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RESEARCH ARTICLE

How the method for delivering loans impacts on the economic efficiency of microfinance institutions

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Abstract

The aim of this research has been to analyse how the method employed for lending can affect the cost efficiency of microfinance institutions (MFIs) since innovations for lending have been introduced in the sector in the last years and there are not empirical studies to analyse the actual impact of it. The improvement of MFIs' cost efficiency is very important for these institutions to achieve their financial self-sufficiency and be sustainable in the long run. The data employed in this analysis have been an unbalanced panel composed of a sample of 1017 MFIs for the 2008–2018 period and collected from the microfinance information exchange (MIX) database. Our results also show that community or group-lending methods, as village banking and solidarity groups, have a positive effect on the MFIs' cost efficiency versus traditional methods based on individual lending. In addition, we have found that MFIs with a higher proportion of borrowers in rural areas are more cost efficient than institutions with more borrowers in urban areas, although community or group-lending methods have a larger positive effect on MFIs' cost efficiency in urban than in rural areas.

1 | INTRODUCTION

Microfinance institutions (MFIs), commonly known as 'banks for the poor', are designed to serve low-income persons excluded from the traditional financial system who need to have access to a variety of basic financial products and services at a reasonable price or conditions (Azad et al., 2016; Daher & Le Saout, 2013; Tchakoute-Tchuigoua, 2010). Since mainstream financial institutions do not allow poor households access to their services because of those households' poor economic status or credit worthiness, MFIs serve as important providers of credit to poor and near-poor borrowers excluded from the traditional banking system allowing their financial inclusion (Azad et al., 2016). Consequently, MFIs can play a significant role in programmes to alleviate poverty and promote economic opportunity in nations around the world (Caudill et al., 2009; Tchakoute-Tchuigoua, 2010).

The core business of MFIs is to develop methods that can enable them to extend financial services to the hitherto un-bankable and excluded from traditional banking activities (Abdulai & Tewari, 2017; El Hachami et al., 2019). To achieve financial self-sufficiency, reach as many customers as possible, and be sustainable in the long-run, MFIs must employ practices that improve their economic efficiency. In recent years, many MFIs have prioritised economic efficiency and cost reduction in their management practices because they have suffered a reduction in subsidies (Fall et al., 2018; Nourani et al., 2021). How to deliver lending is an important issue for it, so that the microfinance movement try to exploit new contractual structures and organisational forms that reduce the riskiness and costs of making small and uncollateralised loans (Morduch, 2000). Community or group-lending methods are financial innovations to improve MFIs' social efficiency, but also their economic efficiency, versus the traditional lending system based on individual analysis and personal collateral. One attribute of community or group lending is that possess a comparative advantage over the traditional system in collecting information about the borrowers

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(Lassoued, 2017). This advantage comes from the fact that the financial institutions are in the same place where their borrowers live and work (i.e. they operate in villages that are small and where family and social ties are strong). In these villages, people know each other well and information is readily accessible and verifiable using family members, friends, neighbours and members of the same indigenous group as the borrower. This information advantage would reduce the costs of screening and monitoring borrowers. Nevertheless, some of the criticisms of community or group lending include high interest rates and cumbersome processes, which would affect MFIs' cost efficiency and, consequently, the sustainability of the system (El Hachami et al., 2019; Lassoued, 2017). Hence, we can think that these institutions could have significant differences in costs depending on the method of lending employed by them. In this research, we will test whether community or group lending may be a cost-effective mechanism to grant loans versus the traditional method based on individual lending. At the same time, we will also contrast whether solidarity group lending is an important innovation over the original village banking model to improve MFIs' economic efficiency. Finally, we will test whether information economies obtained with community or group-lending methods could decline when the organisation extends its operations beyond the boundaries of a single village and is operating mainly in a larger town what would affect negatively in the MFIs' economic performance.

As far as we know there is not relevant empirical research on this topic although it is an important issue for MFIs' sustainability.[1] The main purpose of this paper is, therefore, to analyse how the method employed for lending can impact on MFIs' economic performance. With this research, we have found strong evidence supporting the relationship between the lending method employed by MFIs and their economic performance, being community or group lending more efficient than individual lending. Our results also show that there is not a difference in cost efficiency between village banking and solidarity groups as well as that MFI lending is more efficient in rural than in urban areas, regardless the lending method. However, the use of community or group lending in urban areas would impact more in the MFIs' cost efficiency than when those lending methods are employed in rural areas. Despite of it, traditional lending is more employed in urban areas whereby would be advisable to expand the use of community or group lending in these areas.

In the following section, we review the main methods of delivering loans by MFIs and present formally the research questions to be answered in this research. The methodology employed to test the research questions and the results obtained with it are described and discussed in Sections 3 and 4, respectively. Finally, the conclusions of our work are presented in the Section 5.

Policy Implications

- Community or group-lending methods are effective methods for MFIs to control their costs and be more efficient.
- There is not a significant difference in cost efficiency when the method of village banking or solidarity group is employed.
- MFIs operating in rural areas are more cost efficient than operating in urban areas regardless of the lending method.
- It would be very important for the economic sustainability of these institutions to increase the use of community or group-lending methods in urban areas.

2 | MAIN METHODS TO DELIVER LOANS BY MFIS: THEORY AND RESEARCH QUESTIONS

Unreliability of financial information and absence of conventional collateral complicate the screening and the monitoring process of MFIs' borrowers, being the information asymmetry the main problem for these institutions (Lassoued, 2017). Lenders and borrowers attempt to overcome this problem through a variety of means. The borrower may pledge some type of collateral or provide personal guarantees or, alternatively, the lender may charge a higher interest rate to compensate for the lack of transparency (Kariv & Coleman, 2015). To overcome this problem in developing and less developed countries, different lending innovations have been proposed, being the community or group-lending practice the most important instrument to address the problem of information asymmetry by MFIs (Lassoued, 2017).

This research would analyse specifically the impact of three of the most popular lending methods employed by MFIs. These three methods, which are described below, are the traditional method of individual lending as well as the community or group-lending methods of village banking and solidarity groups (Addae-Korankye, 2020; Bangoura, 2012; Fotabong, 2012; Lassoued, 2017; Ledgerwood, 1999; Ouattara et al., 1999; Westley, 2004):

1. ***The individual lending method***. Individual lending is defined as the provision of credit to individuals who are not members of a group that is jointly responsible for loan repayment. This system assumes that clients have assets that can be deposited as collateral or that persons may act as guarantors of the borrower (i.e. as co-signer) because the institutions require a guarantee for the credit. Client

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follow-up is provided by a loan officer whose client portfolio size is relatively small (between 60 and 140 customers) since the loan amounts and terms (e.g. credit duration) are based on careful analysis by the loan officer and subjected to negotiation between the loan officer and client. Likewise, loan officers can develop close relationships with clients over the years, often providing them minimal technical assistance.

2. ***The village banking method***. Village banks are cooperatives of savings and loans that are managed by the community and sponsored by an MFI with the aim of providing financial products to its members. The creation of such institutions is based on strong social cohesion in each geographical area and, therefore, relatively limited. Members are between 30 and 60 men and women from the same village that together define the operating principles. These members elect a management committee, which receives training from the sponsoring MFI, and two or three leaders. The MFI shall give an initial (seed) capital which is distributed as credit to those members. All members sign the loan agreement which provides a collective guarantee of the initial capital. Although village bank members may receive either individual or group loans, these are guaranteed by some form of joint liability. Thus, peer pressure is applied to ensure full repayment what attracts further injections of loan capital. The aim of this type of lending is to support the entire village and not just a few members as in the previous case.
3. ***The solidarity group method***. Village banks tend to restrict their membership to a maximum of 60 people and have realised that even such a number may be too large for proper loan monitoring. A solution has been found in forming smaller solidarity groups (e.g. groups of 4–7 people living in the same village or town), who have an easier time monitoring each other. Under this system, potential clients are required to organise a peer group that will commit to a mutual loan repayment guarantee. These small groups, based on affinity relationships, have to be approved by MFI officers and loan terms and conditions are determined by the MFI. The members do not provide physical collateral when they apply for a loan, instead members cross-guarantee each other's loan so that loan repayment is co-guaranteed by group members. Credit is only renewed if all members have paid their credit. Priority for credit is given to the poorest members, especially to women. The method also incorporates minimal technical assistance to borrowers, such as organisational capacity building and training. Credit officers, who do not normally get to know their clients very well or have only a very partial knowledge of their customers, carry a load of between 200 and 400 clients. The interest rate charged is relatively high, as the filing fees are in addition to the cost of credit.

The community or group-lending methodology can likely mitigate the risks and costs associated with information asymmetry (Lassoued, 2017). One attribute of community or group-lending methods, as village banking and solidarity groups, is that they possess a comparative advantage over the traditional system in collecting information about the borrowers. This advantage comes from the fact that they are in the same place where their borrowers live and work (i.e. they operate in villages that are small and where family and social ties are strong). In these villages, people know each other well and information is readily accessible and verifiable using family members, friends, neighbours, and members of the same indigenous group as the borrower. At the same time, because group borrowers are related by a joint liability, the probability that their associates will have to pay the liability increases when one of them switches to risky projects (moral hazard). Thus, group members are encouraged to screen other clients (Lassoued, 2017). Furthermore, loan officers are often recruited from the community so that they can base their analysis on their knowledge of the client's creditworthiness (character-based lending) to reduce information asymmetry about client's actual solvency (Lee, 2022). Consequently, this information advantage would low the costs of screening and monitoring borrowers.[2]

Other line of research argues that community or group-lending may generate additional costs like group contracting costs, training borrowers on group procedures, higher degree of supervision and a higher frequency of instalments (e.g. weekly repayments). These costs increase interest rates of such loans what would lead to higher repayment risks, worsening the economic efficiency and sustainability of the system (El Hachami et al., 2019; Lassoued, 2017).[3] However, the monitoring mechanism of regular repayment deadlines to maintain high repayment rates in the absence of collateral has many advantages (Morduch, 2000): (i) It excludes undisciplined borrowers at an early stage before accumulation of their unpaid debt; (ii) severe repayment monitoring may guarantee the bank a minimum level of liquidity; (iii) MFIs that use this practice target a specific customer category with an additional good-standing income since the repayment process begins before their investments generate returns.

We can suppose, therefore, that the joint liability of community or group-lending methods may be a cost-effective mechanism to grant loans versus the traditional lending method based on individual analysis and personal collateral. To test this possibility, we state the following research question (RQ):

> RQ1: Have community or group-lending methods as village banking and solidarity groups a positive effect on MFIs' economic (cost) efficiency?

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Nonetheless, some village banks have realised that smaller groups of six people who know each other well are better for monitoring purposes than large groups of 30–60 people, so that solidarity group lending is an important innovation over the original village banking model to improve MFIs' economic efficiency (Ouattara et al., 1999). Consequently, we want to contrast the following research question:

> RQ2: Has solidarity group lending a greater effect on MFIs' economic (cost) efficiency than village bank lending?

On the contrary, according to Ouattara et al. (1999), the information economies obtained with community or group-lending methods would decline when the organisation extends its operations beyond the boundaries of a single village (i.e. a rural area) and is operating mainly in a larger town (i.e. in an urban area) what would affect negatively in the MFIs' economic performance. The research question that we state to test here is as follows:

> RQ3: Have community or group-lending methods as village banking and solidarity groups the same effect on MFIs' economic (cost) efficiency in urban than in rural areas?

3 | METHODOLOGY

3.1 | Data

The data employed in this analysis are an unbalanced panel composed of a sample of 1017 MFIs from different geographic regions across the world (i.e. Eastern Europe and Central Asia, South Asia, Latin America, the Middle East and North Africa and Africa) over an 11-year period (2008–2018), obtaining a total of 3377 observations. The data used for the analysis (in USD) were collected from the Microfinance Information Exchange (MIX) database and from the World Bank's database World Development Indicators.

3.2 | Model specification and estimation

To measure economic efficiency, we have decided to estimate indices of economic efficiency for each MFI using the stochastic frontier analysis (SFA) approach. Traditionally, the efficiency of financial institutions has been examined using financial ratios although this procedure does not allow to evaluate the overall performance of these institutions (Athanassopoulos & Ballantine, 1995). The use of accounting measures relies on several simplifying assumptions as, for example that producers behave always efficiently (i.e. they always combine the inputs in an efficient way), may not capture qualitative factors (e.g. a technological change) or do not account for external economic factors (e.g. economic development, inflation and so on). To avoid this problem, Farrell (1957) presented a new measure of performance based on the frontier principle. Frontier efficiency summarises an institution's output as a single attribute (efficiency score) capable of monitoring differences among decision-making units (DMUs) within a complex multi-dimensional system based on economic theory (Cummins & Weiss, 1998). Because of it, the frontier approach tends to be superior explaining the productivity residual than the traditional approach based on those financial ratios, allowing to obtain better performance estimates (Chauhan, 2021). This methodology has been employed in other former similar studies (Masood & Ahmad, 2010; Servin et al., 2012; Surender, 2018).

We focus on MFIs' economic efficiency by estimating a cost function rather than revenue or profit functions. A cost function is preferable for the microfinance industry because while some MFIs are not looking for profit, they all strive to minimise costs (Hartarska et al., 2014). Specifically, we employ the SFA methodology to estimate a translog (transcendental logarithmic) frontier cost function. We choose a translog formulation because it does not place a priori restriction on the elasticity of substitution between inputs, and the economies of scale are not restricted to being uniform across all MFIs.[4] The stochastic frontier model to be estimated in this research is the time-variant model proposed by Battese and Coelli (1995). Thus, the stochastic translog cost function is specified as follows:

$$\begin{aligned}\mathrm{Ln}\left(\frac{TC_{it}}{P_{3it}}\right) &= \alpha_0 + \sum_{j=1}^{4}\alpha_j REG_{ji} + \alpha_5 TREND_t + \alpha_6 \mathrm{Ln}\left(\frac{Q_{it}}{P_{3it}}\right) \\ &+ 0.5\times\alpha_7 \mathrm{Ln}\left(\frac{Q_{it}}{P_{3it}}\right)^2 + \sum_{j=1}^{2}\beta_j \mathrm{Ln}\left(\frac{P_{jit}}{P_{3it}}\right) \\ &+ 0.5\times\sum_{l=1}^{2}\sum_{m=1}^{2}\delta_{lm}\mathrm{Ln}\left(\frac{P_{lit}}{P_{3it}}\right)\mathrm{Ln}\left(\frac{P_{mit}}{P_{3it}}\right) \\ &+ \sum_{j=1}^{2}\gamma_j \mathrm{Ln}\left(\frac{Q_{it}}{P_{3it}}\right)\mathrm{Ln}\left(\frac{P_{jit}}{P_{3it}}\right) + \mathrm{Ln}\left(\varepsilon_{it}\right)\end{aligned}$$

where TC_{it} = total cost (operating and financial costs) of the i-th MFI at the t-th year; REG_{ji} is a set of four dummy variables to control the geographic region of each MFI that is not located in Eastern Europe and Central Asia (REG_1 = South Asia, REG_2 = Latin America, REG_3 = Middle East and North Africa, and REG_4 = Africa), which takes the value 1 when the MFI belongs to the j-th geographic region and 0 otherwise; $TREND_t$ is a variable to control for a linear trend in total costs, which takes the value 1 when t = 2008 and 11 when t = 2018; Q_{it} = bank output captured by the number of active borrowers; P_{jit} = the j-th input price

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(P_1 = price of labour calculated as the annual personnel expenses divided by the number of employees; P_2 = price of physical capital calculated as the annual depreciation expenses divided by the fixed assets; P_3 = price of financing funds obtained dividing the annual financial expenses by the total liabilities). The difference between the actual and the efficient cost is captured in the error term ε_{it} ($\varepsilon_{it} = v_{it} + u_{it}$), which consists of two parts: the truly random shock v_{it}, which is independently and identically distributed as a $N(0, \sigma_v^2)$, and the time-varying cost inefficiency term u_{it}, which is presumed to be nonnegative and distributed independently of v_{it}. Hence, when $u_{i,t} = 0$, the i-th MFI lies on the stochastic frontier and, hence, can be considered cost efficient at time t. If $u_{i,t} > 0$, the MFI cost lies over the frontier and, hence, the i-th MFI is inefficient. Specifically, the cost efficiency score of the i-th MFI at the t-th year is $CE_{it} = e^{u_{it}}$, with values between 0 and 1, with smaller values reflecting greater cost inefficiency.[5] Homogeneity in input prices is imposed in the estimation by normalising (dividing) all input prices and the total cost by the price of financing funds (P_3). All monetary variables are adjusted for inflation using the consumer price index (CPI) of each country.

Simultaneously, the cost inefficiency values estimated using the specified SFA model are regressed using different specific MFI internal and external factors as follows (hereafter referred to as the inefficiency function):

$$u_{it} = \mu_0 + \sum_{j=1}^{5} \theta_j Z_{jit} + \sum_{j=1}^{5} \omega_j C_{jit} + w_{it}$$

where Z_{jit} is a set of variables used to test the different research questions. Thus, Z_1 is the proportion of individual loans over total loans what allows to measure the impact of individual lending on MFI's cost inefficiency; Z_2 is the proportion of village banking loans over total loans what allows to measure the impact of village banking lending on MFIs' cost inefficiency; Z_3 is the proportion of solidarity group loans over total loans what allows to measure

TABLE 1 Variable definition and main descriptive statistics.

Variable name	Symbol	Definition	Unit	N	Mean	SD
Total cost	*TC*	Operating and financial costs	mil.$	3377	12.30	35.00
Region 1	REG_1	Dummy variable	0 or 1	3377	0.23	0.42
Region 2	REG_2	Dummy variable	0 or 1	3377	0.43	0.50
Region 3	REG_3	Dummy variable	0 or 1	3377	0.04	0.20
Region 4	REG_4	Dummy variable	0 or 1	3377	0.14	0.35
Region 5	REG_5	Dummy variable	0 or 1	3377	0.15	0.35
Trend	*TREND*	Linear trend	from 1 to 12	3377	5.66	2.78
Borrowers	*Q*	Number of active borrowers	# borrowers	3377	86,310	333,639
Price of labour	P_1	Personnel expenses/Number of employees	$/employee	3377	9434	7095
Price of physical capital	P_2	Depreciation expenses/Fixed assets	%	3377	25.75	19.20
Price of borrowed funds	P_3	Interest expenses/Total borrowed funds	%	3377	8.21	7.13
Individual lending	Z_1	100 × Individual loans/Total gross loans	%	3377	63.58	41.91
Village banking	Z_2	100 × Village banking loans/Total gross loans	%	3377	25.45	38.09
Solidarity group	Z_3	100 × Solidarity group loans/Total gross loans	%	3377	9.71	25.91
Urban loans	Z_4	100 × Urban loans/Total gross loans	%	3377	51.61	32.39
Interaction effect	Z_5	$Z_4 \times (Z_2 + Z_3)/100$	%	3377	15.03	24.17
Experience	C_1	Operating years	# years	3377	9.02	4.49
Size	C_2	Employees	# employees	3377	500	1340
Leverage	C_3	Debt ratio	%	3377	70.96	24.21
Economic development	C_4	GDP per capita in constant USD (2015 = 100)	th.$	3377	3.43	2.86
Inflation rate	C_5	Annual variation in the consumer price index (CPI)	%	3377	5.59	4.18

Notes: N, Number of observations; SD, Standard deviation. Region 1 = South Asia. Region 2 = Latin America. Region 3 = Middle East and North Africa. Region 4 = Africa. Region 5 = Eastern Europe and Central Asia.

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the impact of the solidarity group lending on MFIs' cost inefficiency; Z_4 is the proportion of urban loans over total loans to measure the effect of urban areas on MFIs' cost inefficiency; Z_5 measures the interaction effect of urban areas with community or group-lending methods, which has been obtained multiplying Z_4 with the total proportion of village banking and solidarity group loans (Z_2+Z_3), on MFIs' cost inefficiency. On the other hand, C_{jit} is a set of variables to control specific internal and external factors that may influence the cost efficiency of MFIs. We include MFI-specific control variables for MFIs' experience (C_1), measured by the operating years, size (C_2), measured by the number of employees and leverage (C_3), measured with the liability ratio (in %), as well as country-specific control variables for economic development (C_4), measured with the GDP per capita in constant USD (2015 = 100) of each country (in th.$), and inflation rates ($C_5$), measured with the annual variation in the consumer price index of each country (in %). Finally, w_{it} is a random variable distributed as $N(0, \sigma_w^2)$. Summary statistics for all variables used in this research are given in Table 1.

Parameter estimates of the stochastic frontier cost and the inefficiency functions were obtained simultaneously using the *sfpanel* command in the STATA statistical software package (version 18.0) developed by Belotti et al. (2013).

4 | EMPIRICAL RESULTS

Robust maximum-likelihood (ML) estimates for the translog cost and inefficiency functions are reported in Table 2. The stochastic frontier cost function and the inefficiency function are both estimated simultaneously to avoid biased estimations (Batesse and Coelli, 1995). Our results show that the proposed model is strongly significant ($p < 0.01$), with a Wald test value of 6101.80. In addition, to corroborate the existence of cost inefficiencies in MFIs, we test the null hypothesis H_0: $\lambda = 0$.[6] The null hypothesis is easily rejected ($\lambda = 1.3206$, $p < 0.01$), implying that cost inefficiency exists in MFIs. This result indicates that the difference between the observed cost and the frontier cost is not due to the statistical variability alone but also due to cost inefficiency. Furthermore, the signs of the coefficients of the stochastic frontier are as expected (positive and statistically significant for the bank production and the price of labour variables). Thus, as more borrowers and more labour cost have the MFI, more total cost will have the institution. By the other hand, the results obtained with the inefficient model (see Table 2) reveal that the use of village banking ($\theta_2 = -0.0053$, $p < 0.10$) and solidarity group lending ($\theta_3 = -0.0086$, $p < 0.05$) are both negatively associated with MFIs' cost inefficiency. We have also obtained that MFIs operating mainly in urban areas are less cost efficient than those operating in rural areas ($\theta_4 = 0.0088$,

TABLE 2 Parameter estimates of Battese and Coelli's (1995) stochastic frontier cost and inefficiency functions (dependent variable: Ln*TC*).

Explicative variable	Parameter symbol	Parameter estimate
Stochastic frontier cost function		
Intercept	α_0	1.3173
REG_1 (South Asia)	α_1	−0.5548***
REG_2 (Latin America)	α_2	−0.3142***
REG_3 (Middle East & North Africa)	α_3	−0.5348***
REG_4 (Africa)	α_4	−0.3282***
TREND	α_5	−0.0478***
$\text{Ln}(Q/P_3)$	α_6	0.3395**
$0.5\times\text{Ln}(Q/P_3)^2$	α_7	0.0521***
$\text{Ln}(P_1/P_3)$	β_1	0.7903***
$\text{Ln}(P_2/P_3)$	β_2	0.2017
$0.5\times\text{Ln}(P_1/P_3)^2$	δ_{11}	0.0113
$0.5\times\text{Ln}(P_2/P_3)^2$	δ_{22}	0.0444
$\text{Ln}(P_1/P_3)\times\text{Ln}(P_2/P_3)$	$\delta_{12}=\delta_{21}$	−0.0303
$\text{Ln}(Q/P_3)\times\text{Ln}(P_1/P_3)$	γ_1	−0.0053
$\text{Ln}(Q/P_3)\times\text{Ln}(P_2/P_3)$	γ_2	−0.00403
Inefficiency function		
Intercept	μ_0	−0.0320
Z_1	θ_1	0.0009
Z_2	θ_2	−0.0053*
Z_3	θ_3	−0.0086**
Z_4	θ_4	0.0088***
Z_5	θ_5	−0.0128***
C_1	ω_1	0.0008
C_2	ω_2	0.0000
C_3	ω_3	0.0099***
C_4	ω_4	−0.0279*
C_5	ω_5	−0.0190**
Variance parameters		
Sigma *u*	σ_u	0.5602***
Sigma *v*	σ_v	0.4242***
Lambda	λ	1.3206***
Model information		
Number of observations	*N*	3377
Number of groups (MFIs)		1017
Wald test	χ^2	6101.80***
CE distribution		
Mean		50.32
Std. Dev.		21.48
Min		1.98
Max		95.39

Notes: Robust (MFI cluster) estimation of standard errors. It has not been possible to identify the lending area for 153 MFIs.
***Significant at 1%. **Significant at 5%. *Significant at 10%.

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$p < 0.01$) although the use of community or group lending in urban areas can improve MFIs' cost efficiency ($\theta_5 = -0.0128$, $p < 0.01$).

We present the results of testing the research questions in Table 3. First, we have found that community or group lending have a positive impact on MFIs' cost efficiency (RQ1). A similar result was obtained by Lassoued (2017) who found a negative relationship between group lending and MFIs' credit risks. On the contrary, we have found that there is not a significant difference between village banking and solidarity groups (RQ2). Because of it, we can infer that the important economic benefits of community or group lending would be more related to the relationships and strong ties among the village borrowers (information economies) than with the group size managed by MFIs' loan officers. We have also found that MFIs focused on urban areas are less efficient than those operating mostly in rural areas regardless the lending method. This result can be explained because in rural areas there are small communities with many relationships and strong ties so that would be easier and less costly, due to the information economies, to obtain information of customers and to monitor the credits. Nevertheless, we have found that the use of community or group lending in urban areas has a positive and statistically significant effect on MFIs' cost efficiency (RQ3). An explanation for this puzzling result could be that MFIs focused on rural areas depend heavily on local information what would constraint their potential growth to achieve economies of scale (Ouattara et al., 1999). By contrast, MFIs focused on urban areas could exploit those economies applying community or group-lending methods.

In Figure 1, we show the annual evolution of MFIs' cost efficiency (CE) and the proportion of each lending method. We can observe that there is a soft decline trend in the average CE score. Furthermore, we can appreciate that there is a strong positive correlation between the annual evolution of the CE score and the evolution in the proportion of rural loans as well as in the use of community or group-lending methods as village banking and solidarity groups. Therefore, we can infer that there is a strong relationship between the lending method employed by MFIs and their cost efficiency what agrees with the result obtained for RQ1. Moreover, the decreasing trend in community or group lending is also positively correlated with the decrease

TABLE 3 Testing results for the research questions.

Research question	Test	χ^2	Result
RQ1	$\theta_1 - \theta_2 = 0$ $\theta_1 - \theta_3 = 0$	11.23***	Community or group-lending methods as village banking and solidarity groups have a positive effect on MFIs' economic (cost) efficiency.
RQ2	$\theta_2 - \theta_3 = 0$	1.14	Solidarity group lending has not a greater effect on MFIs' economic (cost) efficiency than village bank lending.
RQ3	$\theta_5 = 0$	12.93***	Community or group-lending methods as village banking and solidarity groups have a larger effect on MFIs' economic (cost) efficiency in urban than in rural areas.

***Significant at 1%.

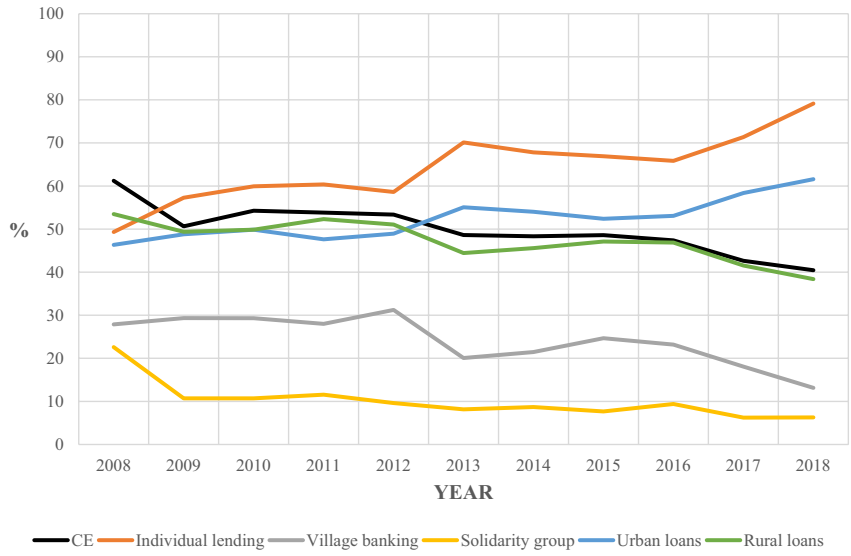

FIGURE 1 Annual evolution of the average cost efficiency (CE) and the proportions of lending methods and lending areas.

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TABLE 4 Average cost efficiency and MFI characteristics by lending method.

Efficiency and MFI characteristics	All sample	Lending method			Difference in means (Kruskal–Wallis test)
		Individual lending	Village banking	Solidarity group	
Cost efficiency	50.32%	40.06%	67.49%	74.82%	1484.43***
Lending in urban areas	51.61%	56.59%	41.41%	44.67%	149.73***
Lending in rural areas	47.99%	42.94%	58.43%	54.74%	153.95***
Lending interest	25.97%	25.73%	25.32%	29.32%	22.68***
Capital cost	8.21%	7.89	8.81	8.87	49.55***
Average loan	$1550	$2196	$347	$327	1332.31***
Borrowers per loan officer	348	298	401	540	308.58***
Write-off ratio	2.09%	2.38%	1.48%	1.64%	214.09***
Loan loss rate	1.62%	1.83%	1.17%	1.38%	72.80***
Portfolio at risk (30 days)	6.58%	7.23%	5.85%	4.09%	329.01***
Cost per loan	$219	$299	$66	$75	1160.09***
Cost per borrower	$244	$337	$68	$79	1201.18***
Labour cost per employee	$9434	$11,341	$5094	7922	653.54***

***Significant at 1%.

TABLE 5 Average cost efficiency and MFI characteristics by geographic area and lending method.

Efficiency and MFI characteristics	Urban area		Mean difference (Kruskal–Wallis test)	Rural area		Mean difference (Kruskal–Wallis test)
	Individual lending	Community or group lending		Individual lending	Community or group lending	
Cost efficiency	34.85%	71.23%	756.93***	47.54%	68.45%	562.13***
Lending interest	25.03%	30.13%	39.84***	26.73%	24.16%	14.45***
Average loan	$2708	$387	630.50***	$1460	$313	583.52***
Borrowers per loan officer	295	396	113.52***	304	466	163.23***
Write-off ratio	2.62%	1.88%	36.87***	2.05%	1.31%	78.67***
Loan loss rate	2.03%	1.59%	15.00***	1.56%	1.01%	32.33***
Portfolio at risk (30 days)	7.35%	4.68%	183.21***	7.07%	5.78%	131.35***
Cost per loan	$363	$89	515.57***	$207	$56	531.26***
Cost per borrower	$421	$92	536.16***	$217	$58	546.91***
Labour cost per employee	$12,440	$8006	137.64***	$9759	$4572	362.14***

***Significant at 1%.

of MFI loans in rural areas. According to our findings, a way to improve MFIs' cost efficiency could be implementing community or group lending methods in urban areas.

In addition to the efficiency analysis based on stochastic frontier cost functions, we have added in Table 4 the calculation of some financial ratios to describe MFI characteristics, differentiated by the lending method, to increase the robustness of our results. We have tested the mean differences of those ratios among the different lending methods using the non-parametric test of Kruskal–Wallis. The results obtained with this test show, in all cases, very significant differences (at the 1% level) among the mean values of each lending method. Firstly, we can observe that the average cost efficiency value obtained using the SFA approach is higher with the lending methods of village banking and solidarity groups (67.49% and 74.82%, respectively) than with the individual lending (40.06%). Regarding the financial ratios, our findings show that the cost per loan and the cost per borrower are significantly lower in the case of community or group lending than in the case of individual lending what is consistent with the result obtained with the SFA approach. We can also observe that the average risk per loan, measured with the write-off ratio, the loan loss rate and the portfolio at risk (30 days), is significantly lower for community or group lending than for individual lending. Furthermore, the average loan in community or group lending is significantly

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TABLE 6 Average cost efficiency (CE) and loan proportion by geographic region.

Geographic region	Number of MFIs	Obs.	CE (%)	Loan proportion by lending method		
				Individual lending (%)	Village banking (%)	Solidarity group (%)
Eastern Europe and Central Asia	162	524	46.45	82.66	13.00	1.73
South Asia	290	866	62.51	26.54	59.20	12.70
Latin America	309	1378	45.99	78.22	8.19	13.06
Middle East and North Africa	45	161	51.89	67.93	30.64	0.63
Africa	211	448	44.01	66.23	26.01	6.21
All sample	1017	3377	50.32	63.58	25.45	9.71
Difference in means (Kruskal–Wallis test)			393.60***	756.28***	577.42***	120.41***

***Significant at 1%.

lower than in the case of individual lending what would be related to a lower credit risk. Even though community or group lending is associated with small groups of borrowers, each loan officer can manage and control more borrowers than in the case of individual lending what would reduce the labour costs of MFIs with a higher proportion of loans under the community or group-lending methods. This relationship between community or group lending and lower labour costs can be observed in Table 4 as well. It seems that the interpersonal links and ties among community members could improve the information employed by MFIs, reducing the transaction costs due to information asymmetry between lenders and borrowers, as well as the credit risk, what would improve the economic efficiency of these institutions. We also observe in Table 4 that the solidarity group lending is a little more expensive than village banking whereby we can infer that the use of very small groups can suppose more complexity of managing so many different groups. In the case of village banking, lending groups are larger so that the loan officers can manage less groups and more borrowers with a lower cost for MFIs.

Moreover, we present average values of cost efficiency and some MFI characteristics by geographic area (urban vs rural) and lending method (individual vs community or group) in Table 5. We have tested mean differences of those values using the non-parametric test of Kruskal–Wallis. The results obtained with this test are again very significant (at the 1% level). Our findings show that the difference of cost efficiency between both lending methods is larger in urban areas than in rural areas. In addition, we observe that less loan officers would be needed in rural than in urban areas and institutions operating in rural areas have on average a lower credit risk and a lower cost per loan and borrower than those operating mainly in urban areas. However, the difference of the cost per loan and borrower between urban and rural areas is larger when individual lending is used, whereas that difference is smaller when community or group lending is employed. Consequently, we can infer that the improvement in cost efficiency is larger when community or group lending is employed in urban areas than in rural areas what agrees with the result obtained for RQ3.

Finally, in Table 6 we present the average cost efficiency (CE) by geographic region. We observe that the average CE score of all regions is low (50.32%), ranging from 46.45% in Eastern Europe and Central Asia to 62.51% in South Asia, so that there is wide room for improvement in the sector. This result has also been revealed previously by Fall et al. (2018). The results obtained with the Kruskal–Wallis test show that there are very significant differences (at the 1% level) among the average CE scores of the different geographic regions. Our findings show that in the regions in which individual lending is more employed (i.e. in the regions of Eastern Europe and Central Asia or Latin America) the average CE score is lower than in the rest of geographic regions. By contrast, the regions where the community or group lending is more employed (e.g. South Asia), the average CE score is higher compared with the rest of geographic regions. Hence, we can infer that there is a relationship between the lending method most employed in a geographic region and the cost efficiency of MFIs in those regions supporting the result obtained for RQ1.

5 | CONCLUSIONS

Because the method of lending could affect the economic efficiency of microfinance institutions (MFIs), these institutions should employ the lending practices that improve their cost efficiency to achieve their financial self-sufficiency and be sustainable in the long run. The aim of this research has been to analyse how the method employed for lending can affect MFIs' cost efficiency since lending innovations have been introduced in the sector in the last years and, as far as we know, there is not empirical studies to analyse this effect.

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The data employed in this analysis has been an unbalanced panel composed of a sample of 1017 MFIs from different geographic regions across the world for the 2008–2018 period. The data used for the analysis (in USD) were collected from the Microfinance Information Exchange (MIX) database and from the World Bank's database World Development Indicators. To measure economic efficiency, we have decided to estimate indices of economic efficiency for each MFI using the stochastic frontier analysis (SFA) approach.

The results of our research have revealed that MFIs' cost efficiency, on average, has decreased over the period 2008–2018, a trend negatively related to the increase of urban loans and the use of individual lending. We have also observed that the average cost efficiency of all geographic regions is very low, whereby there is much room for improvement in the sector.

Our results also show that community or group-lending methods as village banking and solidarity groups have a positive effect on the MFIs' cost efficiency versus traditional methods based on individual lending, so that would be advisable to employ more these new lending methods in the sector to improve the economic performance of these institutions.

On the contrary, solidarity groups have not a greater effect on MFIs' cost efficiency than village banking. We can conclude, hence, that the benefits of information economies are obtained by both lending methods and there is not relevant improvement in cost efficiency reducing the number of borrowers inside the lending groups. We suggest in this case maintaining an equilibrium between the number of groups managed by each loan officer and the number of borrowers inside each group to optimise results.

In addition, we have also found that MFIs with a higher proportion of borrowers in rural areas are more cost efficient than institutions with more borrowers in urban areas, although these lending methods have a larger positive effect on cost efficiency when MFIs operate mainly in urban areas. Consequently, it would be very important for the economic sustainability of these institutions to increase the implementation of community or group lending in MFIs operating in urban areas.

Therefore, community or group lending are effective methods for MFIs to control their costs and be more efficient. It seems that the interpersonal links and ties among community or group members could improve the financial and credit information employed by MFIs, reducing the transaction costs due to information asymmetry between lenders and borrowers or the operational risk, and consequently improving the economic efficiency of these institutions. It would be necessary to research more in the future about the differences in costs and risks between MFIs and traditional banks to obtain more interesting conclusions and recommendations for the sector.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is not any conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in MIX Market database at https://databank.worldbank.org.

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ENDNOTES

[1] As previous work related to this topic, we can point out one research by Lassoued (2017) who analysed the impact of group lending on MFIs' risk.

[2] Village banks, for example, do not pay interest on members' savings like commercial banks what is a way to avoid financial expenses and improve the interest margin. Members only receive dividends from the bank's profits.

[3] Typically, transaction costs (costs related to the initial lending decision and to the ongoing monitoring) are added into the cost of the loan through either a higher interest rate or additional fees (Kariv & Coleman, 2015).

[4] In this way, we avoid an important problem in SFA regarding the functional form specification (Fall et al., 2018).

[5] In the case of this research, we present these values in %.

[6] The parameter λ is an indicator of the relative variability of the two sources of random error ($\lambda = \sigma^2_u/\sigma^2_v$).

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