Banking Crises and the Performance of Microfinance Institutions

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Abstract

Research has shown that a banking crisis affects both the real economy and the financial sector. However, little is known about its effect on microfinance institutions (MFIs). We evaluate how banking crises, their severity, and the strength of government interventions are related to the sustainability and outreach of MFIs. We utilize panel data on 1,746 MFIs from 123 countries of which five had a banking crisis between 2004 and 2017 and estimate dynamic panel GMM and fixed effects regressions that accommodate temporal variations and unobserved MFI heterogeneity. The results show that MFIs that operate in countries with a banking crisis serve more and poorer borrowers and have better financial results. Exploring the real and the financial sector channels of impact transmission, we find that MFIs are resilient to a banking crisis to the extent that they are less embedded in the financial system and serve marginalized clients that operate in the semi-formal economy.

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1. Introduction

Microfinance institutions (MFIs) serve poor clients that lack access to traditional banking services. Like banks and other financial institutions, MFIs are vulnerable to system-wide financial stresses including banking crises. When a banking crisis hits a country and commercial banks curtail their lending, do microfinance institutions pick up the borrowers rejected by commercial banks, reduce credit to their traditional clients, or maintain "mission drift"-free operations? These questions are important as policymakers and socially oriented investors are looking for ways to protect the vulnerable while promoting economic growth (Tchakoute Tchuigoua, 2020). We provide the first evidence on how banking crises affect the outreach and financial sustainability of MFIs.

Numerous studies show that banking crises affect commercial banks and have negative effects on the rest of the economy (Teimouri & Dutta, 2016; Ongena, Smith, & Michalsen, 2003, Hausman & Johnston, 2014). Banking crises are associated with decreases in lending and investment and a subsequent decline in employment and output (Boyd et al., 2005; Chodorow-Reich, 2014; Dell'Ariccia et al., 2008; Furceri and Zdzienicka, 2012; Hoggarth et al., 2002; Ivashina and Scharfstein, 2010). As liquidity decreases, investments decline and bank-dependent borrowers, often smaller firms, suffer (Teimouri & Dutta, 2016; Chava and Purnanandam, 2011). A banking crisis-induced decline in lending activity (credit crunch) affects small and medium enterprises (Bonaccorsi di Patti and Sette, 2016; Deyoung et al., 2015) by leading to a decrease in small firms' access to credit (Popov and Udell, 2012).

Yet, Colombo et al. (2016) propose a different theory. They argue that losses in the real sector resulting from a banking crisis lead to a shift in economic activity from the formal to the

shadow economy, especially in developing countries. This shift may benefit lenders that serve such micro-entrepreneurs. There is indeed evidence that a banking crisis could have little to no effect on firms' welfare even though it affects banks (Ongena et al., 2003). Moreover, a banking crisis may even strengthen the capital positions of small banks with high quality capital and improve their chances of survival as well as help them capture market share (Berger and Bouwman, 2013; De Haas and Van Horen, 2013).

Country-specific characteristics likely contribute to the differences in the effects of a banking crisis. In developing and middle-income countries, where most MFIs operate, a banking crisis is associated with a contraction in deposits and a reduced credit supply (Chipalkatti et al., 2007). Banking crises affect relatively richer countries more because their investment and credit decline more than those in developing countries (Teimouri & Dutta, 2016). Less advanced economies have institutional environments that are less supportive of market discipline. During a banking crisis, however, market discipline weakens less in developing than in developed countries (Cubillas et al., 2012).

Is the effect of a banking crisis different from that of other types of financial distress? The global financial crisis of 2008 led to large financial losses in both banks and firms (Garcia Martinez et al., 2019; Hippler and Hassan, 2015; Sufian and Habibullah, 2010). It also decreased cross-border lending (De Haas and Van Horen, 2013) and credit lines (Berrospide et al., 2012; Cotugno et al., 2013) that led to a contraction in deposits, especially in retail and savings banks (Chipalkatti et al., 2007; Puri et al., 2011). The microfinance literature has evaluated how the global financial crisis of 2008 affected MFIs, which may help to anticipate the effects of a banking crisis. Wagner and Winkler (2013) find that credit growth in MFIs dropped sharply after 2008. Moreover, MFIs in countries with stronger institutions (more advanced financial systems) were more resilient to

the global financial crisis than those in countries with moderately developed financial systems. This resilience indicates that by creating an environment conducive to MFIs, governments play an indirect role in supporting MFIs' outreach and sustainability (Silva and Chavez, 2015). There is evidence that the microfinance sector in developing countries was insensitive to the financial crises of the 1990s (Cozarenco and Szafarz, 2020; Wagner, 2012) but as MFIs became more embedded in the financial system, this situation changed during the 2008 crisis (Brière and Szafarz, 2015).

Shocks to the real sector, including those associated with financial distress, also affect MFIs, which has important implications, including for the impact of the Covid-19 pandemic. Microfinance contracts rely on the promise of a future loan, on peer pressure, and on the social capital within a community to monitor and to enforce these contracts since the poor often do not have traditional collateral. Repayment problems among a few microfinance clients may quickly spread to many leading to a "borrowers' run" (Bond and Rai, 2009). Examples include Caja Los Andes in Bolivia between 1996 and 2000 (Vogelgesang, 2003) and since 2000s the cases of Indian MFIs (Guérin et al., 2011). Moreover, strategic interactions between MFIs and collateral-based lenders may cause defaults in MFIs and affect their sustainability (Bardsley and Meager, 2019)

Quayes (2015) highlights that during financial distress, there is a potential for trade-offs between the two dimensions of MFI performance – outreach and financial sustainability. As MFIs focus on maintaining their financial results, their outreach to the poor may suffer that leads to "mission drift" (Armendariz and Labie, 2011; Augsburg and Fouillet, 2013; Cull et al., 2009, 2007; Hartarska et al., 2013; Quayes, 2015).[1] While microfinance lending is pro-cyclical and driven by large commercial and regulated MFI lenders, non-regulated MFIs that serve more marginalized clients do not have pro-cyclical lending (Tchakoute Tchuigoua et al., 2020). Similarly, the 2008

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[1] Evidence to the contrary also exists but is not related to financial distress (Blanco-Oliver et al., 2016; Gonzalez and Rosenberg, 2006; Schicks, 2007)

financial crisis had a more adverse effect on the productivity of microfinance banks and non-bank financial institutions than on NGOs and cooperatives that serve poorer clients (Wijesiri, 2016). This effect means that a banking crisis may not have uniform effects across MFI types.

Thus, on the one hand, MFIs can be more resilient to financial distress than traditional banks (Wagner, 2012). On the other hand, in times of distress, mission drift can emerge if MFIs are unable to fund the financing needs of their most vulnerable and costliest clients. Therefore, systemic financial distress, and a banking crisis in particular, is likely to affect MFIs' performance in several different ways.

Our study is the first to offer insights on the effect of a banking crisis on the microfinance sector. In our evaluation, we account for the MFIs' double bottom line of outreach (serving more and poorer borrowers) and sustainability (covering costs and remaining profitable). This is important because the literature provides ample evidence of a trade-off between the outreach and the sustainability by showing that financial success may come at the expense of serving fewer and moderately poor clients. Next, we evaluate the effect of the severity of the banking crisis as well as of the measures to mitigate the banking crisis (e.g., liquidity support and the resulting increase in public debt). Further, as we need to control for the role of banking regulation, entry into banking, financial transparency, and deposit insurance as they should mitigate the effect of a banking crisis, we collect and update the latest deposit insurance and bank entry regulation data for all countries in our sample and provide insights on how the institutional environment affects MFIs.

We use the global Mixmarket dataset of 1,746 MFIs from over 123 countries for the period from 2004 to 2017 and complement it with data from Laeven and Valencia (2018), various macro indicators, and deposit insurance data from the World Bank database. Our analysis includes macro and financial system variables as well as MFI-specific characteristics. To ensure robust inference,

we estimate dynamic panel GMM and fixed effects regressions that accommodate temporal variations and inherent unobserved MFI heterogeneity that, if unaccounted for, can confound the estimates.

Overall, we find that MFIs operating in countries with a banking crisis serve more but poorer borrowers (with smaller loans) and improve their financial results. The severity of the crisis is important, and MFIs in countries with larger output losses have better financial sustainability, in addition to reaching more but poorer clients. These results do not support the hypothesis of a mission drift. However, we also find evidence that MFIs in countries with more stress in the financial system serve fewer and moderately poor borrowers but the magnitude of this effect is lower than that of the overall effect of a banking crisis. This is consistent with MFIs rationing their own micro borrowers or acquiring better quality borrowers who commercial banks presumably have rejected. Aggressive and costly government interventions are associated with service to fewer and less poor microfinance borrowers. We find emerging evidence that MFIs are becoming more embedded in the financial sector that makes them more vulnerable to financial distress.

The rest of the paper is organized as follows: We develop the hypotheses Section 2. In Section 3, we describe the empirical framework, while in Section 4 we describe the data. In Section 5, we discuss the results and conclude with a brief summary of the findings in Section 6.

2. Hypotheses Development

2.1. Outreach and Sustainability of MFIs During a Banking Crisis

Unlike banks, MFIs pursue a double bottom line—serving low-income and poor borrowers (outreach) while covering their cost (sustainability). MFIs' clients typically lack or have limited access to alternative loans and their desire to maintain a good standing with the MFIs may strengthen during a banking crisis. This may happen because access to alternative loans that might

have been within the reach of the more well-off MFI clients is no longer feasible. Thus, during a banking crisis the willingness of traditional MFIs' clients to repay their loans may improve, which would improve MFIs' financial sustainability.

Anecdotal evidence shows that, while the quality of loan portfolios in Russia decreased as a result of the 1998 debt default and consequent banking crisis, the quality of the portfolios of the microfinance units within the bank actually improved (Chava and Purnanandam, 2011). Pre-2008 evidence also shows that MFIs were resilient to major macro events such as crises in the domestic and the global financial markets (Gonzalez, 2007). Recently, however, MFIs have become more embedded in cross-border financing, either directly or indirectly via microfinance investment vehicles (MIVs). Closer integration with international financial markets can serve as a channel through which crises negatively affect MFIs' activities (Brière and Szafarz, 2015; Tchakoute Tchuigoua et al., 2020).

A related question is whether MFIs can pick up the slack left by commercial banks. Small businesses with access to commercial bank loans prior to a banking crisis may approach MFIs if rationed by commercial banks as there is an overlap between the smallest clients of banks and the largest clients of MFIs (Cozarenco and Szafarz, 2020). Such presumably better quality clients could improve the MFIs' profitability and possibly the breadth of outreach. Moreover, international donors focused on helping vulnerable populations may intervene during a crisis, and MFIs can either receive a direct capital infusion or otherwise benefit when their clients get direct help (Dokulilová et al., 2009). Since no previous work has evaluated how well MFIs do during a banking crisis, we test the following null hypothesis:

H1. A banking crisis is associated no effect on outreach and sustainability of

microfinance institutions.

We examine the effects on both outreach and sustainability because of the dual bottom line of MFIs. Outreach, however, has two dimensions—the breadth of outreach measured by the number of clients served and the depth of outreach measured by the poverty level of clients. A banking crisis can force MFIs to curtail lending to less poor borrowers, referred in the literature refers to as "mission drift." An influx of less poor borrowers, presumably rejected by commercial banks, could improve sustainability and possibly the breadth of outreach (H1). If, in turn, MFIs ration their smallest clients, the improved sustainability may be at the expense of the depth of outreach. This trade-off between the depth of outreach and sustainability indicates mission drift and means that MFIs operate more like banks.

The literature offers contradictory evidence both supporting the existence of mission drift (Armendáriz et al., 2011; Augsburg and Fouillet, 2013; Cull et al., 2009, 2007; Hartarska et al., 2013; Quayes, 2015) as well as refuting it (Gonzalez and Rosenberg, 2006; Quayes, 2020; Schicks, 2007). Thus, we test for the presence of mission drift with a hypothesis in its null form:

H2. Banking crises are not associated with mission drift in MFIs.

2.2 Crisis Severity and MFIs' Performance

Since not all banking crises are the same, evaluating the effect of their severity on MFI performance is important. A banking crisis affects MFIs through two channels. First, a banking crisis produces significant real output loss (Furceri and Zdzienicka, 2012) and a decrease in the industrial sectors' growth through lending channels (Dell'Ariccia et al., 2008). The slowdown of real economic activity results in a decline in aggregate demand that leads firms to cut investment and demand for credit, while the increase in uncertainty leads to reduced production and delay in investment and borrowing (Dell'Ariccia et al., 2008). Thus, the severity of a banking crisis strengthens the negative effect on the real economy that leads to larger output loss.

MFIs serve clients who operate in a semi-formal, shadow, or informal economy that banking crises typically affect to a lesser extent. In fact, Colombo et al. (2016) find in their cross-county empirical study that "the informal sector is a powerful buffer, which expands at times of banking crises and absorbs a large proportion of the fall in official output." Their model predicts that the informal sector absorbs about 60% of the official loss in output through output and employment increases. If that is the case, a more severe banking crisis would cause more severe output losses that in turn would hurt banks and their clients but would benefit MFIs serving the semi-formal sector. Thus, we formulate the following hypothesis:

H3. MFIs in countries where a banking crisis has induced larger losses of real output have better sustainability and better breadth and depth in their outreach.

This general format of the hypothesis, which is consistent with H1, implicitly facilitates the test for the contribution of mission drift to the severity of a banking crisis. This contribution would be the case if the estimated coefficient for ROA is positive that indicates better sustainability, while the estimated coefficients for the depth of outreach are also positive, which indicate MFIs serve less poor borrowers with smaller loans.

Another effect of the banking crisis is its damage to the banking sector. This is best captured by the level of nonperforming loans in the system with more severe crises resulting in higher level that is especially high in developing countries (Laeven and Valencia, 2020). Since MFIs are becoming more embedded in financial markets, this embeddedness can serve as a channel through which financial distress affects MFIs (Brière and Szafarz, 2015). Thus, severe losses in the banking sector could hurt MFIs, especially those operating as banks. The evidence that pro-cyclical lending drives microfinance banks also means a higher degree of vulnerability in the microfinance sector (Tchakoute Tchuigoua et al., 2020). Thus, we formulate the next hypothesis:

H4. MFIs in countries with more severe damage to the financial sector have worse

outreach and sustainability.

2.3 Government Interventions during a Banking Crisis and MFIs' Performance

Researchers and policymakers have devoted substantial effort to predicting banking crises and designing optimal policies to mitigate their economic effects (Laeven and Valencia, 2020). Liquidity support is the first and most common response to a banking crisis (Robatto, 2019), and the ability to provide it varies by country with high-income countries using more, and more sophisticated, instruments compared to low and middle income countries (Laeven and Valencia, 2010 & 2013). Policy interventions in the financial sector are important as they improve welfare by stimulating investment (Holmström and Tirole, 1998) and consumption (Lagos and Wright, 2005; Lucas and Stokey, 1987). In the context of our previous hypothesis on a trade-off between a better performing semi-formal sector served by MFIs and a formal sector most hurt by a banking crisis, evaluating whether the strength of the interventions help commercial banks have the opposite effect on MFIs is important.

Besides financial sector intervention, policymakers use fiscal policy to mitigate the economic consequences from a crisis but the evidence of their effectiveness is contradictory (Furceri and Zdzienicka, 2012; Laeven and Valencia, 2018). For example, support policies for banks that commit government resources to helping banks are associated with worse economic outcomes (Detragiache and Ho, 2010). Thus, costlier government support aimed at reducing the effect of the banking crises on real economic activities could shift the balance of economic activity away from the semi-formal sector and thus lead to worsening the MFIs' performances if a trade-off exists. Hence the next hypothesis:

H5. During a banking crisis, more aggressive and costlier support by the government to help commercial banks has a negative effect on the performance of MFIs.

2.4 An Enabling Environment for MFIs and Regulations

MFIs operate within a different regulatory environment in each country and that environment affects financial institutions' ability to function and deal with the consequences from financial and banking crises. Relevant regulations include entry requirements and restrictions, transparency requirements for financial statements, prudential regulation, as well as deposit insurance and supporting infrastructure such as private and public credit bureaus.

Regulators widely acknowledge that explicit deposit insurance is the most useful instrument in mitigating the effects of a banking crisis because it limits the flight of deposits and helps banks to access capital. The research shows that in turbulent times, deposit insurance decreases the risk and system fragility in the banking sector (Anginer et al., 2014; Liu et al., 2016). Recent work shows that banks in countries with explicit deposit insurance experienced smaller reductions in total lending and quicker post-2008 recovery. The banks that relied more on deposits benefited the most, and deposit insurance overall had a strong stabilization effect (Hasan et al., 2020; Ivashina and Scharfstein, 2010). But, since not all MFIs rely on deposits and many are loan-only MFIs, how deposit insurance might affect their performance is not clear.

Regulators and scholars rely on three pillars to improve bank stability as described in the Basel II's recommendations (Cubillas et al., 2012).[2] Pillar I includes capital requirements, which are less relevant to MFIs because much of their lending is without collateral. Pillar II is related to the official supervision power. Pillar III relies on market discipline (e.g., competition, credit ratings, and credit bureaus). Market discipline may have a limited role during a banking crisis because of

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[2] Basel II was effective during the study period.

interactions with safety nets such as deposit insurance (Cubillas et al., 2012). Overall, in the microfinance literature, there is a consensus that a transparent and inclusive regulatory framework and an conducive environment are essential for MFIs to maintain market specialization and to pursue sustainability (Gallardo, 2002; Hartarska and Nadolnyak 2007; Cull et al., 2011). Therefore, our last hypothesis is:

H6. Environmental factors such as supportive infrastructure, regulatory requirements, and deposit insurance affect the outreach and sustainability of MFIs.

3. Empirical Analysis

3.1. Framework

We estimate to what degrees a banking crisis, its severity, and government support of the banking sector affect the outreach and the sustainability of MFIs. We follow the microfinance literature that specifies performance as a function of MFI-specific, economy-wide, and institutional factors as well as the regulatory framework (Hartarska, 2005; Hartarska and Nadolnyak, 2008, 2007; Mersland and Strøm, 2009; Wagner and Winkler, 2013). From the perspective of an MFI, a banking crisis is an exogenous event with a varying degree of severity because an MFI finds itself in a country with or without a banking crisis. MFIs are too small to be part of the cause of the banking crisis and about half of them are credit only (Malikov and Hartarska, 2018). The basic specification is:

$$Performance_{ijt} = \alpha + \beta * Banking\_Crisis_{jt} + \qquad\qquad (1)$$

$$\gamma\ Banking\_Crisis_{jt} * Its\_Severity_{jt} + \delta Banking\_Crisis * Interventions_{jt}$$

$$+ \alpha' MFI_{ijt} + \beta' Banking\_Regulations_{jt} + \gamma' Financail\_System\_Controls_{jt}$$

$$+ \delta' Macro\_Controls_{jt} + \eta_{ij} + \varepsilon_j + \varepsilon_t + u_{ijt}$$

where $Performance_{ijt}$ is the indicators of MFI i in country j at time t. $Bank\_Crisis_{jt}$ denotes a dummy variable measuring the effect of a banking crisis at time t on country j. Here, η_{ij} is the MFI-specific fixed effect, ε_j and ε_t are the country and year fixed effects used to control for unobservable persistent country- and year-specific effects, and u_{ijt} is the normally distributed random error term.

3.1.1 Dependent Variables

Since MFIs have the dual objective of reaching poor borrowers while covering costs, we use measures for MFI performance that are standard in the literature (e.g., Strøm et al., 2014; Parmeter and Hartarska, forthcoming). *Sustainability* is measured by the returns-on-assets ratio (ROA), *Breadth of Outreach* by the log of the number of active borrowers, and the *Depth of Outreach* is measured by the average loan size scaled by the country's GNI per capita.

3.1.2 Independent Variables

Banking Crisis and Its Severity. First, we use a simple dummy variable *Banking Crisis_{jt}* that equals one if country *j* had a banking crisis in year *t* and zero otherwise. We capture the severity of the banking crisis by using the measures developed by Laeven and Valencia (2018) that are effectively interactions of the banking crisis dummy and its severity measures because they do not have values during a non-crisis period.[3] The first measure of bank crisis' severity is the *Output Loss* associated with it that we compute as the deviations in the actual GDP from its trend.[4] Next, Laeven and Valencia (2020) argue that for low and middle-income countries where

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[3] Except for output variables – GDP in real terms serves as a macro control.
[4] Laeven and Valencia define deviation as "Output losses are computed as the cumulative sum of the differences between actual and trend real GDP over the period [T, T+3], expressed as a percentage of trend real GDP, with T the starting year of the crisis. Trend real GDP is computed by applying an HP filter (with λ=100) to the log of real GDP series over [T-20, T-1] or the longest available series as long it includes at least four pre-crisis observations. Real GDP is extrapolated using the trend growth rate over the same period. Real GDP data come from the fall 2017 WEO."

most of the MFIs operate, the sharp deterioration in asset quality of banks is mostly reflected in the peak of nonperforming loans, which is our second measure of the severity of the banking crisis (*Peak_NPLs*). It captures the severity of the pain in the banking sector and is used to test the third hypothesis.

Banking Crisis and Government Interventions. Since a country's policy response to bank distress typically is to deploy liquidity support to the banking sector, we use the measure of liquidity support proposed by the Laeven and Valencia (2018). *Liquidity Support* is the difference between the peak and the average of the liquidity support ratio during the year before the start of the crisis. The fiscal costs of the government support are also important, and we use a broad measure of the fiscal cost, *Increase in Public Debt*, that is the difference between pre- and post-crisis debt projections.

MFI Specific variables. This group includes variables typical to the MFI literature (e.g., Malikov and Hartarska, 2018; Zamore et al., 2020). Specifically, we use (1) the age of the MFI captured by three dummy variables (*New* for MFIs up to three years old, *Young* for between four and seven years old, and *Mature* for above eight years old), (2) *Size* of the MFI measured by the logarithm of total assets, (3) *Capital-to-Asset* ratio to capture the leverage, (4) the ratio of deposits to assets to capture MFIs ability to attract deposits[5], (5) the gross loan portfolio to assets ratio to measure the focus on lending, and (6) the percentage of loans overdue by more than 30 days to measure risk. As the microfinance literature recognizes the role of regulation, we include a dummy

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[5] This is helpful because not all MFIs collect deposits and some only lend and because, although many are able to collect deposits, deposits still represent a limited part of the liability structure as many MFIS rely on (soft) loans and subsidies.

that equals one if an MFI is regulated and zero otherwise (Cull et al., 2011; Hartarska and Nadolnyak, 2008).[6]

Banking Regulations. The banking regulation variables measure requirements for entry into banking and financial transparency following Barth et al. (2004) and Cubillas et al. (2012). We use the latest round of the World Bank Survey to update these variables as the published research uses data that end in 2012.[7]

Financial System Controls. Since deposit insurance helps prevent bank runs and ameliorates the negative effects of a banking crisis, we include a dummy variable that measures whether a country has deposit insurance. As competition affects borrowers' runs and the competitive advantages of MFIs, we use the variable *Commercial Bank Branches* per 100,000 adults to reflect the level of competition between MFIs and regular banks. We also include the levels of coverage by public and private credit bureaus because they affect the quality of borrower screening by both banks and the MFIs (Malikov and Hartarska, 2018). Finally, we use a measure of the depth of the banking system, *Broad Money*, that is a percentage of GDP.

Country Characteristics. This group includes the log of GNI to capture the size of the economy, *GDP per capita* (both in PPP values), to measure the level of economic development, annual *GDP Growth* to measure the growth rate of the economy and urban population, and consumer price inflation. The variable *Control of Corruption* is included to capture the quality of the countries' institutions. We control for the influence of the 2008 global financial crisis by including year dummies and setting 2008 as the omitted variable for the group. This year variable

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[6] Both deposit and loan-only MFIs can be subject to a variety of prudential and non-prudential regulations and while there is not much consistency across countries, the dummy created by the Mix owners is the most popular in the microfinance literature.

[7] We are restricted in terms of what variables we can use because the latest dataset provided by the WB does not contain some original variables used in Barth et al. 2004.

facilitates the direct comparison of the coefficients in the years before and after the financial crisis to the base year of 2008.

3.2 Estimation Strategy

We use a dynamic panel system GMM as well as a two-way fixed effects method and cluster the errors at the country level to control for heterogeneity and fixed effects. The GMM picks up a possible dynamic relation between past performance (outreach or financial sustainability) and the current values of any explanatory variables (Athanasoglou et al., 2008; Wintoki et al., 2012). The two-step GMM is comprised of a system of two equations: the level equation and the transformed equation (Cubillas et al., 2012; Roodman, 2009a, 2009b; Windmeijer, 2005; Wintoki et al., 2012). This approach offers a way to accommodate the combination of a short panel, a dynamic dependent variable, fixed effects, and a lack of good external instruments.[8]

This empirical approach allows us to address three relevant econometric issues. The first is the presence of unobserved MFI-specific, country, and fixed effects. The fixed effect estimation method that we use as a robustness check addresses these concerns. The GMM dynamic panel model also eliminates the fixed effects. In addition, it can address a second issue—the possible dynamic relation among the explanatory variables. We include two lags of dependent variables to capture the persistence of the relation. The third issue is the lack of good external instruments. The dynamic panel estimator uses the MFI's history as instruments for the explanatory variables (Wintoki et al., 2012). Time dummies are included when the autocorrelation test and the robust estimates of the coefficient standard errors assume no correlation across individuals in the

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[8] We use the forward orthogonal deviations (FOD) transformation proposed by Arellano and Bover (1995) instead of first differencing to remove the fixed effects. The first-difference transformation applied to the estimators magnifies any gaps in the data as one period of missing data is replaced with two missing differences. Thus, our approach preserves the sample size in our unbalanced panel data with gaps.

idiosyncratic disturbance. The time dummies make this assumption more likely to hold (Roodman, 2009a).

4. Data

The dataset is assembled from several sources. Individual MFI data come from the MIX MARKET dataset now freely available via the World Bank's data depository platform. These data consist of over 1,746 MFIs (over 9,155 annual observations) from 123 countries for the period from 2004–2017. The banking crisis data come from the most comprehensive dataset on banking crises assembled by Laeven and Valencia (2018 & 2020). Data on the financial system and macroeconomic variables come from the World Bank's World Development and Worldwide Governance Indicators database. The variables of *Entry into Banking Requirements* and *Financial Transparency* are constructed following Barth et al. (2013) by using several rounds of survey data from the Bank Regulation and Supervision Surveys by the World Bank.[9] We use data on mandatory deposit insurance from the World Bank dataset. Since it ended in 2013, we updated it to 2016 with data from the International Association of Deposit Insurers (IADI, 2019).[10]

In the literature, a banking crisis is identified in two ways. In the first approach, it is defined through a narrative (Bordo et al., 2001; Caprio and Klingebiel, 2003; Demirgüç-Kunt and Detragiache, 2005; Laeven and Valencia, 2013; Reinhart and Rogoff, 2009; Schularick and Taylor, 2012). In the second approach, which we use, a banking crisis is identified with real-time quantitative measures of banking distress. This approach overcomes potential biases from the backward-looking accounts in the first definition (Romer and Romer, 2017). We use the systemic banking measurement data by Laeven and Valencia (2013, updated in 2018) as it is the standard

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[9] *Entry into Banking Requirements* measures restrictions on the entry of banks with higher values that indicate greater stringency. The variable *Financial Transparency* measures the transparency of bank financial statements in which higher values indicate better transparency.

[10] Available at https://www.iadi.org/en/deposit-insurance-systems/dis-worldwide/.

reference for banking crises worldwide and covers all episodes during the period from 1970–2017. [11] It contains quantitative measures of the bank crisis: its duration, its severity, the government interventions, and the fiscal cost. Table 1 summarizes the definitions of the variables.

In Table 2, we present the five countries with fully-fledged banking crises that were recorded between 2004 and 2017: Dominican Republic (2 MFIs in 2004), Kazakhstan (9 MFIs in 2008), Nigeria (35 MFIs during 2009-2012), Russia (83 MFIs during 2008-2009), and Ukraine (2 MFIs during 2008-2010 and 2014-2015). In total, we have 174 observations from 131 MFIs operating under a crisis in those five countries. MFIs differ by organizational type and each type is well represented in the sample of MFIs in a country with a banking crisis. For example, there were 36 microfinance banks, and the rest were from Credit Unions (71), Non-bank financial institutions (16) and NGOs (8). Thus, the actual realizations of banking crises show the impact on a good mix of MFI types from different regions of the world.

Table 3 presents the summary statistics of the dependent and independent variables. The data also show that MFIs operating in countries with a banking crisis were on average smaller than those in countries without a banking crisis making direct comparison of the average performance less informative. The ROA of MFIs in countries with a banking crisis was higher than that in MFIs in countries without a crisis and differed by MFI type. An MFI in countries without a banking crisis had reached on average 95,568 clients, while an MFI in countries experiencing a banking crisis reached on average only 14,021 clients and the loans were also smaller. The distribution by MFI type shows that microfinance banks were larger than non-banks, serving 28,780 vs. 8,717 borrowers on average. Comparison of the *Depth of Outreach* shows that microfinance banks

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[11] Specifically, Laeven and Valencia (2018) define a banking crisis as a situation that meets two conditions: 1) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations) and 2) significant policy intervention in the banking sector in response to significant losses.

served relatively less poor clients while non-banks served the poorest borrowers. Since the period of our analysis also contains the 2008 financial crisis, we illustrate the dynamics of the ROA, NAB, and Depth in Figure 1 that shows a fairly quick recovery of ROA and NAB and, in the case of *Depth of Outreach*, recovery within several years.

5. Empirical Results

The results from the GMM and fixed effects regressions are presented in three tables—one for each of the performance measures.[12] Table 4 contains the regression results in which the ROA (the measure of sustainability) is the dependent variable. Table 5 contains the results in which the log of the number of active borrowers (measure of breadth of outreach) is the dependent variable, and Table 6 presents the results from the regressions in which the average loan size is scaled by a country GNI (a measure of the depth of outreach) that is the dependent variable. Within each table, we present four specifications. The first two columns in each table contain the results from the system GMM, while the last two columns show the results for the fixed effects. There are two specifications within each method because we have a limited number of observations for the two important controls–stringency measures of the banking entry regulations (*Entry_Banking_Requirement*) and of the level of financial transparency (*Financial Transparency*) due to missing survey data from the World Bank for some countries. Thus, the second and fourth columns serve as additional robustness checks. We organize the discussion of the results by reviewing each of the dependent variables per hypothesis. Such presentation facilitates an

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[12] In support of the GMM as the lead model, we find that the coefficients for the lagged *ROA*, *NAB*, and *Depth* are significant in supporting the GMM specification. The tests for *AR(2)* and the Hansen J test of over-identifying restrictions are not significant. Thus, we could reject the hypothesis that there is no serial correlation and used two lags of the dependent variables. Both GMM and fixed effects produce qualitatively similar resuls.

understanding of the results in the context of the dual bottom line objective of the MFIs: achieving outreach and remaining profitable.

5.1. Outreach and Sustainability of MFIs During a Banking Crisis

The first hypothesis that we test is that the outreach and sustainability of the MFIs operating in a country with a banking crisis remain unaffected or improve. The evidence comes from the estimated coefficients for the banking crisis dummy in the regressions where the dependent variables are the sustainability indicator (ROA) presented in Table 4 and the outreach indicators in Tables 5 and 6.[13]

The key finding from our analysis is that a banking crisis is associated with improvement in a MFI's financial sustainability. An MFI in a country with a banking crisis has a 0.115 (0.08) higher ROA according to the GMM (fixed effects). Moreover, the results in Table 5 show that a banking crisis is associated with a larger number of borrowers with an average increase of about 0.3%–0.4%. The ability to reach more borrowers during the crisis is likely attributable to more clients attracted to MFIs that supports the idea that the semi-formal sector does well during a banking crisis and that MFIs who serve these borrowers also do well (Colombo, 2016). These results confirm the first hypothesis that during a banking crisis MFI do better, possibly because they are closely related to the shadow economy.

An alternative explanation for this result is that the microfinance sector attracts the borrowers rejected by commercial banks. We investigate this next in the context of the "mission drift" hypothesis. A "mission drift" can exist if MFIs in countries with a banking crisis extend larger loans presumably to less poor borrowers. Such a situation can indicate that some borrowers rationed of commercial banks, were served by the microfinance sector.

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[13] The Banking crisis dummy captures effects that may not be measured by the severity of the banking crisis, thus it should be included in addition to the several measures of the severity of the banking crisis.

The results do not support this conjecture. In Table 6 with *Depth of Outreach* as the dependent variable, the estimated coefficient for the banking crisis dummy is negative and between -1.232 and -1.361 in all four specifications. As *Depth of Outreach* is measured by the average loan size that is scaled by per capita GNI, larger values indicate less poor borrowers. Thus, a banking crisis is associated with MFIs serving poorer borrowers who are seeking loans that can be as small as only several hundred dollars.

5.2. Bank Crisis Severity and MFI Performance

The effect of the severity of the banking crisis is measured by the changes in the real sector (*Output_Loss)*, and by the effect on the banking sector (*Peak_NPLs*). We find that these two measures have opposite effects and that the effects are much smaller than those for the dummy variable.

First, consistent with the result of the overall effect of a banking crisis, we find that MFIs in countries where the crisis had stronger effect on the real economy had better sustainability. A 1% higher deviation from the GDP trend is associated with a 0.001–0.003% higher ROA, which is a relatively small magnitude. For example, if an MFI operating in the Dominican Republic with the lowest output loss (12.49%) were to operate in the Ukraine with the highest loss of output (93.23% during its second banking crisis of 2014–2015), this MFI's ROA would be higher by 0.081%, in addition to the 0.11% overall effect of the crisis. The result supports our third hypothesis that a more severe banking crisis with higher losses in real output may improve demand for loans in the semi-formal sectors served by MFIs that thus, improves sustainability and outreach. Indeed, we also find that MFIs in countries with higher losses in real output during a banking crisis served more and poorer borrowers (coefficients between 0.014% and 0.013% in Table 5, and -

0.049–0.051% in Table 6 according to the GMM).[14] These results reject the idea that a more severe real output loss is associated with mission drift as the new loans are of smaller size and presumably go to less wealthy borrowers.

However, the severity of the crisis' impact on the banking sector itself has a very different effect on the microfinance sector. Higher values of peak nonperforming loans (*Peak_NPL* that is measured as a percentage of total loans) indicate more hardship in the banking sector. The results show that higher nonperforming loans ratio is associated with worse sustainability and worse breadth and depth of outreach.[15] An increase in the *Peak_NPLs* by 1% is associated with decreases in ROA by 0.003% and in active borrowers by 0.008%, and also with a decrease of their poverty level (columns 1 in Tables 4–6). Thus, if an MFI in the Dominican Republic (lowest *Peak_NPLs* of 9) were to operate in the Ukraine (largest *Peak_NPLs* of 54), the ROA would decrease by 0.12%, which is about the effect of the crisis dummy. Similarly, the breadth of outreach would decrease by 0.3% that would eliminate the effect of the banking crisis dummy (yet the effect of the real sector loss of output would remain). There may be two explanations for the negative results for sustainability and outreach. First, some of the borrowers that were rejected by commercial banks may have approached MFIs that in turn, rationed their own traditionally poorer borrowers with net negative results because the incentives to repay a loan are very different in MFIs and in banks. Alternatively, it may be that MFIs behaved just like banks and rationed their own smallest micro borrowers.

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[14] The resulting increase from the smallest output loss to the highest would be 80.79*0.014 =1.12% higher in addition to the dummy effect of 0.4%. The result of depth is similar in magnitude.

[15] The countries in our sample were all low and middle income countries for which, according to Laeven and Valencia (2018), the median peak NPL is 30%. In our sample, we have significant variations with the Dominican Republic at 9% PNL while Ukraine in 2014 had 55%.

Thus, on the one hand, we find evidence that more severe losses in the real economy help MFIs, which is consistent with Colombo et al. (2016). On the other hand, we also find evidence that, when the banking sector experiences higher default rates, outreach and sustainability in the microfinance sector worsen. This is consistent with the argument by Brière and Szafarz (2015) that at least some MFIs (e.g. microfinance banks) are embedded in the financial system and therefore more vulnerable to shocks to the financial system.

5.3. Government Intervention during a Banking Crisis and Performance of MFI

Our fifth hypothesis posits that aggressive government interventions to support banks (via *Liquidity_Support*) and the costs of these interventions *(Increase_in_Public_Debt)* are inversely related to the performance of MFIs. In general, our results support this hypothesis. For example, while a higher level of liquidity support leaves the ROA unaffected, it is associated with MFIs serving fewer (only for the fixed effects specifications in Models 3 and 4 of Table 5) and less poor borrowers (Table 6). Similarly, costlier government interventions that increase the public debt are associated with lower ROA, lower outreach, and serving less poor borrowers. A 1% increase in public debt (from its projected trend) is associated with a 0.003% lower ROA, a -0.015% fewer borrowers, and a 0.087% increase in the depth of outreach (Model 1 in each of the tables). Using the example of differences between the Dominican Republic and Ukraine, this increase corresponds to a 0.04% decrease in ROA and -0.54% fewer borrowers, who in turn would be less poor.[16] These results show that governments' actions to ameliorate the effect of a banking crisis by providing liquidity support helps banks but has the opposite effect on MFIs' performance, which supports our fifth hypothesis.

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[16] 53.4 UKR -16.59 DR = 36.99. Thus, 36.99*(0.003) =0.04 and 36.99*(-0.015)=-0.54

Therefore, the overall effect of a banking crisis should be evaluated based on its specific characteristics and depends on the actual losses in the financial and real sectors, as well as the government interventions. In the case of comparison between an MFI in the Dominican Republic during their banking crisis and one in the Ukraine during their second crisis of 2014-2015, the overall net results (estimates of the dummy and the relevant interaction coefficients) would still be a 0.36% increase in ROA and a 1.05% increase in borrowers with smaller size loans.

5.4 A Conducive Environment for MFIs and Regulations

We find only a very limited role for a conducive environment that is consistent with Mathonnat and Minea (2018) who find that very few measures of financial development help in understanding a banking crisis. The performance of MFIs is unaffected by the presence of deposit insurance as the dummy is only significant in one of the 12 specifications – the depth of outreach regressions with fixed effects. Consistent with Yang et al. (2018), the benefits of deposit insurance may be other than mitigating a banking crisis' effects.[17] Similarly, evaluation of the role of competition as measured by the number of bank branches per 100,000 people shows no effect except in one fixed effects model in the depth regressions. This non-effect indicates that competition forces MFIs to serve less poor borrowers. Furthermore, the system GMM results show that the stringency of the banking entry regulations does not affect ROA or outreach; but a fixed effects model with interaction terms shows that during a banking crisis, MFIs in countries with more stringent banking entry regulations have better ROA (by 0.04%), while extending smaller loans.

The level of the financial transparency in a country is associated with MFIs being able to reach more borrowers, but they are less poor. Yet the results from a model with interactions between the crisis dummy and financial transparency show that MFIs in countries with a banking

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[17] Since all countries with a banking crisis had deposit insurance, interaction terms cannot checked.

crisis have worse ROA and serve less poor borrowers.[18] The level of coverage by public credit bureaus is associated with MFIs serving more and poorer borrowers that indicates government support for such services improves financial inclusion, while the coverage by the private sector bureaus is associated with only serving more borrowers, which is consistent with Guérineau and Léon (2019) who find that sharing credit information in developing countries improves the quality of portfolios. Yet, during a banking crisis, a higher level of coverage by credit bureaus (especially by public register) is associated with lower ROA.

5.6 The Effect of Other Control Variables

Overall, the effect of controls is consistent with the findings in the literature. Of particular interest is how the performance of MFIs was affected by the 2008 global financial crisis. We find that during the years from 2004–2007 MFIs were reaching more borrowers (NAB) relative to the years of the financial crisis, and the years from 2009–2017 were associated with a lower NAB than during the 2008 global financial crisis that indicates a lingering effect. In terms of ROA, in the years prior to 2007 (2004–2006), MFIs had a higher average ROA (by 0.015%). After the financial crisis, ROA decreased by only -0.008% in 2009 relative to 2008. Thus, our results are in line with the studies that show the 2008 financial crisis's effect was visible through restricting the growth of MFI's portfolios – outreach (Wagner and Winkler, 2013).

5.7 Microfinance Banks

Since the literature shows that the integration in the financial sector occurs through microfinance banks (Brière and Szafarz, 2015; Tchakoute Tchuigoua et al., 2020), we interact them with the severity of the banking crisis to check if these MFIs behave differently than other types. The results (available on request) show that higher levels of output loss, as well as costlier interventions

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[18] Regression results for the interactions between a banking crisis and these variables are available on request.

(public debt increase), are associated with a mission drift—microfinance banks show a better ROA and serve fewer borrowers who are less poor. An increase in the stress on the banking sector is associated with serving less poor borrowers only. More aggressive liquidity support hurts microfinance banks' ROA and breadth of outreach. Thus, consistent with the literature, to the extent that microfinance banks are embedded in the financial system, they drift away from their mission during a banking crisis.

6. Conclusions

In this manuscript, we evaluate how a banking crisis and its severity and related government interventions and their costs affect the sustainability and outreach of microfinance institutions (MFIs). We analyze a dataset of over 1,746 MFIs with 9,155 annual observations in 123 countries for the period from 2004–2017 by using dynamic panel GMM and fixed effects regressions that are clustered at the country level. We find that, during a banking crisis, the microfinance sector overall is able to maintain and even improve its financial sustainability and outreach. Thus, we conclude that, overall, a banking crisis does not lead to mission drift as long as the sector remains diverse and is not dominated by microfinance banks.

While the overall effect of a crisis is large and important, we also find that the effect of its severity and the aggressiveness of the government interventions and their cost affect the financial sector in a non-uniform fashion. Our evidence supports the idea that, when a banking crisis is accompanied by higher loses in the real sector, MFIs are able to benefit by serving more and poorer borrowers that improves their financial results. This is consistent with the findings of Colombo et al. (2016) that the semi-formal sector serves as a buffer during a banking crisis and that MFIs serving this sector benefit from a financial crisis. However, we also find that MFIs' performance worsens with the increase in the nonperforming loans in the banking sector that indicates MFIs are

to some extent embedded in the financial sector, which is consistent with the observation by Brière and Szafarz (2015). This is also consistent with the observation that some MFIs (microfinance banks) engage in pro-cyclical lending (Tchakoute Tchuigoua et al., 2020). In this respect, we find evidence of potential mission drift in MFIs that extend larger loans either by rationing their own smallest "micro" clients or by serving clients rejected by the commercial banks during crises with more severe financial pain in the banking sector. However, overall, we observe that the severity of the crisis' effect in the past is not large enough to offset the main result that a banking crisis is usually associated with better performance of MFIs. Finally, we find that the effort and the cost that governments incur to ameliorate the effect of a banking crisis by providing liquidity support to help banks has the opposite effect on MFIs.

Our results have important policy implications. First, we demonstrate that MFIs remain resilient to distress in the financial sector, mostly to the extent that they are able to continue to serve marginalized clients that operate in a semi-formal economy (Colombo et al., 2016; Tchakoute Tchuigoua et al., 2020). Second, we find some emerging evidence that, as MFIs become more embedded in the financial sector and transform into microfinance banks, they also become more vulnerable to the negative effects of a banking crisis. Thus, policymakers, donors, and investors should understand that encouraging commercialization of the microfinance sector comes with added fragility and the cost of a possible mission drift. Therefore, if outreach and preventing mission drift remain important policy objectives, stakeholders should be prepared to intervene to help commercial MFIs in a time of a banking crisis. Moreover, it may be valuable to devise mechanisms that can quickly be deployed during a banking crisis to prevent the damage that it can create, rather than waiting until the next crisis hits banks and MFIs and then reforming the supporting institutions (Andersson, 2016).

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Table 1. Variables Definitions

Dependent variables		Original Sources
ROA	Return on assets measures how well the MFI uses its total assets to generate returns.	www.mixmarket.org
Ln_borrowrers	Logarithm of the number of current borrowers that measures the number of individuals that currently have an outstanding loan balance with the MFI or are responsible for repaying any portion of the gross loan portfolio.	www.mixmarket.org
Depth	Average loan balance per borrower / GNI per capita	www.mixmarket.org
Independent variables		
Banking crisis and other measures [19]		
Banking_Crisis	A dummy that equals one if the country suffers a banking crisis	Laeven & Valencia (2020)
Output_Loss	The cumulative sum of the differences between the actual and trend real GDP over the period [T, T+3] in percent	Laeven & Valencia (2020)
Peak_NPLs	Peak nonperforming loans in percent of total loans	Laeven & Valencia (2020)
Financial sector intervention (Liquidity)		
Liquidity_Support	Liquidity support directly provided by the Treasury normalized by the total deposits and bank liabilities to non-residents, %	Laeven & Valencia (2020)
Macro-policies (Fiscal Costs)		
Increase_in_public_debt	The change in debt projections, over [T-1, T+3], relative to the pre-crisis debt projections, %.	Laeven & Valencia (2020)
MIF characteristics		
Capital_to_Asset	Ratio of capital to total assets	www.mixmarket.org
Size	The total assets of the MFI ($100 million) include all assets net of contra asset accounts, such as the loan loss reserve and accumulated depreciation	www.mixmarket.org
Age	Categorized by the number of years since inception:	www.mixmarket.org
Mature	A dummy that equals one if MIF is mature (age>7 years)	
New	A dummy that equals one if MIF is new (age<=3 years)	
Young	A dummy that equals one if MIF is young (age 4-7 years)	
Deposits_to_Assets	Ratio of saving/savings to total assets	www.mixmarket.org
GLP_to_Assets	Ratio of gross loan portfolio (loans outstanding) to total assets	www.mixmarket.org
PAR_30	Portfolio-at-risk > 30 days	www.mixmarket.org
Regulated	A dummy that equals one if MIF is regulated by a government regulatory agency	www.mixmarket.org
Bank	A dummy that equals one if the MIF's legal status is bank	www.mixmarket.org
Banking regulation index		
Entry_bank_requirements	Entry into banking requirements	Bank Regulation and Supervision Survey
Financial_transparency	Financial Statement Transparency	Bank Regulation and Supervision Survey

[19] Other measures' definitions of banking crisis are from Laeven and Valencia (2018)

Financial system characteristics		
Deposit_insurance	Dummy equals one if country enforced explicit deposit insurance	World Bank & IADI[20]
Broad_money	Broad money (% of GDP)	World Bank's World Development
Bank_branches	Bank branches per 100,000 adults	World Bank's World Development
Private_credit_bureau_coverage	Private credit bureau coverage (% of adults)	World Bank's World Development
Public_credit_registry_coverage	Public credit registry coverage (% of adults)	World Bank's World Development
Country characteristics		
GNI	GNI, PPP (constant 2011 international $)	World Bank's World Development
GDP_growth	GDP growth (annual %)	World Bank's World Development
GDP_per_Capita	GDP per capita (constant 2010, $'000)	World Bank's World Development
Inflation	Consumer prices (annual %)	World Bank's World Development
Urban_population	Urban population (% of total population)	World Bank's World Development
Control_of_corruption	Control of corruption	Worldwide Governance Indicators database

Note: T is the starting year of the crisis.

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[20] IADI: International Association of Deposit Insurers

Table 2. Summary Statistics

VARIABLES	No crisis	No crisis	Crisis	Crisis
	Mean	Std. Dev.	Mean	Std. Dev.
Observations with data	9,155		174	
Dependent variables				
ROA	0.0109	0.106	0.0164	0.104
NAB	95,568	440,448	14,021	50,776
Depth	0.609	1.316	0.496	0.748
Independent variables				
Crisis measures, its severity & interventions				
Output_Loss* Banking_crisis			4.836	11.39
Peak_NPLs* Banking_crisis			17.09	10.92
Liquidity_Support* Banking_crisis			24.55	6.917
Macro-policies (Fiscal Costs) Increase_in_public_debt* Banking_crisis			8.066	6.250
MFI characteristics				
Capital_to_Asset	0.307	0.259	0.253	0.240
Size (million)	78.68	296.67	27.473	180.896
Age (%)	Percent		Percent	
1 Mature (age>7)	76.77		37.93	
2 New (age<=3)	8.03		31.61	
3 Young (age 4-7)	15.2		30.46	
Deposit_to_Assets	0.235	0.292	0.526	0.341
GLP_to_Assets	0.784	0.433	0.768	0.213
PAR_30	0.068	0.143	0.122	0.179
Regulated MFI (%)	65.44		90.23	
Bank (MFI type %)	9.65		26.44	
Banking regulation index				
Entry_bank_requirements	7.419	1.118	7.947	0.225
Financial_transparency	5.247	1.007	4.939	1.479
Financial system characteristics				
Deposit_insurance (%)	75.47		98.85	
Broad_Money (million)	71.57	1,643.26	37.86	9.871
Bank_Branch	12.9	12.5	5.6	1.8
Private_credit_bureau_coverage	28.40	31.51	10.19	6.747
Public_credit_registry_coverage	8.974	13.64	0.236	2.051
Country characteristics				
GNI (trillion)	1.043	1.922	2.174	1.186
GDP_growth	6.799	44.26	2.783	5.326
GDP_per_capita	7,863	5,504	16,844	7,631
Inflation	6.07	4.45	15.52	9.46
Urban_Population	52.28	20.34	64.63	12.98
Control_Corruption	-0.564	0.392	-1.095	0.0870
Country/MFI id	97/1677	97/1677	5/131	5/131

Table 3. Banking Crisis Summary across Countries

Country Name	Year/ Freq	No. of MFIs	Freq/Obs	Freq Percent
Dominican Republic	2004 (2)	2	2	1.15
Kazakhstan	2008 (9)	9	9	5.17
Nigeria	2009(8), 2010(10), 2011(18), 2012(9)	35	45	25.86
Russia	2008 (83), 2009(27)	83	110	63.22
Ukraine	2008 (2), 2009(2), 2010(2), 2014(1), 2015(1)	2	8	4.60
Total		131	174	100.00

Note: No. of obs. of MFIs with banking crisis is 174, totally observations is 9,155. The percentage of obs. of banking crises is 174/9155=1.90%
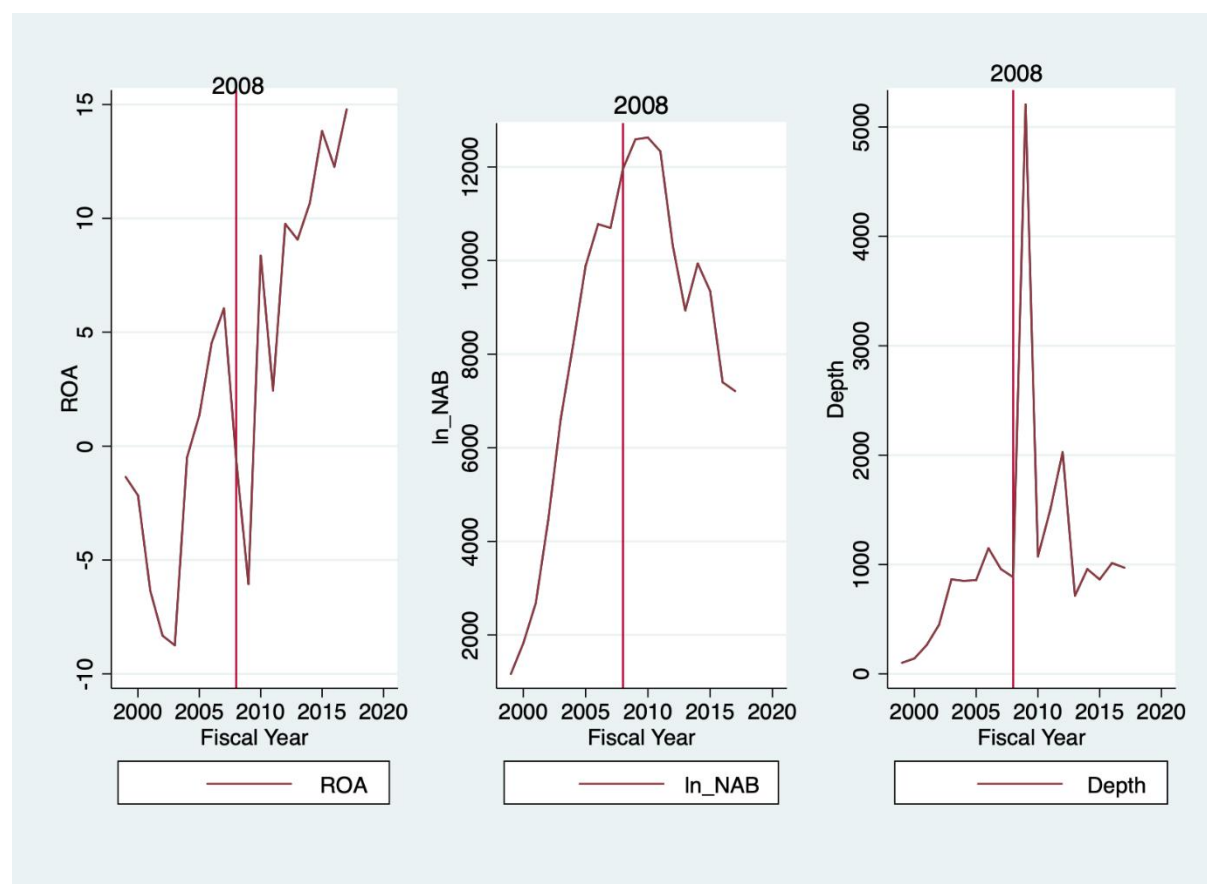

Figure 1. The trends of ROA, NAB, and Depth of MFIs

Table 4. Return on Assets (Sustainability) GMM and Fixed Effects Regressions

VARIABLES	(1)	(2)	(3)	(4)
	Dynamic System GMM		Static fixed Effect	
Banking Crisis, its Severity & interventions				
Banking_crisis	0.115*	0.085	0.081***	0.050***
	(0.062)	(0.064)	(0.013)	(0.013)
Banking_Crisis* Output_Loss	0.002**	0.001*	0.003***	0.001***
	(0.001)	(0.001)	(0.0003)	(0.0002)
Banking_Crisis *Peak_NPLs	-0.003**	-0.002*	-0.002***	-0.001***
	(0.001)	(0.001)	(0.0002)	(0.0003)
Banking_Crisis * Liquidity_Support	-0.001	-0.001	0.00004	0.0003
	(0.002)	(0.002)	(0.0003)	(0.0003)
Banking_Crisis * Increase_in_public_debt	-0.003***	-0.002**	-0.006***	-0.002***
	(0.001)	(0.001)	(0.0004)	(0.0004)
Banking & Financial System Characteristics				
Entry_bank_requirements		-0.002		0.011**
		(0.003)		(0.005)
Financial_transparency		0.004		0.001
		(0.002)		(0.004)
Deposit_insurance	0.007	0.008	-0.003	0.007
	(0.006)	(0.007)	(0.008)	(0.010)
ln_Broad_Money	-0.009	-0.011	-0.042***	-0.046***
	(0.007)	(0.008)	(0.011)	(0.014)
ln_Bank_Branch	-0.001	-0.002	0.0006	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)
Private_credit_bureau_coverage	-0.0001	-0.0001	-0.0002**	-0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Public_credit_registry_coverage	0.0002	-0.00001	0.0002	0.0003
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
MFI, Macro and Country Characteristics	Yes	Yes	Yes	Yes
Time and Country Fixed Effects	Yes	Yes	Yes	Yes
Constant	0.184	0.466	0.041	0.289
	(0.370)	(0.350)	(0.756)	(1.106)
Number of instruments	154	154		
P-value Hansen test for joint validity of instrument	0.112	0.118		
P values Arellano-Bond test for AR(2) in difference	0.353	0.404		
R-squared			0.118	0.112
#Observations/#MFIs	6,351/1,211	5,343/1,083	8,659/1,657	7,230/1,486

Robust standard errors are in parentheses; standard errors are clustered at the country level *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is return on assets. MFI characteristics are age, size, capital to assets, deposit to asset, gross loan portfolio to asses, portfolio at risk 30 days, and regulatory status (bank/non-bank type). Macro and Country controls include GNI, GDP growth, GDP per capital, Inflation, % Urban population, and control of corruption index. Instruments for orthogonal deviations equation: $\sum_{l=1}^{12} ROA_{ijt-l}$, , $\Delta_{\perp} Banking\_Crisis_{jt}$ $\Delta_{\perp} Banking\_Crisis\_Severity_{jt}$,

$\Delta_{\perp} Crisis\_Intervention_{jt}$, $\sum_{l=1}^{12} MFI_{ijt-l}$, $\Delta_{\perp} BR_{jt}$, $\Delta_{\perp} FS_{jt}$, $\Delta_{\perp} C_{jt}$, $\sum_{l=1}^{12} \Delta_{\perp} Year_{ijt}$; Instruments for level equation:

ΔROA_{ijt-1}, ΔMFI_{ijt-1}. MFI specific variables are endogenous variables, and the country-level variable is exogenous. Age Group, Regulated, Bank are considered exogenous.

Table 5. Number of Borrowers (Breadth of Outreach) GMM and Fixed Effects Regressions

VARIABLES	(1)	(2)	(3)	(4)
	Dynamic System GMM		Static fixed Effect	
Banking Crisis, its Severity & interventions				
Banking_crisis	0.363*	0.342*	0.439***	0.747***
	(0.191)	(0.187)	(0.134)	(0.074)
Banking_crisis*Output_Loss	0.015***	0.014***	0.001	0.013***
	(0.002)	(0.002)	(0.002)	(0.001)
Banking_crisis*Peak_NPLs	-0.008*	-0.008*	-0.013***	-0.021***
	(0.004)	(0.004)	(0.003)	(0.002)
Banking_crisis*Liquidity_Support	-0.009	-0.008	-0.011**	-0.022***
	(0.006)	(0.006)	(0.004)	(0.002)
Banking_crisis*Increase_in_public_debt	-0.015***	-0.014***	-0.005	-0.007***
	(0.004)	(0.003)	(0.005)	(0.003)
Banking & Financial System Characteristics				
Entry_bank_requirements		0.006		0.051*
		(0.010)		(0.030)
Financial_transparency		0.029***		0.028*
		(0.006)		(0.015)
Deposit_insurance	-0.002	0.005	0.043	0.074
	(0.022)	(0.021)	(0.049)	(0.056)
ln_Broad_Money	-0.066***	-0.125***	-0.245***	-0.156
	(0.024)	(0.020)	(0.090)	(0.108)
ln_Bank_Branch	-0.011	-0.010	-0.053	-0.040
	(0.008)	(0.007)	(0.039)	(0.037)
Private_credit_bureau_coverage	0.0003	0.0004*	0.0002	-0.0002
	(0.0002)	(0.0002)	(0.001)	(0.001)
Public_credit_registry_coverage	0.002***	0.001***	0.002	0.002
	(0.0004)	(0.0004)	(0.002)	(0.002)
MFI, Macro and Country Characteristics	Yes	Yes	Yes	Yes
Time and Country Fixed Effects	Yes	Yes	Yes	Yes
Constant	-3.247***	-2.526***	1.494	-4.372
	(0.876)	(0.700)	(5.880)	(7.960)
Number of instruments	218	239		
P-value Hansen test for joint validity of instrument	0.116	0.360		
P values Arellano-Bond test for AR(2) in difference	0.412	0.358		
R-squared			0.681	0.677
#Observations/#MFIs	7,344/1,401	6,135/1,253	9,155/1,746	7,629/1,558

Robust standard errors are in parentheses; standard errors are clustered at the country level *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of Number of Active Borrowers. MFI characteristics are age, size, capital to assets, deposit to asset, gross loan portfolio to asses, portfolio at risk 30 days, and regulatory status (bank/non-bank type). Macro and Country controls are GNI, GDP growth, GDP per capital, Inflation, % Urban population, and control of corruption index. Instruments for orthogonal deviations equation: $\sum_{l=1}^{12} NAB_{ijt-l}$, $\Delta_{\perp} Banking\_Crisis_{jt}$, $\Delta_{\perp} Banking\_Crisis\_Severity_{jt}$, $\Delta_{\perp} Crisis\_Intervention_{jt}$, $\sum_{l=1}^{12} MFI_{ijt-l}$, $\Delta_{\perp} FS_{jt}$, $\Delta_{\perp} BR_{jt}$, $\Delta_{\perp} C_{jt}$, $\Delta_{\perp} Age_{jt}$, $\sum_{l=1}^{12} \Delta_{\perp} Year_{ijt}$; Instruments for level equation: $\Delta ln\_NAB_{ijt-1}, \Delta MFI_{ijt-1}, \Delta Age_{jt}$. All MFI specific variables as endogenous variables, and the country-level variable is exogenous. Age Group, ln_Inflation are pre-determined variables in Model 1.

Table 6. Ratio of Average Loan Size (Depth of Outreach) GMM and Fixed Effects

VARIABLES	(9)	(10)	(11)	(12)
	Dynamic System GMM		Static fixed Effect	
Banking Crisis, its Severity & interventions				
Banking_crisis	-1.232***	-1.325***	-1.135***	-1.361***
	(0.312)	(0.312)	(0.089)	(0.059)
Banking_crisis *Output_Loss	-0.049***	-0.051***	-0.006***	-0.015***
	(0.009)	(0.009)	(0.002)	(0.001)
Banking_crisis*Peak_NPLs	0.018***	0.019***	0.019***	0.024***
	(0.006)	(0.006)	(0.002)	(0.002)
Banking_crisis *Liquidity_Support	0.023***	0.025***	0.026***	0.033***
	(0.009)	(0.009)	(0.003)	(0.002)
Banking_crisis *Increase_in_public_debt	0.087***	0.090***	0.017***	0.023***
	(0.017)	(0.017)	(0.003)	(0.002)
Banking & Financial System Characteristics				
Entry_bank_requirements		-0.005		-0.079*
		(0.009)		(0.043)
Financial_transparency		0.020*		-0.030***
		(0.011)		(0.011)
Deposit_insurance	-0.022	-0.017	-0.142	-0.215**
	(0.037)	(0.038)	(0.107)	(0.088)
ln_Broad_Money	0.030	0.030	0.180	0.016
	(0.030)	(0.033)	(0.145)	(0.163)
ln_Bank_Branch	0.042**	0.051**	0.149*	0.122
	(0.021)	(0.026)	(0.076)	(0.088)
Private_credit_bureau_coverage	0.0001	0.0001	-0.0001	0.00005
	(0.0004)	(0.001)	(0.001)	(0.001)
Public_credit_registry_coverage	-0.001**	-0.001**	-0.001	-0.001
	(0.0004)	(0.001)	(0.001)	(0.001)
MFI, Macro and Country Characteristics	Yes	Yes	Yes	Yes
Time and Country Fixed Effects	Yes	Yes	Yes	Yes
Constant	1.199**	1.424***	-2.849	6.516
	(0.495)	(0.468)	(7.797)	(10.16)
Number of instruments	219	219		
P-value Hansen test for joint validity of instrument	0.180	0.209		
P values Arellano-Bond test for AR(2) in difference	0.520	0.494		
R-squared			0.060	0.057
#Observations/#MFIs	5,994/1,232	5,994/1,232	9,090/1,739	7,576/1,552

Robust standard errors are in parentheses; standard errors are clustered at the country level *** p<0.01, ** p<0.05, * p<0.1.
The dependent variable is the Depth of outreach that is the average loan balance per borrower / GNI per capita. MFI characteristics are age, size, capital to assets, deposit to asset, gross loan portfolio to asses, portfolio at risk 30 days, and regulatory status (bank/non-bank type). Macro and Country controls are GNI, GDP growth, GDP per capital, Inflation, % Urban population, and control of corruption index. Instruments for orthogonal deviations equation: $\Delta_\perp Banking_c risis_{jt}, \Delta_\perp Banking_c risis_e verity_{jt}, \Delta_\perp Crisis_i ntervention_{jt}, \Delta_\perp BR_{jt}, \Delta_\perp FS_{jt}, \sum_{l=1}^{12} MFI_{ijt-l}, \Delta_\perp \sum_{l=1}^{12} C_{jt-l}, \Delta_\perp Age_{jt}, \Delta_\perp Bank_{jt}$; Instruments for level equation: $Banking_c risis_{jt}, Banking\_crisis\_everity_{jt}, Crisis\_Intervention_{jt}, BR_{jt}, FS_{jt}, C_{jt}, \Delta MFI_{ijt-1}, \sum_{l=1}^{12} C_{jt-l}$.