Scope Economies from Rural and Urban Microfinance Services

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Abstract

Microfinance institutions (MFIs) operate in both rural and urban credit markets and provide financial services to the poor not served by commercial banks. MFIs must keep operating costs low to better serve their clients. We evaluate whether MFIs can lower their costs by exploiting economies of diversification from serving both rural and urban markets rather than specializing in only one. We apply a novel method to estimate scope economies that minimizes the well-known "excessive extrapolation" and accommodates MFIs' heterogeneity. Analyzing panel data on MFIs from 105 countries over 2008–2018, we find that about half of loan-only MFIs benefited from diversification and enjoyed scope economies of 16.6% while over two thirds of savings-and-loan MFIs experienced scope diseconomies of –11.7% suggesting advantages from specialization. Over time, the declining magnitudes and the prevalence of scope (dis)economies in both groups suggest that loan-only MFIs have been able to serve costlier marginal clients while savings-and-loan MFIs have been learning and decreasing their scope diseconomies. Stakeholders encouraging the transformation of MFIs into regulated savings-and-loan institutions that serve both rural and urban markets should be aware that of the presence of scope diseconomies for that business type and offer adequate support.

Keywords: microfinance, rural and urban credit markets, scope economies, excessive extrapolation

JEL Classification: Q14, G21, G15

Introduction

Microfinance institutions (MFIs) provide financial services to clients not served by commercial banks and operate in both rural and urban credit markets. Clients are served best when lenders keep operating costs low and take advantage of economies of scale and scope. Evidence shows that MFIs benefit from economies of scale because larger MFIs have lower per-unit output costs (Hartarska et al., 2013). Much less is known, however, about the economies from output diversification or scope economies. Are the costs lower when MFIs diversify and offer different products in rural and urban markets (scope economies) or when they specialize in only one (scope diseconomies)? Empirical work shows, furthermore, that the institutional heterogeneity (e.g., some MFIs only lend, others also mobilize savings) affects productivity, efficiency, and costs (Fall et al., 2018; Malikov & Hartarska, 2018). Yet, policymakers and donors encourage the expansion of MFIs' outreach to rural and urban markets and simultaneously promote the transformation of loan-only MFIs into commercial savings-and-loan entities without knowledge of the scope (dis)economies of each business type. This study offers the first estimates of economies of diversification from providing rural and urban microfinance services and shows their evolution over time.

Modern microfinance dates back to the innovative lending in rural areas by the Grameen Bank of Bangladesh in the 1970s but the concept has emerged as a solution for the challenges of rural credit markets across space and time (Suesse & Wolf, 2020). Yet, much of the microfinance growth has been due to its expansion in urban markets as a response to rapid urbanization and increased attention to urban poverty (Armendáriz & Morduch, 2010). Urban credit markets and products (loans and savings accounts) are different from rural credit markets and products. Traditional farming, which is the main driver of the rural economy, is seasonal and weather-dependent, while weather is less relevant to clients in cities (Abay et al., 2021). While microfinance credit contracts are successful in dealing with idiosyncratic risks specific to the individual borrower, much of the risk in rural markets is systemic in nature as it is related to bad weather, natural disasters, and animal and crop diseases (de Janvry & Sadoulet, 2020). At the MFI level, pooling the risks and sharing of Management Infor-

mation Systems and knowledge may lower the average cost of microfinance services, which indicates economies of diversification (scope economies). Conversely, MFIs may have scope diseconomies, in which case their average costs are lower when they specialize in rural-only or urban-only products. Finally, the scope (dis-)economies may vary by business type, i.e., may be different in loan-only and in savings-and-loan MFIs.

This study relates to a sizable literature on the impacts of microfinance and credit because this literature helps to understand the challenges that MFIs face by serving different clients. Randomized controlled trials (RCTs) evaluate the effects of different microfinance services on farmers' incomes, risk management, and overall well-being (e.g., Hossain et al., 2019; Le Cotty et al., 2019). There is emerging evidence of impactful products that result from lenders' improved understanding of their clients and incorporating that information in their products. For example, while the RCTs that evaluate microcredit initiatives in both markets in the 2000s show limited impacts on new borrowers (Field et al., 2013; see also Banerjee et al., 2015, for 6 RCTs), recent work finds significant positive impacts on selected entrepreneurs (Banerjee et al., 2019; Dahal & Fiala, 2020). Other, mostly non-experimental, work offers evidence that access to credit reduces rural poverty, as well as highlights the challenges to implementing innovative financial products (Berhane & Gardebroek, 2011; Burgess & Pande, 2005; Kaboski & Townsend, 2011; Miranda & Gonzalez-Vega, 2011; Möllmann et al., 2020).

The present paper is also related to the literature on the role of distance, geographic diversification, and soft information, especially in the context of the focus on social impacts and the unprecedented rise of fintech and shadow banking (e.g., Bellucci et al., 2019; Bodlaj et al., 2020; Buchak et al., 2018; Erel & Liebersohn, 2020; Castellani & Afonso, 2020; Goetz et al., 2013; Rajan et al., 2015; Nguyen, 2019; Tello, 2020). Given the sustained interest in the role of microfinance products, a variety of economic agents in the developing world—creditors, investors, donors, and governments—can benefit from knowing whether MFIs' provision of financial services in both rural and urban credit markets lowers the costs and thus helps to improve outreach to the poor. Yet, mostly due to a lack of data, we know little about the costs and benefits from such diversification.

We contribute to the literature by providing estimates of the MFIs' economies of scope from operating in rural and urban markets and characterizing their changes over time, as well as identifying factors that correlate with specialization and diversification. We utilize a novel estimation method that avoids the well-known "excessive extrapolation" in scope economy studies. Our approach is well suited to address the limited-size samples as is the case with too few MFIs specializing in rural-only products (Malikov et al., 2017). We also accommodate unobserved MFI heterogeneity and, for better statistical inference, use a wild residual block bootstrap to preserve the within-country correlation in the data. Finally, we pay particular attention to the dynamics of scope economies by tracing their evolution over time to provide fresher and more useful insights that are relevant to policy analysis.

To briefly preview the results, we find that scope economies differ by business model and indicate that loan-only MFIs have cost advantages from serving both rural and urban areas while savings-and-loan MFIs have lower costs when specializing in only one. More precisely, we find that for the period from 2008 to 2018 about half of the loan-only MFIs had statistically significant scope economies (with a mean of 0.16) indicating benefits from diversification but that these benefits decreased over time. In contrast, over two thirds of the savings-and-loan MFIs had statistically significant scope diseconomies, which also decreased over time. After conducting numerous robustness checks, we interpret the results as indicating that the provision of savings products in both rural and urban markets interfered with lending efficiency. These results are consistent with other studies that find challenges in combining microcredit with other financial services (such as insurance) and the need to avoid the "one-size fits all" policy recommendations for the commercialization of MFIs (Farrin & Miranda, 2015; Miranda & Gonzalez-Vega, 2011). The results are also consistent with the arguments for "smart" and nuanced support for the industry (Cull et al., 2018).

The rest of the paper is organized as follows. We briefly overview the relevant literature in Section 2, describe the data in Section 3 and the empirical approach in Section 4. The results are discussed in Section 4, and Section 5 concludes.

Brief Literature Overview

Evidence from developed countries points to the benefits from both specialization (scope diseconomies) and diversification (scope economies) and indicates that incentives to specialize or diversify change over time (e.g., in US agricultural banks, Regmi et al., 2020). In the US, a specialized, cooperative Farm Credit System (FCS) with over 100 years of history provides about 40% of its loans to farmers while specialized and non-specialized commercial banks provide another 40% (Nadolnyak et al., 2017). In Europe, cooperative rural banks emerged to serve the needs of smallholder farmers in the countryside but then transformed into large financial groups. Today, commercial banks with origins in agricultural lending provide a full range of banking products to both urban and rural clients and are among the largest banks in Europe, namely Credit Agricole in France, Robobank in the Netherlands, and Raiffeisenbank in Germany (Fonteyne, 2007; Schildbach et al., 2012).

In the past decade, investors, governments, and donors have promoted the commercialization of microfinance in which loan-only MFIs transform into commercial institutions that also collect deposits. Offering savings accounts in addition to loans is important because savings products meet important needs of the poor and are valued as a service rather than simply a source of loanable funds (Collins et al., 2009). Savings-and-loan MFIs operate in both rural and urban markets to potentially diversify their loan portfolios but also to capture the substantial and growing remittance flows deposited in savings accounts and thus participate in the process of financial development (Aggarwal et al., 2011; Giuliano & Ruiz-Arranz, 2009). Loan-only MFIs and savings-and-loan MFIs have a different underlining production technology. Microfinance research has found economies and diseconomies from the joint production of savings and loans as well as scale economies but has not distinguished these by business type. (Delgado et al., 2015; Hartarska et al., 2011; Malikov & Hartarska, 2018). The cost benefits from rural-urban product diversification within savings-and-loan MFIs may be different from loan-only MFIs because the economies of diversification are driven by spreading fixed costs and cost complementarities associated with credit activities but also with shared technologies that involve savings collection. For example, in remote

areas rural banks, credit unions, or other deposit-collecting MFIs can use the same offices to collect savings and to lend (spreading fixed costs) while the this would not be the case for lending only institutions, or vice versa in urban areas.

Indeed, technological innovations such as joint liability lending and contracts with dynamic incentives are at the core of the MFIs' advantages in expanding the frontier of finance (Ahlin & Waters, 2016). Microfinance contracts rely on enforcement via social sanctions and reciprocity and, to a lesser extent, on legal contract enforcement(Besley & Coate, 1995; De Quidt et al., 2016). Joint liability contracts both build and use local social capital to curtail moral hazard and adverse selection and to promote the development of credit markets in the process (Guiso et al., 2006). Ahlin (2020) shows that borrowers who form groups of similar risk types make risk more systemic because group formation aim at "anti-diversification". He argues that this grouping leaves room for lenders to develop strategies to improve risk diversification.

While diversification within a group or a market is one strategy, another one could be diversification across rural and urban markets. Indeed, the research has shown that the use of joint liability loans is associated with lower default risks and costs for MFIs that are trying to expand to new markets (Zamore et al., 2019). Individual microloans, on the other hand, are based on dynamic incentives such as progressively increasing loan sizes that are contingent on timely repayment of a small initial loan. While they work well in urban settings, MFIs have also successfully incorporated dynamic incentives into group loans in rural areas, which suggests the possibility of cost complementarity (Ahlin & Waters, 2016; Lopez & Winkler, 2018).

Much of the microfinance literature is focused on scale economies which exists when larger MFIs have lower per unit cost of output ((see for example Cozarenco et al., 2022; Parmeter & Hartarska, 2020). Expanding from urban to rural markets or vice versa may not be cost decreasing, however, if large scope diseconomies (from serving both rural and urban markets with specialized producs for each market) overwhelm potential scale economies. Both positive or negative scope economies may exist because rural and urban financial products are very

different in nature. There is a dearth of empirical work evaluating the potential for cost savings from serving both markets through different products or whether there are benefits from specialization, which matters for policy.

Scope economies come from cost complementarity or sharing fixed costs. Specifically, cost complementarities are positive when MFIs take the lessons learned in one setting, typically an urban market, and successfully adapt these lessons to credit products for rural customers (e.g., different products needs in an agriculture dependent economy, digital delivery methods in remote areas, bulky loans related to rural cash flows etc.) or vice versa such as knowledge about group loans from rural markets based on social capital use applied to loans offered in urban markets (Caves et al., 1981; Schreiner & Colombet, 2001; Yaron & Benjamin, 2002). Examples include Procredit and Financiera Calpia in El Salvador who understood the role of cash flows when they observed that repayment by the urban poor was attributable to multiple sources of cash flows. These MFIs adapted their rural loan products to base lending not on collateral requirements (or its substitutes) but instead on the specific cash flows in rural areas. Similarly, Caja Los Andes and PORDEM in Bolivia only lend to farmers who have mupliple sources of cash flows because they were growing three or more crops. In line with the successful practices in some credit co-ops and in specialized US agricultural banks, many rural MFIs also limit their agricultural credit to no more than 25% of all loans. Further, partnerships within global supply chains allow specialized rural credit (Swinnen & Kuijpers, 2019), while experiments with index-based insurance and lending are another example of an attempt to adapt microfinance products to rural residents cash flows and circumstances (Farrin & Miranda, 2015; Miranda & Gonzalez-Vega, 2011).

The second element of scope economies is the shared fixed costs, realized when MFIs share tangible infrastructure but also know how - cross-subsidization of know-how such as management information system that tracks various loans (fixed costs), digital loan delivery systems, mobile money, or even long-term personnel development and training. Many of these mechanisms may differ by business type. For example, rural savings-and-loan can invest in some office space used to collect savings and extend loans as well as lower cost of capital for savings-and-loan.

Theoretical work identifies another mechanism for cost efficiencies related to scope (dis) economies. MFIs may lower costs by expanding operations to cross-subsidize lending to some clients using the cost differentials between poor and unbanked wealthier clients, who differ in proportions by (rural or urban) regions (Armendáriz & Szafarz, 2011). The number of poor people may be small in a rural (or urban) market and that affects cross-subsidization. Empirical evidence shows that efficiency rates may be better (e.g., Mia et al., 2022) or worse in rural markets (e.g., Caudill et al., 2009). Some of these results may be driven by failure to account for the business type - lending-only versus lending-and-savings MFIs. For example, without distinguishing business type, Mia et al. (2022) find that MFIs in rural areas were more efficient, rural banks and credit cooperatives (both offering savings) had the highest cost efficiency indicators, and overall efficiency was highest in areas with a large number of active rural borrowers. The authors also find that larger MFIs were less cost-efficient when serving the poorest. This specific result indicates that the tradeoff between outreach goals and efficiency(sustainability) identified in the microfinnace literature seems to interfere with scale economies typical for commercial banks that do not have explicit outreach goals (Serrano-Cinca & Gutiérrez-Nieto, 2014; Armendáriz & Szafarz, 2011).

Differences in scope economies by business type may be important because of the role of savings. Mia et al. (2022) found that more leveraged MFIs had lower cost while the number of leverage sources (donations and loans to the MFI) did not affect costs, suggesting a role for deposits because of their effect on leverage. This result is consistent with recent literature on MFI efficiency and scope economies highlighting the need to account for business type (Malikov & Hartarska, 2018) and findings that savings and subsidies interfere to affect scale economies in saving-and-loan MFIs (Cozarenco et al., 2022). Dasgupta & Roy Chowdhury (2022) show a different mechanism for efficiency differences by MFIs' business type. Borrowers of saving-and-loan MFIs can invest the small surplus from their production loans returns in savings to accumulate a lump sum and "graduate" to improved life circumstances in either an urban or a rural market. Morduch(forthcoming) also argues that microfinance flourished because it serves as a mechanism to accumulate meaningful lump-sums that the poor desperately need. With respect to differences across rural and urban areas, Hartarska

et al. (2011) found non-linear scope economies from the joint production of savings and loans that peak for MFIs in countries with about 70–75% rural population. They also found that the elements of these scope economies do not work in the same direction with some negative cost complementarities (between savings and loans) but higher shared positive fixed costs savings, especially in countries with higher proportion of rural population. The mixed evidence identifies a need for empirical work to evaluate scope economies from serving both urban and rural markets while accounting for the business model.

Finally, within a country, participants in rural and urban credit markets share an institutional infrastructure (e.g., regulation of financial institutions, credit bureaus coverage, etc.), a culture (attitudes toward credit and risk, women's right to own property, etc.), business cycle, and macro shocks such as the 2008 financial crisis or the Covid-19 pandemic (Popov, 2018; Malik et al., 2020; Tchuigoua et al., 2020). The shared knowledge and infrastructure may further lower the cost of diversification. Thus, we analyze the scope economies from serving rural and urban markets by using microdata on MFIs from across the world and carefully address the issue of heterogeneity in institutions and the environment. We argue that this analysis can offer insights that are relevant to individual MFIs, policymakers, and other stakeholders in the developing world.

The literature highlights both the benefits and the risks from implementing innovative and diverse products (Berhane & Gardebroek, 2011; Blanco-Oliver et al., 2016; Burgess & Pande, 2005; Kaboski & Townsend, 2011; Bjerge & Trifkovic, 2018). However, the knowledge about basic cost-saving strategies such as taking advantage of product diversification remains limited because the combination of institutional heterogeneity, limited data, and the "excessive extrapolation" constrain the typical scope economies work (see, e.g., Baquero et al., 2018; Parmeter & Hartarska, 2021). Our approach largely overcomes these obstacles.

Data

The dataset comes from the Microfinance Information Exchange (MIX).[1] To minimize the distortionary effects of outliers on the cost function estimates (and hence the estimates of

[1] A dataset similar to ours is now publicly available from the World Bank data catalog.

the degree of scope economies), we exclude observations from the 1st and 99th percentiles of the distributions of the covariates for the variable cost function. The final data consist of 4,120 annual observations from six different regions of the world for a period of 11 years from 2008 to 2018. The summary statistics for the variables that enter the cost function are presented in Table.

The microfinance industry comprises two distinct business models and organizational types: loan-only MFIs and savings-and-loan MFIs. These two groups have different underlying production processes in that the first group does not offer savings or payment facilities. Therefore, to account for this technology difference, we follow the recent work and consider them separately (D'Espallier et al., 2017; Malikov & Hartarska, 2018). Our data are comprised of 51% loan-only MFIs and 49% savings-and-loan MFIs, with the latter representing 45% of the annual observations.

The MIX data show that most MFIs serve both rural and urban markets. They comprise 79% of the savings-and-loan and 75% of the loan-only MFIs, while those serving urban-only markets are 13% and 15% respectively.[2] These raw data indicate that MFIs are either taking advantage of the scope economies or, alternatively, pursue their mission to serve the poor and their underlying funding requires them to serve both markets, irrespective of the costs. The share of rural and urban loans measured by the number of active borrowers and by the dollar value of the loan portfolio over the study period show a major trend in the microfinance industry for the 2008–2018 period. Specifically, Figure A.1 in the appendix shows that in loan-only MFIs, the share of borrowers in rural markets and loan portfolio that is devoted to rural lending are lower than that in urban markets. In the savings-and-loan MFIs, the share of borrowers in rural markets is higher than that in urban markets even as the loan portfolio that is devoted to rural lending is smaller than that for urban lending after 2013. Figure A.2 shows that the average size of urban loans by savings-and-loan MFIs is larger than the size of their loans in rural markets, while this difference is less pronounced in loan-only MFIs for which the overall loan size is smaller. These differences may indicate cost differences in

[2]The resulting 154 or 241 observations are too few to permit standard scope economy estimation. Such a small sample only permits estimation by pooling observations across countries and using country dummies to control for country effects (or fixed effects on MFI level) as in Malikov & Hartarska (2018).

serving borrowers in rural markets.

Methodology

Our empirical strategy is to use a cost function estimates to identify scope economies as follows. For each group for loan-only and for savings-and-loan MFIs, we identify the scope economies from providing microfinance products in rural and urban markets separately because their underlining production process is not the same. Unlike loan-only MFIs, savings-and-loan also provide deposit services, which is an additional output. We identify the scope economies and compute the counterfactuals implementing a novel empirical method that suits our data (limited number of observations for rural only MFIs of both business type). This method avoids the issue of excessive extrapolation in scope economies estimation. Next, we test for statistical significance of each of the individual MFI scope economies (estimated by MFI type) and show how they change over time and how they vary by geographical region. We define cost complementarity and show how it contributes to the scope economies. Finally, we also discuss the link between the scope and scale economies.

The Cost Function

We specify a cost function following the relevant banking and microfinance literature and apply a modification that accounts for the limited number of rural-only observations and the specific nature of our data. Specifically, we use the translog functional form adapted from the banking literature (Gilligan et al., 1984; Hughes & Mester, 2013) and the microfinance literature (for justification of this specification, see for example Caudill et al., 2009; Malikov

& Hartarska, 2018; Cozarenco et al., 2022; Kar & Bali Swain, 2018). The cost function is:

$$\ln C = \beta_0 + \sum_i \beta_i \ln y_i + \frac{1}{2}\sum_i \sum_j \beta_{ij} \ln y_i \ln y_j + \sum_n \gamma_n \ln w_n + \frac{1}{2}\sum_n \sum_m \gamma_{nm} \ln w_n \ln w_m + \sum_n \sum_i \delta_{ni} \ln w_n \ln y_i + \varphi_1 \ln r + \varphi_2 \ln r^2 + \sum_i \theta_i \ln r \ln y_i + \sum_n \rho_n \ln r \ln w_n + \lambda_1 \ln e + \lambda_2 \ln e^2 + \sum_i \nu_i \ln e \ln y_i + \sum_n \tau_n \ln e \ln w_n + \kappa \ln r \ln e + \psi_1 t + \psi_2 t^2 + \sum_i \alpha_i t \ln y_i + \sum_n \phi_n t \ln w_n + \zeta t \ln r + \xi t \ln e + \mu + \varepsilon, \tag{12}$$

where C is the variable cost, y_i is the output i, w_n is the price of input n, t is the time trend that measures technological change (temporal shifts), r is a measure of risk, e is equity, μ captures the unobservable MFI-specific effects, and ε is a random error.[3] We impose the homogeneity restriction in the estimation by normalizing (dividing) all input prices and total costs by the price of labor. To account for the unobserved heterogeneity amongst MFIs within each business type, we estimate the cost function by fixed effect regressions. Further, since the MFIs in rural and urban credit markets operate in a similar culture and institutional infrastructure and experience the same country-level macro shocks, we use wild residual block bootstrapping for statistical inference. This bootstrapping can preserve the within-region correlation in the data to approximate the sampling distribution of the estimator (see for example, Malikov et al., 2017).[4]

We define the outputs as loans in urban markets (y_1), loans in rural markets (y_2), and if offered by an MFI, total savings (y_3).[5] Following the microfinance literature, to account for the social mission of outreach to poor borrowers pursued by MFIs, we measure outputs by the numbers of active borrowers and savers in each market (Caudill et al., 2009; Hartarska et al., 2014). While costs increase in both the number of borrowers served and the volume

[3]Since MFIs provide mostly short-term financial products such as loans with maturity of several weeks or months, current output quantity and input prices reflect costs incurred during the year and are unlikely to be spread across years as it may be the case in other firms.

[4]Robustness check with clustering on the country level did not result in qualitative differences from the main clustering on country level.

[5]Our data does not report savings by rural and urban markets.

of loans extended (the output in more traditional banking approach), the number of active borrowers (and savers when appropriate) captures the outreach mission and is a better measure of MFI performance (Ahlin et al., 2011; Cull et al., 2007). Indeed, the data show that MFIs serve proportionally more rural borrowers who get smaller loans, so the share of rural loans is smaller. For comparison purposes, and as the first robustness check, we also estimate specifications in which outputs are measured by the dollar value of the rural and urban loan portfolios and, when appropriate, the value of savings.

We follow Malikov & Hartarska (2018) and define input prices as the cost of capital that is measured as the ratio of administrative (non-personnel) expenses to the number of bank branches (w_1). Labor cost is measured as the ratio of personnel expenses to the number of employees (w_2), and financial cost is measured by the ratio of financial expenses to borrowed funds (w_3). The total costs (C) are the sum of the three inputs' expenditures. Equity (e) is treated as a netput, while risk (r) is measured by the proportion of the portfolio at risk after 30 days or more, which is standard in the microfinance literature (e.g., Hartarska et al., 2011).

Measuring Scope Economies

Scope economies exist when lending in both rural and urban markets is cheaper than producing only rural or only urban loans by separate MFIs. Specifically, if we were to follow the traditional measurement of scope economies like Baumol et al. (1982), a loan-only MFI would enjoy scope economies if:

$$\widehat{\mathbb{C}}\left(y_1, 0\right) + \widehat{\mathbb{C}}\left(0, y_2\right) > \widehat{\mathbb{C}}\left(y_1, y_2\right), \tag{2}$$

where C (.) is a cost function with all other arguments besides urban y_1 and rural loans y_2 suppressed. To accommodate savings-and-loan MFIs that also produce savings denoted as y_3, we can re-write the scope economies' cost of joint production of three outputs (rural loans, urban loans, and deposits) and expect them to be smaller than the sum of the cost of

the individual production of each output. That is:

$$\widehat{\mathbb{C}}\left(y_1, 0, 0\right) + \widehat{\mathbb{C}}\left(0, y_2, 0\right) + \widehat{\mathbb{C}}\left(0, 0, y_3\right) > \widehat{\mathbb{C}}\left(y_1, y_2, y_3\right). \tag{3}$$

We estimate the scope economies separately for loan-only and for savings-and-loan MFIs because these MFIs have different cost functions (Malikov & Hartarska, 2018). As it turns out, accurately accounting for the differences in the underlying production processes produces significant differences in the results for the scope economies that would have been obscured had we assumed that the loan-only and savings-and-loan MFIs had the same underlying cost function.

Within the savings-and-loan MFIs, there are no firms that provide only one of the three outputs, so equation (3) requires the computation of counterfactual costs of producing each output separately, which suffers from the "excessive extrapolation" problem (see Evans & Heckman, 1984; Hughes & Mester, 1993). Also, within the fully specialized loan-only MFIs, as well as savings-and-loan MFIs, we only have a sufficient number of integrated firms (jointly producing urban and rural loans) and of MFIs specializing in urban loans. To address these challenges, we adopt the approach by Malikov et al. (2017) in which, to avoid the extreme extrapolation of $\widehat{\mathbb{C}}\left(\cdot\right)$ to the non-existent (or impossible to estimate) counterfactual case of specialization in y_1, y_2, and y_3, we can instead focus on its most closely related output-mix configuration observable in the data, namely the production of (y_1, y_2, y_3) that has a higher degree of specialization in (y_2). Thus, we focus on a more realistic partial, as opposed to full, specialization of MFIs. Specifically, a savings-and-loan MFI is said to enjoy scope economies if:

$$\widehat{\mathbb{C}}_1\left(\varpi_1 y_1, \varpi_3 y_3\right) + \widehat{\mathbb{C}}_2\left(\left(1-\varpi_1\right) y_1, y_2, \left(1-\varpi_3\right) y_3\right) > \widehat{\mathbb{C}}_2\left(y_1, y_2, y_3\right), \tag{4}$$

where $\widehat{\mathbb{C}}_1\left(\cdot\right)$ is the predicted cost function for savings-and-loan MFIs that provide urban loans and savings, and $\widehat{\mathbb{C}}_2\left(\cdot\right)$ is the predicted cost function for savings-and-loan MFIs that provide all three outputs. The ϖ_1 and ϖ_3 are the weights that specify the degree of scope of the counterfactual MFIs that satisfy $0 \leq \varpi_1 \leq 1$ and $0 \leq \varpi_3 \leq 1$. The choices of these weights are restricted to the "admissible region" to avoid the excessive extrapolation

problem (Evans & Heckman, 1984; Hughes & Mester, 1993). Specifically, we require that each counterfactual MFI does not produce less of each output than MFIs do in our sample, that is, $\varpi_1 y_1 \geq \underline{y_1}$, $(1-\varpi_1 y_1) \geq \underline{y_1}$, $\varpi_3 y_3 \geq \underline{y_3}$, and $(1-\varpi_3 y_3) \geq \underline{y_3}$, where $\underline{y_1}$ and $\underline{y_3}$ denote sample minimums of y_1 and y_3 respectively. We make this constraint more operational by defining our measure of the degree of scope economies (DSE) as follows:

$$DSE = \frac{\widehat{\mathbb{C}}_1\left(\varpi_1 y_1^* + \underline{y_1}, \varpi_3 y_3^* + \underline{y_3}\right) + \widehat{\mathbb{C}}_2\left(\left(1-\varpi_1\right) y_1^* + \underline{y_1}, y_2, \left(1-\varpi_3\right) y_3^* + \underline{y_3}\right) - \widehat{\mathbb{C}}_2\left(y_1, y_2, y_3\right)}{\widehat{\mathbb{C}}_2\left(y_1, y_2, y_3\right)}, \tag{5}$$

where $y_1^* = y_1 - 2\underline{y_1}$, and $y_3^* = y_3 - 2\underline{y_3}$. If the DSE is positive (negative), then the MFI is said to enjoy scope economies (suffer from scope diseconomies); and if the DSE equals zero, then the MFI's costs are invariant to the scope of outputs. In addition, we require that each counterfactual MFI does not *specialize* in either output to a greater extent than the most specialized MFI in our data. That is:

$$min\left\{\frac{y_1}{y_3}\right\} \leq \frac{\varpi_1 y_1^* + \underline{y_1}}{\varpi_3 y_3^* + \underline{y_3}} \leq max\left\{\frac{y_1}{y_3}\right\}, \tag{6}$$

$$min\left\{\frac{y_1}{y_3}\right\} \leq \frac{\left(1-\varpi_1\right) y_1^* + \underline{y_1}}{\left(1-\varpi_3\right) y_3^* + \underline{y_3}} \leq max\left\{\frac{y_1}{y_3}\right\}. \tag{7}$$

The savings-and-loan MFIs differ from traditional banks in that they offer savings to meet customers' needs, especially in rural areas, rather than to mobilize capital and, in the process, generate limited scope economies from integrating savings and lending (e.g., Delgado et al., 2015). Thus, motivated by the arguments of Hughes & Mester (1993), we first verify the output-like role of deposits in savings-only MFIs by using a test based on the restricted variable cost function as in Malikov & Hartarska (2018) who find that, in their sample, deposits act like outputs.[6,7] We confirm that the MFIs' costs should be modeled with a production rather than an intermediation approach (because deposits act as outputs rather than inputs). This modelling further justifies the use of the number of active borrowers rather than the loan portfolio as the preferred measure of output (see Chapter 3.8 in Freixas

[6]In the appendix, Table A.1 presents the cost elasticities of deposits, and Figure A.3 illustrates their distribution.
[7]Regmi et al. (2020) also use deposits as an output in their efficiency analysis of US agricultural banks.

et al., 1997).

Similar to the savings-and-loan MFIs, some loan-only MFIs provide urban loans only, and others provide both rural and urban loans, but we have a very small number of observations for rural-only loans that precludes us from identifying their cost function. Thus, a loan-only MFI is said to enjoy economies of scope if :

$$\widehat{\mathbb{C}}_1\left(\varpi_1 y_1\right) + \widehat{\mathbb{C}}_2\left(\left(1-\varpi_1\right) y_1, y_2\right) > \widehat{\mathbb{C}}_2\left(y_1, y_2\right). \tag{8}$$

The degree of scope economies for loan-only MFIs is defined as:

$$DSE = \frac{\widehat{\mathbb{C}}_1\left(\varpi_1 y_1^* + \underline{y_1}\right) + \widehat{\mathbb{C}}_2\left(\left(1-\varpi_1\right) y_1^* + \underline{y_1}, y_2\right) - \widehat{\mathbb{C}}_2\left(y_1, y_2\right)}{\widehat{\mathbb{C}}_2\left(y_1, y_2\right)}. \tag{9}$$

Since the measure of scope economies for the DSE is sensitive to the choice of weights, we choose the weights via a grid search that yields the smallest value for the DSE. Specifically, we measure the degree of "global" economies of scope (for each MFI) as follows:

$$DGSE = \inf_{\varpi_1, \varpi_3} DSE(\varpi_1, \varpi_3) \qquad \text{for loan-and-savings MFIs,} \tag{10}$$

$$DGSE = \inf_{\varpi_1} DSE(\varpi_1) \qquad \text{for loan-only MFIs.} \tag{11}$$

If the economies of scope of the smallest value are still significantly positive, we can conclude that such economies are "globally" significant over the MFI's output space in a given year.

Empirical Results

To identify scope economies we first estimate the cost function for each business type. In the first subsection, we first investigate if lending to rural clients is costlier than lending to urban clients. In the second subsection, we provide estimates for cost complementarities, which is an element of scope economies (Hartarska et al., 2011). We then present the scope economies by MFI business type (loan-only and savings-and-loan) and their distribution and

summarize the results for the statistically significant scope economies within the sample. We also show how the estimated scope (dis)economies changed in time by business type and by geographical region and show their relationship to MFI-specific factors. Next, we discuss the scale economies. In the final subsection, we relate scope economies to MFIs size and scale economies to get further insights of the contribution of scope economies from serving urban and rural markets.

Cost Elasticities of Rural and Urban Loans

We first estimate the cost functions for the loan-only and savings-and-loan business type and compute the cost elasticity with respect to urban and rural loans. The results presented in Table 2 show that lending to rural borrowers is costlier. In the case of loan-only MFIs, the cost elasticity with respect to rural borrowers is 0.34 which is statistically different from 0.292 for lending to urban borrowers while in savings-and-loan MFIs these elasticities are 0.206 and 0.14, which are also statistically different (all at the 5% level). When output is measured in dollars, the result is similar with a cost elasticity of 0.343 for rural loans and 0.311 for urban loans for the loan-only MFIs and 0.184 and 0.101 respectively for the savings-and-loan MFIs. Thus

These results are consistent with the notion that providing rural credit products is notoriously difficult and costly and, therefore, rural financial markets often fail to emerge (missing markets). We use an innovative scope economies estimation method precisely because we have fewer observations of MFIs specializing in more costly rural lending. In the absence of large scope economies from serving both rural and urban markets or, alternatively, substantial help from donors to offer financial products designed for rural markets, few MFIs operating in urban markets would expand to rural markets. This has important policy implications for stakeholders and donors when deciding whether to fund startups serving only rural or both rural and urban markets or whether to encourage existing urban-based MFIs to develop rural financial products and serve those markets. Since the magnitudes of marginal costs differ by business type, scope economies are also likely to differ by business type.

Cost Complementarity between Rural and Urban Loans

In the classic case, scope economies are driven by the opportunity to spread fixed costs over several outputs, the possibility of re-using client information and reducing risk, and savings due to cost complementarity (Berger et al., 1987). In MFIs, cost complementarity exists when there are "positive synergies" between rural and urban loans so that increase in the level of one output brings down the marginal costs of another output (Baumol et al., 1982). This is equivalent to the condition in which the variable cost function of joint output MFIs is $\frac{\partial C(\cdot)}{\partial y_1 \partial y_2} < 0$. We compute the cost complementarities and find that loan-only MFIs have mean complementarity between rural and urban loans of –1.79 ($\times 10^{-5}$) but the complementarity is significantly less than zero for only 17.57% of the observations, while it is significantly larger than zero for 38.3% of the observations.[8] Among the loan-and-savings MFIs, the mean complementarity is –0.617 ($\times 10^{-5}$), with only 2.5% of the observations having complementarity significantly less than zero, and 38.31% with complementarity significantly greater than zero.

These findings indicate limited synergies that may mean there are only some loan-only MFIs, and very few savings-and-loan MFIs, that are able to decrease costs by learning from lending in one market (e.g., urban) and applying that knowledge to another.

Scope (Dis)economies

The first step in estimating the scope economies is the choice of weights because the DSE measures are sensitive to this choice. We choose the weights via a grid search that yield the smallest value for the DSE. Specifically, for each MFI that provides urban and rural loans in a given year, we perform a grid search where the weights are between 0 and 1 at 0.1 increments. We choose the smallest DSE estimate as the measure of the degree of an MFI's "global" scope economies, that is, $DGSE$.[9]

Table 3 summarizes the $DGSE$ point estimates for loan-only and savings-and-loan MFIs,

[8] We use one-sided 95% percentile bootstrap confidence intervals clustered at the region level. The cross-output derivatives of the rural loans and urban loans are: $\frac{\partial C(\cdot)}{\partial y_1 \partial y_2} = \left(\frac{\partial^2 \ln C(\cdot)}{\partial \ln y_1 \partial \ln y_2} + \frac{\partial \ln C(\cdot)}{\partial \ln y_1} \cdot \frac{\partial \ln C(\cdot)}{\partial \ln y_2} \right) \cdot \frac{C}{y_1 y_2}$.

[9] Since weights are observation specific, we report mean and median here. For lending-only MFIs, such weights are 0.9 at median and 0.89 at mean. For savings-and-loan MFIs, weights for urban loan is 0.1 at median, 0.37 at mean, weights for deposits is 0 at median, 0.21 at mean. Using alternative weights between 0 to 1 in increments of 0.01 does not produce a qualitative difference. The results are presented in Table A.2 in the appendix.

respectively, along with the sample shares of MFIs that have scope diseconomies, scope invariance, and scope economies (SD, SI, and SE), as well as the negating alternatives: scope non-diseconomies, scope non-invariance, and scope non-economies (SND, SNI, and SNE). We classify MFIs into these three binary groups based on whether the $DGSE$ point estimates are statistically less than, equal to, or greater than zero at the 5% significance level by using the appropriate one- or two-sided percentile bootstrap confidence bounds. Specifically, if a one-sided 95% lower (upper) bound of a DSE point estimate is greater (less) than zero, then an MFI benefits from scope economies (suffers from scope diseconomies). If its two-sided 95% confidence interval contains zero, then an MFI is defined as having scope invariance.

Our main results are as follows. For loan-only MFIs, the mean degree of scope economies is estimated at 0.166 that indicates, on average, a potential for 16.6% cost savings if the separate production of rural and urban loans is replaced with the joint production of the two. In the sample, 47.66% of the loan-only MFIs enjoy significant scope economies with the rest invariant to scope economies. A similar outcome applies when outputs are measured in the dollar value of the loan portfolio: the mean degree of scope economies is estimated at 0.142, with 52.76% of loan-only MFIs enjoying significant scope economies.

For savings-and-loan MFIs, the mean degree of scope economies is estimated at –0.119 indicating, on average, the potential for an 11.9% cost savings if the joint production of rural and urban loans is replaced with the separate production of each one. In the sample, 76.10% of the savings-and-loan MFIs suffer from significant scope diseconomies, and 32.06% have a cost invariance to scope. When outputs are measured by the dollar value of the loan portfolio and savings, the mean degree of scope economies is –0.174, and 56.93% of the savings-and-loan MFIs suffer from significant scope diseconomies, which is 20% less compared to the results from the main model. Overall, the empirical evidence shows the existence of significant scope diseconomies that indicates the separate production of urban and rural accounts has the potential to reduce the costs of savings-and-loan MFIs. Figure 1 shows the distribution of scope (dis)economies by the business model illustrating the first main conclusion: the two MFIs business models have opposite scope economies. Therefore, estimating scope economies without accounting for the differences in the business type would

be misleading.

The presence of scope economies in loan-only MFIs suggests that the lower costs may allow them to serve more marginal clients. In contrast, MFIs offering savings and loans that experience scope diseconomies from serving both markets may need subsidies to cover costs, learn how to decrease costs, or avoid diversification and focus on urban market. Analysis of changes in scope economies over time by business type would help understand how the industry works and how it is likely to change with the commercialization trend, that is the push to have MFIs transform into commercial enterprises usually with a mandate to collect savings and to become regulated institutions.

We thus examine the evolution of scope (dis)economies over time for the loan-only and the savings-and-loan MFIs. Table 4 contains the magnitudes of the scope (dis)economies for the sample years for all statistically significant point estimates together with the proportion of observations that have statistically significant (dis)economies. It shows the results from the main model as well as the specifications with output in dollar values that serve as robustness checks. Figure 2 illustrates all estimates (statistically significant and not) over time.

For the sample of loan-only MFIs, the magnitude and the proportion of those that have significantly positive scope economies shrank from 67.88% with mean scope economies of 0.44 in 2008 to only 26.47% with mean scope economies of 0.20 in 2018. This shrinkage may be due to the initially high scope economies that eroded as more MFIs joined the market and may have intensified competition or, alternatively, caused existing MFIs to serve costlier clientele in either or both markets. The results are similar for both savings-and-loan and loan-only MFIs when the outputs are measured in dollars. Figure 2 shows a box plot of statistically significant and insignificant $DGSE$ point estimates. These figures are consistent with the previous findings in which the cost structure of a growing number of MFIs had generally become invariant to scope economies from rural and urban products.

Within the savings-and-loan MFIs, we find that the average absolute magnitude of significantly negative scope economies steadily decreased over time from 0.25 in 2008 to 0.07 in 2018. The share of MFIs that had these significantly negative scope economies declined as

well from 87.18% in 2008 to 53.13% in 2018. A plausible interpretation is that, as savings-and-loan MFIs gained experience and knowledge when providing both urban and rural loans, they were able to decrease the costs of operating in rural and urban markets over time. Given that we find a negligible number of these MFIs with cost complementarity of serving rural and urban clients while also having increasing returns to scale, the observed decrease in the negative scope economies is likely driven by the increase in remittances in many parts of the world during the study period that translated into savings products for recipients. This result is also in line with the finding of a decreasing proportion of savings-and-loan MFIs with negative scope economies from the joint production of savings and loans over the period from 2008 to 2014 (Malikov & Hartarska, 2018). Furthermore, the result is consistent with Turvey's (2011) interpretation that MFIs' savers and borrowers are different groups.

These results point to interesting policy implications. MFIs seem to be gradually exhausting scope economies (loan-only) and decreasing scope diseconomies (saving-and-loans) which may be optimal form cost perspective. Therefore, policy makers should be aware that their push toward commercialization may have unexpected effects. While stakeholder-imposed transformation into deposit-collecting regulated institutions may be associated with scale economies, there are also potential scope diseconomies if the MFIs serve both rural and urban markets. Such commercialization may not be optimal if it leads to serving less poor clients when MFIs are forced to control costs serving both markets. Support for lending-only MFIs can in turn be good for rural markets as these MFIs can benefit from scope economies by jointly serving rural and urban markets and thus more marginal clients.

To further investigate how the magnitude of scope (dis)economies varies by different institutional characteristics, we estimate several OLS models in which the degree of scope economies is regressed on the attributes of MFIs by using all point estimates and the statistically significant $DGSE$ (see Berger et al., 2000; Malikov & Hartarska, 2018). The results (available on request) show that the MFIs' size and risk levels are associated with the level of $DGSE$ but that the MFI's type (NGO, bank, etc.) is not. The estimated $DGSE$ in loan-only MFIs varies by target market clientele with those that target broad markets and microbusinesses with less poor clients having larger $DGSE$s compared to loan-only MFIs

that are devoted to the poorest clients, consistent with the idea that loan-only MFI may be serving the poor by exhausting scope economies. The regulated savings-and-loan MFIs have smaller scope diseconomies than non-regulated MFIs while donations have no impact.

In line with the studies of scale and scope economies in microfinance, we also observe regional differences (Delgado et al., 2015; Hartarska et al., 2013). The largest diseconomies from serving both rural and urban markets are –0.16 and –0.167 for savings-and-loan MFIs that are located in Africa (including Middle East) and Asia (excluding Central Asia), respectively (see Table A.3 in the appendix). Their counterparts in Latin America, Eastern Europe, and in Central Asia have smaller scope diseconomies of –0.123 and –0.116 respectively. Interestingly, loan-only MFIs in Asia show the smallest scope economies at only 0.037 based on estimates from the main model but not when outputs are measured in dollars. This is important because it demonstrates that a focus on the loan portfolio that ignores the number of clients that MFIs serve produces somewhat misleading results and may lead to impactful differences in policy recommendations.

Scale Economies

For a fixed mix of outputs, scale economies are another source of cost reduction (Chavas & Kim, 2010). We use the classical method (Caves et al., 1981) to compute the returns to scale that takes into account the quasi-fixity of the equity input, $RTS = \frac{1-\partial \ln C/\partial \ln e}{\sum_i \partial \ln C/\partial \ln y_i}$. Table 5 shows the RTS point estimates with the corresponding two-sided 95% percentile block-bootstrap confidence intervals and the sample shares of MFIs that have decreasing, constant, or increasing returns to scale. The results show a prevalence of increasing returns to scale. This means that the cost per unit of output decreases with the increase in scale as fixed costs are spread over larger output quantities. However, returns to scale can only measure the cost savings for a fixed output mix.[10]

[10]The elasticity of cost with respect to time shows little improvement over time. Among the MFIs that specialize in urban markets, loan-only MFIs decreased their costs by 2%, while the savings-and-loan MFI costs remained unchanged. Among the MFIs that serve both rural and urban markets, costs rose by about 2% for loan -only and by 1.8% for savings-and-loan.

Scope Economies, Size, and Returns to Scale

The relation between scope economies and the MFI's size is positive in savings-and-loan MFIs while it is less clear in loan-only MFIs (Figure A.4 in the appendix). The relation between scope economies and scale economies (Figure A.5 in the appendix) is generally positive. The bi-variate plot of the relation between $DGSE$ and (estimated increasing) RTS point estimates at different quantiles (by business model) shows a positive association for loan-only MFIs, the magnitude of which declines with the size quantiles. In savings-and-loan MFIs, a higher $DGSE$ is clearly associated with improving (becoming smaller) diseconomies of scale. While there are some differences within the distribution of MFIs, the evidence overall supports the idea that larger MFIs of both business types are better positioned to benefit from scale and scope economies (or smaller scope diseconomies for savings-and-loan MFIs).

Conclusions

Microfinance Institutions (MFIs) operate as either loan-only or savings-and-loan institutions. Investors, stakeholders, and policymakers promote commercialization or transformation of credit-only MFIs into integrated savings-and-loan entities. While the transformed MFIs are expected to continue to offer financial products to rural and urban clients, little is known about the costs associated with (dis)economies resulting from joint provision of rural and urban microfinance services, as opposed to specialization. We provide estimates of scope economies in Microfinance by accommodating the inherent institutional heterogeneity and ensuring robust inference. One novelty of this approach is that we do not rely on the unrealistic assumption that loan-only MFIs share the same technology and incur the same fixed costs as the savings-and-loan MFIs. More importantly, we use a weighting scheme to avoid the reliance on counterfactuals derived from too few observations from MFIs specializing in rural-only products as well as to minimize the well-known "excessive extrapolation" problem. Our results offer investors, policymakers, and stakeholders new insights and a more robust perspective on the costs and benefits of promoting diversification or specialization in rural or urban microfinance on the grounds of the cost saving potential due to scope economies.

Using data on MFIs from 105 countries for the period of 2008–2018, we find that scope economies from offering both rural and urban microfinance products differ by the MFI's business type, i.e., loan-only and savings-and-loan. Loan-only MFIs largely have positive scope economies with a mean degree of 16.6% that is significant for about half of the institutions, which supports the case for diversification. However, these scope economies have declined over time: while over two-thirds of the MFIs had positive scope economies in 2008, only a quarter had them in 2018. For savings-and-loan MFIs, we find statistically significant scope diseconomies from providing rural and urban microfinance services with a mean estimate of 11.7%, which indicates benefits from specialization. Furthermore, while close to 90% of these MFIs had statistically significant scope diseconomies in 2008, by 2018 only about half of them did and the magnitude had decreased from 25% to 7%. We also find negligible cost complementarity in savings-and-loan MFIs. These findings are consistent with recent results that 14% of these MFIs had scope diseconomies from integrating savings and loans (Malikov & Hartarska, 2018). Thus, offering much needed savings products to the poor may be additionally hindered by the negative scope economies from serving both rural and urban markets.

Our main conclusion is that failure to account for differences in MFIs' business models and reliance on one-size-fits-all policy recommendations may be ill-advised. The temporal dynamics of the magnitudes and the prevalence of the scope economies show that, while savings-and-loan MFIs are working to decrease their scope diseconomies from serving both markets, loan-only MFIs are likely lending to more marginal borrowers thereby exhausting their positive scope economies. Thus, if the policy objective is to encourage lending to a specific group (e.g., women, the poor, disabled, etc.) in both rural and urban markets, loan-only MFIs may be better suited for such targeting. The drive for the commercialization of microfinance, usually accompanied by offering much needed savings products and simultaneously regulation of the MFIs, is not costless and is less compatible with diversification across rural and urban markets within one institution. Thus, the cost consequences for MFIs should be considered when policymakers and stakeholders design specific interventions to promote access to financial services across the globe.

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Table 1. Summary Statistics

Loans Only MFIs								
	urban loans only				**rural loans and urban loans**			
Variable	1st Qu.	Median	Mean	3rd Qu.	1st Qu.	Median	Mean	3rd Qu.
C	384.69	1118.61	5400.28	4030.62	583.95	1721.53	4105.05	4652.97
w_1	20.79	48.02	106.70	120.89	13.87	35.22	49.81	64.28
w_2	6.67	11.78	12.97	17.26	3.05	7.30	7.85	10.88
w_3	0.06	0.09	0.19	0.15	0.06	0.08	0.09	0.11
e	516.39	1761.12	12906.76	6258.80	839.73	2624.65	6388.37	7445.65
r	0.01	0.04	0.06	0.08	0.01	0.03	0.06	0.06
y_1 in \$	924.47	3573.41	27109.53	13654.05	917.73	3105.50	8516.55	8940.68
y_1 in #	1312.00	3715.00	59948.83	12203.00	1604.00	5086.00	18808.27	16832.00
y_2 in \$					851.20	2975.40	10674.77	11270.19
y_2 in #					1488.00	6015.00	32136.41	20790.00
# of Obs.		241				1981		
Savings-and-loan MFIs								
	urban loans only				**rural loans and urban loans**			
Variable	1st Qu.	Median	Mean	3rd Qu.	1st Qu.	Median	Mean	3rd Qu.
C	1244.87	3626.29	7947.75	8167.38	809.66	2610.04	7681.31	8507.95
w_1	61.79	135.38	162.90	229.02	12.52	38.99	75.03	103.86
w_2	4.88	7.75	8.45	11.03	2.83	4.91	6.61	9.50
w_3	0.06	0.08	0.11	0.12	0.05	0.07	0.09	0.10
e	1413.82	3848.45	10831.54	8987.71	1108.23	3415.02	10571.07	11123.79
r	0.03	0.05	0.08	0.09	0.02	0.04	0.06	0.07
y_1 in \$	3363.21	13643.42	36466.77	29217.36	1177.19	4876.16	28333.25	21411.47
y_1 in #	5783.00	11913.50	30061.02	27523.00	2481.00	8826.00	26730.28	27074.00
y_2 in \$					1782.27	6303.90	21977.90	23615.13
y_2 in #					2569.00	12176.00	44304.32	45869.00
y_3 in \$	1377.02	5721.31	21840.03	18225.53	1509.63	5635.78	36649.00	31516.29
y_3 in #	12050.00	28642.00	52253.06	66117.00	12225.00	44721.00	113272.60	126742.00
# of Obs.		154				1723		

Note: C – total variable costs; w_1 – price of physical capital; w_2 – price of labor; w_3 – price of financial capital; e – total equity; r – portfolio at risk (30 days); y_1 in \$ – volume of urban loans; y_1 in # –number of borrowers for urban loans; y_2 in \$ – volume of rural loans; y_2 in # –number of borrowers for rural loans; y_3 in \$ – volume of total savings deposits; y_3 in # – number of saver for total savings deposits . Variables C, y_1 in \$, y_2 in \$, y_3 in \$, w_1, w_2 and e are in thousands of real USD. The risk variable r is a unit-free proportion.

Table 2. Urban and Rural Loan Elasticity for MFIs Offering Both Loans

	Loan-only MFIs		**Savings-and-loan MFIs**	
	in #	in $	in #	in $
Urban Loan Elasticity	0.292	0.311	0.144	0.102
	(0.271, 0.317)	(0.293, 0.328)	(0.098, 0.177)	(0.052, 0.152)
Rural loan elasticity	0.34	0.343	0.206	0.184
	(0.309, 0.367)	(0.308, 0.37)	(0.14, 0.252)	(0.135, 0.23)

Note: The mean estimates of urban and loan elasticity for MFIs that offer both loans are reported along with the two -sided 95% percentile block-bootstrap confidence intervals in parentheses.

Table 3. Estimates of Degree of Scope Economies

Loan-only MFIs

	Point Estimates				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**SD**	SND	**SI**	SNI	**SE**	SNE
in #	0.166 (0.11, 0.224)	–0.001 (–0.085, 0.047)	0.111 (0.009, 0.184)	0.269 (0.197, 0.369)	7.92	92.08	53.35	46.65	47.66	52.34
in $	0.142 (0.051, 0.23)	–0.004 (–0.076, 0.045)	0.109 (0.051, 0.132)	0.262 (0.122, 0.398)	9.35	90.65	46.07	53.93	52.76	47.24

Savings-and-loan MFIs

	Point Estimates				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**SD**	SND	**SI**	SNI	**SE**	SNE
in #	–0.119 (–0.256, –0.074)	–0.165 (–0.442, –0.104)	–0.1 (–0.198, –0.044)	–0.036 (–0.098, –0.008)	76.10	23.90	32.06	67.94	0.00	100.00
in $	–0.174 (–0.25, –0.075)	–0.245 (–0.397, –0.122)	–0.118 (–0.198, –0.026)	–0.048 (–0.125, 0.011)	56.93	43.07	52.70	47.30	0.00	100.00

Note: The left panel summarizes the *DGSE* point estimates with the corresponding two-sided 95% percentile block-bootstrap confidence intervals in parentheses. Each MFI is classified as having scope diseconomies, invariance, or economies (SD, SI, or SE) if its point estimate of the *DGSE* is statistically less than, equal to, or greater than zero at the 5% significance level using the appropriate one- or two-sided percentile confidence bounds. The right panel presents the sample shares for each category and for the corresponding negative alternative: scope non-diseconomies, non-invariance, or non-economies (SND, SNI, or SNE), respectively. Percentage points sum up to 100 within binary groups only.

Table 4. Scope Economies for Loan-only MFIs over Time

	in #		in $	
Year	% Obs	Mean Est.	% Obs	Mean Est.
2008	67.88	0.44	63.20	0.46
2009	60.71	0.43	58.46	0.45
2010	61.46	0.39	63.59	0.39
2011	60.20	0.36	61.54	0.34
2012	44.29	0.35	57.34	0.28
2013	49.76	0.31	53.49	0.25
2014	44.13	0.35	52.97	0.24
2015	37.27	0.28	46.43	0.21
2016	34.18	0.23	40.12	0.20
2017	26.47	0.21	37.14	0.18
2018	26.47	0.20	34.29	0.11
2008-2018	47.66	0.35	52.76	0.30

Note: The categories for "scope economies" are respectively based on whether the $DGSE$ point estimates are statistically greater than zero.

Table 5. Scope Diseconomies for Savings-and-loan MFIs over Time

	in #		in $	
Year	% Obs	Mean Est.	% Obs	Mean Est.
2008	87.18	–0.25	87.42	–0.24
2009	89.82	–0.22	77.25	–0.21
2010	87.69	–0.18	70.62	–0.20
2011	82.98	–0.16	59.26	–0.21
2012	81.45	–0.14	52.76	–0.18
2013	77.08	–0.11	46.81	–0.21
2014	71.35	–0.09	45.24	–0.19
2015	68.57	–0.08	42.53	–0.19
2016	61.99	–0.07	42.77	–0.20
2017	60.14	–0.07	42.47	–0.18
2018	53.13	–0.07	51.56	–0.19
2008-2018	76.10	–0.14	56.93	–0.20

Note: The categories for "scope diseconomies" are respectively based on whether the $DGSE$ point estimates are statistically less than zero.

Table 6. Returns to Scale Estimates for Loan-only MFIs

in #	*Point Estimates*				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**DRS**	NDRS	**CRS**	NCRS	**IRS**	NIRS
urban loan only	1.257 (1.055, 1.731)	1.082 (0.397, 1.169)	1.399 (1.251, 1.577)	1.859 (1.666, 2.446)	15.21	84.79	26.73	73.27	63.59	36.41
rural and urban loans	1.474 (1.423, 1.549)	1.335 (1.269, 1.386)	1.466 (1.424, 1.518)	1.611 (1.486, 1.756)	0.00	100.00	0.00	100.00	100.00	0.00
in $	*Point Estimates*				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**DRS**	NDRS	**CRS**	NCRS	**IRS**	NIRS
urban loan only	2.571 (1.668, 2.694)	1.764 (–0.546, 2.086)	2.15 (1.588, 2.688)	2.899 (1.949, 4.148)	2.76	97.24	19.82	80.18	79.72	20.28
rural and urban loans	1.567 (1.534, 1.626)	1.454 (1.408, 1.483)	1.563 (1.532, 1.606)	1.671 (1.607, 1.8)	0.00	100.00	0.00	100.00	100.00	0.00

Note: The left panel summarizes the *RTS* point estimates with the corresponding two-sided 95% percentile block-bootstrap confidence intervals in parentheses. Each MFI is classified as exhibiting decreasing/constant/increasing returns to scale (DRS/CRS/IRS) if the point estimate of its returns to scale is statistically less than, equal to, or greater than one at the 5% significance level using appropriate one- or two-sided percentile confidence bounds. The right panel presents sample shares for each category and for its corresponding negating alternative: non-decreasing, non-constant, or non-increasing returns to scale (NDRS/NCRS/NIRS), respectively. Percentage points sum up to a 100 within binary groups only.

Table 7. Returns to Scale Estimates for Savings-and-loan MFIs

in #	*Point Estimates*				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**DRS**	NDRS	**CRS**	NCRS	**IRS**	NIRS
urban loan only	1.577 (1.297, 1.882)	1.361 (1.064, 1.576)	1.47 (1.237, 1.814)	1.695 (1.409, 2.155)	0.00	100.00	9.42	90.58	92.03	7.97
rural and urban loans	1.803 (1.58, 2.164)	1.658 (1.467, 1.876)	1.775 (1.557, 2.071)	1.917 (1.664, 2.398)	0.00	100.00	0.00	100.00	100.00	0.00
in $	*Point Estimates*				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**DRS**	NDRS	**CRS**	NCRS	**IRS**	NIRS
urban loan only	2.409 (2.238, 2.924)	1.953 (1.754, 2.095)	2.271 (2.05, 2.312)	2.633 (2.439, 3.383)	0.00	100.00	0.00	100.00	100.00	0.00
rural and urban loans	2.319 (2.173, 2.493)	2.119 (1.981, 2.222)	2.288 (2.142, 2.402)	2.488 (2.34, 2.733)	0.00	100.00	0.00	100.00	100.00	0.00

Note: The left panel summarizes the *RTS* point estimates with the corresponding two-sided 95% percentile block-bootstrap confidence intervals in parentheses. Each MFI is classified as exhibiting decreasing/constant/increasing returns to scale (DRS/CRS/IRS) if the point estimate of its returns to scale is statistically less than, equal to, or greater than one at the 5% significance level using appropriate one- or two-sided percentile confidence bounds. The right panel presents sample shares for each category and for its corresponding negating alternative: non-decreasing, non-constant, or non-increasing returns to scale (NDRS/NCRS/NIRS), respectively. Percentage points sum up to a 100 within binary groups only.

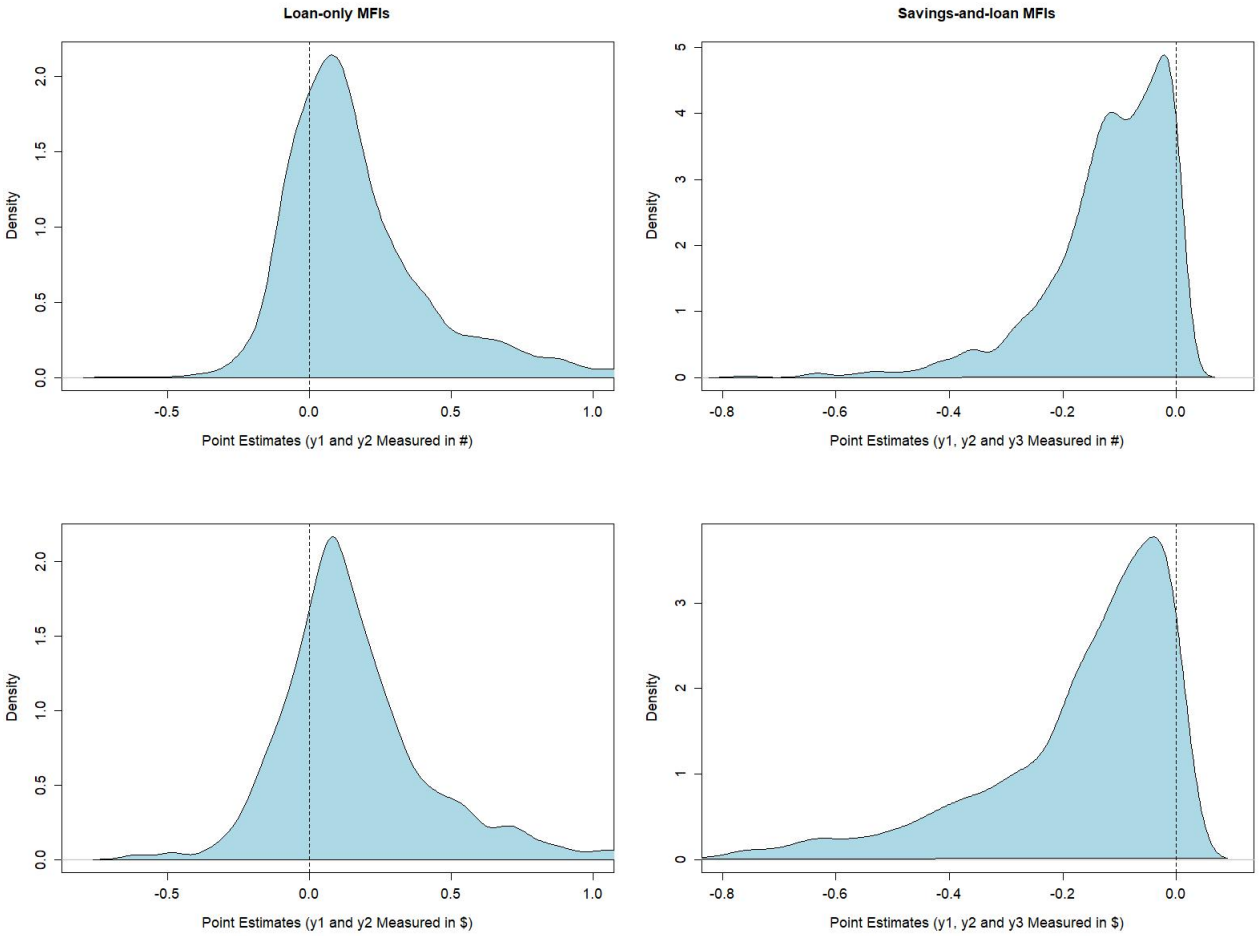

Figure 1 Distribution of point estimates of scope economies

Note: The top line contains the distributions of the model in which outputs are measured by the number of borrowers and the number of savers. The bottom figures are for outputs measured in the dollar value of the loan portfolio and savings.

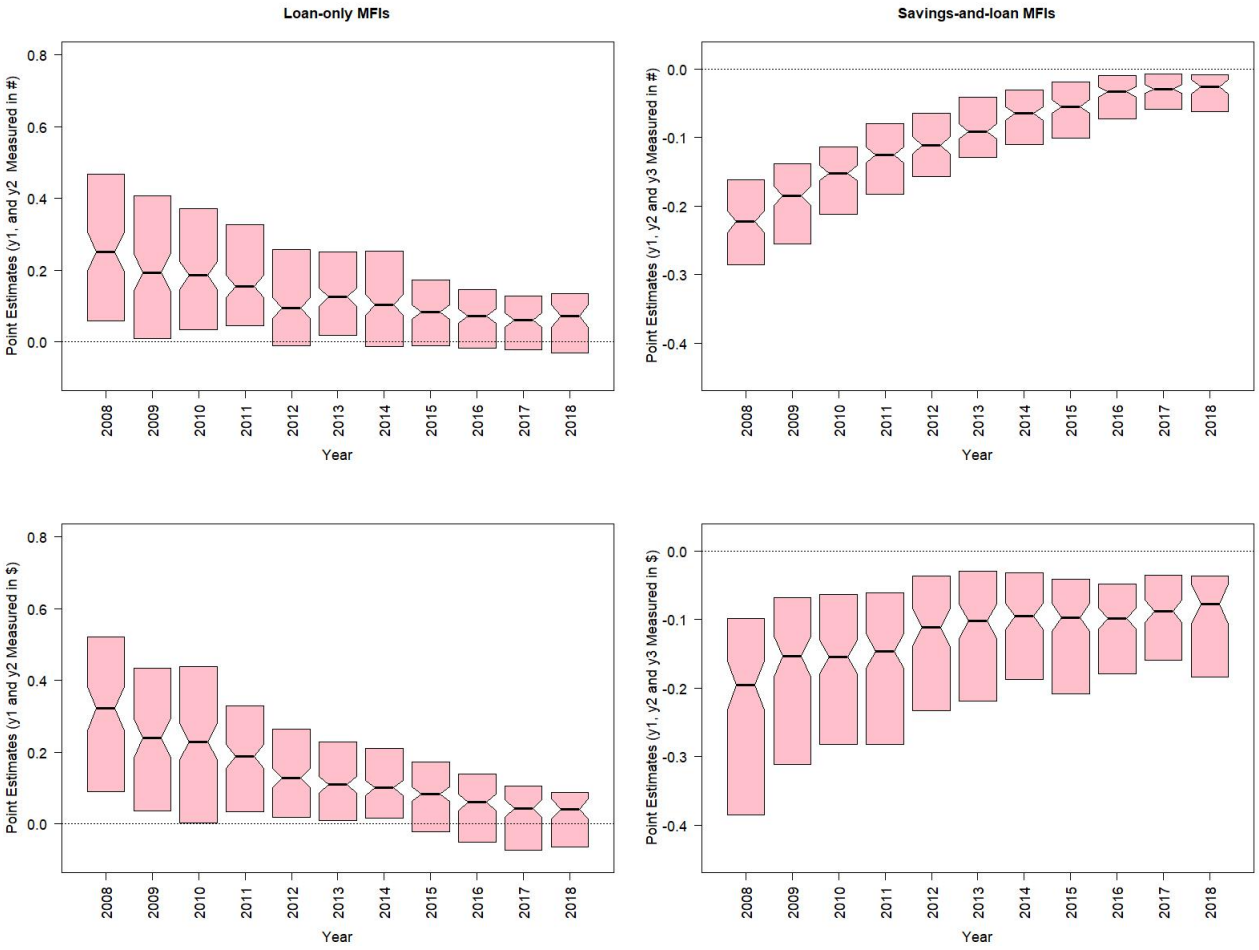

Figure 2 Yearly distribution of the degree of scope economies estimates

Note: The top line contains the figures from the main model in which outputs are measured by the numbers of borrowers and savers, while the bottom line contains the results from models in which outputs are measured by the dollar value of the loan portfolio and savings.

Appendix

Table A.1. Cost Elasticity of Deposits in the Savings-and-loan MFIs

in #				
	urban loans only		**rural and urban loans**	
	Point Estimate	Lower Bound	Point Estimate	Lower Bound
10thPercentile	–0.148	–0.312	0.042	–0.009
1st Quartile	–0.001	–0.029	0.068	0.015
Median	0.193	0.155	0.092	0.039
3rd Quartile	0.309	0.258	0.117	0.066
90thPercentile	0.413	0.319	0.142	0.086
Mean	0.147	0.115	0.091	0.042
in $				
	urban loans only		**rural and urban loans**	
	Point Estimate	Lower Bound	Point Estimate	Lower Bound
10thPercentile	–0.133	–0.185	0.034	–0.035
1st Quartile	–0.034	–0.083	0.060	–0.002
Median	0.097	0.049	0.087	0.030
3rd Quartile	0.218	0.172	0.118	0.061
90thPercentile	0.336	0.283	0.147	0.093
Mean	0.095	0.058	0.091	0.035

Note: This table presents the estimates of the cost elasticity of deposits. The lower bounds are for the one-sided 95% percentile block-bootstrap confidence intervals, with the corresponding upper bounds being $+\infty$.

Table A.2. Degree of Scope Economies Estimates When Weights Range from 0 to 1 at 0.01 Increments

Loan-only MFIs

	Point Estimates				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**SD**	SND	**SI**	SNI	**SE**	SNE
in #	0.148 (0.087, 0.209)	–0.016 (–0.114, 0.038)	0.089 (–0.015, 0.171)	0.254 (0.184, 0.354)	9.78	90.22	54.99	45.01	43.94	56.06
in $	0.128 (0.042, 0.212)	–0.017 (–0.098, 0.037)	0.101 (0.048, 0.125)	0.25 (0.118, 0.387)	11.21	88.79	47.61	52.39	49.73	50.27

Savings-and-loan MFIs

	Point Estimates				*Categories, %*					
	Mean	1st Qu.	Median	3rd Qu.	**SD**	SND	**SI**	SNI	**SE**	SNE
in #	–0.225 (–0.361, –0.155)	–0.306 (–0.498, –0.214)	–0.22 (–0.349, –0.136)	–0.138 (–0.245, –0.045)	89.25	10.75	16.03	83.97	0.00	100.00
in $	–0.281 (–0.366, –0.163)	–0.369 (–0.492, –0.246)	–0.248 (–0.348, –0.107)	–0.158 (–0.264, –0.002)	77.09	22.91	28.44	71.56	0.00	100.00

Note: The left panel summarizes the *DGSE* point estimates with the corresponding two-sided 95% percentile block-bootstrap confidence intervals in parentheses. Each MFI is classified as having scope diseconomies, invariance, or economies (SD, SI, or SE) if its point estimate of the *DGSE* is statistically less than, equal to, or greater than zero at the 5% significance level using the appropriate one- or two-sided percentile confidence bounds. The right panel presents the sample shares for each category and for the corresponding negative alternative: scope non-diseconomies, non-invariance, or non-economies (SND, SNI, or SNE), respectively. Percentage points sum up to 100 within binary groups only.

Table A.3. Geographic differences of significant point estimates

	Loan-only MFIs		Savings-and-loan MFIs	
Region	**in #**	**in $**	**in #**	**in $**
Latin America and the Caribbean	0.335	0.288	–0.123	–0.189
	(0.228)	(0.247)	(0.089)	(0.132)
South Asia, East Asia and the Pacific	0.037	0.189	–0.16	–0.192
	(0.238)	(0.248)	(0.111)	(0.124)
Eastern Europe and Central Asia	0.412	0.257	–0.116	–0.231
	(0.249)	(0.235)	(0.091)	(0.19)
Africa or Middle East and North Africa	0.16	0.185	–0.167	–0.287
	(0.293)	(0.290)	(0.135)	(0.186)

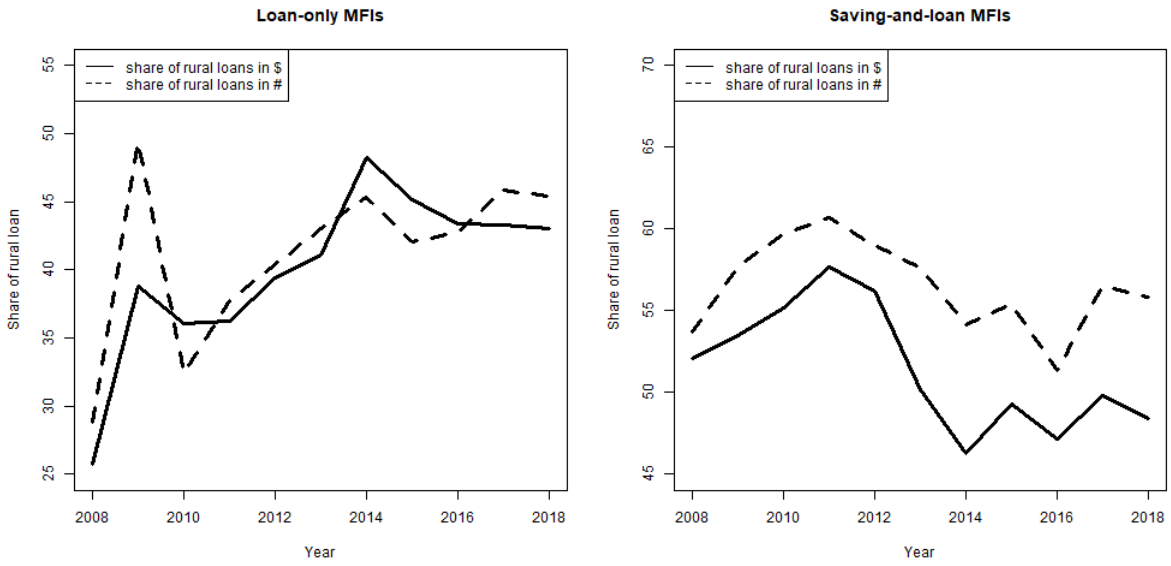

Figure A.1 Share of rural loans in $ volume of the portfolio and in # of active borrowers

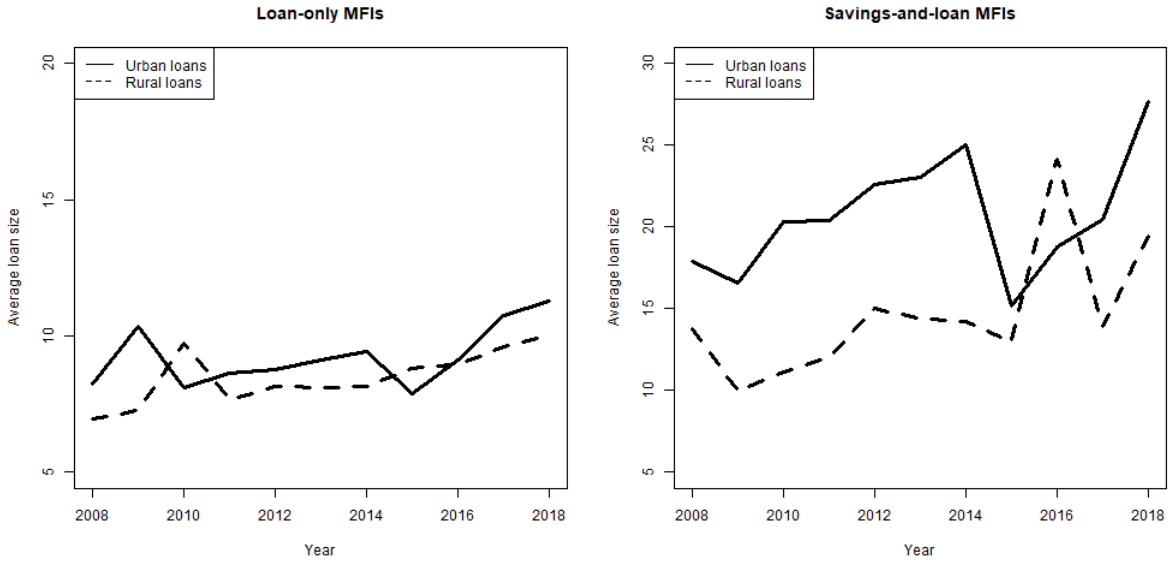

Figure A.2 Average loans size for urban loans or rural lending

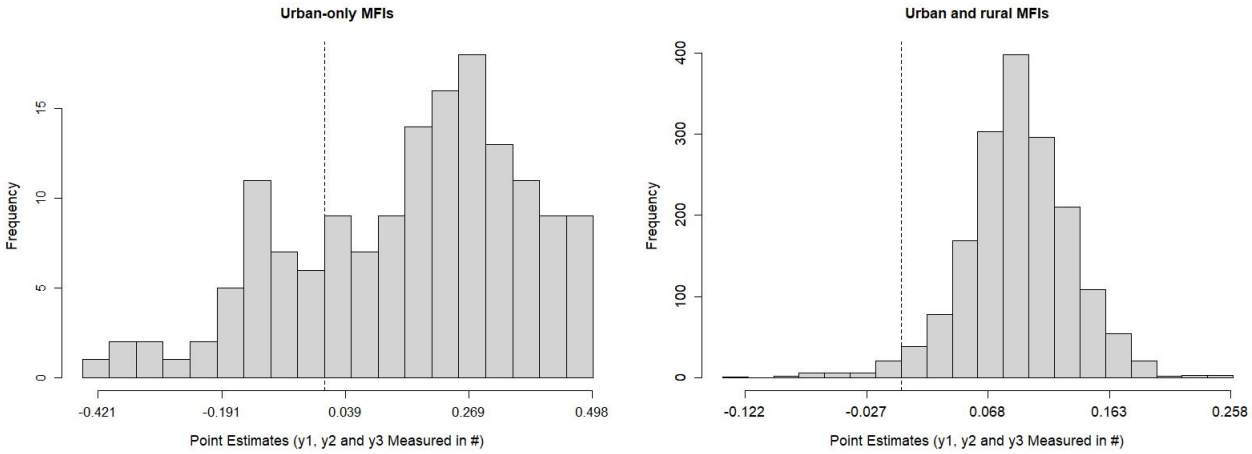

Figure A.3 Distribution of cost elasticity of deposits in the savings-and-loan MFIs

Note: The dotted line corresponds to 0

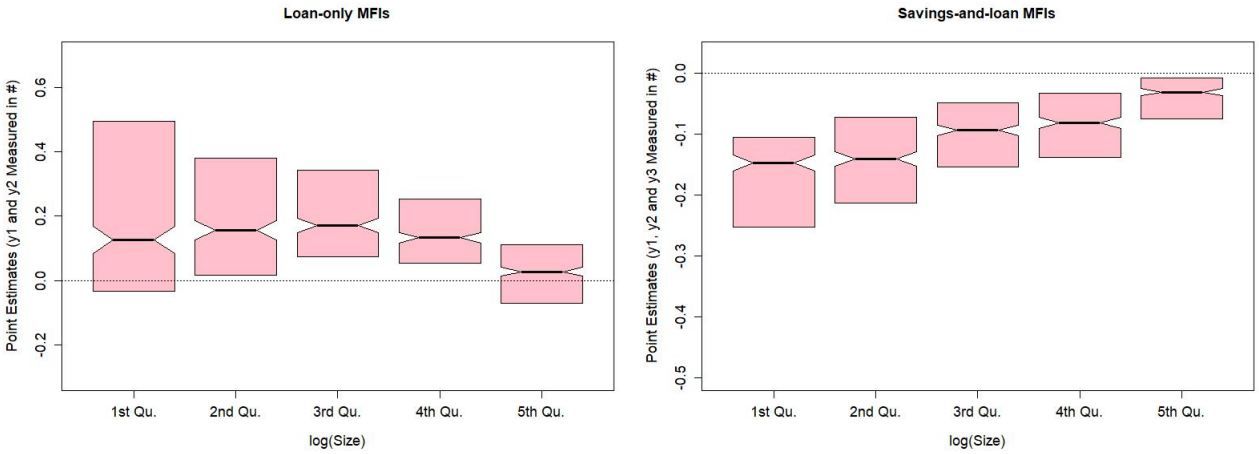

Figure A.4 Degree of scope economies by log(size) quantiles

Note: These are the results from the main model in which outputs are measured by the numbers of borrowers and savers.

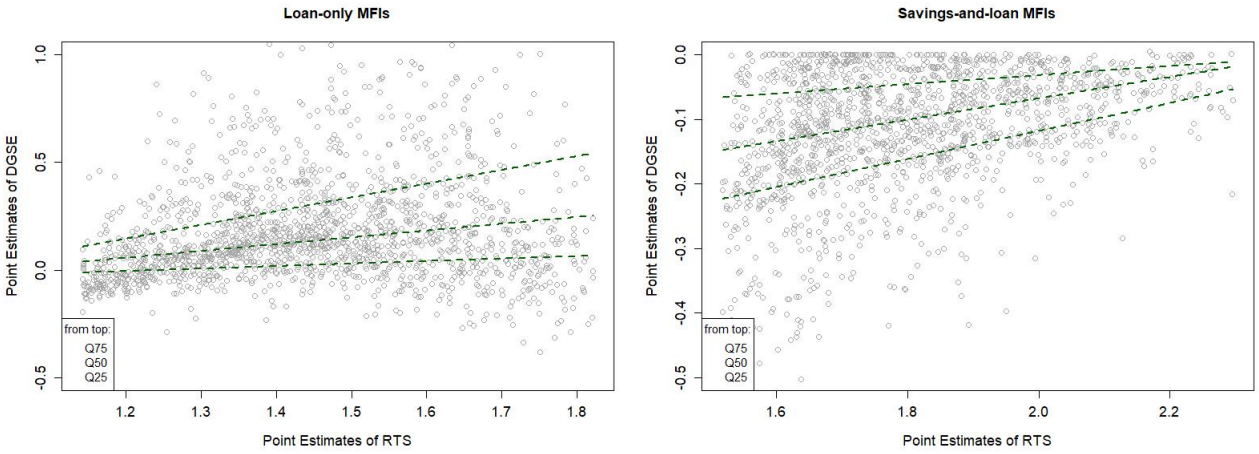

Figure A.5 Bivariate relation between the degree of scope economies and returns to scale estimates, fitted quantiles

Note: These are the results from the main model in which outputs are measured by the numbers of borrowers and savers.