlled by the members, who are at once the customers and the recipients of any profits generated from the operations of the organization. NGOs are organizations without legally recognized owners (Mersland, 2009). They are mostly financed by international impact investors as well as benevolent donors like the World Bank, the Inter-American Development Bank, government agencies, and private individuals. Since NGOs do not have owners, they are exposed to diverse influences from many stakeholders.

NGOs and cooperatives make up the vast majority of MFIs (Misra & Lee, 2007), though they normally serve fewer clients compared to shareholder-owned MFIs, which have easier access to capital from investors and depositors (D'Espallier, Goedecke, Hudon, & Mersland, 2017; Ledgerwood, 1999). Because shareholders have rights to residuals, shareholder-owned MFIs are assumed to be better controlled (Hansmann, 2000; Mersland, 2009) and this suggests that credit risk may be lower in shareholder-owned MFIs than in NGOs and cooperatives. For instance, stricter monitoring of shareholder-owned MFIs can prevent CEOs from engaging in extreme risk-taking behavior to achieve private benefits or build an "empire," whereas such risk-taking behavior can easily go unchecked in NGOs (Galema et al. 2012).

It is these organizational differences among MFI types as well as their dual institutional logics that make MFIs unique and different from traditional banks. Figure 1 summarizes the main differences between MFIs and traditional banks. First, MFIs are double bottom-line achievers, whereas banks are single bottom-line achievers. Second, the main customers of MFIs are the customers excluded by traditional banks. Third, MFIs offer smaller, uncollateralized loans guaranteed by groups or individuals, whereas banks provide larger, collateralized loans to (mostly) individual borrowers and firms. Fourth, MFIs are registered as either shareholder firms or non-profit organizations like NGOs and cooperatives, whereas banks are mainly incorporated as shareholder firms. Finally, MFIs are financed by donors, social investors, and commercial investors, whereas banks are financed by commercial investors. These differences show that MFIs

are indeed unique; hence, an investigation into the link between diversification and risk in MFIs is warranted.

Figure 1: Comparison between microfinance institutions and traditional banks

Basis of comparison	Microfinance Institutions	Traditional Banks
Goal	Social and financial orientations	Profit-oriented
Customer type	Low-income people (poor families and microenterprises). This is the group not served by traditional banks	High-income people (wealthy individuals, SMEs, large enterprises).
Lending model	• Group lending • Individual lending • Small uncollateralized loans	• Mostly individual lending • Large collateralized loans
Organizational form and ownership	• Bank (shareholder-owned) • Nonbank financial institution (shareholder-owned) • Nongovernmental organization (no legal owners) • Cooperative or credit union (customer-owned)	• Bank (shareholder-owned)
Funding sources	• Donations • Subsidized debt • Commercial debt • Equity	• Commercial debt • Equity

2.3 Empirical Literature and Hypothesis Development

Empirical studies on diversification and bank risk report mixed results. For instance, Rose (1996), Levonian (1994), and Liang and Rhoades (1988) find that diversification reduces bank risk. According to Rose (1996), there is a threshold of diversification (e.g., more than 50 percent of bank-held assets outside the home state) above which risk declines.

Other studies show that diversification reduces bank failure (Demsetz & Strahan, 1997; Deng & Elyasiani, 2008) and credit risk (Akhigbea & Whyte, 2003). Furthermore, the risk-return tradeoff achieves a lower risk level (Acharya et al., 2006), insolvency risk declines, bank efficiency improves (Hughes, Lang, Mester, & Moon, 1996b), and deposit risk declines (Aguirregabiria et al., 2016). Goetz et al. (2016) add that diversification lowers risk to a greater extent when banks expand into different economic areas. These findings are consistent with modern portfolio theory. Accordingly, this paper's first hypothesis (stated as an alternative to the null hypothesis of no relationship) is formulated as follows:

H1: There is a negative relationship between geographic diversification and credit risk in microfinance institutions.

Contrary to the predictions based on portfolio theory, some empirical findings suggest that diversification not only does not reduce bank risk but in fact increases it. For instance, Gulamhussen et al. (2014) find that diversification is associated with higher credit risk. Hughes, Lang, Mester, and Moon (1996a) also find that when an efficient bank is more geographically diversified, it reports higher returns, but also higher levels of risk. This finding is consistent with risk-return tradeoff, given that higher returns come with higher risks.

Similarly, Chong (1991) reports that diversification presents an opportunity for banks to take on more risk. Banks increase their leverage to diversify, which can lead to higher bankruptcy risk and market risk. Goetz, Laeven, and Levine (2012) find that diversification increases the complexity of the bank and that this makes monitoring difficult. Complexity enables corporate insiders to extract larger private benefits, which has an adverse effect on firm value. Additionally, Cerasi and Daltung (2000) note that it is costly to monitor multiple operations resulting from diversification. On the other hand, poor monitoring of borrowers due to dispersed operations can result in higher loan defaults.

The findings of Deng and Elyasiani (2008) suggest that as the distance between the bank headquarters and its branches increases, so does risk. This finding is consistent with Winton's (1999) argument linking higher complexity and weaker monitoring, which may lead to higher nonperforming loans. Similarly, Berger and DeYoung (2001) show that diversification increases bank inefficiency since monitoring gets weaker as the distance between the head office and a branch office increases. The increased inefficiency can lead to higher credit risk (Berger & DeYoung, 1997; Fiordelisi, Marques-Ibanez, & Molyneux, 2011). Furthermore, other findings also indicate that diversification does not reduce bank risk (Demsetz & Strahan, 1997; Turkmen & Yigit, 2012). Thus, a second, alternative hypothesis is proposed as follows:

H2: There is a positive relationship between geographic diversification and credit risk in microfinance institutions.

In light of these conflicting theoretical predictions (i.e., portfolio theory versus agency theory), it may come as no surprise that the empirical findings on the relationship between diversification and risk are also mixed. Overall, traditional banking studies do not offer an unambiguous expectation for the microfinance industry. We have therefore proposed the two alternative hypotheses. Moreover, conflicting research in other settings suggests that the effect of diversification is context-dependent and that it is an empirical question whether diversification has a positive or negative relationship to microfinance risk. Due to this ambiguity, all empirical tests conducted in this paper will be two-sided.

3. Data and Variable Definitions

3.1 Data

Our dataset is an unbalanced panel sample of 607 MFIs from 87 countries (see the Appendix) covering the period 1998–2015, comprising a total of 3296 MFI-year observations. The dataset is compiled based on rating assessment reports (formerly available at www.ratingfund2.org and the rating agencies' websites). The reports are produced by five specialized rating agencies (MicroRate, Microfinanza, Planet Rating, Crisil, and M-Cril). All of them have been approved and supported by the Rating Fund of the Consultative Group to Assist the Poor (C-GAP), a microfinance branch of the World Bank. Each of the rating reports contains data for the current rating year and previous years. It is worth noting that there is no perfect dataset to accurately represent the microfinance industry (Strøm, D'Espallier, & Mersland, 2016). However, we believe that our dataset is particularly suited to this study because it excludes small MFIs or development programs that do not seek to apply microfinance in a business-like manner.

In the microfinance industry, rating reports are one of the most reliable and representative sources of available data (Gutiérrez-Nieto & Serrano-Cinca, 2007; Hudon & Traca, 2011). The rating of MFIs, with support from donors such as the Inter-American Development Bank and the European Union, has been key to achieving transparency in the industry (Beisland, Mersland, & Randøy, 2014). Notably, the microfinance ratings provided by the five agencies are much wider in scope than traditional credit ratings are. They cover a wide range of categories, including financial information, outreach, ownership, regulation, governance, clients, and financial products.

The variables applied in this study are identically defined across rating agencies; however, the specific information published varies across agencies and reports, causing a different number of observations for different variables. That is, as an unbalanced panel dataset, not all MFIs have the same number of observations for some variables. For instance, our main metric of diversification, the variable "number of branches," has the lowest number of observations (1277), while the variable "total assets" has the highest number of observations (3219). Thus, in regressions involving the number of branches, the maximum number of observations is 1277, whereas in regressions without this variable the number of observations is higher. Finally, we use country-level data from the World Bank's World Development and Worldwide Governance databases.

3.2 Variables Definitions

Credit risk measures

A common measure of credit risk in banking is the *nonperforming loans rate* (e.g., Kwan and Eisenbeis (1997)), defined as the proportion of a loan portfolio that is in arrears for longer than 90 days. In microfinance, a shorter period (30 days) is often used because loans are mostly short-term in nature. Loan terms are typically around 12 months. Thus, nonperforming loans are commonly referred to as the *30-day Portfolio at Risk* (PaR30). PaR30 has been used in other studies such as Caudill, Gropper, and Hartarska (2009) and Mersland and Strøm (2009). An increase in PaR30 indicates that more borrowers of MFIs are unable to repay their loans within 30 days, resulting in

higher credit risk for the MFI. *Loan loss provisions* (LLP) represent another common measure of credit risk (Ahlin, Lin, & Maio, 2011; Rose, 1996). It is the proportion of the loan portfolio that is reserved in anticipation of future loan losses.

As a robustness check, we use volatility of returns on assets (ROA) (e.g., Aguirregabiria et al. 2013) and a z-score, based on the sum of PaR30 and LLP, as alternative risk metrics. The z-score is defined as the number of standard deviations from the mean of composite risk (i.e., the sum of PaR30 and LLP). It is calculated as *composite risk* minus its mean divided by its standard deviation per MFI. The z-score has been used in prior studies, e.g., Meslier, Morgan, Samolyk, and Tarazi (2016).

Geographic diversification measure

The most common measures of geographic diversification in banking include number of branches and number of regions or states (Deng & Elyasiani, 2008; Fraser, Hooton, Kolari, & Reising, 1997). In this study, geographic diversification is measured as the number of *branches* an MFI has. This variable has also been used by Aguirregabiria et al. (2016) and Hughes et al. (1996a).

However, Deng and Elyasiani (2008) argue that number of branches does not capture the distance between the head office and a branch office; hence, it is not a perfect measure of geographic diversification. However, to us it is not only the geographic distance per se that matters. The mere fact that a bank has branches, whether in the same city/region or different cities/regions, increases the complexity of the bank. That is, even within the same location, having a large number of branches affects credit risk since it is difficult to monitor many branch-level loans at the same time (Winton, 1999). For instance, an MFI with five branches in Mexico City is more complex in terms of risk management and monitoring than an MFI with two branches in different cities in Mexico.

To increase the robustness of our results, we also analyze the MFIs' *market focus* to account for the geographic distance concerns. MFIs that target both urban and rural clients are likely to be more geographically diversified than MFIs that operate in either exclusively urban areas or exclusively rural areas. Moreover, diversification into rural areas exposes the MFI to greater credit risk since the productivity of most farming-related borrowers is influenced by unexpected natural disasters like floods, droughts, and plant and animal diseases. Such exogenous factors affect the ability of the borrowers to repay loans and hence lead to higher defaults. In our sample, some MFIs target urban clients only, others focus on rural areas only, while some focus on both urban and rural areas. In our robustness test, we use the urban-rural dimension as a direct measure of diversification.

Firm-level control variables

MFI size. The size of the MFI has an influence on diversification. Due to their capacity base, larger firms are more diversified than smaller ones (Demsetz & Strahan, 1997; Gulamhussen et al., 2014). Thus, additional diversification requires additional size (Winton, 1999), making it necessary to control for size in our analysis. Moreover, size and number of branches can be expected to be correlated. Thus, to isolate the geography and complexity components of the branch variable it is important to capture the size component in a separate control variable. To measure MFI size, we use *total assets*

(natural logarithm), which is a common measure of firm size (e.g., Deng and Elyasiani 2008).

MFI experience. MFI experience is measured by the number of years that the institution has been in operation as an MFI. Older MFIs are likely to control credit risk better than younger ones do. Learning curve theory suggests that firms become more efficient over time because they learn their business better through the constant repetition of their operations. Caudill et al. (2009) show that over time, some MFIs become cost-efficient. Improved efficiency should result in lower numbers of nonperforming loans (Berger & DeYoung, 1997). Thus, inexperienced MFIs are more likely to have higher credit risks than experienced ones are.

Lending methods. MFIs use different lending methodologies (group and individual), which may influence credit risk. Group lending is an important innovation of microfinance (Hulme & Mosley, 1996). It enhances the repayment of credit by enlisting peer pressure from other group members. This pressure is due to the fact that group members are jointly liable for the default of one member. Overall, group loans are less risky than individual loans because of better screening, monitoring, auditing, and enforcement (Ghatak & Guinnane, 1999). Moreover, it is easier to monitor groups than individuals because it is more cost-efficient. Thus, we expect MFIs that offer group loans to have lower credit risk than those that offer individual loans.

MFI type. According to agency theory, microfinance NGOs may have higher risk levels compared to other types of MFIs because the absence of owners may lead to less monitoring of the CEO, which in turn may lead to excessive risk-taking by the CEO (Galema, Lensink, & Mersland, 2012). However, because NGOs tend to have broader objectives toward helping the poor than do other types of MFIs, they may monitor credit clients more closely (D'Espallier, Guerin, & Mersland, 2011). This monitoring may result in a lower credit risk for NGOs. Likewise, clients in member-based MFIs like credit cooperatives have strong incentives to repay their loans since a saving instalment is part of the business model of cooperatives (Ledgerwood, 1999). Overall, credit risk may vary between shareholder-owned and non-shareholder-owned MFIs. In our sample, we have four types of MFIs: non-governmental organizations (NGO), cooperatives (coop), banks (bank) and non-bank financial institutions (nonbank). We categorize bank and nonbank MFIs as shareholder-owned MFIs, and NGO and coop MFIs as non-shareholder-owned MFIs, and we use this categorization to control for MFI type.

Leverage. We control for the risk-taking behavior of MFIs by including the equity-to-total-assets ratio. MFIs with different capital structures may also have different credit risk levels. Similar to the previous argument, shareholders may monitor the institution to ensure that excessive risks are not taken. Debtholders, on the other hand, do not have residual rights and hence they do not exhibit the same motivations to monitor a firm as long as contract terms are followed.

Country-level and time control variables

Macroeconomy. We control for the influence of systematic factors on credit risk, following other scholars such as Ahlin et al. (2011) and Louzis, Vouldis, and Metaxas (2012). Accordingly, we include in our estimations *GDP per capita* from the World Bank, adjusted for international purchasing power parity (constant 2011).

Governance. We also control for the quality of the governance structure in each country since it may influence credit risk at the MFI level (Ahlin et al., 2011). Thus, we construct a governance index from six of the Word Bank's Worldwide Governance Indicators, namely: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. A similar construction has been used in Mia and Lee (2017).

Time effect control. Finally, we control for time effects in two ways. First, we interact year with country to account for time effects within each country. This approach controls for differences in time effects across countries since the economic performance or policy of a country may vary from year to year. Second, we control for the global financial crisis by constructing a binary variable (*Crisis*) based on the sample period (1998–2015). *Crisis* takes the value of 1 for the period 2007–2009 following Geiger et al.'s (2013) cut-off points, and 0 otherwise. We assume that the credit risk of MFIs in the crisis period is higher than in normal periods. A list of all the variables is provided in Table A2 of the Appendix.

4. Methodology

This study employs panel-data regressions to examine the influence of diversification on credit risk. According to Baltagi (2013), the use of panel data has several advantages over cross-sectional data. One advantage is that panel data helps control for individual heterogeneity. Additionally, panel data provides more information, variability, degrees of freedom, and efficiency, while mitigating the effects of multicollinearity. Furthermore, panel data helps account for unobserved effects that are not detectable in cross-sectional models (Wooldridge 2011). Based on Wooldridge (2011), our empirical model is expressed as follows:

$$Risk_{it} = \beta_0 + \beta_1 branch_{it} + \gamma X_{it} + c_i + u_{it} \quad (1)$$

where $Risk_{it}$ represents credit risk of MFI *i* at time *t*. Credit risk is measured in terms of PaR30, LLP, volatility of ROA, and z-score, as discussed above. $Branch_{it}$ is number of branch offices of the i^{th} MFI at time *t* and X_{it} is a vector of control variables, namely, MFI size, MFI experience, lending method, organizational form of MFI, and macroeconomic and macroinstitutional factors. β_0 is the mean of unobserved heterogeneity, and β_1 and γ are coefficients. C_i is the firm-specific unobserved effect and u_{it} is the remaining error term that varies across both *t* and *i*.

We start the empirical analysis by first checking whether panel techniques are indeed more appropriate than ordinary least squares (OLS) by applying the Breusch–Pagan test (Greene, 2003). If the test rejects the null hypothesis, then the panel-data model is preferable. The test results (unreported) show that panel-data techniques are appropriate. Next, to decide whether the fixed effects (FE) estimator or the random effects (RE) estimator is suitable for the data, we use Hausman (1978) specification test. The FE estimator assumes that C_i is correlated with all of the explanatory variables, whereas the RE estimator assumes that C_i is uncorrelated with the explanatory variables. A rejection of the null hypothesis of Hausman's test suggests that FE is preferable. In

the empirical section, we let the Hausman test decide whether the RE or FE estimator is appropriate for each regression.

To control for possible endogeneity bias, we use the generalized method of moments (GMM) as a robustness test. It is possible that the decision to diversify geographically is an endogenous choice. That is, the number of branches variable can be influenced by the previous period's credit risk. While it is often difficult to get relevant instruments to remove endogeneity bias statistically, panel data offers more opportunities to do so than cross-sectional data (Deaton, 1995). In this regard, the GMM estimator is appropriate (Wintoki, Linck, & Netter, 2012) because it generates instruments using both lagged dependent and explanatory variables. Specifically, we use Blundell and Bond's (1998) system GMM model, where lagged differences of the dependent variables are used as instruments in level equations in addition to lagged levels of dependent variables for equations in the first differences (Baltagi, 2013).

The GMM model requires two specification tests: the serial correlation test and the test for over-identification restrictions (Arellano & Bond, 1991). The serial correlation test considers the presence of second-order autocorrelation in the residuals from differenced equations (Arellano & Bond, 1991). If the p-value is larger than 0.05, it means that there is no second-order autocorrelation – which is the case in this study. The null hypothesis for the over-identification restrictions test (the Hansen test) is that the instrument set is valid. If this test result does not reject the null hypothesis, then the instruments are valid – as they are in our case.

5. Results and Discussion

5.1 Descriptive Statistics and Correlations

Table 1 presents the descriptive statistics of the variables. On average, 6 percent of the total loan portfolio is in arrears for longer than 30 days and 4 percent is reserved in anticipation of future loan losses. The sum of the two indicators is used to produce a mean z-score of 5. The mean volatility of ROA is 6 percent. The average MFI is 11 years old, has 18 branches, and holds US$15 million in total assets, of which 38 percent is financed by equity capital. Regarding lending methodology, 42 percent of the MFIs give group loans and the rest offer individual loans.

Table 1: Descriptive statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Portfolio at risk (%)	6.06	7.50	0.10	48.90	2777
Loan loss provisions (%)	3.61	4.64	0.10	56.60	2561
Z-score	4.57	0.89	-2.01	3.45	2261
Volatility of ROA (%)	5.98	7.73	0.05	75.66	3208
Number of branches	18.11	32.70	1.00	376.00	1277
MFI age	10.76	6.34	2.00	33.00	3078
Assets (US$000)	14944.97	33153.55	50.00	365256.99	3219
Leverage (equity/assets)	0.38	0.24	0.01	1.00	3101
Shareholder firm	0.37	0.48	0.00	1.00	3049
NGO	0.47	0.49	0.00	1.00	3096
Coop	0.15	0.36	0.00	1.00	3096
Bank	0.05	0.21	0.00	1.00	3096
Nonbank	0.32	0.46	0.00	1.00	3096
Group	0.42	0.49	0.00	1.00	2842
GDP per capita (US$)	6533.41	5007.46	703.39	26429.35	3244
Governance index	-2.95	2.22	-10.47	8.63	3082
Rural and urban	0.55	0.49	0.00	1.00	2641

Concerning ownership structure, 37 percent of the MFIs are shareholder-owned (consisting of 5 percent banks and 32 percent nonbank financial institutions) and the rest are non-shareholder-owned MFIs (comprising 47 percent non-governmental organizations and 15 percent cooperatives and member-owned organizations). In terms of geographical focus, about 55 percent of the MFIs serve both rural and urban clients and the rest focus on either rural or urban clients only. With respect to macroeconomic and macroinstitutional indicators, GDP per capita has a mean value of US$6,533 and the mean governance index is -2.95. A higher governance index means a higher quality of governance structure in the country.

Next, we present pairwise correlations and variance inflation factor (VIF) scores between the independent variables (Table 2). Most of the correlations are significant at the 5 percent level or lower but all of them are below 0.50. That is, all of the correlations are below the suggested rule of thumb of 0.80 (Studenmund, 2011). Similarly, all of the VIF scores are below 5 (Studenmund, 2011). This indicates that multicollinearity is not a significant problem in this study.

Table 2: Pairwise correlation matrix and variance inflation factor

	VIF	1	2	3	4	5	6	7	8
1. Branches	1.65	1.0000							
2. MFI age	1.39	0.2034*	1.0000						
3. ln assets	1.38	0.4362*	0.3182*	1.0000					
4. Leverage	1.32	-0.0669	-0.0985*	-0.2221*	1.0000				
5. SHF	1.2	-0.0886	-0.1855*	0.1451*	-0.1035*	1.0000			
6. Group	1.18	0.0978*	-0.1068*	-0.2449*	0.1102*	-0.0751*	1.0000		
7. GDP/cap.	1.14	0.0029	0.0472	0.1657*	0.0148	-0.0576	-0.2173*	1.0000	
8. Gov. ind.	1.07	-0.0240	-0.0025	0.0560	0.0149	-0.0220	-0.0837*	0.4376*	1.0000
9. Crisis	1.02	-0.0246	0.0724*	0.1214*	-0.0877*	0.0454	0.0229	0.0194	-0.0413

Notes: The table reports pairwise correlations among explanatory variables. ln = natural logarithm, SHF = shareholder firm, VIF = variance inflation factor.

* Denotes statistical significance at the 5 percent level or lower.

5.2 The Relation between Geographic Diversification and Credit Risk

Table 3 presents estimates of both random and fixed effects models based on Hausman's (1978) test, as well as OLS[2] estimates for the volatility of earnings since the variable is computed per MFI. We control for country and time effects in two ways. First, we interact country with year in models (1–4). This strategy results in higher explanatory power (22–29% R-square) compared to that of the other models (6–11% R-square). Second, in models (5–8), we replace the country and year interaction term with two country-level variables, namely, GDP per capita and the governance index, and a time indicator (crisis).

The results of models (2–8) show that number of MFI branches (*Branches*) has a significant positive relationship with risk. This clearly suggests that MFIs with a larger number of branches may also have higher default rates and vice versa for those with fewer branches. The finding implies that the disadvantages of diversification (typically arising from agency costs and increased complexity) outweigh the advantages (as suggested by modern portfolio theory). Thus, the net effect of diversification in this study is higher loan defaults.

Concerning the control variables, we get some indications that larger MFIs have lower nonperforming loans – significant in models (4), (5), and (8) but showing a negative coefficient in 6 out of 8 models – suggesting that larger MFIs may have a greater ability to monitor loans (Baele, De Jonghe, & Vennet, 2007). However, it is interesting to note that number of branches is a much more significant variable in the regressions than MFI size. In principle, the number of branches variable could also have been used as a size indicator. However, we control for size through assets to separate the size effect and leave branches as a more clear-cut indicator of geographic diversification. This methodological choice allows us to suggest that the diversification effect is far more important than the mere size effect for the level of credit risk.

[2] Since the volatility of returns on assets is computed per MFI, it is not logical to use a panel estimator. Accordingly, an OLS estimator is used to estimate the volatility of the ROA model.

Table 3: The link between geographic diversification and credit risk

	(1) PAR30	(2) LLP	(3) Z-score	(4) StdROA	(5) PAR30	(6) LLP	(7) Z-score	(8) StdROA
Branches	0.0119	0.0242***	0.0091***	0.0205***	0.0097*	0.0223***	0.0075***	0.0150*
	(0.0117)	(0.0068)	(0.0029)	(0.0076)	(0.0049)	(0.0036)	(0.0020)	(0.0079)
Group	-0.3010	0.3523	0.2478	2.0686***	-2.3293***	0.3724	0.0229	1.8415***
	(0.9342)	(0.5860)	(0.3144)	(0.5347)	(0.4989)	(0.5166)	(0.2294)	(0.4177)
MFI size	0.1764	0.1749	-0.1988	-0.9388***	-1.0215***	-0.1379	-0.1729	-0.7961***
	(0.7551)	(0.6856)	(0.1884)	(0.2092)	(0.1897)	(0.5629)	(0.1806)	(0.1895)
Leverage	-0.6278	-2.0749	-0.1396	1.3087	-1.6566	-4.5316***	-0.6512	0.3077
	(1.9158)	(1.6706)	(0.6194)	(0.9825)	(1.1769)	(1.6407)	(0.5400)	(0.9769)
MFI experience	-0.0290	0.2710***	0.2457***	-0.0429	0.2074***	0.1432	0.1507***	-0.0391
	(0.3384)	(0.0466)	(0.0139)	(0.0447)	(0.0491)	(0.1520)	(0.0515)	(0.0346)
SHF	1.3395	0.0298	0.1674	1.2583**	1.0331**	0.5051	0.2382	0.9842**
	(0.9038)	(1.0379)	(0.4624)	(0.5320)	(0.4367)	(0.7220)	(0.2980)	(0.3986)
Country*year	Yes	Yes	Yes	Yes	No	No	No	No
Gov. index					0.3105***	0.2753	0.1430	0.2200*
					(0.1201)	(0.2768)	(0.1315)	(0.1195)
GDP per capita					-1.2542***	-6.1204**	-2.7995***	0.1891
					(0.3040)	(2.5362)	(0.8578)	(0.3038)
Crisis					0.0955	0.5796*	0.2478**	-0.0555
					(0.3309)	(0.3170)	(0.1102)	(0.4325)
Constant	75.2915	854.8619***	332.9617***	-448.7531***	31.3904***	57.0262***	25.0795***	16.3197***
	(682.9691)	(295.3657)	(89.2207)	(157.9873)	(4.3037)	(19.5171)	(6.6189)	(4.0423)
Observations	1,013	915	847	1,046	982	888	824	1,018
R-squared	0.229	0.235	0.218	0.294	0.108	0.066	0.075	0.061
Number of MFIs	477	443	390	-	460	428	379	-
F/Chi2-test (p-value)	0.0000	0.0000	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman (p-value)	0.0000	0.0000	0.0021	-	0.1793	0.0000	0.0009	-
Estimator	Fixed	Fixed	Fixed	OLS	Random	Fixed	Fixed	OLS

Notes: This table lists fixed, random effects and OLS estimates on the link between geographic diversification and credit risk. *PaR30* is nonperforming loans over 30 days, *LLP* is loan loss provisions, *z-score* is computed based on the sum of PaR30 and LLP, and StdROA is volatility of returns on assets. *Branches* represents number of branches, *MFI size* is the natural logarithm of total assets, *MFI experience* is the age (years) of the institution, and *Leverage* is calculated as equity divided by total assets. *Group* = 1 if group loans and = 0 if individual loans, *SHF* = 1 if shareholder-owned firm and = 0 if non-shareholder-owned firm, *Gov. index* represents governance index capturing macroinstitutional differences, *GDP per capita* is the natural logarithm of gross domestic product per capita adjusted for purchasing power parity, and *Crisis* = 1 if global financial crisis period and = 0 otherwise. Robust standard errors are in parentheses.
*** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

Surprisingly, older MFIs are not efficient in controlling defaults because they have higher nonperforming loans (evident in four models). The finding concurs with that of Caudill et al. (2009) who document evidence of MFIs not becoming efficient over time. In their study, inefficient MFIs are those that rely more on subsidies and less on deposits. In model (5), group lending is negatively associated with lower risk, consistent with microfinance literature (Ghatak & Guinnane, 1999). However, the coefficient is positive and significant in the two OLS models, suggesting higher risk and hence a mixed effect of group lending on risk. The mixed results render this variable far less important than our test variable of diversification.

Furthermore, in model (6), financial leverage is significantly associated with lower risk, suggesting that an increase in equity financing in microfinance can lead to lower credit risk. The finding that MFIs with higher financing risk take on less credit risk is reasonable and expected. However, the results further show that shareholder-owned MFIs carry higher risk than non-shareholder-owned MFIs. This departs from expectation and we will return to this later.

As expected, economic development tends to reduce credit risk, as is evident in the significant negative coefficient of *GDP per capita*, consistent with the literature (Carey, 1998; Louzis et al., 2012). That is, in more developed economies, borrowers have more income to repay debts. However, high-quality governance structure in a country does not necessarily reduce risk. This finding departs from expectation, though it is not necessarily surprising since MFIs serve clients operating in the informal economy where a country's formal governance structure does not often have much influence. Finally, we find that credit risk is not necessarily time-invariant: as expected, credit risk was higher during the global financial crisis as more clients struggled to repay their debts during this economic downturn.

As a robustness check, we repeat models (1–8) using the rural-urban dummy (1 = an MFI serves both rural and urban clients, and 0 = otherwise). This is to account for the geographic distance concerns of Deng and Elyasiani (2008), i.e., whether number of branches actually measures geographic diversification. The (untabulated) results reveal that the *rural-urban* variable is positively related to risk in all eight models, but with fewer significant coefficients. This implies that MFIs extending their services to clients in many geographic areas end up incurring more loan defaults. Overall, the results of this additional test lend support to our main conclusions.

In Table 4, we present results based on trend analysis, continuing with the number of branches as our main explanatory variable. We are interested in knowing whether the positive relationship between number of branches and credit risk is the same before, during, and after the global financial crisis (2007–2009). In other words, in which part of the sample period (1998–2015) does the positive effect of branches on risk set in? To answer this, we regress the z-score on number of branches and all the controls except the financial crisis dummy. The results indicate that the positive effect started during the financial crisis but became significant after this period. We stress that the numbers of observations are smaller in the subperiods, but we report the additional test to suggest that our findings of increased credit risk following increased diversification are relevant.

Table 4: Geographic diversification and credit risk: A trend analysis

	(17) Pre-crisis	(18) Crisis	(19) Post-crisis	(20) Full period
Branches	-0.0001	0.0381	0.0057***	0.0079***
	(0.0117)	(0.0419)	(0.0017)	(0.0020)
Group	-	0.5341*	-0.1781	0.0774
	-	(0.2782)	(0.2950)	(0.2422)
MFI size	0.3191	-1.1888**	-0.0312	-0.0833
	(0.4719)	(0.4995)	(0.4703)	(0.1693)
Leverage	-1.0149	-0.1723	-1.9988	-0.6395
	(0.9069)	(1.0554)	(2.1095)	(0.5420)
MFI experience	-0.0036	0.4665***	0.2270	0.1193**
	(0.1417)	(0.1717)	(0.1400)	(0.0485)
Governance index	0.0001	-0.4049	0.2848	0.0884
	(0.2080)	(0.4920)	(0.2985)	(0.1359)
GDP per capita	-5.8405**	-3.0894	-6.3545*	-2.4677***
	(2.4193)	(3.4044)	(3.2341)	(0.8609)
Shareholder firm	1.0689	0.8743**	0.1373	0.2170
	(1.0376)	(0.4280)	(0.3523)	(0.3143)
Constant	44.8250**	36.7957	53.2684*	21.0886***
	(18.0804)	(28.2888)	(27.9075)	(6.5895)
Observations	259	294	272	825
R-squared	0.111	0.162	0.091	0.062
Number of MFIs	192	203	166	380
F-test (p-value)	0.3625	0.0565	0.0000	0.0000
Estimator	Fixed effects	Fixed effects	Fixed effects	Fixed effects

Notes: This table lists fixed-effects estimates across different periods of the sample. The dependent variable is z-score. Pre-crisis refers to the portion (1998–2006) of the sample period (1998–2015) before the global financial crisis (2007–2009) and post-crisis to 2010–2015. Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

In Table 5, we compare the diversification-risk link across ownership/organizational structures of MFIs. As mentioned before, MFIs without owners may carry higher risk due to slacker monitoring compared to MFIs with owners (Galema et al. 2012). Because shareholders have rights to residuals, they have incentives to monitor a firm more closely than other stakeholders. As the results in Table 5 show, this is indeed the case. It is clearly seen that there is a strong positive relationship between number of branches and risk in terms of PaR30 (as well as the other 3 risk metrics, according to the untabulated results) in the non-shareholder group.

Table 5: Geographic diversification and credit risk: An organizational comparative analysis

	(21) SHF	(22) NonSHF
Branches	0.0009	0.0134***
	(0.0140)	(0.0051)
Group	-2.0069***	-2.3523***
	(0.7347)	(0.5957)
MFI size	-1.0215***	-1.1732***
	(0.3589)	(0.2353)
Leverage	-4.6016**	0.6609
	(1.9253)	(1.6821)
MFI experience	0.3074***	0.1694***
	(0.1126)	(0.0487)
Governance index	0.5441***	0.0792
	(0.1852)	(0.1588)
GDP per capita	-1.2654***	-1.3541***
	(0.4705)	(0.3828)
Crisis	-0.0868	0.2087
	(0.4886)	(0.4673)
Constant	33.1635***	33.4804***
	(7.7881)	(5.0290)
Observations	414	571
Number of MFIs	200	282
R-squared	0.1192	0.1388
Chi2 test (p-value)	0.0002	0.0000
Estimator	Random effects	Random effects

Notes: This table lists random-effects estimates across different organizational types of MFIs. The dependent variable is PaR30. SHF = shareholder firms; NonSHF = non-shareholder firms. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In other tests we check how the positive effect of diversification on risk might be mitigated. First, we repeat models (1–8) in Table 3, excluding the group lending control and compare the results between group and individual lending methods. The (untabulated) results reveal that the positive influence of number of branches is more pronounced among MFIs offering individual loans. This suggests that the difficulty in monitoring individual borrowers becomes worse when an MFI diversifies geographically. Second, we interact number of branches with group lending (1 = group loan, 0 = individual loan) and rerun models (1–8). The results (see Table A3 in the Appendix) indicate that the main effect of number of branches is stronger and the effect of group lending remains the same as in the main results in Table 3, but that the interaction term between branches and group lending is negatively (all models) and significantly (in 5 out of 8 models) related to risk. This suggests that MFIs may mitigate the effect of diversification on risk by employing a group lending methodology, which is self-monitoring. Overall, the results illustrate the

importance of the group lending methodology in microfinance (Armendáriz & Morduch, 2010; Ghatak & Guinnane, 1999).

We further check whether stricter governance can mitigate the negative effect of diversification in terms of higher risk. To do so, we interact internal audit (1 = an MFI has an internal audit function reporting to the board, and 0 = otherwise) with number of branches and rerun the models. The results (see Table A4 in the Appendix) show that number of branches is no longer significantly correlated with risk and that internal audit is negatively related with risk but is significant only in the LLP model. The interaction term between the two variables has no strong statistical influence on risk. Overall, the internal audit function seems to be a control mechanism that MFIs may use to mitigate the effect of diversification on risk.

To further check the robustness of the general positive relationship between diversification and risk, we rerun models (1–8) using a standard OLS estimator, first using number of branches as the test variable and, second, replacing branches with the *rural-urban* dummy. In both robustness tests, the (untabulated) results show that the positive relationship between diversification and risk remains unchanged. Our final robustness check relates to a possible reverse causality concern, which we address by using a GMM estimator. Again, the results (see Table A5) suggest a positive relationship between number of branches and credit risk. The result is statistically significant for the loan-loss provision model.

Overall, the results of the four estimators (random effects, fixed effects, OLS, and GMM) indicate that geographic diversification of microfinance institutions may result in higher risk in terms of higher nonperforming loans and higher loan-loss provisions as well as higher volatility of earnings. Our findings further highlight that the positive relationship is more pronounced among non-shareholder-owned MFIs (like NGOs) compared to shareholder-owned MFIs. Finally, the positive effect of diversification on risk can be mitigated with monitoring mechanisms like group lending and the internal audit function. Thus, diversification can be beneficial to MFIs if internal control and monitoring are improved.

Theoretically, the findings are generally in line with agency theory arguments. Branch managers of microfinance institutions may tend to use diversification to extract private benefits at the expense of the MFI (Bandelj, 2016; Goetz et al., 2012). This is possible because diversification increases the complexity of an institution (Winton, 1999), thus making it difficult for owners and headquarters to monitor remote operations (Acharya et al., 2006). In microfinance, monitoring by owners may be weaker than it is in regular banking because a majority of the MFIs are NGOs, which do not have owners. Thus, higher agency costs may offset any diversification premium, which seems to be the case in this study. The findings may also be attributed to increased complexity, which may diminish the monitoring of clients. To conclude, the findings provide support for the second hypothesis that there is a positive relationship between geographic diversification and credit risk in microfinance institutions.

6. Conclusion

This study investigates the relation between geographic diversification and credit risk in microfinance. The existing empirical studies are inconclusive as to whether banks should diversify. We extend the scope of the literature to include hybrid organizations (organizations with both social and financial logics; Battilana and Dorado 2010) and analyze from a risk perspective whether MFIs should diversify geographically. Number of branches and rural-urban focus are used as proxies for geographic diversification, and credit risk is measured in terms of portfolio at risk, loan loss provisions, z-score, and volatility of returns on assets.

The findings suggest that there is a significant positive relationship between geographic diversification and credit risk in microfinance. In particular, diversification seems to lead to higher nonperforming loans, which in turn leads to higher loan loss provisions. From a risk perspective, this finding suggests that diversification is not beneficial to MFIs, especially non-shareholder-owned MFIs. Operating with many branches makes the institution more complex and probably weakens the monitoring ability of both the owners and the head office. In view of the monitoring argument, the findings further suggest that the effect of diversification on risk can be mitigated by implementing a group lending methodology as well as better internal controls.

The results have important practical implications for both the microfinance industry and banking authorities. For practitioners in general, it is important that they consider their management and monitoring capabilities before making geographic diversification decisions. That is, diversification is not bad in and of itself as long as there are enhanced monitoring and control mechanisms in place. Otherwise, an MFI is better off focusing geographically as far as credit risk is concerned. In the absence of such internal controls, NGOs, in particular, would do well to remain focused on a few geographic areas. Regulatory authorities and other policymakers should avoid issuing general recommendations that MFIs reduce their risk by diversifying geographically. After all, microfinance is a relational transaction requiring close contact between the lender and the borrower. MFIs thus need proper governance and management structures before venturing into new geographic areas.

We conclude by noting that this study is limited to risk. From a risk-return perspective, higher credit risk may improve the financial performance of MFIs if the MFIs reach out to new customers. Even if these customers increase the loan losses, the net effect on bottom-line earnings can still be positive. In future research, it would be interesting to expand the diversification universe and study the effects of product diversification on risk. An additional aspect that should be researched is the relationship between diversification and social performance. Many MFIs have clear objectives of fighting poverty. An important dimension of social performance is outreach to new and more remote clients. Socially concerned MFIs would be willing to increase their risk if the outcome were that more poor people have access to microfinance services.

Notably, it is possible that the number of branches can be influenced by the previous period's credit risk, making the decision to diversify geographically an endogenous choice. We have used a standard statistical approach to handle possible endogeneity, but we cannot

completely rule out the possibility that we are observing an association rather than causation. This issue should be further addressed in future research, and a survey study among managers is needed to shed light on the relation between geographic diversification and credit risk.

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Appendix

Table A1: Distribution of number of microfinance institutions by country

#	Country	No. of MFIs	#	Country	No. of MFIs	#	Country	No. of MFIs
1	Albania	3	30	Mexico	31	59	Tajikistan	11
2	Argentina	2	31	Moldova	2	60	Croatia	1
3	Armenia	6	32	Morocco	8	61	Chad	3
4	Benin	8	33	Nicaragua	14	62	Rwanda	12
5	Bolivia	17	34	Pakistan	2	63	Zambia	3
6	Bosnia and Herzegovina	12	35	Paraguay	2	64	China	5
7	Brazil	14	36	Peru	40	65	Serbia	2
8	Bulgaria	3	37	Philippines	22	66	Ghana	5
9	Burkina Faso	9	38	Romania	7	67	Malawi	2
10	Cambodia	14	39	Russia	17	68	Gambia	1
11	Chile	2	40	Senegal	12	69	Kosovo	5
12	Colombia	14	41	South Africa	4	70	Congo	1
13	Dominican Republic	7	42	Sri Lanka	2	71	Burundi	6
14	Ecuador	20	43	Tanzania	8	72	Niger	8
15	Egypt	6	44	Togo	5	73	Dem. Rep. Congo	1
16	El Salvador	7	45	Trinidad and Tobago	1	74	Afghanistan	2
17	Ethiopia	10	46	Tunisia	1	75	Costa Rica	3
18	Georgia	8	47	Uganda	25	76	Lebanon	2
19	Guatemala	8	48	Montenegro	2	77	Turkey	1
20	Haiti	3	49	Cameroon	5	78	Palestine	3
21	Honduras	13	50	Guinea	3	79	Comoros	1
22	India	32	51	Timor	1	80	Italy	3
23	Indonesia	4	52	Bangladesh	2	81	Samoa	1
24	Jordan	3	53	Nepal	5	82	Sierra Leone	1
25	Kazakhstan	8	54	Vietnam	4	83	South Sudan	1
26	Kenya	18	55	Azerbaijan	9	84	United Kingdom	1
27	Kyrgyz Republic	9	56	Mongolia	4	85	Yemen	1
28	Madagascar	3	57	Nigeria	6	86	Angola	1
29	Mali	11	58	Mozambique	1	87	Macedonia	1
							Total	**607**

Table A2: Definitions of variables

Variable	Definition
Portfolio at Risk	Fraction of loan portfolio in arrears for more than 30 days.
Loan loss provisions	Fraction of loan portfolio reserved for future loan losses.
z-score	Calculated as the difference between composite risk (sum of portfolio at risk and loan loss provisions) and its mean divided by its standard deviation.
Volatility of ROA	The standard deviation of returns on assets per MFI.
Branch	The number of branch offices an MFI has.
MFI experience	Number of years in operation as a microfinance institution.
MFI size	Total assets (log values used in estimations).
Leverage	Equity divided by total assets.
Group	1 = if loans are made mainly to groups, 0 = individuals.
Shareholder firm (SHF)	1 = shareholder owned firm, 0 = non-shareholder-owned firm.
NGO	1 = nongovernmental organization, 0 = otherwise.
Cooperative	1 = if MFI is registered as a cooperative, 0 = otherwise.
Bank	1 = if MFI is registered as a bank, 0 = otherwise.
Nonbank	1 = nonbank financial institution, 0 = otherwise.
Governance index	This is the sum of six global governance scores on voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Data are taken from the World Bank database.
GDP per capita	Gross domestic product per capita, converted to international dollars using purchasing power parity rates (constant 2011).
Crisis	1 = global financial crisis period (2007–2009), 0 = otherwise.
Rural and urban	1= if an MFI serves both rural and urban clients, 0 = MFIs serving only urban clients or only rural clients.

Table A3: Geographic diversification and credit risk: Interaction between branches and lending method

	PAR30	LLP	Z-score	StdROA	PAR30	LLP	Z-score	StdROA
Branches	0.0171*	0.0255***	0.0104***	0.0397***	0.0128**	0.0245***	0.0087***	0.0512***
	(0.0088)	(0.0070)	(0.0031)	(0.0102)	(0.0054)	(0.0042)	(0.0018)	(0.0103)
Group loan	0.0716	0.5509	0.4425	2.4926***	-2.2379***	0.6414	0.2158	2.6537***
	(1.0062)	(0.6409)	(0.3440)	(0.5793)	(0.5277)	(0.5635)	(0.2405)	(0.4723)
Branches*group	-0.0244	-0.0141	-0.0149**	-0.0316***	-0.0056	-0.0190*	-0.0151***	-0.0521***
	(0.0276)	(0.0175)	(0.0066)	(0.0107)	(0.0076)	(0.0099)	(0.0046)	(0.0102)
MFI size	0.1913	0.1887	-0.1909	-0.9508***	-1.0222***	-0.0416	-0.1513	-0.8952***
	(0.7601)	(0.6813)	(0.1857)	(0.2058)	(0.1894)	(0.5922)	(0.1806)	(0.1897)
Leverage	-0.5988	-2.0554	-0.1045	1.3401	-1.6609	-4.4138***	-0.6386	0.2304
	(1.9080)	(1.6555)	(0.6091)	(0.9798)	(1.1757)	(1.6654)	(0.5305)	(0.9763)
MFI experience	0.0624	0.2356***	0.2081***	-0.0498	0.2061***	0.1323	0.1515***	-0.0553
	(0.2741)	(0.0607)	(0.0220)	(0.0444)	(0.0493)	(0.1537)	(0.0510)	(0.0347)
SHF	1.3762	0.0480	0.1889	1.2447**	1.0300**	0.5223	0.2708	1.0453***
	(0.8967)	(1.0282)	(0.4493)	(0.5299)	(0.4361)	(0.7137)	(0.2890)	(0.3952)
Country*year	Yes	Yes	Yes	Yes	No	No	No	No
Gov. index					0.3044**	0.2372	0.1253	0.1814
					(0.1203)	(0.2843)	(0.1344)	(0.1190)
GDP per capita					-1.2512***	-6.3088**	-2.9216***	0.2280
					(0.3045)	(2.5356)	(0.8485)	(0.3035)
Crisis					0.0933	0.5634*	0.2439**	-0.0322
					(0.3310)	(0.3199)	(0.1097)	(0.4318)
Constant	229.6775	777.7174**	249.6275**	-436.9553***	31.3373***	57.0903***	25.7280***	17.1272***
	(554.9044)	(319.5047)	(97.1855)	(158.2151)	(4.3197)	(19.3143)	(6.5398)	(4.0540)
Observations	1,013	915	847	1,046	982	888	824	1,018
Number of MFIs	477	443	390	-	460	428	379	-
R-squared	0.230	0.236	0.225	0.297	0.108	0.069	0.086	0.074
Estimator	FE	FE	FE	OLS	RE	FE	FE	OLS

Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table A4: Geographic diversification and credit risk: Interaction between branches and internal audit

	PAR30	LLP	Z-score	StdROA	PAR30	LLP	Z-score	StdROA
Branches	0.0160	0.0293	-0.0081	0.0144	0.0056	0.0274	-0.0107	0.0038
	(0.0613)	(0.0251)	(0.0202)	(0.0114)	(0.0093)	(0.0196)	(0.0165)	(0.0092)
Internal audit	-0.9384	0.2180	-0.2943	0.5393	-0.6228	-0.5064	-0.5185**	0.5105
	(0.9047)	(0.6592)	(0.3237)	(0.7116)	(0.5223)	(0.6050)	(0.2557)	(0.7144)
Branches*audit	-0.0035	0.0001	0.0110	-0.0095	0.0000	0.0077	0.0121	-0.0092
	(0.0263)	(0.0162)	(0.0131)	(0.0104)	(0.0094)	(0.0114)	(0.0085)	(0.0098)
Group	-0.2803	0.2521	0.3501	2.0226***	-2.3053***	0.0992	0.1835	2.1302***
	(1.5119)	(0.6858)	(0.4603)	(0.7025)	(0.5435)	(0.4984)	(0.2747)	(0.4924)
MFI size	1.1193	0.4142	0.0990	-0.7457***	-1.0921***	-0.5212	0.0014	-0.6597***
	(1.0758)	(0.4671)	(0.2588)	(0.2374)	(0.2425)	(0.7106)	(0.2479)	(0.2217)
Leverage	-0.7727	-1.5198	-0.6909	1.9459*	-2.1827*	-4.6724**	-0.8187	1.7058
	(1.9516)	(1.0800)	(0.6391)	(1.1128)	(1.2826)	(1.8630)	(0.5776)	(1.1209)
MFI experience	-0.0926	0.2900**	0.2880**	-0.0666	0.2000***	0.1560	0.1208*	-0.0289
	(0.2744)	(0.1391)	(0.1142)	(0.0483)	(0.0463)	(0.1491)	(0.0673)	(0.0417)
SHF	2.0763*	0.4179	0.6196	0.7525	1.0141**	0.5385	0.3578	1.2233**
	(1.2556)	(1.1400)	(0.4144)	(0.6791)	(0.4859)	(0.8920)	(0.2447)	(0.5570)
Country*year	Yes	Yes	Yes	Yes	No	No	No	No
Gov. index					0.2386**	0.6132*	0.1396	0.1877
					(0.1177)	(0.3276)	(0.1400)	(0.1290)
GDP per capita					-1.2723***	-4.0684	-2.4355*	0.1301
					(0.3153)	(3.9643)	(1.2622)	(0.3584)
Crisis					0.3486	0.3421	0.1039	-0.1385
					(0.4207)	(0.4133)	(0.1635)	(0.5473)
Constant	348.2834	830.8341***	475.8776**	-481.4850**	33.0286***	46.9099	20.0690**	13.6077***
	(529.3721)	(303.0831)	(218.9712)	(222.3313)	(4.6860)	(29.0330)	(9.7407)	(4.8784)
Observations	673	607	553	695	651	587	537	676
Number of MFIs	439	407	362	-	425	394	353	-
R-squared	0.144	0.525	0.310	0.286	0.115	0.106	0.085	0.063
Estimator	FE	FE	FE	OLS	RE	FE	FE	OLS

Table A5: Geographic diversification and credit risk: System GMM

	PaR30	LLP	Z-score
Branches	0.0854	0.0949**	0.0284
	(0.0925)	(0.0382)	(0.0195)
Group	-1.8180	-1.9351***	-0.9583***
	(1.6253)	(0.3514)	(0.3526)
MFI size	-2.5673	-0.4533	-0.5058
	(1.7714)	(1.3316)	(0.5795)
Leverage	2.3479	-3.5073	-3.9181
	(19.2700)	(5.5125)	(2.8334)
MFI experience	2.4072*	1.9291***	1.1921**
	(1.2466)	(0.4545)	(0.5111)
Governance index	0.3869	0.2547***	0.2812***
	(0.4903)	(0.0920)	(0.0925)
GDP per capita	0.2904	0.1661	0.0348
	(0.2203)	(0.1586)	(0.0802)
Crisis	-0.3644	-0.1759	-0.2059
	(1.7756)	(0.4983)	(0.2299)
Shareholder MFI	0.4664	0.7751*	0.1706
	(0.7418)	(0.3984)	(0.1665)
Constant	30.5537	31.3452***	14.2601**
	(39.4881)	(9.3125)	(6.7764)
Observations	985	889	825
Number of MFIs	463	429	380
Number of instruments	34	35	35
AR(1) test (p-value)	0.354	0.006	0.009
AR(2) test (p-value)	0.728	0.394	0.102
Hansen test (p-value)	0.265	0.294	0.234
Chi2-test (p-value)	0.062	0.000	0.115

Notes: This table reports results of system GMM. AR (1) and AR (2) are tests for first- and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation, which is the case for PaR30 model. For the LLP and Z-score models, there is serial correlation in the first order but not in the second order. The Hansen test of over-identification is under the null hypothesis that the instrument set is valid, as is the case here. In specifying the GMM model, we use one-year lags of PaR30, LLP, and z-score as GMM instruments, and the "collapse" option of limiting instrument proliferation. Robust standard errors are in parentheses.

* Denotes statistical significance at the 10% level.

** Denotes statistical significance at the 5% level.

*** Denotes statistical significance at the 1% level.

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Study 2:

Should Microfinance Institutions Diversify or Focus? A Global Analysis

Should Microfinance Institutions Diversify or Focus?

A Global Analysis[3]

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Abstract

This paper investigates the effects of revenue diversification on the financial performance of microfinance institutions (MFIs). The long-standing question about whether financial institutions should diversify or focus is a topic of ongoing debate. Using a global sample of MFIs, we investigate which view is appropriate for microfinance institutions. The results show that, diversification across revenue streams improves sustainability and profitability of MFIs. This suggests that revenue diversification is an important strategy for the sustainability of microfinance.

JEL classification: G21

Keywords: revenue diversification, financial performance, microfinance, sustainability, profitability

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1.Introduction

This paper examines the effects of revenue diversification on the financial performance of microfinance institutions (MFIs). The paper is motivated by increasing trends of interest rates ceilings for MFIs. As of 2004, about 40 countries introduced interest rates ceilings to protect poor borrowers from high interest rates charged by micro-lenders (Helms & Reille, 2004). In 2016, the Kenyan government for example, also established interest rate ceiling (The Economist, September 8, 2016) and on March 13, 2017, the National Bank of Cambodia announced interest rate ceiling for all MFIs in the country (Sokunthea, 2017).

One effect of interest rate ceiling in the microfinance industry is reduced transparency concerning cost of loans. "MFIs influenced by interest rate ceilings have tried to cover their costs by imposing new charges and fees" (Helms & Reille, 2004, p. 6). The new charges and fees are indirect costs of loans but less transparency makes the borrower unware of these costs. Moreover, the imposition of interest rates ceilings laws may force MFIs to find alternative sources of income to cover their huge operational costs. Interest rates are higher in microfinance than mainstream banking because of the high operational costs associated with smaller loans (Fernando, 2006; Helms & Reille, 2004; Mersland & Strøm, 2013). Thus, revenue diversification in microfinance could possibly be as result of interest rates ceilings. In the global sample applied in this study, MFIs get income from non-interest sources including investment income, fees and commissions. However, as far as their sustainability is concerned, should MFIs diversify their revenue sources?

The question about whether financial institutions such as banks should diversify or focus is yet to receive a clear-cut answer. Empirical findings seem to support either view. For instance, Acharya, Hasan, and Saunders (2006) and Berger et al. (2010) find that diversification does not improve bank performance while Chiorazzo, Milani, and Salvini (2008), Cotugno and Stefanelli (2012) and Chen and Lai (2017), on the contrary, document evidence to support diversification; it improves bank performance. Besides the mixed findings, common in the banking industry, there seems to be few empirical insights from the microfinance industry.

Microfinance is a poverty reduction tool with the primary aim of financial inclusion where poor people excluded from mainstream banking are provided with financial services (Armendáriz & Morduch, 2010). Since the 1970s when the concept took its inception, many observers worldwide have praised microfinance for the achievement of its primary goal (Balkenhol & Hudon, 2011; Biosca, Lenton, & Mosley, 2014; Convergences, 2017). Beside financial inclusion, microfinance also aims at being a financially sustainable concept, thus, it pursues a double bottom line which Morduch (1999) describes as a "win-win" solution. Thus, MFIs are hybrid organizations pursuing both social and financial objectives. Like other social organizations, MFIs seek to enhance the welfare of the clients and like banks, MFIs aim to be profitable or at least break-even.

The microfinance industry is growing very fast, yet few scholars seem to pay attention to it concerning the diversification versus focus issue. For example, in 2016, MFIs provided microcredit to 132 million borrowers around the globe with USD 102 billion of loan portfolio (Convergences, 2017). The annual growth rates in number of credit clients and loan portfolio between 2015 and 2016 are 9.6 and 9.4 percent respectively. Previous growth

trends can be found in sources reporting on the state of microfinance including Microfinance Baraometer (Convergences, 2017) and Microcredit Summit Campaign (Reed, 2015). Additionally, evidence from the banking industry may not be applicable to the microfinance industry since MFIs are hybrid organizations. Commercial banks on the other hand are purely profit- oriented firms. Moreover, since there are real world cases to support both diversification and focus (Winton, 1999), it makes sense to investigate which view is appropriate for micro-banks (MFIs) . Accordingly, this paper investigates the case of MFIs by answering the questions: should microfinance institutions diversify or focus? Is diversification helpful in attaining their financial objective? To answer these questions, the paper employs a unique global data set.

Scope studies in banking are often criticized since they are based on only a single country (e.g., Acharya et al., 2006; Berger et al., 2010; Jouida et al., 2017) or region (e.g., Bandelj, 2016; Mercieca et al., 2007; Smith et al., 2003), exceptions include Laeven and Levine (2007). This is a disadvantage we overcome with our global panel data set of 607 MFIs in 87 countries spanning 1998 -2015. This sample at least provides us with some international evidence on the diversification versus focus issue from the microfinance industry.

Finally, this paper is distinguished by its methodological approach from existing studies that conducted pure cross-sectional analysis. It uses panel data to investigate a "within" analysis and quantify the effects of variations in diversification for an MFI. The main advantage of this approach is that, it controls for important omitted variables such as MFI-specific and regional effects (Wooldridge, 2011).

This paper could be relevant for policymakers who regulate the activities of MFIs. Like banks, the diversification versus focus issue is vital for MFIs as some of them are being regulated by banking authorities. Banking regulations may tend to incentivize banks or regulated MFIs to diversify or focus (Acharya et al., 2006; Berger et al., 2010, Hayden et al., 2007). Moreover, some MFIs collect deposits, making them delegated monitors on behalf of depositors (Diamond, 1984). Effective monitoring of MFI's activities will depend on the degree of its diversification. The more diversified an MFI is, the more complex it becomes (Winton, 1999) and this makes monitoring ineffective (Acharya et al., 2006; Hayden, Porath, & Westernhagen, 2007). Thus, policymakers may find this paper relevant as to whether or not financial institutions benefit from diversification (Bandelj, 2016). In this regard, it is important to investigate empirically the case of MFIs.

The results suggest that diversification is helpful for the achievement of MFIs' financial objective. Specifically, revenue diversification improves sustainability and profitability of MFIs. The paper therefore makes an important contribution to the microfinance sustainability literature. The paper is among the first to provide empirical insights on the impact of diversification on the financial performance of MFIs. The findings imply that one way MFIs can be sustainable is to diversify into non-interest revenue streams. The revenue diversification premium is consistent with the modern portfolio theory, which asserts that holding many imperfectly correlated investments results in net positive outcomes (Markowitz, 1952).

The remainder of this paper unfolds as follows. Section 2 reviews the theoretical and empirical literature on diversification. In Section 3, information on data and estimation

approach is provided. Section 4 presents and discusses the empirical results and Section 5 concludes the paper.

2.Literature Review

2.1 Theoretical Literature on Diversification

Theoretically, firms diversify for a number of reasons including: risk management, efficiency, market power, resource exploitation, and managerial entrenchment (Chiorazzo et al., 2008; Elsas, Hackethal, & Holzhauser, 2010; Goddard, McKillop, & Wilson, 2008; Klein & Saidenberg, 1998). Portfolios theory, developed by Markowitz (1952), suggests that diversification leads to risk reduction and improved firm's value as long as assets returns are imperfectly correlated. For instance, expanding geographically requires "dissimilar" economies where correlations of returns of new and existing assets are low (Goetz, Laeven, & Levine, 2016). Thus, diversification reduces total risk resulting in improved financial performance, as idiosyncratic risk is minimal if not eliminated in a well-diversified firm.

Diversification leads to increased operational efficiency through economies of scope as fixed costs are spread among a wide range of products and regions (Drucker & Puri, 2009) and through joint production of financial services (Klein & Saidenberg, 1998). Operational efficiency is particularly important for microfinance institutions as far as their sustainability is concerned. Given that MFIs are struggling with huge operational costs (Mersland & Strøm, 2013), gaining operational efficiency through diversification could be a step in the right direction. Like banks, MFIs often enter into a long-term relationship with their customers allowing them to reuse previously gathered customer information without additional costs (Elsas et al., 2010). MFIs may also diversify to increase their market power if market competition intensifies (Goddard et al., 2008; Winton, 1999) and to exploit resources in new markets (Goddard et al., 2008) or leverage managerial expertise among products and regions (Iskandar-Datta & McLaughlin, 2007). Agency theory suggests that managers diversify their firms for private benefits including empire building or managerial entrenchment (Campa & Kedia, 2002; Jensen, 1986; Klein & Saidenberg, 1998).

2.2 Empirical Literature on Diversification and Financial Performance

There is a growing body of empirical literature on the issue of diversification versus focus and performance of financial institutions. The findings are mixed and tend to follow two main streams of empirical research namely: diversification premium (benefits) and diversification discount (disadvantages). Proponents of diversifications suggest that banks can enhance profitability by diversifying across a wide range of business lines and regions. For instance, Deng and Elyasiani (2008) find that geographic diversification is positively correlated with bank's value. Similarly, Klein and Saidenberg (1998) find that geographic diversification is beneficial to banks. Efficiency opportunities associated with internal capital allocation can be exploited by expanding geographically. Campa and Kedia (2002) also document evidence that counteracts diversification discount and conclude that diversification is a value-creating strategy. Other authors find that revenue diversification

improves bank's profitability, in terms of both unadjusted and adjusted returns on assets and equity (Chiorazzo et al., 2008; Cotugno & Stefanelli, 2012; Elsas et al., 2010; Sanya & Wolfe, 2010; Sissy, Amidu, & Abor, 2017) and these findings are robust during market instability (Cotugno & Stefanelli, 2012) and even during the sub-prime crisis (Elsas et al., 2010).

In addition, Lamont and Polk (2001) argue that diversification discount must be investigated, taking into consideration both future cash flows and assets returns. They find that diversified firms with low value tend to have large future returns compared with diversified firms with high value. Graham, Lemmon, and Wolf (2002) also argue that diversification is not a value-destroying strategy in that it depends on the financial health of the target firm prior to acquisition. Their findings suggest that, acquiring an already discounted firm will reduce the value of the acquirer, hence, diversification per se does not destroy firm's value.

Following the discussion on diversification premium evident in banking, we hypothesize that revenue diversification among microfinance institutions could lead to improved financial performance. This could be as a result of benefits associated with reduced risk based on portfolio theory and operational efficiency through economies of scale and scope. Therefore, the first hypothesis to test in this study is as follows.

Hypothesis 1: There is a positive relationship between revenue diversification and financial performance of microfinance institutions.

On the other hand, opponents of diversification say it is a value-destroying strategy because when a firm diversifies, existing management expertise gets diluted and agency costs increase. Other previous studies including Acharya et al. (2006), Hayden et al. (2007) and Jouida, Bouzgarrou, and Hellara (2017) find that diversification is inversely related to bank's performance. Similarly, the findings of Berger et al (2010) suggest that MFIs should focus instead of diversifying. More focused banks tend to be cost-efficient resulting in higher profitability. Stiroh (2004) and Stiroh and Rumble (2006) find that income diversification does not improve financial institutions' net operating income as non-interest income tends to be highly volatile. These results are consistent to those of Goddard et al. (2008) who additionally report that income diversification is beneficial to only larger credit unions.

Furthermore, Berger and Ofek (1995) find that diversification decreases firm's value and this is as a result of overinvestment or wasteful spending, and subsidization of segments with poor performance. Laeven and Levine (2007) report that banks' diversification through financial conglomerates is associated with lower market value. They argue that increased agency costs tend to offset gains from economies of scope.

Like banks, we also believe that diversification discount could be present among diversified MFIs too because of monitoring difficulties and operational inefficiencies. Having many financial activities could make MFIs worse-off if competent management team is not put in place. Thus, for management control purposes, it may be financially sustaining for MFIs to focus than to diversify. To this end, we hypothesize that:

Hypothesis 2: There is a negative relationship between revenue diversification and financial performance of microfinance institutions.

3. Data and Methodology

3.2 Sample

Our sample is an unbalanced panel of 607 microfinance institutions observed over 18-year period (1998-2015). It is a global sample of MFIs from 87 countries (Table A1 in Appendix) covering six regions: East Asia and Pacific (56 MFIs), Eastern Europe and Central Asia (105 MFIs), Latin America and Caribbean (199 MFIs), Sub-Saharan Africa (176 MFIs), South Asia (46 MFIs), and Middle East and North Africa (25 MFIs). The data are collected from www.ratingfund2.org and the rating agencies' (MicroRate, Microfinanza, Planet Rating, Crisil and M-Cril) websites. All of the five rating agencies have been approved and supported by the Rating Fund of the Consultative Group to Assist the Poor (C-GAP), a microfinance branch of World Bank. Each of the rating reports contains data for the rating year and the previous years. It is worth noting that, there is no perfect data set to accurately represent the microfinance industry (Strøm, D'Espallier, & Mersland, 2016). Accordingly, the data set used for this paper does not cover all the small savings and credit cooperatives worldwide but majority of our MFIs are small in size.

In the microfinance industry, rating data are one of the sources of the most reliable and representative available data (Mersland & Strøm, 2009). Rating MFIs, with support from donors such the Interamerican Development Bank and the European Union, is one of the main ways of achieving transparency in the industry (Beisland, Mersland, & Randøy, 2014). The rating reports provided by the five agencies are much wider in scope of information compared to traditional credit ratings (Beisland & Mersland, 2012). They cover a wide range of information including financial, outreach, ownership, regulation, governance, clients, financial products among others. Rating assessment is done in order to produce independent information for stakeholders' decision making purposes (Strøm et al., 2016). The sample for this study is an updated version of the data set used in Lensink et al. (2018), Pascal et al. (2017), Randøy et al. (2015) and Delgado et al. (2015).

3.3 Measures of Diversification and Financial Performance

Diversification measure

There are three dimensions of diversification: across financial products and services, geographic expansion, and a combination of these two (Mercieca et al., 2007). This paper is concerned with the first dimension. Specifically, this study investigates the effects of revenue diversification on the financial performance of MFIs. As mentioned earlier, the motivation for investigating revenue diversification in this study is because of the increasing trends of interest rates ceilings many MFIs face worldwide. Currently, over 40 countries have established interest rates ceilings to protect the poor borrowers from high interest rates charged by microlenders (Helms and Reille, 2004; Mbengue, 2013). The interest rates ceilings suggests that MFIs may have to find alternative revenue-generating

activities to cover their operational costs in order to stay in business. Hence, we investigate the influence of revenue diversification on MFIs' financial performance.

We follow other scholars (Jouida, 2017; Morgan & Samolyk, 2003; Stiroh, 2004; Stiroh & Rumble, 2006) to construct Herfindahl-Hirschmann Index for revenue diversification for each MFI. The measure of revenue diversification (DIV) takes into consideration various sources of net operating revenue, which are broadly grouped into two categories: interest and non-interest. *Interest* represents net interest income from loan portfolio while *non-interest* represents all non-interest income including investment income, fees and services charges, among others. Based on this breakdown, we construct our revenue diversification measure for MFIs as follows.

$$DIV = 1 - \left[\left(\frac{Interest}{Netop}\right)^2 + \left(\frac{Non-interest}{Netop}\right)^2\right] \quad (1)$$

Where NetOp = net operating revenue and it is the sum of *interest* and *non-interest* revenue. DIV measures the level of diversification of an MFI's net operating revenue. Increase in DIV means that an MFI becomes more diversified as far as revenue sources are concerned and a figure close to zero indicates that all operating revenue nearly comes from one source, thus, an MFI is more focused.

For robustness checks, we alternatively measure revenue diversification in terms of the share of non-interest income (*share-non*) defined as non-interest income as a proportion of total net operating revenue. Increase in *Share-non* also indicates that an MFI is diversifying into non-interest revenue generating activities. Thus, the institution is becoming more diversified.

Financial performance measures

As mentioned earlier, this paper investigates whether diversification is helpful in achieving the financial objective of microfinance. Like banks, MFIs should be able to generate profit or at least break-even. Thus, this paper focuses on the sustainability and profitability of MFIs. We use two indicators for each financial dimension. That is, we use OSS and FSS as sustainability indicators and ROA and ROE as profitability measures. OSS is operational self-sustainability, a ratio that demonstrates the ability of MFIs to be fully sustainable in the long-run, in the sense that they can cover all their operating costs and maintain the value of their capital. The operational self-sustainability ratio is a better measure of financial performance than standard financial ratios, such as return on assets or equity, because it entails a more complete list of inputs and outputs. FSS is financial self-sustainability (explained below). ROA (return on assets) and ROE (returns on equity) are traditional measures for financial performance, used in different fields not only in microfinance. Overall, OSS, FSS, ROA and ROE have been widely used to measure the financial performance of MFIs (Abdullah & Quayes, 2016; Adusei, Akomea, & Poku, 2017; Armendáriz & Morduch, 2010; Cull, Demirgüç-Kunt, & Morduch, 2007, 2011; Dorfleitner, Priberny, & Röhe, 2017; Mersland & Strøm, 2009).

ROA is a ratio of net operating income of the MFI divided by average assets. This ratio allows a comparison of an MFI's performance to those of other MFIs or to the industry

benchmark. OSS measures the ability of an MFI to cover its operating costs from operating revenue. It is computed as follows.

$$OSS = \frac{Operating\ revenue}{Costs\ on\ (funding + loan\ loss\ provision + operations)} \quad (2)$$

Where operating revenue consists of interest and non-interest income. Funding cost is the cost of borrowings (interest and fees on loans and bonds), loan loss provision is the amount set aside to cover costs of loans default, and operations refer to cost of operations and include staff and non-staff costs. If OSS is 1 or 100 percent means full operational self-sufficiency. A value less than 1 means that the MFI needs to rely on external funding to meet operational costs while a value greater 1 indicates the MFI can operate without subsidies; it is "self-sufficient."

Note that the computations of both operating revenue and operating costs in equation (2) include subsidies enjoyed by some MFIs, hence, they are not intrinsic or market values. FSS deals with subsidies from "soft" loans and investments and it is calculated as:

$$FSS = \frac{Operating\ revenue}{Adjusted\ costs\ on\ (funding + loan\ loss\ provision + operations)} \quad (3)$$

FSS adjusts operating revenue and costs to reflect how sustainable an MFI is if its operations were unsubsidized and its borrowings were at arm's length transactions. It is important to make subsidy adjustments since MFIs are heterogeneous in terms of the amount of subsidy received. These adjustments allow better comparison among MFIs. Additionally, subsidy adjustments allow us to get an objective picture of the true financial sustainability of an MFI since they operate on commercial basis. Overall, FSS seeks to answer the question: can an MFI continue to operate in the near future without subsidy?

There are three types of subsidy adjustments: concessionary borrowings, in-kind donations, and cash donations (Armendáriz & Morduch, 2010; Mersland & Strøm, 2014). The first concerns adjustment to funding costs and it takes into account the difference between subsidized and unsubsidized funding costs. This difference is added back to funding costs. The second adjustment captures donations in-kind or where raw materials were donated or supplied below market cost. Cash donations adjustment also capture monies given to the institution at no cost. This should be deducted from operating revenue.

Control variables

MFI size. As in other empirical studies [e.g., Mersland and Strøm (2009); Sanya and Wolfe (2010)] we take the natural log of total assets to control for MFI size since there are scale economies in microfinance (Hartarska, Shen, & Mersland, 2013). It is possible that diversification benefits could be related to large size since larger firms are able to diversify better than smaller ones (Demsetz & Strahan, 1997; Gulamhussen, Pinheiro, & Pozzolo, 2014).

Capital/Asset. This ratio measures the ability of the institutions to withstand shocks. Institution's probability of failure depends on its level of capitalization, larger capitals are safer (Lehar, 2005).

Loan/Asset. This ratio, gross loan portfolio to total assets, measures differences in MFIs loan portfolios. Financial institutions with larger loan assets may focus more on interest activities compared with non-interest activities as far as income diversification is concerned (Stiroh & Rumble, 2006). Moreover, high switching costs in lending relationships tends to stabilize interest income (DeYoung & Roland, 2001).

MFI experience. Age controls for differences in experience across MFIs. Learning curve theory suggests that the older you are, the better experienced you become. Thus, well-established MFIs are more likely to perform better than less experienced MFIs as they already have established relationships with customers, suppliers, and other stakeholders. MFI age has been used as a control variable in other empirical studies [e.g., Pascal et al. (2017); Hermes, Lensink, and Meesters (2011)]

Portfolio at risk (PaR30). PaR30 is the proportion of loan portfolio that is in arrears over 30 days. This is a widely used measure of portfolio quality in microfinance as most loans are short-term in nature. Other empirical studies have used this measure as control variable [e.g. Mersland and Strøm (2009); D'Espallier, Guerin, and Mersland (2011)].

Regulation. Some MFIs in our sample are regulated by banking authorities. Regulated MFIs stand the chance of gaining greater reputation leading to high customer loyalty. The bottom line effect of customer loyalty is improved performance (Mersland & Strøm, 2009). However, costs of regulation such as security requirement cost may reduce the amount of resources available for innovations. Accordingly, costs associated with regulation may offset its benefits leading to lower financial performance (Hardy, Holden, & Prokopenko, 2003). In sum, regulatory policies concerning activity restrictions, diversification requirements, and institutional environment may affect benefits associated with diversification (Mercieca et al., 2007).

Geographical area. We also control for the geographical areas within which the MFIs operate. In our sample, some MFIs serve only urban clients and others focus on only rural or both rural and urban clients. Serving urban clients is less costly compared to rural clients. For instance, transportation costs relating to monitoring should be lower among MFIs serving urban clients compared to those serving rural clients because of differences in distance and quality of road.

Lending methodology. MFIs adopt three different lending methodologies when it comes to the supply of microcredit namely solidarity group, individual and village banking. - Solidarity group lending is an important innovation of microfinance regarding the repayment of credits (Hulme & Mosley, 1996; Morduch, 1999). It enhances the repayment rates due to peer pressure from other group members (Ledgerwood, 1999). In the empirical analysis, the first two dummies are included while village banking serves as the reference category.

Finally, the paper controls for other country specific characteristics including GDP (gross domestic product) per capita adjusted for purchasing power parity (constant 2011 international $) and annual GDP growth rate, following Sanya and Wolfe (2010) approach.

Additionally, we control for inflation – consumer price index. Table 1 summarizes the variables defined above.

Table 1: Variables definitions

Variable	Definition
Diversification	
DIV	Revenue diversification index, defined in equation (1)
Share-non	Non-interest revenue as a proportion of total revenue
Financial performance	
Returns on assets (ROA)	Net operating income divided by average assets
Returns on equity (ROE)	Net income divided by equity
OSS	Operational self-sustainability, defined in equation (2)
FSS	Financial self-sustainability, defined in equation (3)
Control variables	
MFI size	Natural logarithm of total assets
MFI experience	The number of years an institution is in operation as MFI
Portfolio at Risk (PaR30)	Proportion of loan portfolio in arrears over 30 days.
Equity to asset ratio	Total equity over total assets
Loan to asset ratio	Gross loan portfolio over total assets
Urban market	1= MFI emphasizes urban areas as main market 0= otherwise
Group lending	1 = if MFI adopts group lending method, 0 = otherwise
Individual lending	1 = if individual lending method, 0 = otherwise
GDP per person	Gross domestic product per capita adjusted for purchasing power parity (constant 2011)
GDP growth	Annual gross domestic product percentage growth rate
Inflation	Annual consumer price index
Regulation	Regulation is a dummy variable and takes the value of 1 if the institution is regulated by banking authorities and 0 otherwise.

3.4 Estimation Approach

This paper employs fixed effects model to account for any important variables omitted (Wooldridge, 2011). In particular, the paper takes into account any unobserved firm-specific effects across MFIs. Our basic regression model is expressed as follows.

$$y_{it} = \beta_0 + \beta_1 DIV_{it} + \gamma X_{it} + C_i + u_{it} \quad (4)$$

Where y_{it} is a vector of dependent variables, DIV is the diversification index for revenue, β_0 is the mean of unobserved heterogeneity, β_1 and γ are coefficients, X_{it} constitutes the controls for size, experience, loan quality, level of capital, loan to asset ratio, location of market, lending method, GDP per person, and GDP growth rate. C_i is firm-specific unobserved effect and u_{it} is the remaining error term that varies across both t and i. The main advantage of using fixed effects estimator is that, it wipes out all of the firm-specific unobserved effects (C_i's).

To determine whether our estimation method is appropriate for the data, we first check whether panel techniques are more appropriate than ordinary least squares (OLS) by applying the Breusch-Pagan test (Greene, 2003). If the test rejects the null hypothesis, then the random effects model (RE) is preferable (i.e., panel-data model is appropriate). The results (Table A2 in Appendix) show that RE model is appropriate. Second, we test the assumed correlation between MFI-specific effects and regressors using Hausman's (1978) specification test. A rejection of the null hypothesis in the specification test shows that MFI-specific effects correlate with regressors, such that a fixed effects model is preferable, which is the case in this study (see Table A2). Only in two models (using ROA as dependent) out of eight models, the RE estimator is desirable. However, to be consistent, we use the fixed effects (FE) estimator for all models. Moreover, when we compare the results of the two models (involving ROA) between FE and RE[4] and they are not substantially different from each other.

[4] The random effects results are not reported but are available upon request.

4.Results and Discussion

4.1 Descriptive Statistics, Correlations and Variance Inflation Factor scores

Table 2 presents the descriptive statistics of the variables used in our estimations. *DIV* has a mean value of 0.13 indicating relatively small degree of diversification across non-interest revenue sources. On average, about eight percent of MFI's total revenue is from non-interest sources such as commissions and fees (*Share-non*). Concerning the dependent variables, ROA has a mean value of 2.60 percent and that of ROE is 8.20 percent. These profitability means are quite low, suggesting that MFIs are not purely profit oriented firms. What is important for them is self-sustainability, which is the case in this sample as OSS is above one (1.104), indicating that MFIs can cover their operational costs from revenue earned. However, the mean value of FSS less than one (0.952) suggests that MFIs cannot survive in the long-run without subsidies from governments and other advocates of financial inclusion.

Table 2: Descriptive statistics of variables

Variable	Mean	S.D.	Min	Max	Obs.
Operational self-sustainability (OSS)	1.104	0.315	0.076	1.977	1574
Financial self-sustainability (FSS)	0.952	0.298	0.064	3.469	1562
Returns on assets (ROA)	0.026	0.074	-0.298	0.293	3030
Returns on equity (ROE)	0.082	0.208	-0.887	0.862	2908
Diversification index (DIV)	0.130	0.135	-0.473	0.500	3167
Non-interest revenue (share-non)	0.081	0.105	-0.296	0.599	3122
Total assets in logarithm (MFI size)	15.297	1.642	4.871	20.923	3248
Age of MFI in years (MFI experience)	10.892	7.584	0.000	52.000	3268
Portfolio at risk over 30 days (Par30)	0.054	0.067	-0.271	0.398	2949
Equity to assets ratio (Equity)	0.369	0.273	-1.571	1.000	3216
Loan portfolio to assets ratio (Loan)	0.745	0.170	0.008	0.999	3167
Urban market	0.266	0.442	0.000	1.000	2641
Group lending (Group)	0.255	0.436	0.000	1.000	2855
Individual lending (Individual)	0.573	0.495	0.000	1.000	2855
GDP growth (%)	5.121	3.260	-14.150	14.722	3253
GDP per person (log)	8.446	0.892	6.307	10.544	3288
Inflation	0.064	0.051	-0.185	0.287	2298
Regulation	0.363	0.481	0.000	1.000	2913

S.D. = standard deviation

Regarding the control variables, on average, an MFI has about eleven years of experience with thirty-seven percent of total assets funded by equity. The average portfolio at risk (Par30) is five percent. A large proportion (seventy-five percent) of total assets are loan assets. This makes sense, since microfinance mission is to supply financial services to poor families and microenterprises. In terms of geographical focus, twenty-seven percent of MFIs in the sample serve urban clients and with respect to their lending methodologies, about twenty-six percent of MFIs offer solidarity group loans while fifty-seven percent offer individual loans.

Furthermore, on average, gross domestic product (GDP) experiences an annual growth rate of about five percent over the eighteen-year period. Similarly, inflation has a mean of about six percent. Finally, about thirty-six percent of MFIs are regulated by banking authorities.

Table 3 presents pairwise correlations and variance inflation factor (VIF) scores among the regressors, which provide information concerning multicollinearity problem. Many correlations are significant at one percent level of significance. The correlations indicate that multicollinearity is less problematic because all of them (except the one between DIV and Share-non) are less than suggested threshold of 0.70 (Kennedy, 2008). The correlation between DIV and Share-non is quite high (0.96) because they mean the same thing in different measurements. Therefore, we do not include both in a model. An alternative and a common approach to detect severity of multicollinearity between explanatory variables is the use of VIF score (Studenmund, 2011). The rule of thumb is to have VIF values lower than five (Studenmund, 2011) or ten (Gujarati, 2011; Hair, Black, Babin, & Anderson, 2010) in order to conclude absence of severe multicollinearity problem. Accordingly, our test for VIF indicates that all values are less than five, the highest value is 2.02 (individual lending). This suggests that multicollinearity problem is not severe in this study.

4.2 Fixed Effects Regression Results

To estimate equation (4), we employ the specific-to-general model-building approach as follows (Brooks, 2008; Koopmans, 1937). For each dependent variable, we run four models. In the first model, the dependent variable is regressed on only the diversification variable (DIV). Then in the second model, we add only MFI-specific controls while the third model adds macroeconomic indicators. In the fourth model, industry regulation control is included. The reason for this systematic approach is to establish some level of robustness of the results. Finally, for comparison and convenience purposes, we then report all the dependent variables in one table (Table A2 in the Appendix).

Table 4 presents the regression results of the link between revenue diversification and sustainability of MFIs. In models (1) to (4), the dependent variables is operational self-sustainability while models (5) to (8) relate to financial self-sustainability. Thus, both variables are sustainability measures. As expected, the R-squared improves with respect to the systematic approach from 0.10 percent in model (5) to 28.80 percent in model (8). The coefficient of DIV is positive in seven out of eight models indicating that revenue diversification comes with improved sustainability. This suggests that MFIs could be more sustainable by having several non-interest revenue generating activities. The finding (DIV) is however not significant in seven models.

Table 3: Pairwise correlation matrix and VIF scores

	VIF	1	2	3	4	5	6	7	8	9	10	11	12	13
1. DIV	1.20	1.0000												
2. Share-non	1.16	0.9634*	1.0000											
3. MFI size	1.41	0.0077	0.0043	1.0000										
4. MFI experience	1.30	0.0923*	0.0740*	0.3591*	1.0000									
5. Par30	1.22	0.2139*	0.2022*	-0.0792*	0.1458*	1.0000								
6. Equity/asset	1.14	-0.1270*	-0.1197*	-0.1123*	-0.0701*	-0.1108*	1.0000							
7. Loan/asset	1.16	-0.3616*	-0.3411*	0.1208*	0.0428	-0.1895*	0.0176	1.0000						
8. Urban	1.11	-0.0223	-0.0284	-0.0440	-0.0796*	0.0496	0.0601	0.0233	1.0000					
9. Group	1.83	-0.0555	-0.0497	-0.2154*	-0.1525*	-0.0882*	0.0240	-0.0869*	-0.0347	1.0000				
10. Individual	2.02	0.1184*	0.1092*	0.2417*	0.1426*	0.1488*	-0.0705	0.0558	0.1479*	-0.6784*	1.0000			
11. GDP growth	1.08	-0.1051*	-0.0993*	-0.1197*	-0.0628	-0.1124*	0.0637	0.0818*	-0.0720	0.1044*	-0.0843*	1.0000		
12. GDP per person	1.20	-0.1156*	-0.1013*	0.1924*	0.0691*	-0.0645	0.0315	0.2068*	0.0956*	-0.2183*	0.2216*	-0.2042*	1.0000	
13. Inflation	1.05	0.0577	0.0521	-0.0608	-0.0320	-0.0490	-0.0188	-0.0345	0.0202	0.0556	-0.0247	0.1229*	-0.1068*	1.0000
14. Regulation	1.28	0.0776*	0.0665	0.2334*	0.0089	0.0128	-0.1500*	-0.0605	-0.0967*	-0.0332	0.1646*	0.0702	-0.2406*	-0.0537

Notes: VIF = Variance inflation factor. * Denotes statistical significance at the 1 percent level

Table 4: Effects of revenue diversification on sustainability of microfinance institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Operational self-sustainability				Financial self-sustainability			
DIV	0.1151*	0.0298	0.0965	0.1116	0.0666	-0.0496	0.0181	0.0296
	(0.0653)	(0.0730)	(0.0763)	(0.0763)	(0.0659)	(0.0653)	(0.0686)	(0.0684)
MFI size		0.1314***	0.1040***	0.1099***		0.1408***	0.1330***	0.1389***
		(0.0162)	(0.0201)	(0.0201)		(0.0157)	(0.0187)	(0.0188)
MFI experience		-0.0129**	-0.0158**	-0.0143**		-0.0050	-0.0089	-0.0072
		(0.0053)	(0.0066)	(0.0066)		(0.0049)	(0.0060)	(0.0060)
Portfolio at risk		-0.9335***	-0.9313***	-0.8534***		-0.7150***	-0.9082***	-0.8061***
		(0.1723)	(0.1860)	(0.1891)		(0.1564)	(0.1684)	(0.1705)
Equity/assets		0.1742***	0.2271***	0.2229***		0.0793	0.1098**	0.1072**
		(0.0499)	(0.0564)	(0.0563)		(0.0483)	(0.0535)	(0.0532)
Loan/assets		0.3024***	0.2959***	0.2749***		0.2717***	0.2183***	0.2045***
		(0.0746)	(0.0755)	(0.0757)		(0.0631)	(0.0636)	(0.0634)
Urban market		0.1222***	0.0822	0.0740		0.2582***	0.2205***	0.2110***
		(0.0470)	(0.0531)	(0.0531)		(0.0410)	(0.0478)	(0.0477)
Group lending		0.2029*	0.1666	0.1521		-0.1785*	-0.2530**	-0.2647**
		(0.1101)	(0.1172)	(0.1171)		(0.1050)	(0.1088)	(0.1083)
Individual lending		-0.0284	-0.0947	-0.0766		-0.0816	-0.1375*	-0.1146
		(0.0726)	(0.0818)	(0.0819)		(0.0728)	(0.0766)	(0.0766)
GDP growth			0.0041	0.0038			0.0053**	0.0051**
			(0.0026)	(0.0026)			(0.0024)	(0.0024)
GDP per person			0.3392***	0.3686***			0.1401	0.1734
			(0.1238)	(0.1240)			(0.1140)	(0.1139)
Inflation			-0.1805	-0.1678			-0.7478***	-0.7559***
			(0.1749)	(0.1745)			(0.1623)	(0.1616)
Regulation				-0.1123***				-0.1197***
				(0.0424)				(0.0391)
Constant	1.0888***	-1.0638***	-3.4829***	-3.7968***	0.9438***	-1.3057***	-2.2214**	-2.5759***
	(0.0103)	(0.2287)	(0.9736)	(0.9780)	(0.0104)	(0.2237)	(0.8967)	(0.8996)

Observations	1,526	1,112	908	903	1,526	1,124	936	931
Number of MFIs	386	343	272	270	384	347	284	282
R-squared	0.003	0.180	0.200	0.209	0.001	0.256	0.277	0.288

Notes: This table lists fixed effects regression results where *OSS* and FSS are regressed on *DIV* with(out) controls. *OSS* is operational self-sustainability (models 1 to 4), FSS is financial self-sustainability (models 4 to 8) and *DIV* is an indicator for revenue diversification. *MFI size* is the natural logarithm of total assets, *MFI experience* is number of years the institution has operated as an MFI, *Portfolio at Risk* is proportion of loan portfolio in arrears over 30 days, *Equity/Assets* is the ratio of equity to total assets, *Loan/Assets* is the ratio of loans to total assets, and *Urban market =1 if MFI emphasizes urban areas as* main market, 0 = otherwise. *Group lending* = 1 if MFI adopts solidarity group lending method, 0= otherwise, and *individual lending* = 1 if individual loans are offered, 0= otherwise. *GDP per person* is the country's Gross Domestic Product per person (in log) and *GDP growth* is the annual growth rate of Gross Domestic Product. *Inflation* is the annual consumer price index and *Regulation* is a dummy variable, which takes the value of 1 if the institution is regulated by banking authorities and 0 otherwise. Standard errors are in parentheses.
*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

Concerning the control variables, the coefficient of MFI size is positive and significant in all models, confirming scale economies in microfinance (Hartarska et al., 2013). We also observe that MFI experience reduces operational self-sustainability. This is in contrast to learning curve theory. Probably, younger MFIs leapfrog older ones in terms of current efficiency practices, which older MFIs may have to learn by trial and error means (Hermes et al., 2011). As expected, portfolio at risk has negative impact on sustainability and it is significant in all models. Increase in non-performing loans requires more efforts in monitoring, leading to increased operational costs associated with monitoring (Berger & DeYoung, 1997).

Furthermore, equity and loan portfolio as proportions of total assets have significant positive effects on sustainability. As expected, group lending improves operational sustainability. However, it reduces financial sustainability. It is also observed that, serving urban clients increases MFIs' sustainability, perhaps, costs of doing business with them are lower compared to rural clients. As expected, both GDP indicators are significant, suggesting that a healthy economy increases the sustainability of MFIs. However, increase in inflation reduces MFIs' sustainability. Finally, regulation is found to have a negative impact on sustainability. This finding concurs with the argument that costs of regulations may outweigh its benefits (Hardy et al., 2003).

Table 5 reports the FE regression results on the effects of revenue diversification on financial performance in terms of profitability (ROA and ROE). This time, DIV is significant in four models with control variables included. This suggests that MFIs' profitability could be improved if they have many other sources of revenue aside interest revenue. With respect to the control variables, the findings are not significantly different from those in Table 4.

For robustness checks, we replace DIV with the ratio of non-interest revenue to total revenue (Share-non) as the independent variable and repeat all the regressions discussed above. The results are presented in Tables 6 and 7. *Share-non* is highly significant with the same positive coefficients in majority of the models. Thus, the additional results provide strong evidence that revenue diversification increases the financial performance of microfinance institutions.

Finally, for easy comparison of the results with the different dependent variables used, Table A2 presents a summary. The table contains only models with all the controls included. Overall, revenue diversification (DIV/Share-non) has a significant positive

relationship with performance indicators supporting hypothesis 1. This suggests that MFIs may at least break-even when they have multiple revenue sources apart from interest revenue.

Table 5: Effects of revenue diversification on profitability of microfinance institutions

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Variables		Returns on assets				Returns on equity		
DIV	-0.0082	0.0147	0.0313*	0.0287*	0.0362	0.0810**	0.0761*	0.0708
	(0.0129)	(0.0145)	(0.0160)	(0.0163)	(0.0359)	(0.0407)	(0.0459)	(0.0464)
MFI size		0.0137***	0.0152***	0.0162***		0.0532***	0.0532***	0.0546***
		(0.0031)	(0.0038)	(0.0039)		(0.0088)	(0.0108)	(0.0109)
MFI experience		-0.0009	-0.0011	-0.0010		-0.0064**	-0.0067*	-0.0068*
		(0.0009)	(0.0012)	(0.0012)		(0.0026)	(0.0034)	(0.0035)
Portfolio at risk		-0.1827***	-0.2196***	-0.2222***		-0.7218***	-0.9139***	-0.9239***
		(0.0303)	(0.0352)	(0.0355)		(0.0825)	(0.0977)	(0.0987)
Equity/assets		0.0546***	0.0483***	0.0483***		0.0021	0.0231	0.0270
		(0.0093)	(0.0106)	(0.0108)		(0.0274)	(0.0306)	(0.0311)
Loan/assets		0.0867***	0.0762***	0.0757***		0.1764***	0.1585***	0.1594***
		(0.0135)	(0.0149)	(0.0151)		(0.0383)	(0.0423)	(0.0429)
Urban market		0.0092	0.0138*	0.0145*		0.0431**	0.0337	0.0339
		(0.0070)	(0.0083)	(0.0084)		(0.0198)	(0.0240)	(0.0241)
Group lending		0.0140	-0.0048	-0.0014		0.0646	0.0469	0.0475
		(0.0174)	(0.0204)	(0.0206)		(0.0493)	(0.0568)	(0.0573)
Individual lending		0.0027	-0.0172	-0.0129		0.0237	0.0028	0.0031
		(0.0159)	(0.0188)	(0.0191)		(0.0458)	(0.0522)	(0.0529)
GDP growth			0.0014***	0.0013**			0.0018	0.0018
			(0.0005)	(0.0005)			(0.0014)	(0.0014)
GDP per person			0.0029	0.0085			0.0474	0.0433
			(0.0249)	(0.0253)			(0.0691)	(0.0704)
Inflation			-0.0011	-0.0063			-0.1054	-0.1127
			(0.0339)	(0.0343)			(0.0951)	(0.0962)
Regulation				-0.0149*				0.0007
				(0.0088)				(0.0246)
Constant	0.0278***	-0.2569***	-0.2869	-0.3490*	0.0796***	-0.8107***	-1.1806**	-1.1698**

	(0.0019)	(0.0439)	(0.1977)	(0.2020)	(0.0053)	(0.1279)	(0.5503)	(0.5619)
Observations	2,956	2,163	1,674	1,648	2,841	2,088	1,634	1,609
Number of MFIs	591	515	421	417	549	484	410	405
R-squared	0.000	0.083	0.102	0.107	0.000	0.103	0.134	0.137

Notes: This table lists fixed effects regression results where *ROA* and ROE are regressed on *DIV* with(out) controls. *ROA* is returns on assets (models 9 to 12), ROE is returns on equity (models 13 to 16) and *DIV* is an indicator for revenue diversification. *MFI size* is the natural logarithm of total assets, *MFI experience* is number of years the institution has operated as an MFI, *Portfolio at Risk* is proportion of loan portfolio in arrears over 30 days, *Equity/Assets* is the ratio of equity to total assets, *Loan/Assets* is the ratio of loans to total assets, and *Urban market =1 if MFI emphasizes urban areas as* main market, 0 = otherwise. *Group lending* = 1 if MFI adopts solidarity group lending method, 0= otherwise, and *individual lending* = 1 if individual loans are offered, 0= otherwise. *GDP per person* is the country's Gross Domestic Product per person (in log) and *GDP growth* is the annual growth rate of Gross Domestic Product. *Inflation* is the annual consumer price index and *Regulation* is a dummy variable, which takes the value of 1 if the institution is regulated by banking authorities and 0 otherwise. Standard errors are in parentheses.

*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

Table 6: Effects of revenue diversification on sustainability of microfinance institutions

	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Variables	Operational self-sustainability				Financial self-sustainability			
Share-non	0.1472*	0.0757	0.1653*	0.1783*	0.1069	-0.0395	0.0301	0.0385
	(0.0822)	(0.0923)	(0.0979)	(0.0978)	(0.0828)	(0.0838)	(0.0894)	(0.0891)
MFI size		0.1316***	0.1026***	0.1084***		0.1405***	0.1332***	0.1392***
		(0.0162)	(0.0201)	(0.0202)		(0.0157)	(0.0188)	(0.0188)
MFI experience		-0.0135**	-0.0165**	-0.0150**		-0.0046	-0.0086	-0.0067
		(0.0053)	(0.0066)	(0.0066)		(0.0049)	(0.0060)	(0.0060)
Portfolio at risk		-0.9563***	-0.9650***	-0.8883***		-0.7324***	-0.9403***	-0.8347***
		(0.1736)	(0.1873)	(0.1908)		(0.1569)	(0.1692)	(0.1714)
Equity/assets		0.1710***	0.2230***	0.2196***		0.0830*	0.1114**	0.1100**
		(0.0500)	(0.0565)	(0.0564)		(0.0484)	(0.0535)	(0.0532)
Loan/assets		0.3064***	0.3015***	0.2803***		0.2565***	0.1981***	0.1812***
		(0.0746)	(0.0755)	(0.0758)		(0.0640)	(0.0648)	(0.0647)
Urban market		0.1257***	0.0877	0.0794		0.2613***	0.2284***	0.2192***
		(0.0471)	(0.0533)	(0.0533)		(0.0410)	(0.0478)	(0.0477)
Group lending		0.1987*	0.1645	0.1507		-0.1812*	-0.2575**	-0.2696**
		(0.1105)	(0.1173)	(0.1172)		(0.1049)	(0.1087)	(0.1081)
Individual lending		-0.0330	-0.0971	-0.0797		-0.0841	-0.1400*	-0.1170
		(0.0732)	(0.0820)	(0.0820)		(0.0729)	(0.0766)	(0.0766)
GDP growth			0.0043*	0.0039			0.0059**	0.0056**
			(0.0026)	(0.0026)			(0.0024)	(0.0024)
GDP per person			0.3497***	0.3776***			0.1475	0.1809
			(0.1240)	(0.1242)			(0.1139)	(0.1138)
Inflation			-0.1844	-0.1713			-0.6963***	-0.6975***
			(0.1749)	(0.1747)			(0.1653)	(0.1645)
Regulation				-0.1077**				-0.1204***
				(0.0425)				(0.0391)
Constant	1.0924***	-1.0596***	-3.5422***	-3.8428***	0.9436***	-1.2970***	-2.2795**	-2.6370***

	(0.0088)	(0.2293)	(0.9743)	(0.9791)	(0.0089)	(0.2239)	(0.8960)	(0.8988)
Observations	1,513	1,108	905	900	1,515	1,119	932	927
Number of MFIs	385	343	273	271	383	346	284	282
R-squared	0.003	0.181	0.202	0.211	0.001	0.258	0.280	0.291

Notes: This table lists fixed effects regression results where *OSS* and FSS are regressed on *Share-non* with(out) controls. *OSS* is operational self-sustainability (models 17 to 20), FSS is financial self-sustainability (models 21 to 24) and *Share-non* is a ratio of non-interest revenue to total revenue. *MFI size* is the natural logarithm of total assets, *MFI experience* is number of years the institution has operated as an MFI, *Portfolio at Risk* is proportion of loan portfolio in arrears over 30 days, *Equity/Assets* is the ratio of equity to total assets, *Loan/Assets* is the ratio of loans to total assets, and *Urban market =1 if MFI emphasizes urban areas as* main market, 0 = otherwise. *Group lending* = 1 if the MFI adopts solidarity group lending method, 0= otherwise, and *individual lending* = 1 if individual loans are offered, 0= otherwise. *GDP per person* is the country's Gross Domestic Product per person (in log) and *GDP growth* is the annual growth rate of Gross Domestic Product. *Inflation* is the annual consumer price index and *Regulation* is a dummy variable, which takes the value of 1 if the institution is regulated by banking authorities and 0 otherwise. Standard errors are in parentheses.

*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

Table 7: Effects of revenue diversification on profitability of microfinance institutions

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Variables		Returns on assets				Returns on equity		
Share-non	-0.0061	0.0276	0.0452**	0.0424**	0.0240	0.1125**	0.1244**	0.1195**
	(0.0171)	(0.0190)	(0.0209)	(0.0212)	(0.0473)	(0.0537)	(0.0602)	(0.0607)
MFI size		0.0148***	0.0155***	0.0165***		0.0527***	0.0551***	0.0566***
		(0.0031)	(0.0038)	(0.0039)		(0.0088)	(0.0109)	(0.0110)
MFI experience		-0.0013	-0.0013	-0.0013		-0.0066**	-0.0074**	-0.0074**
		(0.0009)	(0.0012)	(0.0012)		(0.0026)	(0.0034)	(0.0035)
Portfolio at risk		-0.1677***	-0.2078***	-0.2104***		-0.6912***	-0.9014***	-0.9118***
		(0.0302)	(0.0348)	(0.0351)		(0.0837)	(0.0975)	(0.0985)
Equity/assets		0.0540***	0.0444***	0.0445***		-0.0020	0.0167	0.0207
		(0.0092)	(0.0104)	(0.0106)		(0.0274)	(0.0305)	(0.0309)
Loan/assets		0.0999***	0.0862***	0.0861***		0.1971***	0.1770***	0.1787***
		(0.0136)	(0.0150)	(0.0152)		(0.0390)	(0.0430)	(0.0436)
Urban market		0.0116*	0.0172**	0.0179**		0.0482**	0.0403*	0.0405*
		(0.0069)	(0.0082)	(0.0083)		(0.0197)	(0.0239)	(0.0240)
Group lending		0.0135	-0.0061	-0.0026		0.0610	0.0441	0.0447
		(0.0172)	(0.0201)	(0.0203)		(0.0492)	(0.0565)	(0.0570)
Individual lending		0.0020	-0.0181	-0.0139		0.0210	-0.0009	-0.0007
		(0.0158)	(0.0185)	(0.0188)		(0.0458)	(0.0519)	(0.0526)
GDP growth			0.0014***	0.0012**			0.0017	0.0016
			(0.0005)	(0.0005)			(0.0014)	(0.0014)
GDP per person			0.0018	0.0071			0.0413	0.0368
			(0.0245)	(0.0250)			(0.0688)	(0.0701)
Inflation			-0.0201	-0.0254			-0.1329	-0.1409
			(0.0337)	(0.0341)			(0.0954)	(0.0965)
Regulation				-0.0146*				0.0005
				(0.0087)				(0.0245)
Constant	0.0269***	-0.2814***	-0.2845	-0.3441*	0.0821***	-0.8154***	-1.1606**	-1.1480**

	(0.0017)	(0.0437)	(0.1946)	(0.1987)	(0.0046)	(0.1282)	(0.5470)	(0.5584)
Observations	2,921	2,141	1,664	1,638	2,808	2,066	1,624	1,599
Number of MFIs	590	513	420	416	548	482	409	404
R-squared	0.000	0.089	0.104	0.110	0.000	0.101	0.137	0.140

Notes: This table lists fixed effects regression results where *ROA* and ROE are regressed on *Share-non* with(out) controls. *ROA* is returns on assets (models 25 to 28), ROE is returns on equity (models 29 to 32) and *Share-non* is a ratio of non-interest revenue to total revenue. *MFI size* is the natural logarithm of total assets, *MFI experience* is number of years the institution has operated as an MFI, *Portfolio at Risk* is proportion of loan portfolio in arrears over 30 days, *Equity/Assets* is the ratio of equity to total assets, *Loan/Assets* is the ratio of loans to total assets, and *Urban market =1 if MFI emphasizes urban areas as* main market, 0 = otherwise. *Group lending* = 1 if MFI adopts solidarity group lending method, 0= otherwise, and *individual lending* = 1 if individual loans are offered, 0= otherwise. *GDP per person* is the country's Gross Domestic Product per person (in log) and *GDP growth* is the annual growth rate of Gross Domestic Product. *Inflation* is the annual consumer price index and *Regulation* is a dummy variable, which takes the value of 1 if the institution is regulated by banking authorities and 0 otherwise. Standard errors are in parentheses.

*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

4. Conclusion

The academic literature presents two conflicting theories about the extent to which financial institutions could expand their operations. Modern portfolio and banking theories suggest diversification premium while agency theory argues that it is value destroying for a firm to diversify. Thus, it is better to focus in order to reduce agency costs. However, since there is empirical evidence supporting each view, the question this study asks is, which view is appropriate for microfinance institutions?

Thus, this paper investigates the effects of revenue diversification on the financial performance of MFIs. Using fixed effects estimator, we find evidence that diversification premium exists for microfinance institutions. Precisely, diversification across revenue streams improves both sustainability and profitability of MFIs.

The findings imply that microfinance practitioners could expand and sustain their revenue generating activities in order to take advantage of diversification benefits. Once an institution is self-sustainable, it is in a better position to meet its core objective of financial inclusion since more resources could be amassed to effectively serve poor people.

A limitation for this paper is that, since the data is based on rating reports, there can be self-selection bias as MFIs that chose to be rated are those included in the sample. In order to access external funding, MFIs may choose to be rated and in the process, they might massage some information just be included in the rating assessment. Therefore, it would be interesting to replicate this study with international evidence from unrated MFIs.

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Appendix

Table A1: Distribution of number of microfinance institutions by country

#	Country	No. of MFIs	#	Country	No. of MFIs	#	Country	No. of MFIs
1	Albania	3	30	Mexico	31	59	Tajikistan	11
2	Argentina	2	31	Moldova	2	60	Croatia	1
3	Armenia	6	32	Morocco	8	61	Chad	3
4	Benin	8	33	Nicaragua	14	62	Rwanda	12
5	Bolivia	17	34	Pakistan	2	63	Zambia	3
6	Bosnia and Herzegovina	12	35	Paraguay	2	64	China	5
7	Brazil	14	36	Peru	40	65	Serbia	2
8	Bulgaria	3	37	Philippines	22	66	Ghana	5
9	Burkina Faso	9	38	Romania	7	67	Malawi	2
10	Cambodia	14	39	Russia	17	68	Gambia	1
11	Chile	2	40	Senegal	12	69	Kosovo	5
12	Colombia	14	41	South Africa	4	70	Congo	1
13	Dominican Republic	7	42	Sri Lanka	2	71	Burundi	6
14	Ecuador	20	43	Tanzania	8	72	Niger	8
15	Egypt	6	44	Togo	5	73	Dem. Rep. Congo	1
16	El Salvador	7	45	Trinidad and Tobago	1	74	Afghanistan	2
17	Ethiopia	10	46	Tunisia	1	75	Costa Rica	3
18	Georgia	8	47	Uganda	25	76	Lebanon	2
19	Guatemala	8	48	Montenegro	2	77	Turkey	1
20	Haiti	3	49	Cameroon	5	78	Palestine	3
21	Honduras	13	50	Guinea	3	79	Comoros	1
22	India	32	51	Timor	1	80	Italy	3
23	Indonesia	4	52	Bangladesh	2	81	Samoa	1
24	Jordan	3	53	Nepal	5	82	Sierra Leone	1
25	Kazakhstan	8	54	Vietnam	4	83	South Sudan	1
26	Kenya	18	55	Azerbaijan	9	84	United Kingdom	1
27	Kyrgyz Republic	9	56	Mongolia	4	85	Yemen	1
28	Madagascar	3	57	Nigeria	6	86	Angola	1
29	Mali	11	58	Mozambique	1	87	Macedonia	1
							Total	**607**

Table A2: Effects of revenue diversification on financial performance of microfinance institutions

Variable	(1) OSS	(2) FSS	(3) ROA	(4) ROE	(5) OSS	(6) FSS	(7) ROA	(8) ROE
Share-non	0.1783*	0.0385	0.0424**	0.1195**				
	(0.0978)	(0.0891)	(0.0212)	(0.0607)				
DIV					0.1116	0.0296	0.0287*	0.0708
					(0.0763)	(0.0684)	(0.0163)	(0.0464)
MFI size	0.1084***	0.1392***	0.0165***	0.0566***	0.1099***	0.1389***	0.0162***	0.0546***
	(0.0202)	(0.0188)	(0.0039)	(0.0110)	(0.0201)	(0.0188)	(0.0039)	(0.0109)
MFI experience	-0.0150**	-0.0067	-0.0013	-0.0074**	-0.0143**	-0.0072	-0.0010	-0.0068*
	(0.0066)	(0.0060)	(0.0012)	(0.0035)	(0.0066)	(0.0060)	(0.0012)	(0.0035)
Portfolio at risk	-0.888***	-0.8347***	-0.2104***	-0.9118***	-0.8534***	-0.8061***	-0.2222***	-0.9239***
	(0.1908)	(0.1714)	(0.0351)	(0.0985)	(0.1891)	(0.1705)	(0.0355)	(0.0987)
Equity/assets	0.2196***	0.1100**	0.0445***	0.0207	0.2229***	0.1072**	0.0483***	0.0270
	(0.0564)	(0.0532)	(0.0106)	(0.0309)	(0.0563)	(0.0532)	(0.0108)	(0.0311)
Loan/assets	0.2803***	0.1812***	0.0861***	0.1787***	0.2749***	0.2045***	0.0757***	0.1594***
	(0.0758)	(0.0647)	(0.0152)	(0.0436)	(0.0757)	(0.0634)	(0.0151)	(0.0429)
Urban market	0.0794	0.2192***	0.0179**	0.0405*	0.0740	0.2110***	0.0145*	0.0339
	(0.0533)	(0.0477)	(0.0083)	(0.0240)	(0.0531)	(0.0477)	(0.0084)	(0.0241)
Group lending	0.1507	-0.2696**	-0.0026	0.0447	0.1521	-0.2647**	-0.0014	0.0475
	(0.1172)	(0.1081)	(0.0203)	(0.0570)	(0.1171)	(0.1083)	(0.0206)	(0.0573)
Individual lending	-0.0797	-0.1170	-0.0139	-0.0007	-0.0766	-0.1146	-0.0129	0.0031
	(0.0820)	(0.0766)	(0.0188)	(0.0526)	(0.0819)	(0.0766)	(0.0191)	(0.0529)
GDP growth	0.0039	0.0056**	0.0012**	0.0016	0.0038	0.0051**	0.0013**	0.0018
	(0.0026)	(0.0024)	(0.0005)	(0.0014)	(0.0026)	(0.0024)	(0.0005)	(0.0014)
GDP per person	0.3776***	0.1809	0.0071	0.0368	0.3686***	0.1734	0.0085	0.0433
	(0.1242)	(0.1138)	(0.0250)	(0.0701)	(0.1240)	(0.1139)	(0.0253)	(0.0704)
Inflation	-0.1713	-0.6975***	-0.0254	-0.1409	-0.1678	-0.7559***	-0.0063	-0.1127
	(0.1747)	(0.1645)	(0.0341)	(0.0965)	(0.1745)	(0.1616)	(0.0343)	(0.0962)
Regulation	-0.1077**	-0.1204***	-0.0146*	0.0005	-0.1123***	-0.1197***	-0.0149*	0.0007

	(0.0425)	(0.0391)	(0.0087)	(0.0245)	(0.0424)	(0.0391)	(0.0088)	(0.0246)
Constant	-3.842***	-2.6370***	-0.3441*	-1.1480**	-3.7968***	-2.5759***	-0.3490*	-1.1698**
	(0.9791)	(0.8988)	(0.1987)	(0.5584)	(0.9780)	(0.8996)	(0.2020)	(0.5619)
Observations	900	927	1,638	1,599	903	931	1,648	1,609
Number of MFIs	271	282	416	404	270	282	417	405
R-squared	0.211	0.291	0.110	0.140	0.209	0.288	0.107	0.137
Breusch: p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman: p-value	0.0000	0.0000	0.3217	0.0045	0.0000	0.0000	0.4303	0.0059

Notes: This table lists the results of fixed effects regression. Standard errors are in parentheses.

*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

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Study 3:

Do Microfinance Institutions Benefit from Integrating Financial and Nonfinancial Services?

Do Microfinance Institutions Benefit from Integrating Financial and Nonfinancial Services?[5]

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Abstract

This paper examines the impact of microfinance 'plus' (i.e., coordinated combination of financial and nonfinancial services) on the performance of microfinance institutions (MFIs). Using a global data set of MFIs in 77 countries, we find that the provision of nonfinancial services does not harm nor improve MFIs' financial sustainability and efficiency. The results however suggest that the provision of social services is associated with improved loan quality and greater depth of outreach.

Keywords: Microfinance 'plus'; Business development services; Outreach; Financial sustainability

JEL codes: G21; O16; C23.

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1. Introduction

Microfinance aims at providing financial services to low income households and microenterprises who have been excluded from traditional banking. The achievement of this goal has been universally recognized (Balkenhol & Hudon, 2011; Biosca, Lenton, & Mosley, 2014). Beside this primary social mission of financial inclusion, Microfinance Institutions (MFIs) also seek to remain financially sustainable. According to Morduch (1999), this is the "win-win" solution of microfinance. Thus, MFIs are hybrid organizations pursuing both social and financial objectives. Like banks MFIs should be profitable or at least break-even, and like social organizations MFIs should reach out to unbanked clients and enhance their welfare.

In the late 1970s and early 1980s, the provision of financial services to microentrepreneurs was often done alongside nonfinancial services (social and business development services) (Goldmark, 2006). The social services focused on improving clients' welfare while the business development services were offered to teach the clients basic financial management principles. This was believed to enhance clients' business success and thereby improve MFI's loan quality. This belief was however not supported by early studies such as Kilby and D'Zmura (1985) and Boomgard (1989).

While some MFIs continue to deliver nonfinancial services in recent times, many others have phased out the practice since the late 1990s (Goldmark, 2006). The focus on only financial services (minimalist model) could among other things be attributed to low impact of the training programs and pressure to commercialize microfinance. Often the training programs are counter-productive because they are either of low quality or do not meet the specific needs of the poor (Goldmark, 2006; Yunus, 2007).

Moreover, proponents of the minimalist approach argue that access to credit alone is enough for the poor to work themselves out of poverty. For instance, Dr Muhammad Yunus, a renowned pioneer of microfinance, states that "rather than waste our time teaching them new skills, we try to make maximum use of their existing skills. Giving the poor access to credit allows them to immediately put into practice the skills they already know" (Yunus, 2007, p. 225). Another argument for the minimalist approach is that, including ''plus'' services will have a negative influence on MFIs' financial sustainability. This argument is related to the claimed trade-off between social mission and financial sustainability (Cull, Demirgüç-Kunt, & Morduch, 2007, 2011; Hermes, Lensink, & Meesters, 2011). This can be described as a "win-loss" situation for the clients and MFIs respectively.

However, the minimalist approach has been reassessed (Lanao-Flores & Serres, 2009) with an increasing conclusion that the "microcredit, by itself, is usually not enough" (Reed, 2011, p. 1). To this end, some MFIs today still adopt the credit-plus model (what we call microfinance 'plus') by bundling financial and nonfinancial services to clients. A typical proponent of this model is Freedom from Hunger, a U.S.-based village banking organization. Proponents argue that, the credit-plus model maximizes MFIs' social impact (Dunford, 2001).

About 27 percent of MFIs in our sample adopt a 'plus' model while the remaining 73 percent follow the minimalist approach. The fact that some MFIs are specialized while others are 'plus' providers offers an interesting research setting. Thus, what we set out to study in this paper is to investigate whether the microfinance 'plus' model is more beneficial than the minimalist approach in terms of the achievement of MFIs'

social and financial objectives. This has not been addressed in the academic literature to the best of our knowledge. Empirical literature on the impact of microfinance 'plus' in general is very limited (Biosca et al., 2014). In addition, we adopt several estimation methods to address potential endogeneity.

The relevance of this study is demonstrated by recent concerns that the client's impact of accessing stand-alone credit has been overstated (Angelucci, Karlan, & Zinman, 2015; Banerjee, Duflo, Glennerster, & Kinnan, 2015). These studies imply that providing only microcredit as a solution to poverty is probably not adequate. According to Armendáriz and Morduch (2010), poor households benefit from a combination of services, rather than the simple provision of credit. Similarly, Khandker (2005) argues that because poverty is multidimensional, poor people need access to a coordinated combination of both financial and nonfinancial services (e.g., business trainings) to overcome poverty. Such developmental services are crucial for making credit more productive and impactful for the clients.

The arguments for the importance of the microfinance 'plus' (maximalist) approach are further supported by several studies documenting improved clients' impact when accessing credit in combination with nonfinancial services or ''plus'' services (Copestake, Bhalotra, & Johnson, 2001; Dunford, 2001; Halder, 2003; Karlan & Valdivia, 2011; McKernan, 2002; Noponen & Kantor, 2004; Smith, 2002). A main problem with these studies, in addition to being case studies with relatively little external validity, is that they focus on the impact of microfinance 'plus' on clients, without considering the outcomes for the MFIs. In contrast, this paper uses a global sample to investigate the potential influence of microfinance 'plus' on the MFIs' performance.

Since controversies persist between the minimalist and maximalist approaches (Bhatt & Tang, 2001; Morduch, 2000), it is the aim of this paper to provide policymakers and practitioners with informed information as to whether the provision of ''plus'' services influences the financial and social performance of MFIs. To achieve this aim, the paper focuses on two main questions: (1) do MFIs that combine financial and nonfinancial services achieve better financial performance, in terms of financial sustainability, efficiency and portfolio quality, than MFIs that deliver only financial services? and (2) do microfinance 'plus' providers attain better social performance, in terms of outreach, than their specialist peers?

Using a unique sample of MFIs in 77 countries we find that there is no evidence of microfinance 'plus' influence on financial sustainability and efficiency. The results however indicate that MFIs that provide social services have higher repayment rates and greater depth of outreach than those that do not. Thus, bundling financial services with nonfinancial further enhance the outreach mission of MFIs (Dunford, 2001).

The paper proceeds as follows. In Section 2, we discuss the concept of microfinance 'plus' and then provide a conceptual framework on the impact of such services on performance. This precedes the hypothesis development. Section 3 presents the data and the specific variables used in the estimation. Section 4 outlines the estimation procedure taking into account endogeneity concerns. Section 5 presents and discusses the empirical results while Section 6 concludes the paper with some remarks for practitioners and policymakers.

2. Conceptual Framework: Influence of Microfinance 'Plus' on MFI Performance

2.1 The Concept of Microfinance 'plus'

Microfinance 'plus' services are any activities aside financial services (Goldmark, 2006) targeted at improving both the welfare of poor people and their businesses. An overall understanding of the concept is relatively straightforward, but a more detailed explanation is also possible. For example, an MFI that provides savings, insurance, or money transfers together with loans is not involved in microfinance 'plus', because all these services are financial in nature. An MFI that provides informational sessions to potential clients or trains existing clients in the use of credit or the importance of repayment is not practicing microfinance 'plus', nor is an MFI that partners with another organization that provides clients with 'plus' services. Rather, a 'plus' service refers specifically to a nonfinancial service provided by the MFI itself.

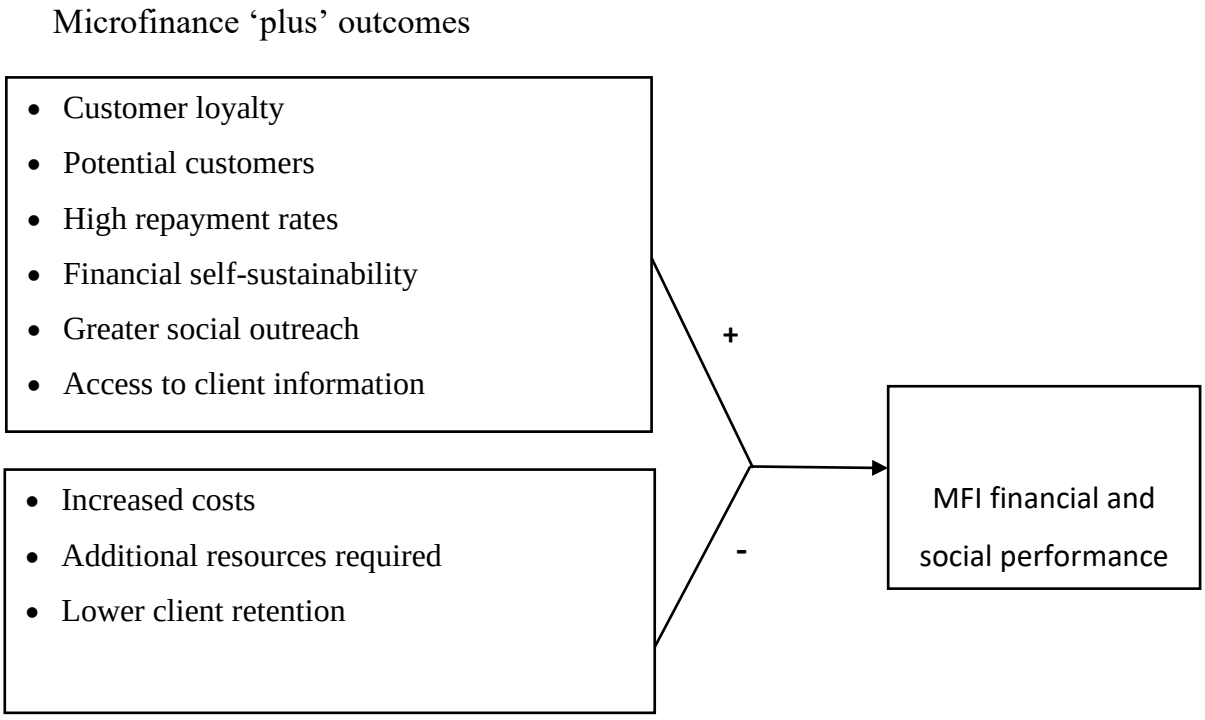
Various MFIs offer a wide variety of 'plus' services, ranging from access to markets and business development services (BDS) to health provision and literacy training (Goldmark, 2006; Maes & Foose, 2006). In most cases, these 'plus' services are either BDS or social services (Goldmark, 2006). The former aims to boost competitiveness by improving productivity, product design, service delivery or market access (Sievers & Vandenberg, 2007). These services include (but not limited to) management or vocational skills trainings, technical and marketing assistance (Goldmark, 2006; Sievers & Vandenberg, 2007). Social services (e.g. health, nutrition, education, etc.) on the other hand are intended to raise the general welfare of clients.

2.2 Conceptual Framework for the Effects of Microfinance 'plus'

Empirical studies on the impact of microfinance 'plus' programs on microenterprises are limited (Biosca et al., 2014). One of the earliest studies that evaluated the influence of 'plus' services in microfinance is McKernan (2002) who finds positive effect of such services on clients' profitability. Other impact studies include Smith (2002) Bjorvatn and Tungodden (2010), Karlan and Valdivia (2011), McKenzie and Woodruff (2013), among others. The findings of these and other studies range from no significant impact of microfinance 'plus' to mixed effects. However, what seem not to be taken into account is that nonfinancial services have the potential to influence not only the outcome for the clients but may also influence the performance of the MFI (Sievers & Vandenberg, 2007).

Thus, this study examines the influence of microfinance 'plus' on the institution itself and not on the clients. Although no clear-cut theory exists on the link between microfinance 'plus' and performance, we can use different theories from extant literature to derive a framework that demonstrates potential outcomes of microfinance 'plus' (Figure 1). Specifically, we argue that microfinance 'plus' services may have both positive and negative outcomes on the performance of MFIs. By providing 'plus' services, an MFI could benefit from client loyalty, potential clients, high repayment rates, self-sustainability, better social outreach, and greater access to client information (see top of Figure 1). On the other hand, the microfinance 'plus' model comes with some challenges for the provider. Among other things, the MFI may suffer from increased costs, resource constraints and lower client retention. (see bottom of Figure 1).

Figure 1: Effects of microfinance 'plus' on microfinance institutions' performance.



Client loyalty. A key benefit of adding 'plus' services to microfinance is the stimulation of client loyalty (Sievers & Vandenberg, 2007). If the 'plus' services improve client satisfaction, they should help increase retention rates. Such an increase in retention rate was confirmed by Karlan and Valdivia (2011) in their randomized control trial study from Peru. Another example from Financiera Solucion, also shows that the institution benefits from including management training because it can better retain clients (Sievers & Vandenberg, 2007) which is, of course, beneficial for the MFI (Reichheld, 1996).

Potential clients. MFIs providing nonfinancial services have the opportunity to earn a comparative advantage in terms of attracting new clients (Khandker, 2005; Paul Mosley & Hulme, 1998) especially in the increasing competition in microfinance markets (McIntosh & Wydick, 2005). Attracting more clients improves the financial sustainability of the MFI because of scale economies (Hartarska, Shen, & Mersland, 2013). And, obviously, having more clients could be equated with greater breadth of microfinance outreach mission.

High repayment rates. Microfinance 'plus' can help reduce the risk of default. Relevant training programs could for example increase the clients' business success and trainings on how to invest loans could help borrowers avoid using loans for consumption purpose rather than productive activities (Marconi & Mosley, 2006). For instance, Karlan and Valdivia (2011) find some evidence of improved repayment rates arising from microfinance 'plus'. Giné and Mansuri (2014) however do not find evidence of improved repayment rates following clients' participation in business training programs.

Self-sustainability. Since borrowers are normally limited by their lack of business knowledge, they often end up doing petty trade where even negative return on capital

is a possible outcome (De Mel, McKenzie, & Woodruff, 2008). 'Plus' services may motivate better investments with higher potential returns which could enhance loan repayment rates. Likewise, with improved human capital, the clients may be able to service bigger loans which enhances the financial performance of MFIs (Hartarska et al., 2013). Finally, 'plus' services might be offered for a fee, resulting in a positive profit margin for the MFI (Sievers & Vandenberg, 2007).

Greater social outreach. By providing 'plus' services an MFI maximizes its social mission with a wide range of social services such as health education (Dunford, 2001). Although MFIs aim to reach poor people, most of them access the 'upper poor' more than the 'very poor' (P. Mosley, 2001). In addition, pressure from governments and donors to ensure financial sustainability leads many MFIs to ignore social protection objectives and target less risky clients. Therefore, a major argument in support of the microfinance 'plus' approach is that it might enable MFIs to reach poorer and more vulnerable clients compared to the minimalist model (Halder, 2003; Maes & Foose, 2006). After all, other antipoverty modalities including primary health and education may be more effective than microfinance when wishing to enhance the welfare of the poorest sectors (P. Mosley, 2001). Of course, providing 'plus' services is not devoid of potential disadvantages for the MFI as outlined in the following.

Increased costs. The microfinance 'plus' approach may come with additional operational and administrative costs for the MFI. A study of four Freedom from Hunger affiliates reveals that the direct cost of including learning sessions, related to family, health, nutrition, business development and self-confidence, accounted for between 4.7 and 10 percent of each MFI's operational costs (Vor der Bruegge, Dickey, & Dunford, 1999). Also Dunford (2001) documents that combining financial and education services offers benefits for borrowers but increases the costs for the MFI.

Additional resources required. The provision of 'plus' services requires additional resources (e.g., time, money, staff, etc.) from the institution. It increases administrative burdens and may distract managers and other staff from credit administration, which could decrease repayment rates (Berger, 1989). Since many MFIs are already struggling to be financially self-sustainable, adopting the maximalist model may make them worse-off. Probably, the difficulty in being self-sustainable makes some MFIs unwilling to incorporate nonfinancial services into their business models.

Lower client retention. Just as the provision of specific and relevant 'plus' services could lead to client loyalty, poor quality or irrelevance of such services could also lead to client dissatisfaction. Some evidence shows that microfinance borrowers do not consider training useful and do not retain or apply their acquired knowledge, such that time spent in training appears to be an opportunity cost for credit (Goldmark, 2006). In this regards, dissatisfied clients are more likely to stop doing business with 'plus' providers (Sievers & Vandenberg, 2007). On the other hand, the positive outcomes of business training on clients' business success may also result in reduced client retention because successful microenterprises may progress to the formal banking sector (Karlan & Valdivia, 2011).

Based on the conceptual framework above, we formulate our hypotheses. Given that providers of 'plus' services benefit from client loyalty, possibility to attract new clients, and income realized from demand-driven 'plus' services, our first hypothesis is

that MFIs providing 'plus' services are likely to perform financially better than specialized MFIs.

Second, there is some evidence that 'plus' services, especially BDS, may improve the creditworthiness of borrowers resulting in higher repayment rates (e.g., Karlan and Valdivia 2011). Therefore, we hypothesize that repayment rates in MFIs providing 'plus' services are higher than those in specialized MFIs. Since the positive creditworthiness effect probably holds only for BDS providers, and not for SS 'plus' providers, we hypothesize that BDS 'plus' providers are more effective in improving financial performance than SS 'plus' providers.

Third, many studies (e.g., Vor der Bruegge et al. 1999, Dunford 2001) suggest that 'plus' services come with additional costs for the institutions. Therefore, we hypothesize that 'plus' providers will experience higher costs ratios than specialists.

Finally, we hypothesize that 'plus' providers perform better socially than MFIs providing only financial services. Moreover, to distinguish which 'plus' services lead to higher social performance, we hypothesize that the social performance of SS providers is better than for BDS providers. However, we must highlight that there are potential trade-offs between social and financial performance of MFIs (Cull et al., 2011) which could become evident in our results.

3. Data and Variables Definitions

3.1 Data

The dataset is hand-collected from rating reports from the five leading rating agencies in the microfinance industry; i.e. Microrate, Microfinanza, Planet Rating, Crisil and M-CRIL. The rating reports are narratives consisting of contextual and MFI specific information including accounting details, organizational features and benchmarks. The reports are not fully standardized and therefore differ in their emphasis and in the amount of information available. The result is that not all reports have information on all variables. When necessary, all numbers in the dataset have been annualized and dollarized using the official exchange rates from the given time. Overall, we use observations of 478 rated MFIs from 77 countries[6] spanning the period 1998–2012.

No dataset is perfectly representative of the microfinance field. Ours contains relatively fewer mega-sized MFIs and does not cover all small savings and credit cooperatives. The former are rated by agencies such as Moody's and Standard & Poor's; the latter are not rated by these traditional agencies. However, our use of rating reports should be relevant for studying the effects of microfinance 'plus', because MFIs that are rated have a common interest in accessing funding and increasing their sustainability. The data set includes specialists and providers of 'plus' services, so it enables meaningful comparisons. For a further description of the dataset please see Beisland and Mersland (2012).

[6] The number of MFIs per country is avaiable from the authors upon request.

3.2 Variables definitions

Dependent variables

We focus on financial sustainability, efficiency and portfolio quality as measures of financial performance and outreach as a measure of the social performance of MFIs.

Financial sustainability measures. We consider the operational self-sufficiency ratio (OSS) as a main indicator of financial performance. This ratio demonstrates the ability of MFIs to be fully sustainable in the long run, in the sense that they can cover all their operating costs and maintain the value of their capital. As a robustness check, we include financial self-sufficiency (FSS) and return on assets (ROA). Operational self-sufficiency, financial self-sufficiency and return on assets have been used widely to measure the financial sustainability of MFIs (Cull et al., 2007, 2011; Mersland & Strøm, 2009).

Efficiency measures. We use four indicators for efficiency. The *operating expense ratio* which measures the MFI's operating expenses compared with the annual average loan portfolio. A decrease in this ratio implies an increase in efficiency. Since MFIs offering small loans will look worse than MFIs offering large loans we also include the *cost per client* variable (Rosenberg, 2009). Next, we employ the ratio of *credit clients per loan officer* as well as *credit clients per staff member* to evaluate how 'plus' activities influence the employment of personnel resources in the MFI.

Loan portfolio quality measures. We use two indicators of portfolio quality. First, the *portfolio at risk* beyond 30 days (PAR30) reveals the potential for future losses based on the current performance of the portfolio. Second, the *write-off ratio* measures the actual amount of loans that have been written off as unrecoverable during a given period of time, in relation to the outstanding loan portfolio. The variables have been used in previous studies (D'Espallier, Guerin, & Mersland, 2011).

Social performance measures. To evaluate social performance, we use three indicators of outreach: number of clients, average loan size and percentage of women clients. First, the *number of clients* serves as a proxy for the 'breadth of outreach' (Rosenberg, 2009; Schreiner, 2002). For the 'depth of outreach', i.e. economic poverty level of the clients, we apply *average loan size* and *share of female borrowers.* We recognize that average loan size and share of female borrowers are rough proxies for 'depth of outreach' (for a discussion of their shortcomings see Armendariz and Szafarz, 2011), still the most commonly used variables to measure clients poverty level (Ahlin, Lin, & Maio, 2011; Cull et al., 2007; Cull, Demirgüç-Kunt, & Morduch, 2009; Hermes et al., 2011; Mersland & Strøm, 2009; Schreiner, 2002).

Independent variables

We distinguish three types of MFI services: (1) specialized financial services only, (2) financial services and BDS and (3) financial services and social services (SS). We include *BDS* and *SS* dummies, as well as a constant in our estimates. BDS equals 1 if the MFI provides business development services and 0 otherwise. Similarly, SS equals 1 if the MFI provides social services and 0 otherwise.

Control variables

To control for macroeconomic institutional differences we include annual percentage growth rate of gross domestic product (GDP) (based on constant 2005 U.S. dollars)

(*GDP growth)* and *inflation* (Claessens, Demirguc-Kunt, & Huizinga, 2001; Lensink & Hermes, 2004). To further control for country influence we include the countries' scores on the human development index (HDI). HDI is a composite index that combines three dimensions of human development: education, economy and life expectancy. Finally, we include regional as well time dummies in all estimations.

To control for MFI-specific characteristics, we include *number of credit officers* since the number of field officers may be driving the results and not the 'plus' service itself. We further control for the size by including the total assets of the MFI. The lending methodology, either group based or individual has the potential to influence efficiency levels, repayment as well as outreach, thus we include *group lending* as a control variable regarding the repayment of credits (Hulme & Mosley, 1996; Morduch, 1999). It enhances the repayment rates due to peer pressure from other group members (Ledgerwood, 1999). Furthermore, it is cost-efficient to offer group loans due to scale economies. Group loans are less risky than are those offered to individuals because of better screening, monitoring, auditing and enforcement (Ghatak & Guinnane, 1999). Thus, we expect MFIs offering group loans to have improved portfolio quality and high efficiency than those offering individual loans. Also, in line with Mersland, Randøy, and Strøm (2011) and Mersland, D'espallier, and Supphellen (2013), we control for *MFI experience* (age), whether the MFI is a member of an *international network*, and whether it was initiated by a *religious* organization. Finally, we control for the organizational form of the MFI (NGO, Bank, Cooperative, and Non-Bank financial institution, and state banks). Table 1 presents a summary of all the variables.

Table 1: Variable descriptions

Variables	Description
Operational self-sufficiency	Operating revenue / (Financial expense + loan loss provision expense + operating expense)
Financial self-sufficiency	Adjusted operating revenue / adjusted (financial expense + loan loss provision expense + operating expense)
Return on Assets	Net operating income / average total assets
Portfolio at risk (PAR30)	Portfolio at Risk > 30 days/ loan portfolio
Write-off ratio	Write-off of loans / loan portfolio
Clients	Number of active clients
Average loan size	Amount issued in the period / Number of issued loans
Women	Percentage of female clients
Operating expense ratio	Operating expenses/ loan portfolio
Cost per client ratio	Operating expenses/ number of active clients
Staff productivity	Number of active borrowers/ Number of staff
Loan officer productivity	Number of active borrowers / Number of loan officers
BDS	1 if business development services, 0 otherwise
SS	1 if MFI provides social services, 0 otherwise
Group lending	1 if MFI uses group lending methodology, 0 otherwise
MFI experience (age)	Number of years the MFI has been in operation
Credit officers	Number of credit officers at the end of year
Assets	Total assets of the MFI
Bank	1 if a MFI is registered as a bank, 0 otherwise
Nonbank	1 if a MFI is non-financial institution, 0 otherwise
NGO	1 if non-governmental organization, 0 otherwise
Coop	1 if a MFI is registered as a cooperative, 0 otherwise
International network	1 if the MFI is member of an international network, 0 otherwise
Religious organization	1 if the MFI was initiated by an organization with a religious agenda, 0 otherwise
GDP growth	Annual GDP growth (constant 2005)
HDI	Human Development Index
Inflation	Annual inflation rate

4. Estimation Approach

We employ panel data modelling to examine the potential effects of microfinance 'plus' on the financial and social performance of MFIs. Thus, we specify our panel model as follows:

$$y_{ijt} = \beta_0 + \beta_1 BDS_{ijt} + \beta_2 SS_{ijt} + \gamma M_{jt} + \tau MF_{ijt} + c_i + \varepsilon_{ijt} \qquad (1)$$

where the dependent variable y_{ijt} is a measure of financial and social performance of the i^{th} MFI located in country j^{th} at time t, and β_0 is a constant term. BDS_{ijt} equals 1 if the i^{th} MFI is a 'plus' provider that integrates BDS and 0 if it is a specialist or a 'plus' provider that integrates social services in country j at time t; SS_{ijt} equals 1 if the i^{th} MFI is a 'plus' provider of social services and 0 if it is a specialist or 'plus' provider that integrates BDS in country j at time t. Furthermore, M_{jt} is a vector of control variables describing the macroeconomic environment in country j at time t; MF_{ijt} is a vector of control variables describing the features of the i^{th} MFI in county jt^h at time t; c_i is the MFI's individual unobserved effects; and ε_{ijt} is mean-zero errors.

First, we use the random effects model (RE) because our main variables of interest (i.e., BDS and SS) are time invariant and a fixed effects model (FE) is impossible. However, the rejections of Hausman test null hypothesis in our results show that FE is consistent. Since FE is not appropriate time-invariant variables, our second estimator is the Hausman-Taylor's (HT). This estimator distinguishes between regressors that are uncorrelated with FEs and those that are potentially correlated with them. Hausman and Taylor (1981) suggest using an economics intuition to determine which variables should be treated as potentially correlated with the FE. The model also distinguishes time-varying from time-invariant regressors. It is specified as follows.

$$y_{ijt} = \beta_0 + X_{1ijt}\beta_1 + X_{2ijt}\beta_2 + W_{1ij}\gamma_1 + W_{2ij}\gamma_2 + c_i + \varepsilon_{ijt} \qquad (2)$$

where the dependent variable y_{ijt} is a measure of performance of the i^{th} MFI located in country j at time t; β_0 is a constant term; **X** denotes time-varying regressors: Inflation, GDP growth, MFI size, MFI experience, Credit officers, HDI, and W denote time-invariant regressors; International network, Religious organization, BDS, SS, Group lending, Coop, bank, NGO, non-bank and c_i are MFI-specific unobserved effects; and ε_{ijt} is idiosyncratic errors. Regressors with subscripts 1 are uncorrelated with c_i, whereas those with subscripts 2 are specified as correlated with c_i. All regressors are assumed uncorrelated with ε_{ijt}.[7]

The MFI's choice to integrate financial and 'plus' services depends substantially on its specific characteristics. Therefore, we treat BDS and SS as endogenous. We similarly assume that group lending is endogenous and must be instrumented. The same holds for the number of credit officers. Group lending offers an excellent platform for the delivery of 'plus' services alongside microfinance (MkNelly, Watetip, Lassen, & Dunford, 1996). The decision to provide individual or group lending also depends on

[7]The Hausman and Taylor (1981) estimator assumes that the exogenous variables serve as their own instruments; X_{2ijt} is instrumented by its deviation from individual means; and $W_{2ij}$is instrumented by $\overline{X_{1ij}}$.

the presence of some MFI-specific characteristics. The remaining control variables are treated as exogenous.

The validity of instruments used in the Hausman-Taylor model is tested by Sargan-Hansen test of overidentifying restrictions. The null hypothesis of this test is that the instruments are valid. If the test results reject the null hypothesis (which is the case in this study), it suggests that there are endogeneity problems other than fixed effects. This leads us to the use of Blundell and Bond (1998) system GMM (generalised method of moments) estimator which uses lagged differences of the dependent variable as instruments for equations in levels, in addition to lagged levels of dependent variable for equations in the first differences (Baltagi, 2013).

5. Results and Discussion

5.1 Descriptive Statistics and Correlations

Table 2 presents descriptive statistics of all variables used in the estimations. On average, an MFI can cover operational costs from revenue 1.13 times, indicating that the MFI is self-sustainable. However, OSS does not depict the intrinsic self-sustainability of the MFI because of the presence of subsidies and that is what FSS corrects. The mean value for FSS is 0.95 which shows that on average, MFIs in our sample are not financially self-sustainable. Returns on assets has a mean value of 2.4 percent. In terms of outreach, the average MFI has about 15000 clients of which 66 percent are women and the average loan size 1.3 times GDP per capita. With respect to loan quality, on average, about 6 percent of the total loan portfolio is in arrears over 30 days and 1.4 percent is written off as loan loss. Concerning efficiency dimension, an MFI has on average, operational costs of 25 percent of gross loan portfolio, cost per client of USD 118.65, 132 borrowers per staff, and 272 borrowers per loan officer.

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Operational self-sufficiency	1.128241	0.3678306	0.075	2.96
Financial self-sufficiency	0.9484163	0.3047077	0.063	3.469
Return on assets	0.0240719	0.0858322	-0.373	0.373
Number of clients	15008.51	18951.42	24	98639
Average loan size	1.296353	2.826229	0.027	35.72
Percentage of women	0.6646034	0.2601223	0.000	1.000
Portfolio at risk	0.0601583	0.0689986	0.001	0.39
Write-off ratio	0.0135395	0.0196164	0.000	0.099
Write-off ratio (log)	-5.053952	1.616904	-6.907	0.948
Operating expense ratio	0.2458689	0.1269165	0.016	0.6
Cost per client	118.648	107.004	0.242	574.99
Borrowers per staff member	132.1854	111.304	1	1893
Borrowers per loan officer	272.4617	159.7607	3	989
Assets	11301397.26	24831411.8	19288	279350816
MFI age	9.782793	5.828356	0	29
Group lending	0.1923767	0.3942558	0	1
Credit officers	38.10859	39.05367	1	199
International network	0.3729858	0.483713	0	1
Religious organization	0.1685289	0.3744224	0	1
BDS	0.2524664	0.4345248	0	1
SS	0.2699552	0.4440358	0	1
Bank	0.0483496	0.2145538	0	1
Nonbank	0.2924221	0.454981	0	1
NGO	0.5099954	0.5000163	0	1
Coop	0.1338912	0.3406146	0	1
GDP growth	5.206064	3.175086	-14.149	17.33
Inflation	0.0611677	0.0487948	-0.185	0.287
HDI	0.6060426	0.1358599	0.058	0.806

Furthermore, about 25 and 26 percent of MFIs offer business development and social services respectively. The average MFI has about: USD 11.3 million of total assets, 10 years of industry experience and 38 credit officers. Approximately 37 percent of the MFIs are members of an international network, 17 percent of them (MFIs) were started by religious organisations and 19 percent offer group loans only. In terms of legal status, about 51 percent of the MFIs are NGOs, 29 percent are nonbank financial institutions, 13 percent are cooperatives and 5 percent are banks. Finally, the mean values for GDP growth, inflation and HDI are 5.2 percent, 6.1 percent and 0.606 respectively[8].

[8] Testing (unreported) for multicollinearity problems indicates that none of the correlation values are above cut-off point of 0.90 (Hair et al. 2010). The only correlation close to the cut-off point is that of BDS and SS (0.84) indicating that if MFIs offer 'plus' services they often offer both BDS and SS.

5.2 The Link between Microfinance 'plus' and MFI Performance: Random Effects

First, we present the results of the RE estimator. Table 3 presents estimates of the effects of microfinance 'plus' on financial sustainability. The statistics show that we pass the Hausman's test in models (1) and (2) as the p-values are greater than 0.05 but fail in model (3) because the p-value is less than 0.05. The Wald's chi-squared test is significant showing that our models are correctly specified, and our regressors explain up to 27 percent of the variance of the outcome variables (model 2) and as low as 17 percent (model 3). The results show that BDS and SS are statistically insignificant suggesting that they have no effect on the financial sustainability of MFIs.

As for the control variables we observe that HDI is negatively associated with the FSS while MFI size significantly enhances financial sustainability. As expected, inflation reduces financial self-sustainability of MFIs because it increases their cost of production. The results further indicate that MFIs with large number of loan officers tend to reduce financial sustainability in terms of OSS, FSS and ROA. Similarly, MFIs with religious orientation have lower financial sustainability compared to those without, while group lending is associated with increased ROA. Finally we observe that any ownership type is better than being state owned when it comes to financial sustainability. Finally, group lending is associated with increased returns on assets.

Table 3: The link between microfinance 'plus' and financial sustainability

Variables	(1) OSS	(2) FSS	(3) ROA
BDS	0.0089	-0.0214	-0.0067
	(0.0333)	(0.0270)	(0.0095)
SS	-0.0060	0.0030	0.0072
	(0.0292)	(0.0249)	(0.0097)
HDI	-0.2367	-0.2811**	-0.0170
	(0.1769)	(0.1408)	(0.0642)
GDP growth	0.0023	0.0057*	0.0013
	(0.0046)	(0.0035)	(0.0010)
MFI size	0.1342***	0.1075***	0.0248***
	(0.0207)	(0.0159)	(0.0038)
MFI experience	-0.0069	-0.0072	0.0005
	(0.0047)	(0.0044)	(0.0007)
Inflation	-0.1548	-0.7004***	0.0737
	(0.2662)	(0.2398)	(0.0677)
Credit officers	-0.0026***	-0.0017***	-0.0004***
	(0.0007)	(0.0005)	(0.0001)
International network	-0.0399	0.0109	0.0003
	(0.0471)	(0.0358)	(0.0086)
Religious organization	-0.0463	-0.0837*	-0.0193*
	(0.0534)	(0.0430)	(0.0100)
NGO	0.3541	0.3995***	0.0346
	(0.3560)	(0.1318)	(0.0457)

Non-bank	0.2093	0.3175**	0.0170
	(0.3557)	(0.1261)	(0.0459)
Bank	0.3720	0.3933***	0.0385
	(0.3645)	(0.1462)	(0.0473)
Coop	0.3281	0.4057***	0.0306
	(0.3565)	(0.1368)	(0.0466)
Group lending	0.0447	0.0333	0.0187***
	(0.0329)	(0.0264)	(0.0065)
Constant	-0.8750*	-0.7562***	-0.3634***
	(0.4797)	(0.2712)	(0.0853)
Time dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
Observations	628	654	1,104
Number of MFIs	196	211	317
Hausman test (p-value)	0.7758	0.4205	0.0016
R-squared (overall)	0.2071	0.2658	0.1688
Chi-squared	142.12***	306.36***	133.38***

Notes: This table lists Random effects results of the link between microfinance 'plus' and financial sustainability of MFIs. *OSS* is operational self-sustainability and measures the ability of MFI to cover its operational costs from revenue, *FSS* is financial self-sustainability and measures the ability of MFI to cover operational costs from revenue without subsidies and *ROA* is returns on assets. BDS=1 if MFI provides business development services, 0=otherwise, and SS=1 if MFI provides social services, 0=otherwise. *MFI size* is the natural logarithm of total assets, *MFI experience* is the number of years the MFI has been in operation, and *Credit officers* is the number of credit officers at the end of the year. *Group lending*=1 if MFI offers group loans, 0= otherwise, *International network*=1 if MFI is a member of international network, 0=otherwise, *Religious organisation*=1 if MFI was started by a religious organisation, 0=otherwise. *NGO* =1 if the MFI is registered as a nongovernmental organisation, 0 =otherwise, Non-bank =1 if the MFI is registered as a non-bank financial institution, 0 =otherwise, *Bank* =1 if the MFI is registered as a bank, 0 =otherwise, and *Coop* =1 if the MFI is registered as a cooperative, 0 =otherwise. *GDP growth* is the real annual Gross Domestic Product growth rate, *Inflation* is annual producer price index, and *HDI* is human development index. In parentheses are robust standard errors.

*, **, and *** denote statistical significance at the 10%, 5%, 1% respectively.

Table 4 also presents RE results on the link between microfinance 'plus' and efficiency. Like in Table 3, BDS and SS are not significant and thus, have no effect on MFIs' efficiency.[9]

[9] Because of space constraints, we do not comment on the control variables included in tables 4, 5 and 6.

Table 4: The link between microfinance 'plus' and MFI efficiency

Variables	(4) Operating expenses	(5) Cost per client	(6) Staff productivity	(7) Credit officer productivity
BDS	0.0046	-11.1686	-6.4027	-13.6241
	(0.0092)	(8.2730)	(4.6786)	(9.7459)
SS	-0.0006	7.3049	1.8171	1.3546
	(0.0102)	(7.2725)	(4.6595)	(10.1066)
HDI	-0.1051	100.1630	84.3848*	61.4425
	(0.0999)	(76.6951)	(44.5177)	(117.7688)
GDP growth	0.0010	-1.8255**	0.6072	0.8140
	(0.0011)	(0.7907)	(0.6034)	(1.3391)
MFI size	-0.0551***	12.6214*	16.3686***	39.5467***
	(0.0066)	(6.7782)	(3.6843)	(7.1674)
MFI experience	-0.0009	0.2095	0.7911	1.9210
	(0.0015)	(1.2514)	(0.8511)	(1.7786)
Inflation	-0.0367	-6.5753	-82.5389**	-165.1948*
	(0.0876)	(62.6171)	(41.7542)	(86.9073)
Credit officers	0.0006***	-0.3000**	-0.2736**	-1.2017***
	(0.0002)	(0.1443)	(0.1184)	(0.2305)
International network	0.0463***	-8.9624	21.2268**	58.0469***
	(0.0147)	(10.9173)	(9.9890)	(19.0053)
Religious organization	-0.0235	-6.6840	26.6914*	17.3264
	(0.0167)	(13.1452)	(15.0120)	(23.1394)
NGO	-0.0829**	4.1400	-31.1030	-28.3443
	(0.0382)	(37.1670)	(18.9918)	(37.8816)
Non-bank	-0.0907**	31.7750	-40.0253**	-39.4110
	(0.0373)	(36.5450)	(18.8842)	(35.8501)
Bank	-0.0599	-16.4869	-76.2367**	-19.1276
	(0.0449)	(47.5149)	(30.9760)	(57.5899)
Coop	-0.1948***	-29.9296	-76.8696***	-69.6188
	(0.0416)	(39.1691)	(22.6003)	(42.7219)
Group lending	-0.0137**	-2.0071	0.4042	8.5278
	(0.0067)	(6.0482)	(3.9206)	(8.6970)
Constant	1.2140***	-152.1842	-135.6015**	-334.4640**
	(0.1207)	(111.7720)	(63.4283)	(132.5162)
Time dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
Observations	994	960	1,123	1,106
Number of MFIs	295	278	315	313
Hausman test (p-value)	0.0001	0.0002	0.9036	1.0000
R-squared (overall)	0.3410	0.2724	0.1924	0.2093
Chi-squared	334.69***	266.08***	172.43***	154.27***

Notes: This table lists Random effects estimates of the link between microfinance 'plus' and MFI efficiency. *Operating expense* is total operating expenses as a percentage of average gross loan portfolio, *Cost per client* is total operating expenses as a percentage of number of active clients, *Staff productivity* is the number of active borrowers per staff, and *Credit officer productivity* is the number

of active borrowers per credit officer. Regressors are defined previously. In parentheses are the robust standard errors.
*, **, and *** denote statistical significance at the 10%, 5%, 1% respectively.

Next, we provide the RE estimates on the link between microfinance 'plus' and loan quality. Table 5 lists the results and it is clearly shown that BDS does not affect loan quality in terms of portfolio at risk and write-offs but SS has positive outcome on the former suggesting that providing social services enhances repayment rates. Our interpretation is that the provision of social services enhances clients' loyalty and that in turn improves their repayment of loans. Thus, clients find the SS services relevant. The finding that MFIs do not improve repayment rates over time is not necessarily surprising since more experienced MFIs can allow a larger share of their clients to be in arrears.

Table 5: The link between microfinance 'plus' and loan quality

	(8)	(9)
Variables	PAR30	Write-off
BDS	0.0038	0.1091
	(0.0054)	(0.2420)
SS	-0.0110**	-0.3611
	(0.0055)	(0.2361)
HDI	0.0330	-0.8982
	(0.0504)	(0.9150)
GDP growth	-0.0023***	-0.0244
	(0.0006)	(0.0206)
MFI size	-0.0055	0.0935
	(0.0033)	(0.0701)
MFI experience	0.0023***	0.0169
	(0.0007)	(0.0159)
Inflation	-0.0628	1.4634
	(0.0431)	(1.1286)
Credit officers	0.0001	-0.0008
	(0.0001)	(0.0021)
International network	-0.0234***	-0.1109
	(0.0073)	(0.1565)
Religious organization	0.0082	0.1442
	(0.0083)	(0.1959)
NGO	0.0177	0.5172
	(0.0332)	(0.5032)
Non-bank	0.0221	0.2957
	(0.0333)	(0.5000)
Bank	0.0054	0.0621
	(0.0357)	(0.5943)
Coop	0.0327	-0.0124

	(0.0347)	(0.5327)
Group lending	0.0023	0.2515*
	(0.0044)	(0.1404)
Constant	0.0939	-7.0021***
	(0.0698)	(1.2779)
Time dummies	Yes	Yes
Regional dummies	Yes	Yes
Observations	1,001	1,087
Number of MFIs	298	301
Hausman test (p-value)	chi2<0	0.4105
R-squared (overall)	0.1640	0.0913
Chi-squared	117.50***	228.54***

Notes: This table lists Random effects estimates of the link between microfinance 'plus' and loan portfolio quality of MFIs. *PaR30* is nonperforming loans over 30 days, and *Write-off* is natural logarithm of the proportion of loans portfolio that have been written off as loan loss. Regressors are defined previously. In parentheses are robust standard errors.

*, **, and *** denote statistical significance at the 10%, 5%, 1% respectively.

Table 6 presents the last set of RE estimates on the link between microfinance 'plus' and social performance. SS is significantly and positively related to women suggesting that the provision of social services maximizes MFIs' outreach efforts (Dunford, 2001). BDS on the other hand is insignificant and hence has no effect on social performance.

Table 6: The link between microfinance 'plus' and social performance

Variables	(10) Clients	(11) Average loan size	(12) Women
BDS	-602.9183	-0.0212	-0.0098
	(777.4759)	(0.1556)	(0.0443)
SS	597.1599	0.0755	0.0899**
	(699.2822)	(0.1505)	(0.0431)
HDI	3,861.4355	-1.6081	0.4286**
	(5,486.8614)	(1.4455)	(0.2067)
GDP growth	110.2542	-0.0238	0.0143**
	(83.0698)	(0.0348)	(0.0065)
MFI size	1,933.2793***	0.1736*	-0.0615***
	(516.9265)	(0.1006)	(0.0202)
MFI experience	142.4659	-0.0321	0.0038
	(115.0366)	(0.0349)	(0.0043)
Inflation	-5,247.5854	-2.1151	-0.5878*
	(6,821.1764)	(2.8034)	(0.3159)
Credit officers	222.4752***	-0.0022	0.0009**
	(21.2049)	(0.0038)	(0.0004)
International network	2,452.8597*	-0.3416	0.1434***
	(1,290.6792)	(0.4111)	(0.0401)
Religious organization	-1,606.7106	0.3312	-0.0466
	(1,166.1896)	(0.5857)	(0.0602)
NGO	-2,557.9972	0.7308**	-0.0822
	(2,521.8525)	(0.3527)	(0.0728)
Non-bank	-1,930.1692	1.6658**	-0.1872**
	(2,504.2784)	(0.6494)	(0.0806)
Bank	-2,524.7437	2.3336**	-0.2099**
	(3,992.8307)	(1.0651)	(0.1055)
Coop	3,843.7740	1.3902**	-0.2162*
	(3,551.6547)	(0.5984)	(0.1105)
Group lending	82.3783	-0.0524	0.0214
	(525.3579)	(0.2298)	(0.0268)
Constant	-32,712.4700***	-1.0653	1.2537***
	(8,845.9372)	(1.9017)	(0.3633)
Time dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
Observations	976	645	176
Number of MFIs	277	201	139
Hausman test (p-value)	0.2034	0.0000	0.3599
R-squared (overall)	0.6376	0.1521	0.4716
Chi-squared	827.32***	66.19***	229.78***

Notes: This table lists Random effects estimates of the link between microfinance 'plus' and social performance of MFIs. *Clients* is the number of active clients an MFI has, *Average loan size* is the amount of loan disbursed per borrower scaled by gross domestic product per capita, and *women* is a percentage of female clients. Regressors are defined previously. In parentheses are robust standard errors.
*, **, and *** denote statistical significance at the 10%, 5%, 1% respectively.

5.3 The Link between Microfinance 'plus' and MFI Performance: Fixed Effects present

The results of the Hausman's specification test presented in Tables 3-6 suggest that there are fixed effects as we did not pass the test in some of the models (e.g.,3, 4, 5). To account for fixed effects, we use the HT estimator which uses exogenous regressors as instruments. The results for the financial sustainability are presented in Table 7 while the results for the efficiency, repayment and outreach effects are available from authors upon request. We pass the Sargan-Hansen test with p-values greater 0.05 in all models (Table 7) suggesting that our instruments are valid. We however fail the test especially in three models for efficiency (unreported). Generally, the results in the HT models mirror those of the random effects models reported in tables 3-6 – the provision of 'plus' services does not have significant effect on the MFI's performance. However, the rejection of the null hypothesis of valid instruments suggests that the results may be biased; there are real endogeneity problems aside fixed effects. Next, we employ the system GMM to account for potential endogeneity issues.

Table 7: The link between microfinance 'plus' and financial sustainability

Variables	(13) OSS	(14) FSS	(15) ROA
BDS	-0.0114	-0.0302	-0.0099
	(0.0514)	(0.0339)	(0.0106)
SS	-0.0023	0.0017	0.0066
	(0.0492)	(0.0326)	(0.0104)
HDI	-0.0794	-0.0837	0.0598
	(0.2881)	(0.2324)	(0.0592)
GDP growth	0.0030	0.0064*	0.0014
	(0.0050)	(0.0034)	(0.0010)
MFI size	0.1507***	0.1551***	0.0350***
	(0.0260)	(0.0191)	(0.0048)
MFI experience	-0.0090	-0.0067	0.0003
	(0.0056)	(0.0056)	(0.0009)
Inflation	-0.1246	-0.6438***	0.0731
	(0.3045)	(0.2235)	(0.0591)
International network	-0.0485	-0.0112	0.0007
	(0.0563)	(0.0573)	(0.0104)
NGO	0.5578**	0.5296***	0.0591*
	(0.2845)	(0.1549)	(0.0355)
Non-bank	0.4077	0.4339***	0.0363
	(0.2826)	(0.1422)	(0.0348)
Credit officers	-0.0025***	-0.0024***	-0.0007***
	(0.0009)	(0.0006)	(0.0002)
Group lending	0.0611	0.0429*	0.0252***
	(0.0386)	(0.0242)	(0.0074)
Religious organization	-0.0386	-0.0808	-0.0208
	(0.0630)	(0.0653)	(0.0129)
Bank	0.5090*	0.4489**	0.0549
	(0.2963)	(0.1986)	(0.0402)
Coop	0.5225*	0.5182***	0.0460
	(0.2833)	(0.1609)	(0.0370)
Constant	-1.4732**	-1.7077***	-0.5844***
	(0.6083)	(0.3850)	(0.1012)
Time dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
Observations	628	654	1,104
Number of MFIs	196	211	317
Chi-squared	106.24***	262.62***	199.78***
Sagran-Hansen (P-value)	0.6688	0.1783	0.2927

Notes: This table presents estimates of the Hausman-Taylor model. Our endogenous regressors are credit officers, BDS, SS, and Group lending, of which credit officers is time varying and the rest are time-invariant. The remaining regressors are considered exogenous. Time varying exogenous variables are HDI, GDP growth, MFI size, MFI experience and inflation. The remaining exogenous regressors are time invariant. Variables are defined in Table 2. Standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.10.

5.4 The Link between Microfinance 'plus' and MFI Performance: Endogeneity Present

Table 8 reports system GMM results on the link between microfinance 'plus' and financial sustainability of MFIs. The statistics show that there is first-order serial correlation as the p-values of AR(1) are all less than 0.05 but no second-order serial correlation (p-values>0.05). We pass the Hansen's test of overidentifying restrictions indicating joint validity of instruments set (all p-values > 0.05). All the lags of the dependent variables are statistically significant at least at the 5 percent level. Once again, neither BDS nor SS are significantly associated with the financial sustainability confirming the results previously reported. Likewise, we find that the GMM regressions do not result in significant findings for the effect of BDS or SS on the efficiency, repayment or social outreach of the MFI (unreported).

Table 8: The link between microfinance 'plus' and financial sustainability

	(16)	(17)	(18)
Variables	OSS	FSS	ROA
OSS_{t-1}	0.4490**		
	(0.1794)		
FSS_{t-1}		0.4881**	
		(0.2207)	
ROA_{t-1}			0.5066***
			(0.0875)
BDS	0.1630	0.0109	0.0009
	(0.1221)	(0.1047)	(0.0132)
SS	-0.0864	0.0743	0.0011
	(0.1477)	(0.1745)	(0.0131)
HDI	-0.2846	0.3117	0.0236
	(0.2883)	(0.6601)	(0.0646)
GDP growth	-0.0007	0.0128	0.0012
	(0.0060)	(0.0124)	(0.0008)
MFI size	0.0468*	0.0703	0.0025
	(0.0266)	(0.0725)	(0.0031)
MFI experience	0.0019	-0.0201	-0.0009*
	(0.0067)	(0.0205)	(0.0005)
Inflation	0.1433	-0.1500	0.0550
	(0.5422)	(0.6218)	(0.0749)
Credit officers	-0.0010	-0.0007	-0.0000
	(0.0008)	(0.0013)	(0.0001)
International network	0.0518	-0.0541	0.0036
	(0.0593)	(0.1124)	(0.0045)
Religious organization	0.0003	-0.0590	0.0085
	(0.0464)	(0.0993)	(0.0075)
NGO	-4.5378	4.1261	-0.1938
	(5.3656)	(6.0511)	(0.3040)
Non-bank	-4.7924	4.3736	-0.2106
	(5.4818)	(6.3937)	(0.3170)

Bank	-4.4579	4.0063	-0.1954
	(5.3021)	(5.9865)	(0.3022)
Coop	-4.5834	4.0857	-0.2145
	(5.3237)	(6.0198)	(0.3056)
Group lending	-0.0672	-0.0698	-0.0046
	(0.0678)	(0.0642)	(0.0120)
Constant	4.7866	-4.7093	0.1909
	(5.4758)	(7.0737)	(0.3576)
Time dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
Observations	466	472	844
Number of MFIs	187	201	305
Number of instruments	41	41	43
Chi-squared	229.83***	210.41***	321.87***
AR(1) test (P-value)	0.045	0.033	0.000
AR(2) test (P-value)	0.412	0.296	0.792
Hansen test (P-value)	0.800	0.284	0.176

Notes: This table lists system GMM (generalized methods of moments) results of the link between microfinance 'plus' and financial sustainability of MFIs. *OSS* is operational self-sustainability and measures the ability of MFI to cover its operational costs from revenue, *FSS* is financial self-sustainability and measures the ability of MFI to cover operational costs from revenue without subsidies and *ROA* is returns on assets. Regressors are defined previously. *AR (1)* and *AR (2)* are tests for first-and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation. The *Hansen test* of over-identification is under the null hypothesis that all instruments are valid. In specifying the two-step System GMM model, we use lags of: dependent variables, BDS and SS as GMM instruments allowing the default lags limits in Stata. "By default, gmmstyle() generates the instruments appropriate for predetermined variables: lags 1 and earlier of the instrumenting variable for the transformed equation and, for system GMM, lag 0 of the instrumenting variable in differences for the levels equation" (Roodman, 2009, p. 124). The exogenous regressors are also standard instrumental variables, and the 'collapse' option is used to limit instrument proliferation. In parentheses are robust standard errors.

*, **, and *** denote statistical significance at the 10%, 5%, 1% respectively.

A concern with the system GMM estimates relates primarily to our time-invariant regressors (i.e., BDS and SS) as their lagged values cannot be used as instruments because their lagged first differences are zero. This leaves us with first differences of time-varying variables which unfortunately cannot be valid instruments either because they suffer from Nickell's bias (Nickell, 1981) and do not also correlate sufficiently with the observed BDS and SS. Thus, the estimates of the system GMM are also problematic. Therefore, the random effects estimates are preferred because of the nature of our variables of interest which get wiped out if the fixed effects model is used and their estimation in the HT model is not appropriate due to invalidity of instruments. In any case, results from the three estimators (RE, HT and system GMM) suggest that microfinance 'plus' do not influence overall performance of MFIs. Only in few cases the RE estimates provide some evidence of improved loan quality and outreach and thus support our hypotheses on these dimensions of performance.

6. Conclusion

This paper set out to examine the potential impact of microfinance 'plus' on the financial and social performance of microfinance institutions (MFIs). Impact studies of nonfinancial services have always used the clients as their unit of analysis. In contrast, this paper focuses on the providers of 'plus' services. Using a unique global sample of MFIs and an arsenal of estimation methods, we find insignificant impact of business development services on MFIs' financial and social performance. Furthermore, we find only meagre evidence of improved loan quality and outreach with the provision of social services. Specifically, providing social services comes with lower portfolio at risk and more women clients though these findings are not stable across estimation methods.

Thus, this paper provides a first-hand information on the outcome of microfinance 'plus' from the perspective of the providers. Overall, it appears there is no performance disparity for those MFIs providing 'plus' services and those that do not. Perhaps, the benefits of microfinance 'plus' might have been neutralised by the disadvantages associated with it, hence, leaving a negligible net impact on MIFs' performance.

The insignificant findings in this study actually offer important policy lessons for MFIs. With this information, microfinance practitioners are informed that, adopting the maximalist approach causes no harm on their overall financial and social performance. Thus, if the 'plus' services are of value for the customers, the provision of such does not harm the performance of the MFI. We do however recognize that the design and the cost structure of the 'plus' service does of course influence the outcome for the client as well as the MFI. Our study only shows that MFIs offering 'plus' services today have, on average, been able to design these in such a way that they do not harm the performance of the MFIs. We thus recommend future studies to look deeper into how the design and cost structure of 'plus' services have an influence on the MFI performance. Likewise, an interesting area for future researchers could be an investigation of how "smart subsidies" (Morduch, 2007) might account for the additional costs of providing 'plus' services, as well as how coordinated nonfinancial services provided by non-MFIs, in cooperation with MFIs, might influence MFI performance. Finally, like Berge, Bjorvatn, and Tungodden (2014) recognise the need for more research, studies are much warranted on whether or not different 'plus' services actually enhance clients' impacts.

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Study 4:

Excessive Focus on Risk? Non-performing Loans and Efficiency of Microfinance Institutions

Excessive Focus on Risk? Non-performing Loans and Efficiency of Microfinance Institutions[10]

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Abstract

Microfinance is a banking market in which operating costs are high while defaults rates are low. While the existing literature tends to explain that the high operating costs arise from the provision of small loans, we argue that excessive efforts to control loan losses can also be a contributing factor. Therefore, this paper investigates the relationship between non-performing loans and the cost efficiency of microfinance institutions (MFIs). Using a unique global sample of rated MFIs and applying stochastic frontier analysis, we find, in contrast to positive linear relationship evidence in commercial banking studies, a nonlinear (U-shape) relationship between operating costs and defaults. This implies that MFIs need to balance their operational efficiency with asset quality.

JEL: F34, G21, G23, G24, L31, O16

Keywords: operational efficiency, non-performing loans, microfinance, stochastic frontier analysis

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1. Introduction

In this paper, we aim to be the first to rigorously study the relationship between non-performing loans and operational efficiency in the global microfinance industry. Modern microfinance emerged in the 1970s as a response to the failures (e.g., high default rates) of state-funded credit programs (Armendáriz & Morduch, 2010; Hulme & Mosley, 1996). Lower default rates have been one of the main achievements and advantages of microfinance over the former credit programs. In fact, default rates in microfinance are lower than those in traditional banking markets (Rosenberg, Gonzalez, & Narain, 2009; Sievers & Vandenberg, 2007).

However, in the ongoing attempt to meet the high demand for credit of micro-enterprises, microfinance institutions (MFIs) failed to pay sufficient attention to their cost efficiency. The main reason for this is that borrowers were willing to pay high interest rates. Given that businesses in the informal economy are normally profitable due to the availability of promising investment opportunities (Armendáriz & Morduch, 2010), the poor are often willing to pay a high price for credit. Based on the principle of diminishing marginal returns to capital, Lucas (1990) shows that Indian borrowers were willing to pay 58 times more interest than American borrowers. As a result, MFIs often pass the cost of lending on to the borrower in the form of high interest. Thus, while default rates are low in microfinance, operating costs are generally high. This suggests a possible trade-off between defaults and costs, and hence offers an interesting research setting.

While banking scholars have long been concerned with the relationship between operating costs and loan defaults (e.g., Hughes & Mester, 1993; Berger & DeYoung, 1997; Fiordelisi et al., 2011), we are not aware of similar studies using microfinance data. This omission is unfortunate considering the relationship between the high operating costs and the high interest rates in the industry. Moreover, an overemphasis on risk may lead MFIs to practice too strict credit screening, thus leaving the target clientele unserved (Amin, Rai, & Topa, 2003; Pearlman, 2012).

To cover the high operating costs, MFIs are forced to charge high interest rates on loans (Battilana & Dorado, 2010; Hardy, Holden, & Prokopenko, 2003). There are several examples of MFIs charging 50 and even 100 percent or more on loans to economically poor individuals. This practice has brought discredit on the microfinance industry (Bateman, 2010; Malkin, 2008). Nevertheless, the high interest rates in microfinance are generally a result not of high profits but of the high costs of delivering microcredit. As shown by Mersland and Strøm (2010), it is not the "hunger for high profits" but the need to cover costs that is the main operating compass of MFIs. Therefore, reducing operating costs means that MFIs' lending rates can be reduced, and poorer segments of the population can be served in a sustainable manner.

Relationship banking theory, which many MFIs practice (Serrano-Cinca & Gutiérrez-Nieto, 2014), suggests a negative relationship between operating costs and non-performing loans. In relationship banking, more resources are often invested in creating and maintaining ties with clients in the form of more screening and monitoring (Boot, 2000; Diamond, 1991; Petersen & Rajan, 1995). This investment makes the overall operating costs of the financial institution shoot up, while, obviously, repayment rates improve (Puri, Rocholl, & Steffen, 2017), and hence there is a negative relationship between operating costs and non-performing loans. Moreover, the

historical account of microfinance (see Section 2), where cost efficiency was sacrificed for high repayment rates, also suggests a negative relationship.

However, many banking studies show that there is a positive link between non-performing loans and operating costs (e.g., Altunbas et al., 2007; Berger & DeYoung, 1997; Fiordelisi et al., 2011). Berger and DeYoung (1997) outline three reasons for the positive relationship. First, poorly managed banks tend to offer many low-quality loans, which eventually increase the stock of non-performing loans. Second, skimping on screening costs results in the issuance of poor-quality loans, which leads to more defaults and more costs to control the defaults. Third, external exogenous factors cause borrowers to default, which in turn causes the lender to incur extra monitoring costs to curb the defaults. Since MFIs mirror banks in the services they provide (Armendáriz & Morduch, 2010), one can also expect such a positive relationship in microfinance. Taken together, all these arguments –those for a negative relationship and those for a positive relationship between non-performing loans and operating costs – suggest the possibility of a nonlinear relationship between cost efficiency and asset quality in microfinance.

We apply a unique, hand-collected global sample based on external rating reports on 607 MFIs operating in 87 countries. Using stochastic frontier analysis, we find that, indeed, there is a significant relationship between operating costs and loan defaults in microfinance. While previous banking studies indicate a linear relationship between cost efficiency and default rates, we find a nonlinear, U-shaped relationship. Specifically, our findings show that an increase in non-performing loans enhances the cost efficiency of MFIs, but a further increase deteriorates it.

An important implication of this result is that microfinance practitioners should consider the trade-off between the two types of costs in order to avoid an overemphasis on asset quality at the expense of cost efficiency. High operating costs are argued by many to be *the* main challenge facing MFIs today (Mersland & Strøm, 2010). Thus, MFIs operating with low loan defaults could consider relaxing some of their screening and monitoring efforts in order to reduce their operational costs and potentially include more vulnerable customers. At the same time, MFIs with higher non-performing loans could put emphasis on reducing such loans in order to help them reduce their operating costs.

The rest of the paper is organized as follows. Section 2 reviews the literature and formulates the hypotheses. Section 3 presents the data and describes the econometric methods applied. Section 4 presents the empirical results and Section 5 concludes.

2.Literature and Hypothesis Development

2.1 Determinants of Operating Costs

There are many factors influencing the operating costs of MFIs. Such factors may include economies of scale and scope (Hartarska, Shen, & Mersland, 2013), learning and experience, technological advancement (Caudill, Gropper, & Hartarska, 2009), and the operating institutional environment. Economies of scale concern the link between average cost per unit and the number of units produced by a firm (Kwan & Eisenbeis, 1996). The ability to produce in large volumes is associated with cost savings as lower per-unit costs are achieved. Hartarska et al. (2013) prove the existence of economies of scale in the microfinance industry.

Economies of scope are achieved when a financial institution reuses previously gathered customer information as well as infrastructure to generate new revenue without incurring additional costs (Petersen & Rajan, 1994). Such economies are basically concerned with joint production, where the total production cost is less than the sum of individual production costs (Kwan & Eisenbeis, 1996). Delgado et al. (2015) show that most, if not all, MFIs achieve economies of scope when offering clients saving services alongside loans. Learning curve theory suggests that cost efficiency improves over time as a firm repeats its processes and learns from them each time. Caudill et al. (2009) produce evidence to support learning curve theory in the microfinance industry where a group of MFIs becomes more cost effective over time.

In addition, with the introduction of new technologies in production, a bank may improve its cost efficiency level. For instance, new microfinance technologies such as mobile banking and online crowdfunding may help reduce costs and increase MFIs' outreach (Cull, Demirgüç-Kunt, & Morduch, 2009). Furthermore, the costs of financial intermediation can be influenced by banking regulation (Demirguc-Kunt, Laeven, & Levine, 2004). Like banks, some MFIs are regulated by banking authorities (Ledgerwood, 1999) and the costs associated with this regulation are passed on to their clients in the form of higher lending rates (Hardy et al., 2003).

Finally, relationship banking influences the cost of lending when financial intermediaries like MFIs create and maintain ties with their customers over a long period. To create such ties, the financial institution begins by gathering private or "soft" information about the client and such private information is costly to gather (Diamond, 1984). Thus, , screening and monitoring costs are often high in the short run, but at the same time intermediation costs decline because of information reusability and lower defaults, resulting in lower screening and monitoring costs in the long run (Bharath et al., 2011; Boot, 2000; Petersen & Rajan, 1994) . In sum, relationship banking influences operating costs both positively and negatively.

2.2 Efficiency and Non-performing Loans

Hughes and Mester (1993) and Berger and DeYoung (1997), among others, demonstrate how non-performing loans relate to cost efficiency. Hughes and Mester (1993) argue that when a bank fails to invest resources in the initial screening and monitoring of borrowers, the result is lower operating costs in the short run but higher non-performing loan defaults in the long run. The high defaults then require more monitoring efforts, leading to high monitoring costs. Berger and DeYoung (1997) refer to this as the "skimping" hypothesis. They further illustrate that bad luck or external factors (e.g., economic downturns), which are beyond the borrowers' control, can cause defaults resulting in additional costs for the lending institution. These additional costs may relate to factors such as additional monitoring efforts, renegotiations of contract terms, and the efforts of senior management to curb losses on loan (Berger & DeYoung, 1997).

In general, banking studies (e.g., Kwan & Eisenbeis, 1996; Berger & DeYoung, 1997; Altunbas et al., 2000; Fiordelisi et al., 2011) provide evidence for a positive relationship between operating costs and non-performing loans. Kwan and Eisenbeis (1996) use a stochastic efficient frontier approach to investigate inefficiency of US banking firms in relation to their non-performing loans. They find that inefficient banks tend to have higher non-performing loans. Similar findings have been documented by Berger and DeYoung (1997). In a relatively recent study, Fiordelisi et al. (2011) report similar findings to those of Berger and DeYoung (1997).

To the best of our knowledge, empirical evidence on the link between efficiency and risk is missing in the microfinance literature. We aim to close this gap. The importance of improving MFIs' cost efficiency has been stressed not only because the high costs jeopardize the overall sustainability of the industry (Cull et al., 2009), but also because the high interest rates impede MFIs' ability to benefit their target customers, the poorest potential clients (Mersland & Strøm, 2010). Thus, the high operating costs of MFIs are actually the main challenge in the industry as well as the main reason for much of the criticism that has been directed at the microfinance industry (Rosenberg et al., 2009).

Equation (1) illustrates why operating costs are the main challenge in microfinance:

$$Profit = yield - funding\ cost - operating\ cost - loan\ loss, \quad (1)$$

where *yield* is the interest revenue from the loan portfolio, *funding cost* is the interest expense on borrowings, *operating cost* includes salaries and administrative costs, and *loan loss* represents losses arising from non-performing loans. Thanks to access to international loans from impact investors (Mersland & Urgeghe, 2013), subsidies (Hudon & Traca, 2011), and low interest on deposits, the finance costs and loan losses of MFIs are generally quite low. As mentioned earlier, loan losses are also low in microfinance. The challenge is the operating costs, which are the main determinant of lending rates in microfinance (Cull et al., 2009).

As Mersland and Strøm (2014) illustrate, operating costs represent about 61 percent of financial revenue, funding costs 17 percent, and loan loss provisions only 7 percent, leaving a profit margin of 15 percent. This indicates that reducing operating costs could greatly reduce lending rates and improve MFIs' profitability level, which could pave the way for a more sustainable industry. Moreover, high operating costs make it

unprofitable to offer small loans to target clientele; thus, reduced operating costs could facilitate MFIs' outreach to poorer clients (Mersland & Strøm, 2010).

Finally, focusing too much on repayment of microcredit has the tendency to drive away the poorest segments of the poor populations, whom MFIs claim to be their target clients. Using data from Peru, Pearlman (2012) shows that because of strict repayment requirements and penalties in microfinance, very poor people have less of a tendency to use microcredit. This finding supports that of Amin et al. (2003) who use data from Bangladesh. Thus, overemphasis on risk has implications on not only the operational efficiency but also the outreach of MFIs. That is, both the sustainability and social objectives of MFIs are affected by too much focus on defaults.

2.3 Hypothesis Development

Relationship banking theory suggests a negative relationship (trade-off) between operating costs and loan defaults. Creating and keeping relationships with clients is costly due to high selection and monitoring costs (Diamond, 1984; Petersen & Rajan, 1994). Since the business model of most MFIs is one of relationship banking with close contact between the loan officer and the client (Dixon, Ritchie, & Siwale, 2007; Serrano-Cinca & Gutiérrez-Nieto, 2014; Siwale & Ritchie, 2012), the low defaults reported in the industry are a result of the large investments in the screening and monitoring of clients. Puri et al. (2017) find that relationship banking methods result in lower defaults because of better selection and monitoring of borrowers. Implicitly, the selection and monitoring costs in relationship banking are negatively related to the loan defaults.

Moreover, the history of microfinance paints a picture of a trade-off between high operating costs and low loan defaults. Modern microfinance emerged in the 1970s as a solution to problems associated with development finance institutions (DFIs), which were funded by governments and agencies to provide credit to farmers and other poor people (Hulme & Mosley, 1996; Morduch, 1999). About four decades after the DFI initiatives were launched in the 1930s (Hulme & Mosley, 1996), many studies (e.g., World Bank, 1975; Sanderatne, 1978; Adams & Graham, 1981) showed that the financial performance of these DFIs had turned out to be unsatisfactory.

For instance, Adams, Graham, and von Pischke (1984, p. 1) described the performance of DFIs as "disappointing," while Thillairajah (1994) claimed that DFIs in Africa had a 100 percent failure rate! It was shown that high rates of default were a major problem since arrears rates ranged from 55 percent (e.g., in Ghana) to 95 percent (e.g., in Nigeria) (Sanderatne, 1978). In short, the average default rate in state-funded credit programs was more than 50 percent (Hulme & Mosley, 1996; Morduch, 1999).

Microfinance sprang up with innovations to overcome three main problems faced by DFIs. Obviously, one problem was the high default rates; the other two were lack of access to credit for poor people, especially women, and challenges related to screening borrowers without collateral (Hulme & Mosley, 1996). MFIs started to provide small amounts of credit to poor people and microenterprises that were excluded from mainstream banking services (Armendáriz & Morduch, 2010). Since its inception, microfinance has been praised worldwide for achieving its primary goal of financial inclusion (Biosca, Lenton, & Mosley, 2014; Cull et al., 2009) while at the same time

being a sustainable business model where customers generally repay their loans (Morduch, 1999).

To overcome screening and repayment problems, new loan products such as lending with joint liability and short-term step-wise loans (progressive lending) were introduced following the advent of the microfinance industry (Armendáriz & Morduch, 2010; Hulme & Mosley, 1996). These innovations improved repayment rates substantially. Today, the microfinance industry reports lower default rates than many traditional banking markets (Rosenberg et al., 2009; Sievers & Vandenberg, 2007). The average repayment rate in microfinance is about 97 percent (Cull et al., 2009), which is indeed impressive considering that these are uncollateralized loans given to economically poor people operating businesses in informal markets in emerging economies.

However, in attempts to improve repayment rates, it seems that MFIs have relegated their operational efficiency to the background. This is because, while default rates in microfinance are under control, operating costs remain high. As we mentioned in the Introduction, access to capital for micro-enterprises was a major focus of microfinance. Micro-enterprises at the bottom of the pyramid in the informal sector are normally profitable (Armendáriz & Morduch, 2010); hence, they are generally willing to pay high interest (Lucas, 1990). Due to the high demand for capital of micro-businesses, MFIs focused on lending at the expense of their operational efficiency; after all, the cost of lending can be passed on to the borrower.

Thus, from an efficiency perspective, microfinance is a high-cost business (Gonzalez, 2007; Hardy et al., 2003). Mersland and Strøm (2009) report an operating cost to loan portfolio ratio of approximately 31 percent, which is 20 times higher than what is normal in the most efficient banking markets, like those in the Nordic countries (Berg, Førsund, Hjalmarsson, & Suominen, 1993). Of course, the high cost ratios in microfinance can partly be explained by the small loans (Helms & Reille, 2004) and the poor institutional frameworks where MFIs operate (Kirkpatrick & Maimbo, 2002). But, in addition, we argue that too much focus on risk could be another contributing factor. Therefore, we hypothesize that:

H1: There is a negative relationship between non-performing loans and cost efficiency of microfinance institutions.

However, the theoretical arguments of Hughes and Mester (1993) and Berger and DeYoung (1997) as well as many empirical studies using mainstream banking data suggest that there is a positive relationship between operating costs and loan defaults. In particular, using U.S. commercial banking data from 1985 to 1994, Berger and DeYoung (1997) find that when non-performing loans increase exogenously (due to external shocks), operating costs also increase. Their results also show that an increase in operating costs due to poor management practices eventually leads to higher loan defaults. Similarly, Kwan and Eisenbeis (1997) find that inefficient banks are more prone to risk-taking compared to efficient banks. Berger and DeYoung (1997) further report that banks that skimp on selection costs in the name of cost efficiency end up having higher non-performing loans and higher operating costs in the long run. When a small amount of resources are allocated to the screening and selection of applicants,

low-quality loans are made, which often surface in the future as non-performing loans. To control these, banks have to incur costs.

Applying the approach of Berger and DeYoung (1997) in the context of European commercial banking, Williams (2004) confirms that poorly managed banks make low-quality loans, which result in higher non-performing loans. He also finds an insignificant positive correlation between operating costs and non-performing loans with respect to the bad luck and skimping hypotheses of Berger and DeYoung (1997). In the same spirit, Fiordelisi et al. (2011) confirm the "bad management" hypothesis of Berger and DeYoung (1997). That is, inefficient European banks tend to have more problem loans. Similarly, using data from Malaysia and Singapore, Karim, Chan, and Hassan (2010) document findings that support those of Berger and DeYoung (1997).

As mentioned earlier, this positive relationship between operating costs and non-performing loans may also be expected in microfinance because of its banking logic (Armendáriz & Morduch, 2010; Battilana & Dorado, 2010). Specifically, external shocks such as floods, droughts, crop losses, and infectious diseases affecting the productivity of farmers in rural areas where the majority of the MFIs' clients live (Armendáriz & Morduch, 2010) could increase the non-performing loans of MFIs. Moreover, based on the skimping and bad management hypotheses of Berger and DeYoung (1997), some MFIs may be struggling with non-performing loans today due to a failure to conduct strict screening and monitoring in the past. Obviously, these are MFIs that do not practice relationship banking. Thus, extra efforts are needed today to control the increasing risk. Therefore, we formulate a rival hypothesis to H1 as follows.

H2: There is a positive relationship between non-performing loans and cost efficiency of microfinance institutions.

Taken together, the negative (H1) and positive (H2) hypotheses do not rule out a nonlinear relationship between non-performing loans and cost efficiency of MFIs. This is because MFIs vary in a wide range of dimensions, including management practice, geographical focus, lending method, and organizational form (Armendáriz & Morduch, 2010). Some MFIs may be efficient in controlling both operating costs and non-performing loans, other MFIs may be concerned with defaults and hence practice relationship banking in order to enhance asset quality, which comes with high selection and monitoring costs, while still other MFIs may be poorly managed and hence incur high operating costs and high non-performing loans.

Geographically, MFIs serve different groups of clients. Some target only rural clients, others focus only on urban clients, while still others serve both urban and rural clients (Mersland & Strøm, 2009). This suggests that costs and risk may vary among MFIs with different geographical foci. For instance, the bad luck hypothesis of Berger and DeYoung (1997) may be more pronounced among MFIs with a purely rural focus.

Furthermore, based on the skimping hypothesis, it is possible that some MFIs may look efficient today in order to attract funding from investors and donors, but this strategy may have long-term consequences on asset quality and monitoring costs. Additionally, while some MFIs (e.g., the famous Grameen Bank in Bangladesh and BancoSol in Bolivia) focus on granting loans to groups, other MFIs practice only the individual-lending method (Armendáriz & Morduch, 2010). Group lending is generally

believed to be correlated with lower costs and lower risk (Armendáriz & Morduch, 2010; Ghatak & Guinnane, 1999). This suggests that costs and risk may also differ between group-lending and individual-lending MFIs.

Finally, MFIs are incorporated as either shareholder-owned (banks and nonbank financial institutions) or non-profit organizations (e.g., non-governmental organizations) (Mersland, 2009). Owners have incentives to monitor the institution to ensure that excessive risks are not taken by management. Galema, Lensink, and Mersland (2012) find that excessive risk-taking is more likely in MFIs without owners than in shareholder MFIs. Overall, the above discussions imply different relationships between operating costs and non-performing loans among different MFIs. Thus, in the empirical analysis, it will not be surprising to find evidence supporting the two hypotheses (a nonlinear relationship).

3.Data and Methodology

3.1 Data

Our dataset is an unbalanced panel of MFIs around the world. It is based on hand-collected rating reports from five leading microfinance rating agencies (MicroRate, Microfinanza, Planet Rating, Crisil, and M-Cril). These rating agencies were originally approved by the Rating Fund of the Consultative Group to Assist the Poor (C-GAP), a microfinance branch of the World Bank. The rating reports contain information concerning the MFI and its governance, management, financial profile, and operations.

The sample does not include the largest MFIs, which are typically rated by traditional rating agencies like Standard & Poor's and Moody's. Nor does it include all the numerous small savings and loans cooperatives around the world or the many loan funds providing credit mainly as a social service for their beneficiaries. Overall, our sample consists of 607 rated MFIs operating in 87 countries (see Table 1), observed over an unbalanced period of 18 years (1998–2015), with a common aim of operating professional and sustainable services and attracting funding from investors and donors. Former versions of the dataset have been used in high impact studies like Hartarska and Mersland (2012) and Mersland and Strøm (2009). Additionally, we use data from the World Bank to control for country effects.

Table 1: Distribution of number of microfinance institutions by country

#	Country	No. of MFIs	#	Country	No. of MFIs	#	Country	No. of MFIs
1	Albania	3	30	Mexico	31	59	Tajikistan	11
2	Argentina	2	31	Moldova	2	60	Croatia	1
3	Armenia	6	32	Morocco	8	61	Chad	3
4	Benin	8	33	Nicaragua	14	62	Rwanda	12
5	Bolivia	17	34	Pakistan	2	63	Zambia	3
6	Bosnia and Herzegovina	12	35	Paraguay	2	64	China	5
7	Brazil	14	36	Peru	40	65	Serbia	2
8	Bulgaria	3	37	Philippines	22	66	Ghana	5
9	Burkina Faso	9	38	Romania	7	67	Malawi	2
10	Cambodia	14	39	Russia	17	68	Gambia	1
11	Chile	2	40	Senegal	12	69	Kosovo	5
12	Colombia	14	41	South Africa	4	70	Congo	1
13	Dominican Republic	7	42	Sri Lanka	2	71	Burundi	6
14	Ecuador	20	43	Tanzania	8	72	Niger	8
15	Egypt	6	44	Togo	5	73	Dem. Rep. Congo	1
16	El Salvador	7	45	Trinidad and Tobago	1	74	Afghanistan	2
17	Ethiopia	10	46	Tunisia	1	75	Costa Rica	3
18	Georgia	8	47	Uganda	25	76	Lebanon	2
19	Guatemala	8	48	Montenegro	2	77	Turkey	1
20	Haiti	3	49	Cameroon	5	78	Palestine	3
21	Honduras	13	50	Guinea	3	79	Comoros	1
22	India	32	51	Timor	1	80	Italy	3
23	Indonesia	4	52	Bangladesh	2	81	Samoa	1
24	Jordan	3	53	Nepal	5	82	Sierra Leone	1
25	Kazakhstan	8	54	Vietnam	4	83	South Sudan	1
26	Kenya	18	55	Azerbaijan	9	84	United Kingdom	1
27	Kyrgyz Republic	9	56	Mongolia	4	85	Yemen	1
28	Madagascar	3	57	Nigeria	6	86	Angola	1
29	Mali	11	58	Mozambique	1	87	Macedonia	1
							Total	**607**

Table 2 presents summary statistics of the variables used in the estimations. On average, operating costs amount to US$ 1.9 million, annual salary per employee is US$ 7,607, and the ratio of non-labor operating expenses to net fixed capital is 3.1. In terms of client base, the average MFI has 20,897 active clients, the majority of whom are borrowers (18,058). The average MFI is about 11 years old with approximately US$ 15 million total assets and 6 percent portfolio at risk.

Interestingly, group lending is not the dominant uncollateralized lending method. About 42 percent of the MFIs offer group loans and the remaining majority (58 percent) give individual loans. In terms of ownership, about 37 percent of the MFIs are shareholder-owned while the remaining 63 percent are non-shareholder-owned (i.e., they are mutual organizations organized as member-based cooperatives or non-governmental organizations). Concerning their geographical focus, 27 percent of the

MFIs focus on urban areas as their main market, 18 percent target only rural areas, and the rest of the MFIs serve both urban and rural clients. Finally, the mean for gross domestic product (GDP) per capita adjusted for purchasing power parity is US$ 6,533.

Table 2: Descriptive statistics of variables

Variable	Mean	Std. Dev.	Min	Max	Obs.
Operating cost (US$ 000)	1875.28	3239.78	30.10	29940.00	3120
Number of clients	20896.71	34990.92	205.00	249531.00	2624
Number of borrowers	18058.14	30338.63	204.00	238140.00	2959
Wage per staff (US$)	7607.00	6510.01	152.46	84317.66	2754
Physical capital	3.06	4.03	0.03	39.99	2966
Year	9.20	3.29	1.00	18.00	3296
GDP per capita (US$)	6533.41	5007.46	703.39	26429.35	3244
Portfolio at risk (%)	6.06	7.50	0.10	48.90	2777
MFI age (years)	10.76	6.33	2.00	33.00	3078
Total assets (US$ 000)	14944.97	33153.54	50.00	365256.99	3219
Shareholder MFI	0.37	0.48	0.00	1.00	3049
Group lending	0.42	0.49	0.00	1.00	2842
Urban market	0.26	0.44	0.00	1.00	2641
Rural market	0.18	0.38	0.00	1.00	2641

3.2 Methodology

Cost efficiency is measured in terms of how close an MFI's costs are to those of a best practice MFI, assuming both produce similar output under identical production settings (Fries & Taci, 2005; Hermes, Lensink, & Meesters, 2011). Cost efficiency concerns cost savings achieved when the MFI is efficient in terms of resource allocation and technical capabilities. Because cost functions cannot be observed directly, inefficiencies are normally compared to an efficient cost frontier (Hermes et al., 2011). In general, cost efficiency is investigated by employing either data envelopment analysis (DEA) or stochastic frontier analysis (SFA). The latter technique is applied in this paper because it takes into account both measurement errors and random effects (Hermes et al., 2011; Silva et al., 2017) . DEA on the other hand is not able to decompose the residual into the statistical noise and the inefficiency effect. Moreover, compared to DEA, SFA offers an opportunity to uniquely specify the empirical model in order to test a particular hypothesis (Hjalmarsson, Kumbhakar, & Heshmati, 1996). SFA has been used previously in other microfinance studies (e.g., Hartarska et al., 2013; Hartarska and Mersland, 2012; Hermes et al., 2011).

Specifically, this paper uses Battese and Coelli (1995) one-step SFA, which has been applied to MFIs by Hermes et al. (2011). One main advantage of the Battese and Coelli (BC) model over the traditional two-step SFA proposed by Aigner, Lovell, and Schmidt (1977) is that the BC model estimates both the cost frontier and the inefficiency equation at the same time. Moreover, Wang and Schmidt (2002) show that the two-step approach produces biased coefficients since it suffers from the assumption that the

efficiency term is independent and identically truncated and normally distributed in the first step, while in the second step the efficiency terms are assumed to be normally distributed and dependent on the explanatory variables.

To specify the cost function, we follow the Sealey and Lindley (1977) model, which has been applied in microfinance studies, including Hermes et al. (2011) and Hartarska and Mersland (2012). The model views MFIs as financial intermediaries in channeling funds from depositors, lenders, and donors to borrowers. The translog cost function is specified in equation (2), following Hermes et al.'s (2011) and Hartarska and Mersland's (2012) specifications, with a few modifications to suit this study's purpose. For instance, we do not include interest expense as in Hermes et al. (2011) or price of financial capital as in Hartarska and Mersland (2012) because we are concerned only with operating costs. The translog specification, which we apply, is common in cost-efficiency studies (Greene, 1980) because of its flexibility in functional form (Karim et al., 2010).

$$\begin{aligned}\ln(OC_{itj}) &= \beta_0 + \beta_1 \ln(Clients_{itj}) + \beta_2 ln(Wage_{itj}) + \beta_3 \ln(Physical_{itj}) \\ &+\beta_4 ln(Clients_{itj}^2) + \beta_5 \ln(Wage_{itj}^2) + \beta_6 \ln(Physical_{itj}^2) \\ &+ \beta_7\, ln(Wage_{itj})x\, ln(Physical_{itj}) + \beta_8\, ln(Wage_{itj})x\, ln(Clients_{itj}) \\ &+ \beta_9\, ln(Physical_{itj})x\, ln(Clients_{itj}) + \beta_{10} Year_{tj} + \beta_{11} \ln(GDP_{itj}) \\ &+ u_{itj} + v_{itj} \qquad (2)\end{aligned}$$

In equation (2), *OC* is the total operating costs of MFI *i* at time *t* located in country *j*, *Wag*e represents annual price per unit of labor, and *physical* is the price of physical capital, calculated as operating costs minus personnel costs divided by fixed assets (Hartarska & Mersland, 2012). C*lients* is an output measure representing the number of active clients (both borrowers and savers); alternatively, we use the number of borrowers as an output measure, following Hartarska & Mersland (2012). *ln* denotes natural logarithm. *Year* and *GDP* are control variables. *Year* ranges from 1 to 18 (representing 1998 to 2015) and it controls for changes in technology over time (Battese & Coelli, 1995) and GDP represents GDP per capita (Fries & Taci, 2005), adjusted for purchasing power parity, and it controls for country differences. u_{itj} is the inefficiency component, assumed to have a truncated-normal distribution that is independently but not identically distributed over different MFIs. v_{itj} is a random error term.

As the aim of the paper is to investigate the relationship between non-performing loans and efficiency, we now turn to the main empirical model: the inefficiency equation (3). In equation (3), the inefficiency component (from the cost frontier) is the dependent variable and the indicator of loan defaults is the independent variable. The model also includes MFI-level control variables, which may influence inefficiency. Thus, the mean inefficiency is modeled as a function of MFI-level covariates as follows.

$$\begin{aligned}U_{itj} = \delta_0 + \delta_1(PAR30_{itj}) + \delta_2\,(PAR30_{itj}^2) + \delta_3(Age_{itj}) + \delta_4(SHF_{itj}) + \delta_5(Group_{itj}) \\ + \delta_6(Urban_{itj}) + \delta_7(Rural_{itj}) + \delta_8 ln(Size_{itj}) + \varepsilon_{itj} \qquad (3)\end{aligned}$$

In equation (3), U_{itj} is the inefficiency distribution of the i^{th} MFI at time *t* in country *j*. It represents the first moment condition, where more of it means a high likelihood that

the MFI is inefficient. *PAR30* is the portfolio at risk (>30 days). The most common measure of default in banking is the non-performing loan rate defined as the proportion of the loan portfolio that is more than 90 days overdue (Kwan & Eisenbeis, 1997). In the microfinance industry, a shorter period (30 days) is often used since loans are mostly short-term in nature and, as a result, non-performing loans are commonly referred to as portfolio at risk more than 30 days overdue (*PAR30*). Thus, in this paper, we use *PAR30* and non-performing loans interchangeably.

PAR30 has been used in other studies such as Caudill et al. (2009), Mersland and Strøm (2009), and Kar (2012). A higher loan portfolio quality signifies a smaller portfolio at risk. Since the dependent variable represents inefficiency, the negative coefficient of this variable means that an MFI becomes efficient as the number of non-performing loans increases.

Following Hermes et al. (2011), we include MFI *age* and lending method (g*roup loans*). In addition, we control for MFIs' ownership structure (*shareholder-owned firms*) (Fries & Taci, 2005), geographical markets (*only urban* and *only rural*), and *size*. Thus, heteroscedasticity in the variance of the inefficiency is explained not only by defaults but also by other covariates It has been suggested that it is costly to offer individual loans, compared to group loans (Ghatak & Guinnane, 1999); thus technical inefficiency may vary between providers of group and individual loans. With respect to MFI age (or experience), learning curve theory suggests that MFIs' efficiency improves over time (Caudill et al., 2009), which implies fewer technical inefficiencies over time. In the empirical analysis, non-shareholder-owned MFIs (mutual ownership), individual-lending MFIs, and MFIs that serve both urban and rural clients are the reference categories for ownership, lending method, and geographical market, respectively.

MFI size is measured as the natural logarithm of total assets. Economies of scale are usually correlated with size, as Hartarska et al. (2013) have confirmed in microfinance. This suggests that the variance in the inefficiency component could be heteroscedastic due to size effects.

Finally, as a robustness check, we employ Greene's (2005) true fixed-effects SFA model, in addition to the random-effects BC model[11], to control for heterogeneity across MFIs. The fixed-effects model allows for a separation of time-varying inefficiency from MFI-specific time-invariant unobserved effects.

[11] We acknowledge that operating costs and loan defaults are simultaneously determined (i.e., there is a reversed causality between the two). However, the use of the one-step SFA approach in this study makes this endogeneity bias less problematic since costs and defaults enter separate models. Moreover, we are not testing causation but correlation.

4. Results and Discussions

Table 3 reports the results of the cost function (Panel A) and those relating to the inefficiency equation (Panel B). Model (1) contains the estimates of Battese and Coelli's (1995) model while models (2) and (3) report those based on Greene's (2005) model. In both methods, we assume the inefficiency term has a truncated-normal distribution.

Table 3: The cost function, and the link between non-performing loans and inefficiency of MFIs

	(1)	(2)	(3)
Panel A: Cost frontier equation			
Y (output is the number of clients)	-0.1440	0.0469	
	(0.1750)	(0.1356)	
Y (output is the number of borrowers)			0.0559
			(0.1348)
Y^2	0.0242***	0.0170***	0.0150***
	(0.0058)	(0.0052)	(0.0053)
Price of labor	0.2868	0.0792	0.0674
	(0.3136)	(0.2930)	(0.3052)
Price of labor^2	0.0021	0.0110	0.0049
	(0.0155)	(0.0156)	(0.0165)
Price of physical capital	-0.5002***	-0.2437	-0.1979
	(0.1845)	(0.1683)	(0.1584)
Price of physical capital^2	-0.0180**	0.0211***	0.0245***
	(0.0092)	(0.0075)	(0.0073)
Price of labor ∗ Price of physical capital	0.0289*	-0.0011	0.0019
	(0.0173)	(0.0162)	(0.0160)
Y∗ Price of labor	0.0287*	0.0134	0.0094
	(0.0148)	(0.0151)	(0.0152)
Y∗ Price of physical capital	0.0386***	0.0341***	0.0238**
	(0.0101)	(0.0094)	(0.0094)
Year	0.0103**	0.1308***	0.1552***
	(0.0042)	(0.0054)	(0.0059)
GDP per capita	0.1514***	-0.1044	-0.0797
	(0.0199)	(0.0921)	(0.0953)
Constant	6.1449***	9.5468	9.8502
	(1.8525)	(0.0000)	(0.0000)

Table 3 continued.

	(1)	(2)	(3)
Panel B: Inefficiency equation			
Portfolio at risk	-0.0837***	-0.2886**	-0.2231**
	(0.0313)	(0.1153)	(0.1136)
Portfolio at risk^2	0.0021**	0.0090***	0.0070**
	(0.0009)	(0.0030)	(0.0028)
MFI age	0.1085***	0.1192***	0.0429
	(0.0165)	(0.0348)	(0.0356)
Shareholder MFI	0.8973***	-7.0146	-17.8349
	(0.1963)	(24.3242)	(32.5952)
Group loans	-0.6957***	-0.8152	-0.8895**
	(0.2116)	(0.5163)	(0.4247)
Urban market	-0.3038	-3.1463	-3.3499**
	(0.1873)	(2.0537)	(1.5529)
Rural market	-16.0346	-28.3245	-56.7368
	(0.0000)	(14.2843)	(0.0000)
MFI size	1.7070***	-0.0567	-0.1620
	(0.1010)	(0.1952)	(0.1891)
Constant	-28.9294***	-3.7865	-0.7260
	(1.6391)	(3.2722)	(3.1385)
Observations	1,577	1,483	1,595
Number of MFIs	400	306	330
Wald chi-square	3433.32***	11371.01***	10168.22***
Log likelihood	-842.27	225.24	137.63
Estimation method	Random effects	True fixed effects	True fixed effects

Notes: This table reports panel stochastic frontier analysis estimates of Battese and Coelli's (1995) random-effects time-varying inefficiency-effects model (1) and Greene's (2005) true fixed-effects model (models (2) and (3)). In Panel A (the cost function), O*perating costs* is the dependent variable and output is measured in terms of number of active clients (borrowers and savers) and number of active borrowers (for simplicity, Y is used to denote output measure, especially when interacting it with input price). The inputs are *Price of labor* – annual salary per employee, and *Price of physical capital*, measured as non-labor expenses divided by net fixed assets. Control variables are *Year*, a categorical variable, which runs from 1 to 11, and accounts for technological changes over time, and *GDP per capita*, the annual gross domestic product adjusted for purchasing power parity (constant 2011). Standard errors are in parentheses. In Panel B (inefficiency equation), inefficiency is the dependent variable, generated simultaneously from the cost frontier (Panel A). *Portfolio at risk (PaR30*) is the proportion of loan portfolio that is in arrears over 30 days, *MFI age* is the number of years the institution has been operating as a microfinance organization, *Shareholder MFI* = 1 if shareholder-owned firm and = 0 if non-shareholder-owned firm, *Group* = 1 if solidarity group loans and = 0 if individual loans, *Urban* market = 1 if urban market is emphasized and = 0 if otherwise, *Rural market* = 1 if rural market is emphasized and = 0 if otherwise and, finally, *MFI size* is measured in terms of total assets. Standard errors are in parentheses.
*, **, *** denotes statistical significance at the 10 percent, 5 percent and 1 percent level respectively

If a variable has a positive coefficient in Panel A (of Table 3), it means an outward departure from the cost frontier – suggesting higher costs. In general, the true fixed-effects estimates are similar to those based on the random-effects estimator with few exceptions. The quadratic terms of both output measures are significant in all models, suggesting that serving a larger number of clients increases the operating costs of MFIs. This is not surprising since numerous transactions (e.g., average loan and savings)

relating to borrowers and depositors are normally smaller in volume. The price of physical capital plus its quadratic term are negatively related to cost in model (1); however, in models (2) and (3), the quadratic term is positively related to costs, as expected.

In model (1), the interaction between labor and physical capital, as well as the interaction between price of labor and number of total clients, are positively related to cost. Similarly, the interactions between each output measure (number of clients and borrowers) and price of physical capital have positive correlations with cost in all models, suggesting a departure from the cost frontier. *Year* has positive effects on cost, suggesting that operational costs in MFIs are "sticky". One explanation is that technological changes over time are costly for MFIs to implement. Indeed, Hermes et al. (2011) find a positive long-term effect of technological changes on MFIs' cost. Finally, in model (1), GDP per capita relates positively to operating costs, indicating that MFIs operating in more developed economies have higher operating costs. This finding is consistent with that of Grigorian and Manole (2002).

Panel B (of Table 3) contains estimates of the inefficiency equation, the most important part of the empirical investigation. In this panel, the dependent variable is the inefficiency term (obtained simultaneously from the cost frontier; Panel A). The results show in all models that, indeed, there is a significant relationship between non-performing loans and cost efficiency in microfinance. The significant negative effect of *PAR30* on cost inefficiency indicates that an increase in non-performing loans improves the efficiency of MFIs. In other words, as asset quality is enhanced, the efficiency of MFIs deteriorates. The finding implies that MFIs with low default rates and high operating costs may benefit from relaxing extra monitoring efforts. This finding supports our claimed trade-off proposition and the relationship banking theory; hence, hypothesis 1 is supported.

The significant positive effect of the quadratic term of *PAR30* on inefficiency shows that a further rise in non-performing loans worsens the efficiency of MFIs. To put it differently, as asset quality declines, so does the cost efficiency of MFIs. The finding implies that MFIs with high default rates exert extra efforts to control non-performing loans. However, the extra efforts, like monitoring and negotiation of possible repayment plans, cause the overall operating costs of the institution to shoot up (Berger & DeYoung, 1997); hence, cost efficiency deteriorates. This finding supports hypothesis 2.

Given that both hypotheses 1 and 2 are supported, the relationship between non-performing loans and cost efficiency is nonlinear[12] (U-shaped). This means that there is an optimal point of *PAR30* above which cost efficiency declines. We could not pin down that point because there seems to be no general optimal point of *PAR30* fitting all types of MFIs. While the majority of MFIs have *PAR30* below 10 percent of the portfolio value, there are some that have *PAR30* ranging from 10 to 50 percent. Therefore, we leave this threshold for practitioners to assess for themselves.

[12] In unreported robustness checks, we confirmed the nonlinear (U-shaped) relationship between cost efficiency and non-performing loans in simple pooled OLS and fixed effects regressions. Also, the U-shaped relationship exists when loan portfolio is used as an output measure in the stochastic frontier analysis. We chose number of clients to reflect the double bottom line of MFIs.

Concerning the control variables in Panel B, we observe, in models (1) and (2), that older MFIs are cost inefficient compared to younger MFIs, similar to Hermes et al.'s (2011) finding. Perhaps younger MFIs are more able to keep abreast of current efficiency and technology practices compared to older MFIs, which may have to learn them by trial and error. A possible explanation is that the lack of learning effects among MFIs is a result of subsidies (Caudill et al., 2009). For example, about 70 percent of the MFIs in our sample hold subsidized debt. In any case, "sticky" operating costs are a major challenge in the industry and future research should definitely investigate why there are no cost-learning effects among MFIs globally.

Similarly, in model (1), shareholder-owned MFIs are more cost inefficient compared to non-shareholder-owned MFIs and this departs from the transformation debate that shareholder-owned firms are more operationally efficient than non-shareholder-owned firms (D'Espallier et al., 2017). In untabulated regressions, we checked whether shareholder MFIs are indeed inefficient compared to non-shareholder MFIs by replacing the *Shareholder MFI* variable with *Bank, Nonbank and NGO* as controls for MFI type (co-operative is the base category). The results showed that nonbank and NGO MFIs are significantly and positively associated with higher cost inefficiencies compared to co-operative MFIs. The overall impression in our sample is that shareholder-owned MFIs are probably not different from non-shareholder MFIs in terms of cost efficiency. This suggests that both groups of MFIs probably apply similar business models.

We further observe (in models (1) and (3)) that, as expected, group lending reduces MFIs' inefficiency compared to individual lending (Ghatak & Guinnane, 1999) and MFIs focusing only on urban clients are more efficient compared to those serving both urban and rural clients (model (3)). Finally, and similarly to Hartarska and Mersland (2012), we find that MFI size increases cost inefficiency (model (1)), suggesting diseconomies of scale.

Overall, we find a nonlinear relationship between non-performing loans and cost efficiency in microfinance, contrary to the linear relationship reported in traditional banking studies (e.g., Berger and DeYoung, 1997; Altunbas et al., 2000; Fiordelisi et al., 2011). The U-shaped relationship indicates that, at some point, an increase in non-performing loans improves cost efficiency but a further increase (beyond that point) deteriorates the cost efficiency of MFIs.

5.Conclusion

In this paper, we examine the relationship between non-performing loans and cost efficiency of microfinance institutions (MFIs). While there is a significant body of banking literature on the aforesaid relationship (e.g., Berger & DeYoung, 1997; Williams, 2004; Fiordelisi et al., 2011), studies using microfinance data are, to the best of our knowledge, nonexistent. This is unfortunate since high operating costs are hampering the microfinance industry and these could be related to historical reasons where MFIs were too concerned about repayment performance and not concerned enough about operational costs. As a solution to high default rates among government banks tasked with agricultural lending, modern microfinance emerged in the 1970s (Hulme & Mosley, 1996) and it remains a successful banking market for the poor today

(Armendáriz & Morduch, 2010). Microfinance pioneers shifted the lending focus to non-farm businesses, which are less vulnerable to weather shocks, and this strategy resulted in massive improvements in repayment rates (Cull et al., 2009).

However, focusing on access to capital and not on the price of capital has resulted in huge operating costs in the global microfinance industry today. MFIs paid little attention to their cost efficiency because the cost of lending can always be passed on to borrowers, who are normally profitable and willing to pay high interest (Armendáriz & Morduch, 2010). We therefore study a possible trade-off between (low) default rates and (high) operating costs in the global microfinance industry. After all, modern microfinance has been successful in achieving high loan asset quality (Cull et al., 2009; Hulme & Mosley, 1996), but not cost efficiency.

Our motivation in investigating the claimed trade-off is linked to the high lending rates in the microfinance industry. The high operating costs force MFIs to increase their interest rates (Battilana & Dorado, 2010; Hardy et al., 2003), which harms the good reputation of microfinance (Bateman, 2010). Thus, reducing operating costs could mean reducing interest rates, which could bring some relief to the poor borrower. Moreover, an overemphasis on repayment performance may render MFIs unwilling to serve some of their target clientele – the most vulnerable ones (Amin et al., 2003; Pearlman, 2012).

Using a large global sample of MFIs, we find that the relationship between non-performing loans and cost efficiency is nonlinear (U-shaped), contrary to the evidence for a positive linear relationship reported in commercial banking studies. In particular, we find that an initial increase in non-performing loans improves cost efficiency while a subsequent increase worsens it. Our finding is consistent with two streams of research. The first is relationship banking, which suggests that creating and maintaining ties with clients is costly (Diamond, 1984; Petersen & Rajan, 1994) but that it enhances asset quality (Puri et al., 2017). The second stream relates to the theoretical arguments of Hughes and Mester (1993) and Berger and DeYoung (1997) that efficiency and loan defaults are positively related. For instance, exogenous events cause loan defaults, which warrant extra monitoring costs. On the other hand, poorly managed institutions end up having a large stock of non-performing loans.

Our finding is relevant to practice. Each MFI needs to strike a reasonable balance between its operational efficiency and risk. MFIs operating with too low credit risk could find it operationally useful to streamline their selection, monitoring, and collection activities or increase risk a bit by relaxing efforts devoted to these activities. This would allow them to serve more vulnerable clients, thereby enhancing their social outreach and at the same time remaining operationally sustainable. On the other hand, MFIs struggling with high non-performing loans could benefit from installing more strict screening, monitoring, and collection procedures. The challenge however is how to do strict client selection without screening out the poorest clients. This calls for a selection model that maximizes both institutional and client benefits. This is an avenue for future research.

It would also be interesting to rigorously investigate why learning effects are lacking among MFIs around the world. Is it that younger MFIs have up-to-date owners and the older ones are dependent on donors? Another important avenue for future research is an investigation into the cost drivers of an MFI. To date, there has been limited research on the cost structure of a typical microfinance institution. What is the most important

driver of operating costs in microfinance and how can digitalization help reduce such costs are questions that need to be addressed.

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