

Efficiency of Microfinance Institutions in Africa

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Abstract

We use Data Envelopment Analysis (DEA) to examine the drivers as well as levels of financial efficiency, social efficiency, and socio-financial efficiency of microfinance institutions (MFIs) in Africa for the period 2000-2019. Broadly, our results show a trend of declining financial efficiency but no discernible trend in social and socio-financial efficiency. NGOs have markedly better social efficiency and socio-financial efficiency scores than other legal forms of MFIs. Stock market capitalization to GDP and private credit to GDP, proxies for financial sector development, have a negative relationship with social and socio-financial efficiency. Financial efficiency has an inverse relationship with both size and asset structure of MFIs. These results suggest that commercialization of MFIs does not necessarily improve their financial sustainability. Our results remain robust after excluding outliers in the analysis.¹²

Key Words: Microfinance, Efficiency, Social, Financial, Performance

JEL Classification: G210, G230

1 Introduction

This work examines the drivers and levels of microfinance institutions (MFIs) financial and social efficiencies in Africa, considering the transformation of MFIs from not-for-profit ventures to commercial entities. Specifically, the research examines the levels and drivers of financial and social efficiencies in MFIs on the one hand. On the other hand, the study examines the levels and drivers of the joint financial and social efficiency (socio-financial efficiency) of MFIs in Africa. MFIs have a dual mission. First, they derive legitimacy by availing financial services to the poor and other often financially excluded members of society (Marconatto, Cruz, and Pedrozo 2016). To achieve this social goal, MFIs have primarily relied on private donations and government subsidies (D'Espallier et al. 2017). However, with the rise of neo-liberalism (Bateman 2010), donors and stakeholders increasingly presume that MFIs should be financially self-sufficient, which is the second goal of MFIs (Beisland, D'Espallier, and Mersland 2019). Political and economic uncertainties surrounding donations and subsidies reinforce the need for MFIs to be financially independent (Armendariz and Szafarz 2011; Garmaise and Natividad 2013).

If MFIs are to be financially sustainable, they should not do so by neglecting their social mission. The social mission of MFIs centres around providing appropriate and affordable financial services to the financially excluded. In Africa, the financially excluded comprises mainly women, youth and rural dwellers. When MFIs convert to the commercial model, they have to attain the financial objective of making profits and attaining financial sustainability over and above the social mission. The pursuit of financial and social objectives makes MFIs hybrid organisations. It is notable, though, that purely commercial firms are also under increasing pressure to maximise social welfare primarily through corporate social responsibility (CSR) interventions and the rise of the Environmental, Social and Governance (ESG) accounting (Van Duuren, Plantinga, and Scholtens 2016), and impact investing (Barber, Morse, and Yasuda 2021). However, the expectation for business firms to exclusively meet social goals may not be as elevated as the expectations for social and hybrid enterprises, like MFIs. Their mission achievement predicated on meeting their social mandate.

In this study, we utilise Data Envelopment Analysis (DEA) to generate indices of efficiency scores for financial performance, social performance, and the joint socio-financial performance of MFIs in Africa. In examining efficiency, we focus on the extent to which MFIs optimise their output for a given level of inputs, using the output-oriented DEA approach. The alternative input-oriented approach deals with the ability of MFIs to minimise inputs for a given level of output. The choice of the output-oriented method derives from the

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functions of MFIs, that is, reaching out to the financially excluded sustainably. Although the optimisation of inputs is also desirable, the outputs are more relevant to this study. The DEA inputs are liabilities and equity and operating expense to assets ratio. The output metric for the financial outcome is operational self-sufficiency (OSS). Simultaneously, the average loan balance per borrower, and per cent of women borrowers are the social performance output indicators.

This research extends existing knowledge in three primary ways. First, the work sheds light on the determinants of the simultaneous drivers of the financial and social efficiencies of MFIs, especially in Africa, where data challenges had hitherto hindered relevant research. Secondly, as noted earlier, the paradigm shift towards the commercial approach means that MFIs should meet both financial and social objectives (D'Espallier et al. 2017; Chahine and Tannir 2010). However, the extant research on the drivers of financial and social efficiencies tends to examine each objective separately instead of viewing them as two sides of the same coin (Efendic and Hadziahmetovic 2017; Gutierrez-Nieto, Serrano-Cinca, and Mar Molinero 2009).

What is more noteworthy is that research on the social and financial efficiency of MFIs is principally in the context of the transformation from NGOs to commercial firms and the post-conversion presence or absence of mission drift (Wassie, Kusakari, and Sumimoto 2019; @ D'Espallier et al. 2017; Mersland and Strom 2009; Mia and Lee 2017; Ramus and Vaccaro 2017). While some researchers find that better financial performance harms social outreach (Tina Dacin, Goodstein, and Richard Scott 2002; Kent and Dacin 2013), others find the opposite (Kar and Rahman 2018; Abeysekera, Oguzoglu, and Le 2014). Researchers such as Leite, Mendes, and Sacramento (2019) find mixed outcomes, with better financial performance harming depth of outreach while improving the breadth of outreach. Therefore, by simultaneously examining both the financial and social efficiencies of MFIs, this study presents novel insights that extend the abundant literature on the financial and social performance of MFIs.

The final contribution of our work is in respect of the drivers of the social efficiency of MFIs. This contribution is paramount because it particularly informs decision making that would enhance outreach to the teeming population of the financially excluded. Researchers can, to an extent, infer the determinants of the financial performance of MFIs from insights of plenty of extant research in corporate finance. That is not the case for the social performance of MFIs and other financial institutions, for that matter. Nason, Bacq, and Gras (2018) note that, unlike financial performance, which has specific reference points, the criterion for evaluating social performance is ambiguous. Firms must then negotiate with stakeholders on suitable standards for assessing social performance.

For this reason, some researchers gauge social performance by using the percentage of female borrowers, the proportion of rural borrowers, and the average loan size, all of which have their shortcomings. Much of the research in this domain dwells on the extent and causes of social failure, based on individual MFI social performance metrics without explicitly quantifying total social efficiency (Lebovics, Hermes, and Hudon 2016; Louis and Baesens 2013; Louis, Seret, and Baesens 2013) with the noted exception of Gutierrez-Nieto, Serrano-Cinca, and Mar Molinero (2009). The subsequent research output is difficult to compare.

Overall, little research investigates the socio-economic factors that enable or hinder the achievement of the dual objectives of MFIs. This absence of pertinent research is especially glaring in Africa, the continent with the lowest financial inclusion rates. For the stakeholders of MFIs, this could be a significant oversight. Therefore, the management of MFIs may not know the optimal strategies to adapt to fulfil the twin missions. The donors and venture capitalists may mistime their exit while regulators could set policies that hinder rather than enhance the efficacy of MFIs in fulfilling their dual mandate. Accordingly, this research will enlighten the management of MFIs, policymakers, donors, and stakeholders on interventions necessary to enable MFIs to reach the financially excluded sustainably.

We take all formal MFIs in Africa as the population, with the sampling frame being the MFIs that submit their data to the Microfinance Information Exchange (MIX) pooled database. MIX pools data from over 2000 MFIs across the globe, representing 20% of all formal MFIs globally, which in their assessment provide 80% of the microcredit and incidental financial services (Market 2015). A significant issue is that a substantial number of financially excluded people often rely on informal financial services ranging from family and friends to neighbourhood kiosks and shylocks. There is also a rise of fintech firms that use mobile phones and the internet to offer inclusive financial services. However, the data for these equally essential portions of MFIs

activities is hard to capture at scale. Hence, in this study, we will rely exclusively on the MFIs listed on the MIX database.

The remainder of the research proceeds as follows. In section 2, we review the empirical literature and describe the theoretical basis for the financial and social efficiency of MFIs. The following section provides a summary of the results of the study. Part 4 states the hypothesis and describes the empirical methods deployed in the research. In contrast, part 5 focuses on the data used in computing the efficiency scores that serve as variables in the regression. Next, Section 6 details the results and the associated robustness checks, and Section 7 concludes.

2 Theory and Empirical Literature

In Microfinance Schism, Morduch (2000) urges caution about the win-win view of microfinance. The win-win view posits that MFIs can simultaneously pursue and achieve financial sustainability and social goals without trade-offs. This perspective seeks to reconcile the welfare approach that views financial sustainability and social performance as incompatible and the financial sustainability perspective, which, while recognising the need for meeting social goals, emphasises financial sustainability. Morduch calls for the accommodation of multiple, hybrid MFI models on the continuum that includes those seeking profits while serving the poor and those that strictly focus on social goals like NGOs that rely on donations and subsidies. The broad array of microfinance programs, Morduch (2000) argued, would then serve diverse populations and contexts instead of prioritising or rating some MF models over others (Marconatto, Cruz, and Pedrozo 2016).

Nonetheless, much of the ensuing research has compared the financial sustainability model with the welfare model, with empirical support on either side (Kodongo and Kendi 2013). For instance, some research examines the extent to which different models of MFIs fare both financially and socially (Abeysekera, Oguzoglu, and Le 2014; Bedecarrats, Baur, and Lapenu 2012). Socially, ample research finds NGO-oriented MFIs better at reaching out to the poor than commercial based MFI models, that is, more socially efficient. However, other researchers counter that commercial oriented MFIs are better at outreach to the poor without much reliance on donations and subsidies (Abeysekera, Oguzoglu, and Le 2014; Kar 2013; P. W. Roberts 2013). For instance, Dorfleitner, Priberny, and Rohe (2017), Dorfleitner, Rohe, and Renier (2017), and Bos and Millone (2015) find that MFIs with better portfolio quality have a greater depth of outreach. This finding again highlights the variety of metrics used to gauge the financial and social performance of MFIs.

However, as Morduch (2000) further points out, MFI social performance could depend on the segments of the population served and regional and country-level contexts. Consequently, by extension, poor and social performance definitions must expand to the different profiles and economic activities of poor people as MFIs may not effectively reach out to the “core” indigent. Also, the differing views on the levels of social performance could result from the diverse meanings that different stakeholders, that is, employees, managers, MFI clients, and donors, attach to the term social performance (Marti and Scherer 2016). As the metrics for social performance are ambiguous (Nason, Bacq, and Gras 2018), it is hard to reconcile the different views of the extent to which MFIs achieve their social objectives relative to financial goals.

As a case in point, Beisland et al. (2020) examine the determinants of social performance using data from social rating agencies. The researchers conclude that different rating agencies place different weights on social indicators. Nevertheless, they find financial performance, rural outreach, service quality and customer service critical determinants of MFI social performance. A related study by Hermes and Hudon (2018) identify firm-specific and economic factors that drive the social efficiency of MFIs by conducting a meta-analysis of published papers. Key among the factors identified are age, size, institutional type, and the funding sources of an MFI, thus collaborating earlier findings by Gutierrez-Nieto, Serrano-Cinca, and Mar Molinero (2009). However, social ratings as a measure of social performance may not be feasible in the African context, where data is challenging. Again, the importance of each indicator could vary by context. The variance motivates the need for context-specific research.

Much of the research addresses both financial performance and social performance as stand-alone without addressing the conditions under which it is possible to achieve or fail to achieve these two, respectively. Gutierrez-Nieto, Serrano-Cinca, and Mar Molinero (2009) quantified financial and social performance using

the DEA efficiency estimation technique. Nonetheless, their study does not ascertain the drivers of financial efficiency, social efficiency, and combined socio-financial efficiency, as is the case in this study. Instead, these researchers examine the relationships between social performance, on the one hand, profitability, location, age, and legal type of MFI. This study goes beyond Gutierrez-Nieto, Serrano-Cinca, and Mar Molinero (2009) by examining the drivers of joint socio-financial efficiency and focusing on Africa. Moreover, their data consisted of a narrower set of 89 MFIs and did not focus on a specific region for richer and potentially generalisable insights, as D'Espallier et al. (2017) propose. In addition to being dated, their study also uses a notably different set of inputs and outputs data for the DEA analysis.

Hitherto, the dominant debate has been on how commercial MFIs can balance financial sustainability and social performance objectives, which attempts to mitigate the mission drift. Some researchers argue that the pursuit of financial sustainability is incompatible with outreach to the poor (Cobb, Wry, and Zhao 2016; Mia and Lee 2017). The argument draws from the agency theory and its inherent profit incentive. The objectives of equity and debt holders would conflict with the strategic and costly social goal of serving the poor. It is the agency theory that forms the bedrock of arguments from the welfare school in that MFIs cannot pursue financial sustainability while at the same time reaching out to the financially excluded. These views that MFIs are likely to shift their emphasis from outreach to the poor to generate returns for the investors due to pressure from equity holders and debt servicing requirements of creditors.

Mersland, Nyarko, and Szafarz (2019) also argue that restrictive covenants inherent in debt funding could push managers away from social targets to emphasise making financial returns. Armendáriz et al. (2013) attribute mission drift to the need for MFIs to build up precautionary fund reserves as a cushion against uncertainties in subsidies and donations. However, other researchers like Im and Sun (2015), Lutzenkirchen, Weistroffer, and Speyer (2012), and Quayes (2012) argue that for transformed MFIs, mission drift cannot occur. However, Morduch and Ogden (2019) sensibly counter this point of view by arguing that NGO MFIs would be few in number or non-existent. It is notable that NGOs that rely on donations and subsidies still form a substantial number of MFIs (Armendáriz et al. 2013) which to some extent validates the concern about mission drift even among funders. Despite these reservations, some works find that commercial MFIs can achieve both financial and social objectives (Kodongo and Kendi 2013). Other researchers have found that the quest for financial sustainability lowers the chances of meeting social goals (Hishiguren 2006).

Further, some scholars argue that mission drift is often confused with progressive lending and cross-subsidisation (Abeysekera, Oguzoglu, and Le 2014). Notable among these studies is the mission expansion thesis by Mersland and Strøm (2010), which claims that financially sustainable MFIs can achieve better outreach through cross-subsidisation – lending at market rates to the relatively well-off and using the proceeds to subsidise interest payments for the poor. Interestingly, Campion and White (1999) and Ramus and Vaccaro (2017) argue that mission expansion could occur not due to the commercialisation of MFIs but due to a failure of corporate governance. Hence, corporate governance could resolve mission drift without affecting the financial positioning or social orientation of an MFI.

Lastly, a closely related study by Lam et al. (2020) finds that MFIs exhibit no evidence of mission drift. Instead, they find that financial performance is positively associated with subsequent social performance in for-profit MFIs relative to not-for-profit MFIs. Moreover, in contrast, the social performance of not-for-profit MFIs varies positively with subsequent financial performance compared to for-profit MFIs. Therefore, these authors surmise that for-profit MFIs are more efficient at translating financial performance to social goals while nonprofits are better at translating social objectives to financial goals. For nonprofits, part of the reason could be the goodwill generated by meeting social goals, which leads to more support from donors, the state, and other stakeholders. MFIs that are profit-based, however, must first generate profit to enable them to address social goals.

3 Hypotheses

While the highlighted studies examine efficiency aspects separately, this study goes further by looking into the collective socio-financial and social performance. Hence, in addition to reviewing the drivers of financial and social efficiencies of MFIs, we hypothesise as follows.

- Hypothesis 1: MFIs that follow the commercial model exhibit better financial performance than MFIs that follow the NGO model.
- Hypothesis 2: The social performance of NGO based MFIs is better than that of commercial model based MFIs.
- Hypothesis 3: The joint socio-financial performance of NGO based MFIs is better than that of commercial model based MFIs.

In these hypotheses, we note that most NGOs are also shifting to the commercial model but continue to rely substantially on donor funds, government subsidies, and guarantees to access low-cost commercial funds (D'Espallier, Hudon, and Szafarz 2013). Further, the mission of NGO MFIs may defer markedly from that of commercial MFIs, meaning that even when pursuing profits, they are less likely to abandon the social goals (Louis and Baesens 2013; @ Mersland, Nyarko, and Szafarz 2019). The section that follows summarises the results of the study.

4 Summary of Results from Data Analysis

This section highlights the results of the data analysis on the levels and drivers of social efficiency, financial efficiency, and combined socio-financial efficiency of MFIs in Africa. The section also elucidates our hypothesised relations vis-a-vis MFI types. The inputs for the DEA analysis constitute measures for financial performance and social performance. We capture financial performance using operational self-sufficiency (OSS). For social performance, we use two metrics; the per cent of women borrowers and the average loan balance per borrower. These metrics capture the ability of MFIs to reach the most financially excluded people such as women, rural dwellers, and other people that require and would typically make do with small loans sizes. The discussion captures the individual inputs and overall DEA score that researchers have documented in the literature.

MFIs in Africa are barely financially sustainable, with marginal disparities between MFIs legal types. On a scale between zero to one, the mean and median financial efficiency scores are 0.1572 and 0.1079, respectively. The regression analysis shows that the asset structure and size of an MFI are the primary drivers of financial efficiency. Larger MFIs have lower financial efficiency scores, as do MFIs with a higher capital structure ratio of non-current assets to total assets. MFIs exhibit a high level of social efficiency, consistent with their mission of providing financial services to the financially excluded, mostly the poor. The mean and median social efficiency scores are 0.786 and 0.777, respectively. The socio-efficiency scores are equally high. NGOs have significantly higher social efficiency and socio-financial efficiency scores than other legal forms of MFIs. Consequently, the key driver of social efficiency and socio-financial efficiency is the MFI legal status. Financial markets development, proxied by stock market capitalisation to GDP and private credit to GDP, negatively affects social efficiency and socio-financial efficiency. The following section lays out the methodology.

5 Methodology and Data

The study adopts a quantitative approach with the model specified next.

5.1 The Empirical Model

We primarily use the fixed and random-effects model regression as per the result of the Hausman test (see Appendix 1). Specifically, we estimate the following model.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \mu_{it}$$

Further, assume that,

$$\mu_{it} = C_i + \epsilon_{it}$$

Where Y_{it} represents the dependent variable, which takes efficiency scores derived from the data envelopment analysis (DEA) model. We compute three measures of efficiency that take turns as the dependent variables:

social efficiency, financial efficiency, and socio-financial efficiency. Section 5.3 describes in detail the DEA model.

X_{it} , on the other hand, represents the set of independent variables as described in Table 2 below. Further, c_i captures the aggregate effects of the unobserved, time-invariant explanatory variables for Y_{it} . Further, assume that e_{it} has zero mean conditional on X_{it} . In the case where C_i and X_{it} are correlated, then C_i is a fixed effect; otherwise, it is a random effect. Note that the existence of fixed effects implies the presence of endogeneity. For random effects, on the other hand, endogeneity is not a concern. However, the random-effects model affects the computation of standard errors (M. R. Roberts and Whited 2013).

5.2 Data, Data Sources and Description of Variables.

We source our data from the Microfinance Information Exchange (MIX) pooled database,³ the World Development Indicators (WDI),⁴ the Global Financial Development Database (GFDD),⁵ and the Worldwide Governance Indicators (WGI).⁶ The dataset used in this article consists of 705 MFIs across Africa. While the MIX data is not a comprehensive representation of the microfinance industry in Africa, it does provide general trends in the sector (Jarotschkin 2013).

5.3 The DEA Model

As noted earlier, the study adopts the Data Envelopment Analysis (DEA) technique to estimate both the financial and social efficiency scores for a given MFI in each period. Charnes, Cooper, and Rhodes (1978) and Charnes, Cooper, and Rhodes (1981) formulated the traditional data envelopment analysis (DEA) by following the ideas of Farrel (1957). Unlike the other measures of financial and social performance of MFIs, DEA quantifies the (inverse) agency costs without confounding factors unrelated to agency costs (Berger and Di Patti 2006). A significant advantage of DEA is that it is not prone to the standard econometric problems because it is a deterministic and non-parametric enveloping technique. For instance, in running the DEA model, the researcher does not have to specify a functional form, estimate parameters, or define an error term. Importantly, DEA makes no distinction between dependent and independent variables (Zhou, Poh, and Ang 2007).

DEA requires the resolution of the following linear programming model.

$$\frac{\sum_{r=1}^n u_r v_r}{\sum_{i=1}^m v_i x_i} \leq 1$$

$$for, u_r, v_r \geq 0$$

In this case, n is the output number while m is the input number. Also, u_r is the weight of n , and v_i is the weight of m . Hence, v_i and x_i represent the weight of m and output of m , respectively. Similarly, u_r and y_r represent the weight and amount of input in that order.

When researchers run DEA assuming constant returns to scale (CRS), the resulting output represents technical efficiency (TE). Technical efficiency stands for the efficiencies due to input-output configurations and the size of operations. Under variable returns to scale, the output is pure technical efficiency (PTE). PTE is the efficiency that arises from input-output configuration while ignoring the scale of operations (Staub, Souza, and Tabak 2010; Ulus and Keskin 2015). Additionally, input-oriented DEA seeks to minimise inputs for a given level of output, while in the case of output-oriented DEA, the goal is to maximise outcomes for a given level of inputs with the choice of the orientations based on the input or output variables that managers have the most control over (Huguenin 2012).

³The MIX Market database is available on this link <https://datacatalog.worldbank.org/dataset/mix-market>.

⁴The link to the WDI database is <https://databank.worldbank.org/source/world-development-indicators>.

⁵The link to the GFDD is <https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database>.

⁶Follow the link for more information about the WGI, <https://info.worldbank.org/governance/wgi/>.

5.3.1 Inputs and Outputs for the DEA Model

In this section, we first describe the inputs and outputs for the DEA efficiency model. We derive the efficiency scores from the Data Envelopment Analysis (DEA) model, where each of the MFIs is a decision-making unit (DMU) that converts multiple inputs into outputs. The efficiency scores show the relative annual configuration of inputs and outputs per MFI in the sample, as listed below. The output from the DEA forms the dependent variables. After describing the inputs and outputs for the DEA model, we describe the independent variables for the regression analysis.

5.3.1.1 Inputs for the DEA efficiency scores: Following the intermediation approach, we use the following variables as inputs.

- Liabilities and equity to total assets ratio: Liabilities and equity, an equivalent of total assets, capture all the funding sources for the MFI, including debt, equity, deposits, donations, and subsidies at the end of the reporting period. Liabilities and equity is a prominent input for DEA analysis, for instance, in studies on efficiency summarised by Fethi and Pasiouras (2010), Paradi, Sherman, and Tam (2017), and Fall, Akim, and Wassongma (2018).
- Operating expenses to total assets ratio: This ratio captures the portion of assets per annum used to fund the operations of the MFI that directly generates the financial and social outputs described next. Staff numbers are the primary input in several DEA models. In this study, we take operating costs by subsuming the number of staff (labour cost).

5.3.1.2 Outputs for the DEA efficiency scores: We classify outputs in both financial and social terms. Social outputs proxy the extent to which MFIs avail financial services to the poor and the financially excluded. Other outputs measure financial sustainability by MFIs. Accordingly, outputs consist of the following variables;

Social Performance outputs

- Depth Measures: Percent of female borrowers and average loan size per borrower: The percentage of women borrowers as a measure of social efficiency draws from the fact that women form the bulk of the impoverished population and are financially excluded. Researchers have used the average loan size to proxy social performance as poor people will often borrow small amounts regularly to run their businesses and settle bills. In this case, the lower the average loan balance per borrower, the deeper the outreach (D'Espallier et al. 2017).

Financial Performance outputs

- Operational self-sufficiency (OSS): OSS 1 captures the extent to which an MFI meets its financial objectives by generating financial returns that can cover all the expenses. MIX defines the OSS as follows;

$$OSS1 = \frac{\text{Operating Revenue}}{\text{Expenses on Funding, Loan Loss Provisions, and Operations}}$$

OSS 1 has an advantage over OSS 2, which only shows the extent to which an MFI can cover its operating costs. We utilise OSS 1 in the study.

$$OSS2 = \frac{\text{Operating Revenue}}{\text{Operating Expenses}}$$

Table 1 presents summary statistics for the DEA input and output variables.

Before running the DEA analysis, we start by transforming the inputs and outputs. We add a significantly large number to eliminate zeros and negatives (Ataullah and Le 2006). In line with Avkiran (2006), we also mean-normalize the data. Figure 1 shows that there is a very low correlation between the inputs and outputs. Hence, collinearity will not adversely affect the DEA scores.

Table 1: Summary Statistics: Inputs and Outputs for the DEA Model

Variable	Mean	SD	Min	Q1	Median	Q3	Max
Liabilities/Equity	4.472e+07	3.307e+08	0	5.843e+05	2.618e+06	1.322e+07	9.538e+09
Operating Expense/Assets	2.269e-01	1.848e-01	0	1.241e-01	1.807e-01	2.695e-01	2.517e+00
Female borrowers (%)	5.689e-01	2.366e-01	0	4.206e-01	5.500e-01	7.478e-01	1.000e+00
Average Loan	8.675e+02	7.094e+03	0	1.502e+02	3.510e+02	7.240e+02	4.008e+05
Gross Loans/Assets	6.547e-01	7.040e-01	0	5.074e-01	6.536e-01	7.746e-01	2.742e+01

Source: Authors construction from the data

5.4 Independent Variables

Table 2 presents a summary of the independent variables applied in the study.⁷

Table 2: Description of Independent Variables

Variable	Description
1. Current Legal Status:	The legal forms of registration of an MFI are as follows; Commercial Bank, Non-Bank Financial Institution (NBFI), Non-Governmental Organization (NGO), Credit Union/ Cooperative, or Rural Bank. The legal status may dictate the profit orientation and sources of capital for the MFIs. The legal status of an MFI may impact the financing structure in several ways. First, legal status or form typically restricts NGOs from taking deposits, lowering the debt-equity ratio and deposits to assets, raising the capital asset ratio. Also, NGOs may not venture into capital markets for funds, given their not-for-profit orientation. The opposite is the case for MFIs of commercial banks legal form whose legal status allows for deposits.
2. Age:	MIX classifies MFIs into three categories depending on the time that has elapsed since the MFI started operations- new (0-4 years), young (4-8 years) and mature (over eight years). The variable is hence a dummy. We hypothesise that older, and hence larger MFIs are more likely to be more efficient given they can draw from economies of scale, hire better managers, and have a long experience in running microfinance programs.
3. Size (Log of Total Assets):	We proxy the size of MFI with the natural logarithm of total assets, again using MIX data. Assets are supported by the sum of capital and liabilities or, equivalently, the total value of resources owned or controlled by the MFI resulting from past and current activities and from which the MFI derives future benefits. We propose that larger firms should be more efficient due to economies of scale and scope.
4. Governance/ Institutional Quality (KKM):	We create the country level KKM index using the first principal component of the WGI available in the World Bank databases. The index captures the institutional quality in corruption control, government effectiveness, political stability, the rule of law, and voice and accountability (Kaufmann, Kraay, & Mastruzzi, 2011). Firms in countries with better governance can quickly raise debt finance due to ease of contract enforcement — the result, a high debt-equity ratio and a low capital asset ratio. Similarly, the level of deposits mobilisation may be higher in better-governed countries arising from consumer confidence in legislation relating to deposits protection (La Porta, Lopez-de-Silanes, & Shleifer, 2013; Allen et al., 2014). Lastly, MFIs in countries with low KKM may have higher donations as donors opt to circumvent corrupt government channels. We use the terms institutional quality and governance interchangeably throughout the text

⁷See Jensen and Meckling (1976), Titman and Wessels (1988), Ledgerwood (1998), Kyereboah-Coleman (2007), Kraay, Kaufmann, and Mastruzzi (2010), Allen et al. (2014), Kurshev and Strebulaev (2015), Bayai and Ikhide (2016), Schnyder, Siems, and Aguilera (2018), Kimmel, Weygandt, and Kieso (2018), Ito, Kawai, et al. (2018), Market (2019)

5. Private Credit to GDP: We capture the total amount of credit advanced to the private sector by financial intermediaries as a proxy for capital markets development concerning the banking sector following Ito and Kawai (2018). The data source is the Global Financial Development Database, GFDD, of the World Bank (See note 4). Private credit to GDP represents the financial resources provided to the private sector by domestic money banks as a share of GDP. Domestic money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. The data is available in WDI. Financial sector development is central to the acquisition of both equity and debt financing. We hypothesise a high debt to equity ratio, and deposits to assets ratios in countries with more robust financial sectors as financial institutions tend to be highly leveraged.

6. Stock market capitalisation to GDP: We capture the extent of stock market development using the ratio of stock market capitalisation to GDP to proxy how firms can raise equity capital. Although Africa's equity markets are thin, some relatively large stock markets like South Africa, Kenya, and Ghana exist. The data are from the GFDD.

7. Asset Structure (Tangibility): Asset structure is measured as the ratio of non-current assets to total assets of an MFI (Microfinance Information Exchange (MIX), 2019). The percentage indicates the extent of investment in physical infrastructure, a significant issue in constraining banking for the poor due to the perceived lack of scale economies to warrant the erection, for instance, of brick and mortar branches (Ledgerwood, 1998). MFIs with a more significant physical presence are likely to attract more deposits. Therefore, they also have a higher capacity to borrow and service debt. Further, tangible assets serve as collateral to protect lenders from the moral hazard problem (Jensen & Meckling, 1976). Hence, there is a positive relationship between debt and asset tangibility (Titman & Wessels, 1988; Kyereboah-Coleman, 2007a).

8. Profit Margin: The profit margin is the net operating income divided by financial revenue. The ratio represents the ability of MFIs to generate income from the core mandate of offering financial services like lending, savings, insurance, and so on. Profitability may enhance the capacity of an MFI to secure debt, thus leading to a higher debt to equity ratio and low capital to assets ratio. The opposite is the case when an MFI retains earnings and hence raises the level of equity.

Source:

Authors' construction from the literature

Notes

¹ MIX Database on www.themix.org and <https://datacatalog.worldbank.org/dataset/mix-market>

² WDI on <https://databank.worldbank.org/source/world-development-indicators>.

³ WGI/ KKM on <https://databank.worldbank.org/source/worldwide-governance-indicators>.

⁴ GFDD on <https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database>

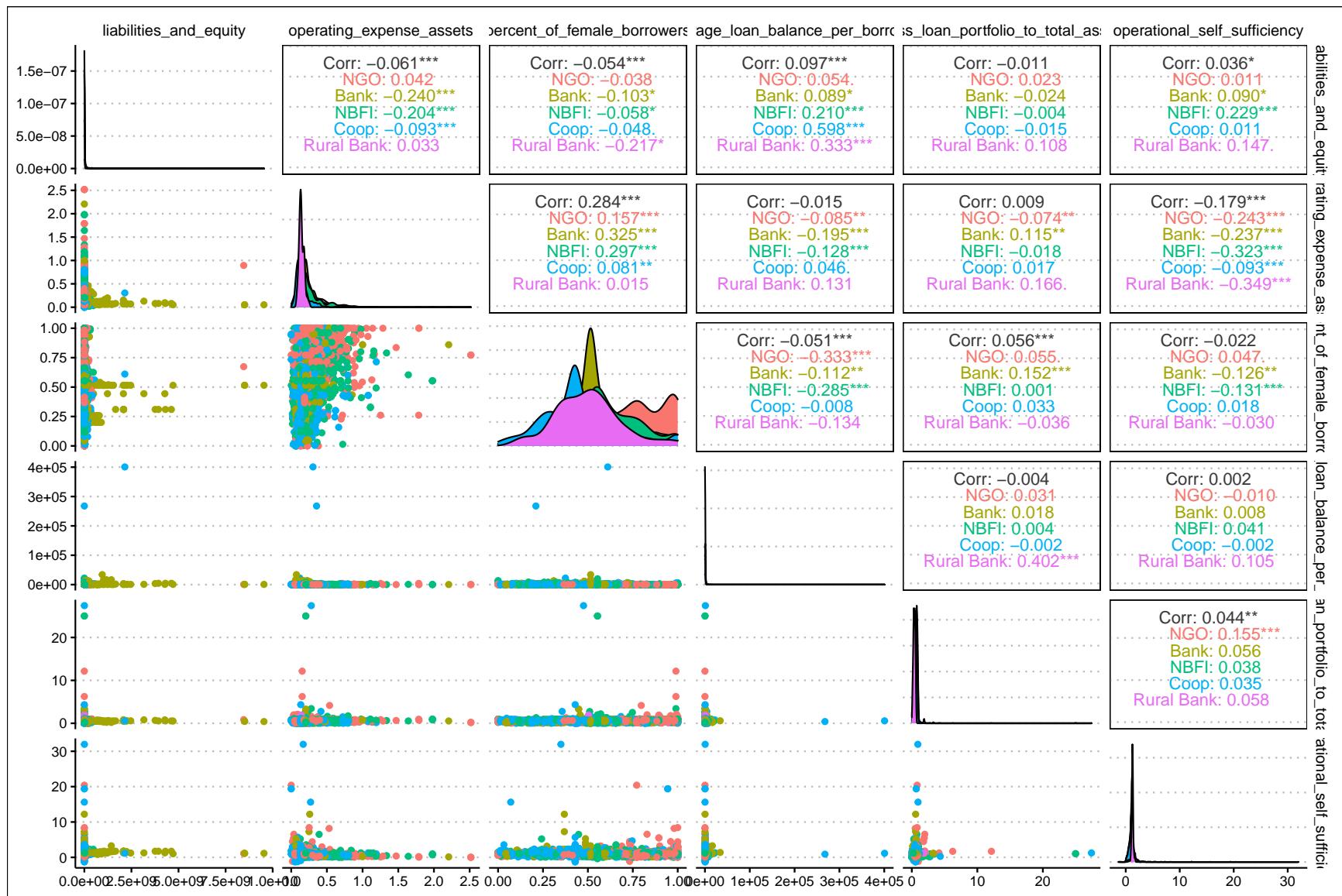


Figure 1: Correlation Matrix for DEA Inputs and Outputs

6 Results

6.1 Exploratory Data Analysis

We examine the indicators of financial and social performance by MFIs in Africa. Here, we focus on taking individual performance measures, the proportion of female borrowers, average loan balance per borrower, gross loans to assets, and operational self-sufficiency. While the examination of indicator variables does not explicitly measure efficiency (we do this in a later section using DEA), they illustrate the extent to which MFIs fare in their mission:

1. Table 2 (above) presents the descriptive statistics. We visualise the data and describe the scope of financial and social performance, followed by a discussion of the DEA efficiency scores.
2. We discuss the levels of efficiency by MFIs types based on the DEA scores.
3. We layout and describe the results of the regression model.

6.1.1 DEA Efficiency Scores

Table 3 shows summary statistics of the efficiency scores for MFIs in Africa. Given that the model is output-oriented, the interpretation is as follows: given a set of inputs, to what extent are MFIs able to maximise output? Given that the study targets the extent of financial inclusion and financial sustainability of MFIs, the maximisation of outputs is more relevant for this study.

6.1.1.1 Financial Efficiency Table 3 shows a summary of the efficiency scores. The mean and median financial efficiency scores are 0.16 and 0.11, respectively.⁸ Taken together with Figure 2, the results show that the financial efficiency scores skew heavily to the right. Critically, MFIs are hardly financially sustainable regardless of their legal form, despite the paradigm shift towards commercialization. This observation begs the two questions; do commercially oriented legal forms of MFIs perform better than NGOs? Further, do newer MFIs that took root when donors emphasize the financial sustainability of MFIs do better financially than older MFIs?

Figure 2, panel C shows that only cooperatives and rural banks have higher median financial efficiency scores than NGOs. These results do not support the supposition that commercialization raises financial sustainability, given that commercial banks and NBFIs fare worse financially. The poor financial performance by banks and NBFIs can only further worsen their outreach to the financially excluded. Besides, the poor financial performance is contrary to the “mission expansion” hypothesis where commercial MFIs generate profits that they then use to reach more financially excluded clients. Further, in Figure 2, panel D shows that newer MFIs have higher financial sustainability scores relative to older MFIs. These results could mean that newer MFIs focus more on financial sustainability at the expense of social goals or are better at balancing financial sustainability with social goals.

Figure 5, panel B shows the trends in median financial efficiency scores of MFIs for 1999-2020. Cooperatives consistently do better financially than other legal forms. Surprisingly, NGOs and rural banks follow, while NBFIs and commercial banks have the lowest median financial efficiency scores, with commercial banks showing wide variability. The results indicate that commercialization does not necessarily raise financial sustainability, especially in the absence of grants and state subsidies. What is concerning is the observation that financial efficiency is on a downward spiral, meaning that MFIs may not achieve the goal of financial sustainability of MFIs. The worsening trend in financial performance by MFIs may point to the harm that neo-liberalism, commercialization, or other unidentified macro-economic factors have on MFIs.

⁸The DEA scores range between zero and one, with zero indicating the worst performance and one the best.

Table 3: Summary Statistics for Efficiency Scores

Variable	Mean	SD	Min	Q1	Median	Q3	Max
financial Efficiency	0.1572	0.1892	0.0292	0.0944	0.1079	0.1272	1
Social Efficiency	0.7862	0.1186	0.5000	0.7126	0.7767	0.8750	1
Financial and Social Efficiency	0.7947	0.1228	0.5000	0.7146	0.7767	0.8938	1

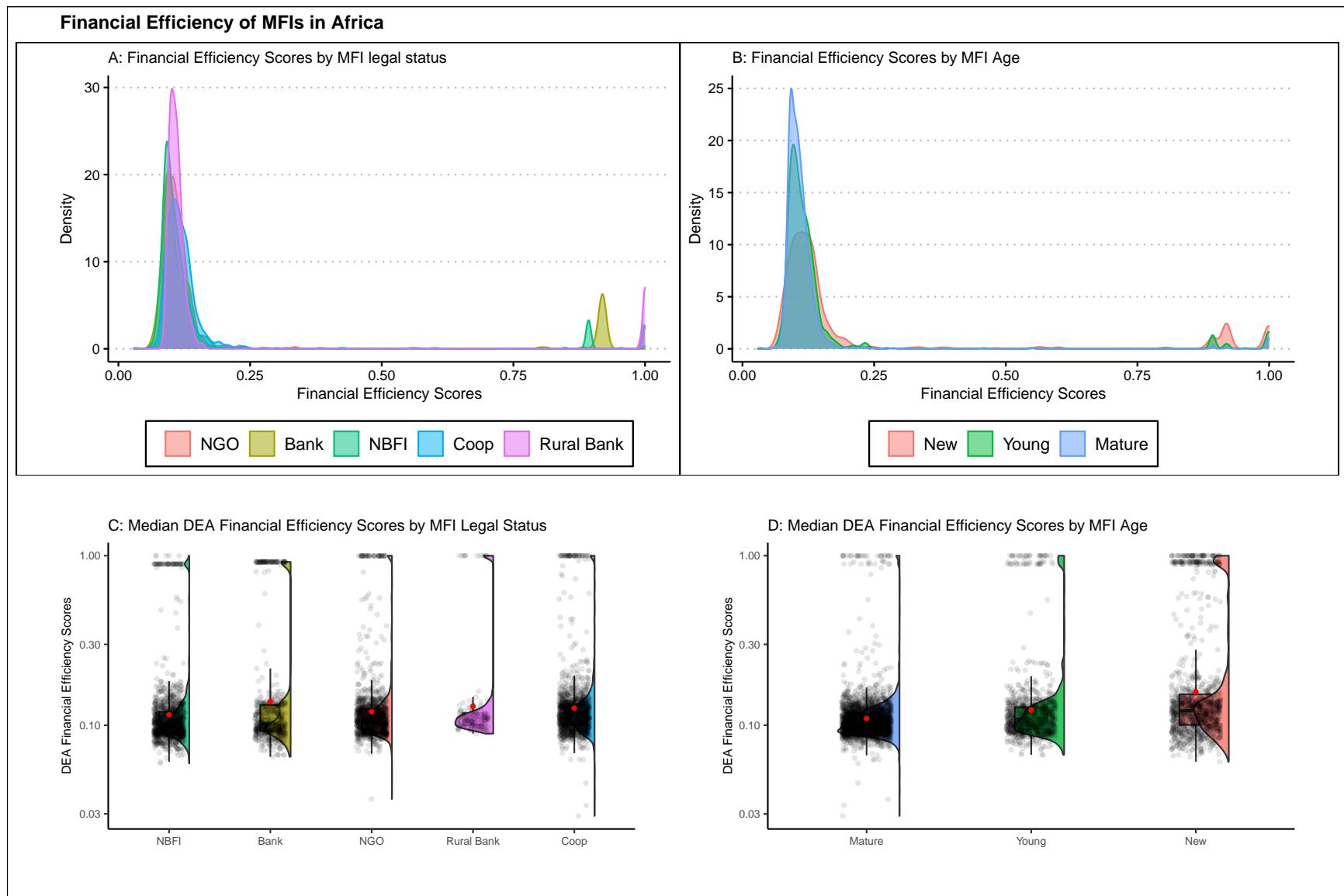


Figure 2: Financial Efficiency Scores for MFIs in Africa

6.1.1.2 Social Efficiency Overall, the social efficiency of MFIs in Africa is high, with a mean and median of 0.79 and 0.78, respectively. However, as Figure 3 and 5 show, NGOs have consistently the highest levels of social efficiency, followed by NBFIs and other forms of MFIs. Rural banks and credit unions, respectively, are the least socially efficient. Considering the financial efficiency scores, it appears that commercialization causes mission drift. Also, both NGOs and NBFIs show a notable decline in social performance over time, which could also be an indictment of the shift towards financial sustainability (D'Espallier et al. 2017).

An important observation is that younger MFIs have a higher level of social performance than mature MFIs. Earlier, we saw that younger MFIs also have better financial performance than older MFIs. The implication is that younger MFIs are better at balancing financial and social goals than mature MFIs. The explanation could be that younger MFIs have developed their business model in the face of declining donor support or the complete absence of donor funding and state subsidies. Older MFIs required to shift from the donor and state subsidy reliant model to the commercial model do not perform well. Given that mature MFIs are larger and reach more financially excluded clients, the issue is how to support mature MFIs to transition to the financial sustainability model without reducing their outreach.

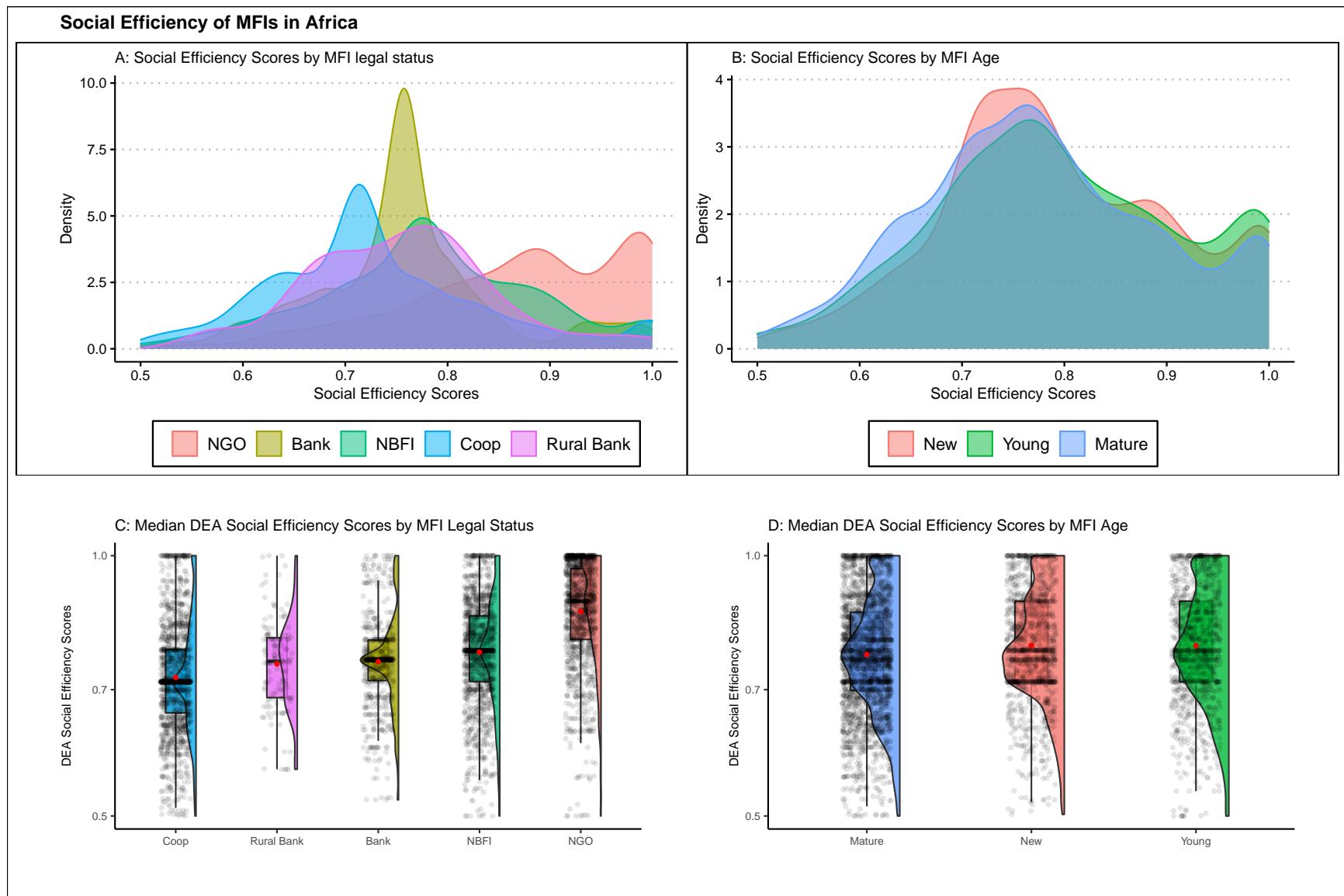


Figure 3: Social Efficiency Scores for MFIs in Africa

6.1.1.3 Financial and Social Efficiency Scores In Figure 4, we combine the social and financial metrics. The DEA model now captures the efficiency with which MFIs in Africa convert the inputs (liabilities and equity) into outputs (average loan balance per borrower, percentage of women borrowers, and operational self-sufficiency, OSS). Table 3 shows the summary statistics of the DEA analysis. The socio-financial efficiency scores are high, with a median of 0.7947 and a mean of 0.7767. Again, the median financial efficiency metric is highest for NGOs, which is an oddity for we expect commercial firms to dominate (see panels A and C). These results mean that NGOs are better at balancing microfinance's financial and social goals than commercial MFIs. NBFIs, banks, rural banks, and cooperatives follow in that order. These results seem like an indictment of the conversion of MFIs to the commercial model.

In Figure 4, panels B and D, we plot the median financial and social efficiency of MFIs faceted by age. As in the social and financial efficiency analysis, younger MFIs fare better in socio-financial efficiency scores than do older MFIs. Again, these results imply that younger MFIs are better at balancing the social and financial aspects of microfinance, as discussed before. Figure 4, panel D shows the trends in the socio-financial efficiency of MFIs. While the scores appear stable across time, NGOs score consistently higher. Overall, these results mean that embracing neo-liberalism may be harming social performance without helping improve financial performance.

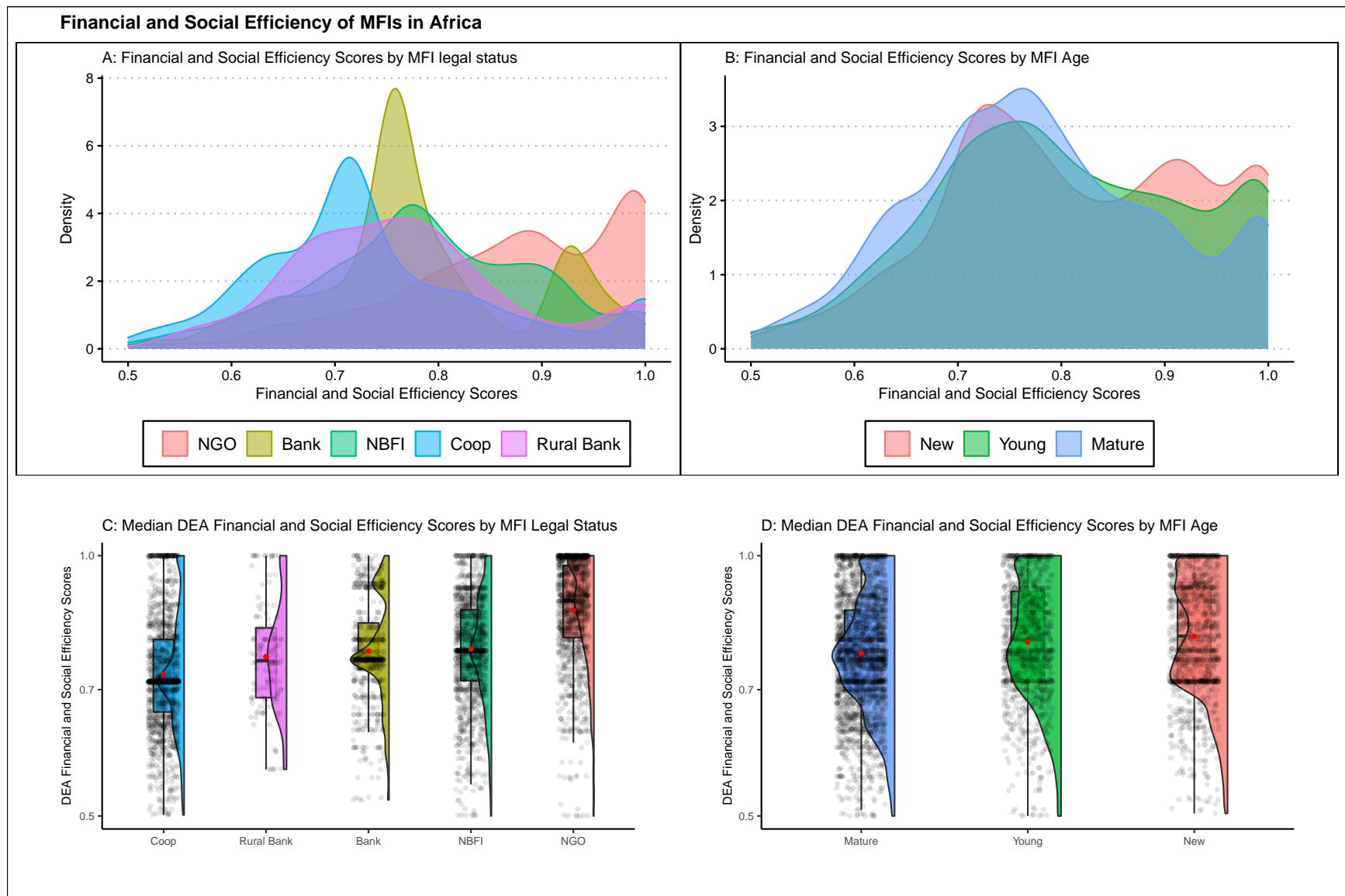


Figure 4: Financial and Social Efficiency Scores for MFIs in Africa

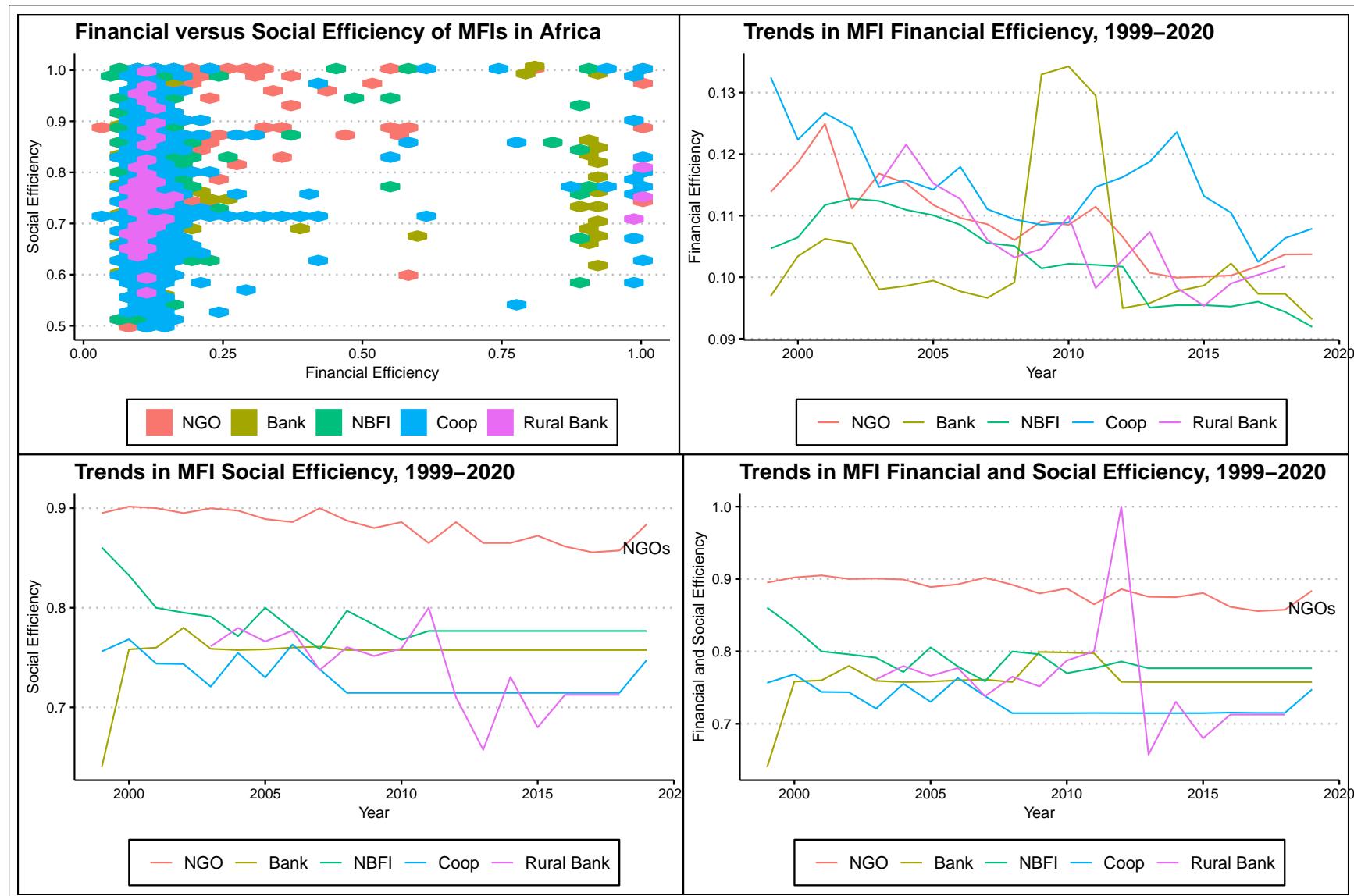


Figure 5: Trends in Financial and Social Efficiency Scores

Table 4: Summary Statistics: Independent Variables for Regression Model

Variable	Mean	SD	Min	Q1	Median	Q3	Max
Asset Structure	0.0759	0.0694	0.000e+00	0.0351	0.0599	0.092	0.8598
KKM	0.0026	2.0064	-5.233e+00	-1.3041	-0.1137	1.628	7.3690
Private Credit	2.7194	0.6852	2.981e-01	2.3864	2.7584	3.052	6.8806
Stock Market	1.1410	1.4732	0.000e+00	0.0000	0.0000	2.428	5.7972
Profit Margin	-7.7393	513.2995	-3.550e+04	-0.1814	0.0484	0.189	6.2019
Assets	14.9461	2.2619	6.931e-01	13.5399	14.8577	16.416	22.9786

Source: Authors construction from the data

Note:

¹ Private credit refers to credit advanced by deposit taking banks as a percentage of GDP

² Stock market is the stock market capitalisation as a percentage of GDP

6.1.2 The Independent Variables

Table 4 shows summary statistics for the independent variables. Profit margin has the highest variability due to extreme minimum observation. To proxy the size of an MFI, we take the logarithm of assets. We use all the other independent variables without transformation.

In the next section, we detail the regression output from the drivers of the efficiency of MFIs in Africa.

7 Regression Analysis

In this section, we regress each of the DEA efficiency scores against the dependent variables. We bootstrap the DEA efficiency scores before applying them to the regression model (Simar and Wilson 2000; Tziogkidis 2012; Fethi and Pasiouras 2010). The purpose of using the bootstrapping approach is two-fold: first, to obtain the bias-corrected estimates and the confidence intervals of DEA-efficiency scores and second, to overcome the correlation problem of DEA-efficiency scores and to provide consistent inferences in explaining the determinants of financial and social efficiency (Assaf and Matawie 2010). The bootstrapped DEA scores serve as the dependent variables in the regression analysis. This section provides results from the regression models on the drivers of the socio-financial efficiency of MFIs in Africa.

7.1 Financial Efficiency of MFIs

Table 5 shows the results of the regression analysis with financial efficiency as the dependent variable. The significant drivers of financial efficiency are asset structure, MFI size proxied by the logarithm of total assets, and stock market capitalisation to GDP. Current legal status has a weak relationship with financial efficiency. The regression analysis shows that commercial banks and rural banks have significantly better financial efficiency, which goes against the visualisation in figure 2. The extreme values in the financial performance of banks and rural banks could explain this contradiction. But overall, NGOs do better financially than all the legal forms of MFIs except cooperatives.

These results go against the stated objectives of MFI commercialisation. The commercial model of microfinance aims at increasing the financial sustainability of MFIs, which would allow for their sustainability without reliance on donations and subsidies (D'Espallier et al. 2017). Again, financial sustainability by MFIs would lead to mission expansion by using profits to teach the financially excluded. However, the data shows that this is not the case. Overall, the financial performance of MFIs is poor (Mersland and Strøm 2010). However, the commercial MFIs do not outperform NGOs in financial performance in the sample dataset. It then seems like commercialisation does not necessarily translate into financial sustainability. And given the relatively good financial performance by NGOs that do not explicitly prioritise profitability, it appears that the win-win

school has the upper hand. MFIs can balance financial and social goals while retaining the NGO model that focuses on social goals.

The asset structure of MFIs has an inverse relationship with financial efficiency. As noted earlier, asset structure or asset tangibility is the ratio of non-current assets to total assets of an MFI. The results then imply that investment in physical infrastructure harms financial sustainability (Iman 2018; Demirguc-Kunt et al. 2018). The results are consistent with the theory because serving the financially excluded is expensive and may not yield economies of scale to offset the investment in physical infrastructure by MFIs. The advent of Fintech allows MFIs to reach out to the financially excluded without high expenditures in brick and mortar branches and other physical assets (Iman 2018). However, given that most financially excluded people also suffer from financial illiteracy, MFIs still must deploy field workers or mobile banking units in targeted areas (Allen et al. 2014). Hence, there is an opportunity for research into how Fintech affects the investment in physical infrastructure, profitability and outreach of MFIs in Africa.

The size of an MFI is also negatively related to the financial efficiency of MFIs in Africa. Large, older MFIs have lower financial efficiency scores relative to smaller, younger, which could arise due to dis-economies of scale. Also, larger, older MFIs may not emphasise financial sustainability, given they receive relatively more donations. If donors emphasise outreach to financial sustainability, this could explain the lower levels of financial performance by older MFIs (D'Espallier, Hudon, and Szafarz 2013). The ratio of stock market capitalisation to GDP has a weak positive relationship with financial efficiency, implying that MFIs operating in countries with better functioning capital markets exhibit better financial performance. Lower incidence of financial exclusion in countries with well developed capital markets could explain the relationship (Allen et al. 2014). The ratio of private credit to GDP is insignificant. The remaining variables, age and institutional quality, have no significant relationship with financial efficiency. However, as we saw earlier in table 2, younger MFIs have marginally higher financial performance, which is not significant in the regression.

Table 5: Regression Output for Financial Efficiency (Standard Errors in Brackets)

	Dependent variable: depvar					
	(1)	(2)	(3)	(4)	(5)	(6)
currentlegalstatusBank				0.127*** (0.025)	0.012 (0.020)	0.028** (0.013)
currentlegalstatusNBFI				0.019 (0.019)	-0.006 (0.015)	0.005 (0.009)
currentlegalstatusCoop	-0.002 (0.019)	-0.001 (0.018)	-0.0004 (0.022)	-0.003 (0.015)	-0.005 (0.014)	0.008 (0.009)
currentlegalstatusRural Bank				0.053* (0.031)	-0.038 (0.028)	-0.004 (0.028)
ageYoung	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	0.001 (0.003)	0.001 (0.003)	0.002 (0.002)
ageMature	0.005* (0.003)	0.004 (0.003)	0.005 (0.003)	0.002 (0.003)	0.003 (0.003)	0.004 (0.003)
kkm	-0.002 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.0001 (0.001)	-0.001 (0.001)	0.0004 (0.001)
asset_structure	-0.070*** (0.015)	-0.060*** (0.016)	-0.066*** (0.016)	-0.087*** (0.018)	-0.069*** (0.017)	-0.067*** (0.016)
pcrdbgdp	-0.001 (0.003)	0.002 (0.003)	0.002 (0.003)	-0.002 (0.004)	-0.003 (0.004)	-0.004 (0.003)
stmktcap	0.004* (0.002)	0.004 (0.002)	0.007*** (0.002)	0.005** (0.003)	0.003 (0.002)	0.005*** (0.002)
log(assets)	-0.159*** (0.012)	-0.138*** (0.012)	-0.128*** (0.017)	-0.183*** (0.013)	-0.152*** (0.013)	-0.127*** (0.016)
Model	<i>Within</i>	<i>Within</i>	<i>Within</i>	<i>Random</i>	<i>Random</i>	<i>Random</i>
Data	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>
Observations	4,782	3,840	3,165	4,782	3,840	3,165
R ²	0.078	0.073	0.098	0.151	0.095	0.101
Adjusted R ²	-0.142	-0.057	-0.003	0.146	0.088	0.093
F Statistic	11.630*** (df = 28; 3862)	9.522*** (df = 28; 3366)	11.080*** (df = 28; 2845)	380.100***	281.000***	293.000***

Note:

*p<0.1; **p<0.05; ***p<0.01

7.2 Drivers of Social Efficiency of MFIs

Unlike financial performance, the legal form of an MFI is the dominant driver of social performance (see Table 6). Consistent with figure 3, NGOs have significantly higher social performance levels than all the other legal forms of MFIs. The concern by the welfare school of microfinance is that the levels of outreach by NGOs to the financially excluded could be affected by focusing on financial sustainability. However, as the previous section shows, NGOs do not fare badly in financial efficiency than other legal forms of MFIs. It means, therefore, that NGOs could aim at a degree of financial efficiency while still maintaining their social goals. As Mersland, Nyarko, and Szafarz (2019) note, the mission statements of MFIs have a significant relationship with the performance of these MFIs. Given that NGOs have the stated mission of reaching the unbanked, they are better positioned to achieve these social goals. If NGOs are to give financial goals as much weight as social goals, there is likely to be a trade-off, more so where fund providers put pressure on management to make financial returns.

The results are consistent with the data visualisations. Credit unions have the objective of serving subscribed members within a designated geographic location or a common professional background. It is not their mission to explicitly target social performance (Mathuva, Mboya, and McFie 2017). The contestation here is between NGOs and the other commercial entities, excluding credit unions. The results illustrate that MFIs that exclusively target social performance tend to achieve more socially. Hence the place of the social mission of an MFI is central to achieving social objectives, a view that is in line with findings by Berbegal-Mirabent, Mas-Machuca, and Guix (2019).

Both stock markets capitalisation to GDP and private credit to GDP have a negative and significant relationship with social performance. These two metrics capture the levels of capital market development. People in countries with higher levels of financial development have lower incidences of financial exclusion, on average, relative to people in countries with lower levels of financial inclusion. This observation is despite the concurrence in the literature that the ability to access financial services does not necessarily translate into the usage of financial services. However, access to financial services is a necessary precondition for people to use financial services (Allen et al. 2013; Jarotschkin 2013). Financial development means better financial infrastructure that allows people who could otherwise not use financial services because of lack of access to these services.

Institutional quality (KKM) has a mixed but insignificant relationship with the social performance of MFIs. As expected, asset structure has a positive, albeit insignificant relationship with social performance, given that MFIs that have a greater presence in financially under-served communities would tend to serve more financially excluded clients. Likewise, the size of an MFI shows a positive but insignificant relationship with social outreach. Again, consistent with the data visualisation, younger MFIs have better levels of social performance than older MFIs, although the coefficients are not significant in the regression. The result seems odd because younger MFIs started when the sustainability school was gaining ground, meaning low donations and subsidies (D'Espallier, Hudon, and Szafarz 2013). But given that younger MFIs are smaller, they may serve geographically limited areas to reach more financially excluded clients. The broader coverage by older MFIs makes it hard for them to focus on social goals, given the financial implications of sustaining their presence in these settings.

7.3 Socio-Financial Efficiency of MFIs

In this regression model, we examine joint social and financial efficiency (socio-financial efficiency). Specifically, we seek to uncover how well MFIs convert their inputs into financial (operational self-sufficiency) and social goals (percentage of female borrowers and average loan balance per borrower). The results in Table 7 show that, like social efficiency, the statistically significant drivers of socio-financial efficiency are legal status and the ratio of stock market capitalisation to GDP. Specifically, the regression analysis shows that NGOs have higher socio-financial efficiency scores than the other legal forms of MFIs, confirming the results of exploratory data analysis. These results suggest that transformed MFIs do not achieve the attained benefits of commercialisation- increased financial sustainability, which allows for greater outreach to the financially excluded (mission expansion) (Mersland and Strøm 2010). Instead, it is NGOs that are capable of balancing financial and social goals. Like in social goals, socio-financial efficiency has a negative relationship with

stock market capitalisation to GDP, highlighting the importance of financial sector development in enabling financial inclusion (Allen et al. 2013).

Table 6: Regression Output for Social Efficiency (Standard Errors in Brackets)

	Dependent variable: depvar					
	(1)	(2)	(3)	(4)	(5)	(6)
currentlegalstatusBank				-0.106*** (0.014)	-0.096*** (0.020)	-0.095*** (0.022)
currentlegalstatusNBFI				-0.084*** (0.011)	-0.080*** (0.014)	-0.077*** (0.015)
currentlegalstatusCoop	0.047 (0.054)	0.048 (0.057)	0.048 (0.063)	-0.137*** (0.010)	-0.122*** (0.014)	-0.124*** (0.017)
currentlegalstatusRural Bank				-0.103*** (0.022)	-0.124*** (0.033)	-0.130** (0.052)
ageYoung	-0.001 (0.005)	-0.003 (0.005)	-0.001 (0.006)	-0.002 (0.004)	-0.003 (0.005)	-0.001 (0.006)
ageMature	-0.004 (0.007)	-0.005 (0.008)	-0.002 (0.009)	-0.006 (0.006)	-0.008 (0.007)	-0.003 (0.009)
kkm	0.0004 (0.003)	0.0003 (0.003)	-0.0002 (0.004)	-0.001 (0.002)	-0.003 (0.002)	-0.003 (0.003)
asset_structure	0.024 (0.029)	0.029 (0.034)	0.036 (0.042)	0.010 (0.027)	0.022 (0.032)	0.029 (0.040)
pcrdbgdp	-0.011 (0.007)	-0.013 (0.008)	-0.013 (0.009)	-0.009* (0.005)	-0.011* (0.007)	-0.010 (0.007)
stmktcap	-0.013*** (0.004)	-0.014*** (0.004)	-0.012** (0.005)	-0.002 (0.003)	-0.002 (0.003)	-0.004 (0.004)
log(assets)	0.026 (0.026)	0.035 (0.028)	0.034 (0.045)	-0.029 (0.018)	-0.014 (0.025)	-0.006 (0.039)
Model	<i>Within</i>	<i>Within</i>	<i>Within</i>	<i>Random</i>	<i>Random</i>	<i>Random</i>
Data	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>
Observations	4,782	3,840	3,165	4,782	3,840	3,165
R ²	0.037	0.039	0.038	0.619	0.348	0.200
Adjusted R ²	-0.192	-0.096	-0.070	0.617	0.342	0.192
F Statistic	5.293*** (df = 28; 3862)	4.840*** (df = 28; 3366)	3.971*** (df = 28; 2845)	421.500***	243.900***	183.800***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 7: Regression Output for Joint Financial and Social Efficiency (Standard Errors in Brackets)

	Dependent variable: depvar					
	(1)	(2)	(3)	(4)	(5)	(6)
currentlegalstatusBank				-0.106*** (0.015)	-0.096*** (0.020)	-0.095*** (0.022)
currentlegalstatusNBFI				-0.084*** (0.012)	-0.080*** (0.014)	-0.077*** (0.015)
currentlegalstatusCoop	0.047 (0.055)	0.048 (0.058)	0.048 (0.063)	-0.137*** (0.011)	-0.122*** (0.014)	-0.124*** (0.017)
currentlegalstatusRural Bank				-0.103*** (0.023)	-0.124*** (0.033)	-0.130** (0.052)
ageYoung	-0.001 (0.005)	-0.003 (0.005)	-0.001 (0.006)	-0.002 (0.004)	-0.003 (0.005)	-0.001 (0.006)
ageMature	-0.004 (0.007)	-0.005 (0.008)	-0.002 (0.009)	-0.006 (0.006)	-0.008 (0.008)	-0.003 (0.009)
kkm	0.0004 (0.003)	0.0003 (0.003)	-0.0002 (0.004)	-0.001 (0.002)	-0.003 (0.002)	-0.003 (0.003)
asset_structure	0.024 (0.029)	0.029 (0.034)	0.036 (0.042)	0.010 (0.028)	0.022 (0.033)	0.029 (0.040)
pcrdbgdp	-0.011 (0.007)	-0.013 (0.008)	-0.013 (0.009)	-0.009* (0.006)	-0.011* (0.007)	-0.010 (0.007)
stmktcap	-0.013*** (0.004)	-0.014*** (0.004)	-0.012** (0.005)	-0.002 (0.003)	-0.002 (0.003)	-0.004 (0.004)
log(assets)	0.026 (0.026)	0.035 (0.028)	0.034 (0.045)	-0.029 (0.019)	-0.014 (0.025)	-0.006 (0.039)
Model	<i>Within</i>	<i>Within</i>	<i>Within</i>	<i>Random</i>	<i>Random</i>	<i>Random</i>
Data	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>	<i>Full</i>	<i>>= 3Years</i>	<i>>= 5Years</i>
Observations	4,782	3,840	3,165	4,782	3,840	3,165
R ²	0.037	0.039	0.038	0.619	0.348	0.200
Adjusted R ²	-0.192	-0.096	-0.070	0.617	0.342	0.192
F Statistic	5.293*** (df = 28; 3862)	4.840*** (df = 28; 3366)	3.971*** (df = 28; 2845)	421.500***	243.900***	183.800***

Note:

*p<0.1; **p<0.05; ***p<0.01

7.4 Robustness Tests

We first run the fixed and random effects models for the entire dataset for robustness, with the results reported in tables 5, 6 and 7. Secondly, we check for outliers by winsorising the data. We remove the top 10% and the bottom 10% observations of the independent variables and rerun the fixed and random effects regressions. The results are in Appendix 3 (Table 9). The results remain to correspond to those in Tables 5 to 7 except for the magnitude of the regression coefficients.

Given the panel structure of data, there is a possibility of cross-sectional dependence and serial correlation. We correct the standard errors – presenting the panel corrected standard errors to deal with these problems. Appendix 7 is a plot examining the normality of residuals for the regression outputs in Table 4. The results show slight deviations from normality, which may not be an issue given the large sample size.

8 Conclusion

This study examined the levels and drivers of financial efficiency, social efficiency, and socio-financial efficiency of MFIs in Africa, particularly along MFI legal status lines. NGOs have the highest levels of social efficiency and socio-financial efficiency, whereas cooperatives have the least. In terms of financial efficiency, cooperatives and rural banks perform best while NBFIs trail. Social efficiency and socio-financial efficiency drivers are legal statuses, operating expense to assets ratio, capital to assets ratio, asset structure, and education. For financial efficiency, the drivers are similar to social efficiency, except that education is not a significant driver. Notably, capital structure positively influences both financial and social efficiency outcomes that support the need for MFIs to seek external capital. However, operating expenses positively relate to social performance and negatively relate to financial performance, pointing to mission drift. The legitimacy of transformed MFIs rests with how well they balance the need to access commercial capital and the profit motive that may negatively impact their overarching social mission.

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Table 8: Results of the Hausmann Tests

Statistic	P.value	Parameter	Method	Alternative
73.36	0	8	Hausman Test	one model is inconsistent
62.45	0	8	Hausman Test	one model is inconsistent
84.55	0	8	Hausman Test	one model is inconsistent

10 Appendices

10.1 Appendix 1: Hausmann Test for the Choice Between Fixed and Random effects

10.2 Appendix 2: Visualization of DEA Inputs and Outputs

OSS, Female Borrowers, Average Loans, and Gross Loans of MFIs in Africa

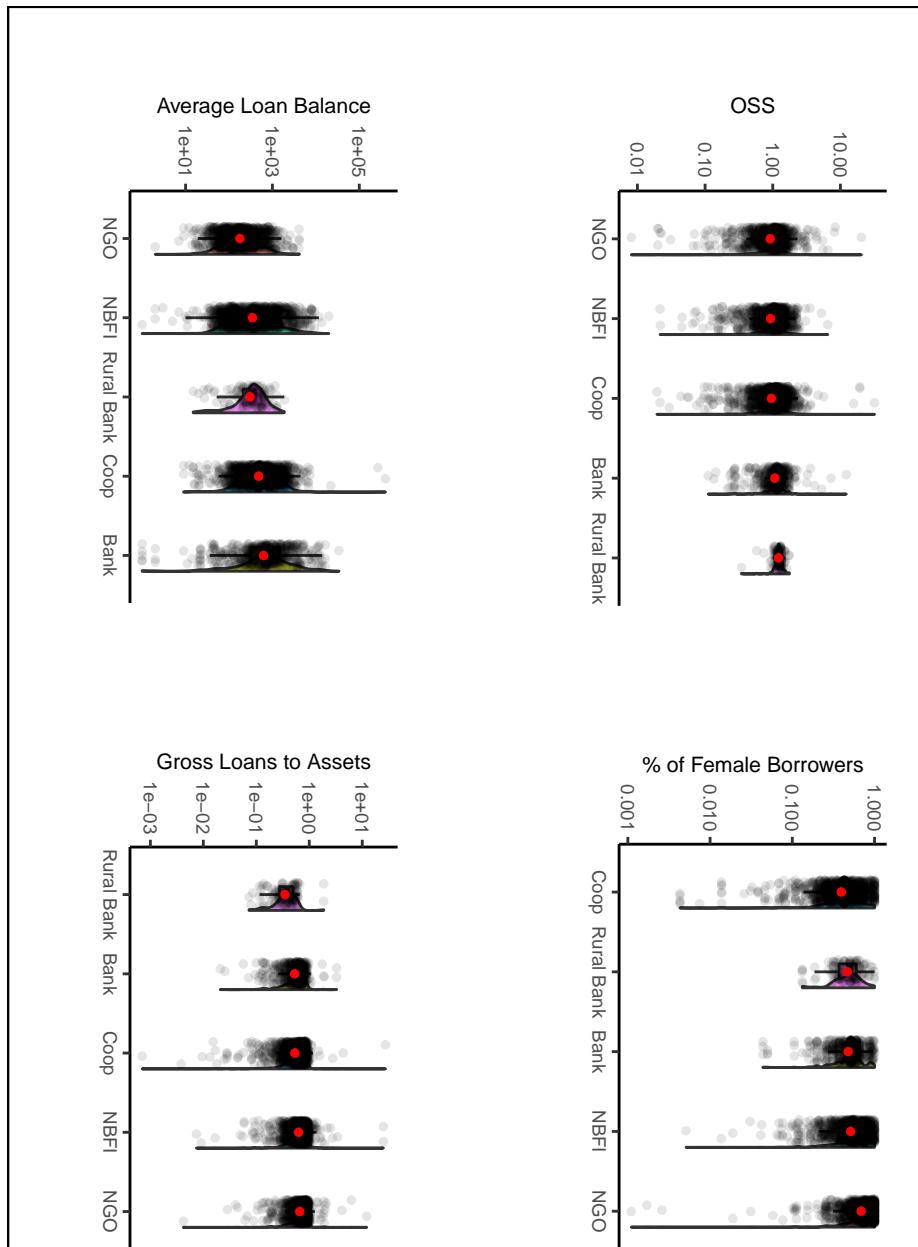


Figure 6: Financial Sustainability and Social Performance Metrics for MFIs in Africa

Table 9: Regression Output for Efficiency for Winsorized Data (Standard Errors in Brackets)

	Dependent variable: depvar					
	(1)	(2)	(3)	(4)	(5)	(6)
currentlegalstatusBank				0.125*** (0.025)	-0.108*** (0.015)	-0.077*** (0.016)
currentlegalstatusNBFI				0.003 (0.018)	-0.087*** (0.012)	-0.082*** (0.012)
currentlegalstatusCoop	-0.0001 (0.015)	0.041 (0.052)	0.041 (0.052)	0.010 (0.015)	-0.137*** (0.011)	-0.126*** (0.011)
currentlegalstatusRural Bank				0.066** (0.028)	-0.106*** (0.022)	-0.080*** (0.023)
ageYoung	0.003 (0.002)	0.002 (0.005)	0.002 (0.005)	0.001 (0.003)	0.001 (0.005)	-0.001 (0.005)
ageMature	0.005* (0.003)	-0.0002 (0.008)	-0.0001 (0.008)	0.002 (0.004)	-0.002 (0.007)	-0.006 (0.007)
kkm	-0.002 (0.001)	0.001 (0.003)	0.001 (0.003)	-0.00001 (0.001)	-0.001 (0.002)	-0.0002 (0.002)
asset_structure	-0.078*** (0.020)	0.065 (0.044)	0.069 (0.045)	-0.092*** (0.025)	0.034 (0.041)	0.024 (0.043)
pcrdbgdp	-0.003 (0.004)	-0.020* (0.010)	-0.020* (0.010)	0.0004 (0.005)	-0.019*** (0.007)	-0.016** (0.008)
stmktcap	0.005** (0.002)	-0.013*** (0.004)	-0.011*** (0.004)	0.006** (0.003)	-0.0003 (0.003)	0.002 (0.003)
log(assets)	-0.162*** (0.018)	0.014 (0.037)	0.017 (0.038)	-0.178*** (0.019)	-0.034 (0.026)	-0.046* (0.027)
Model	<i>Within</i>	<i>Within</i>	<i>Within</i>	<i>Random</i>	<i>Random</i>	<i>Random</i>
Depvar	<i>FinEff</i>	<i>SocEff</i>	<i>FinSocEff</i>	<i>FinEff</i>	<i>SocEff</i>	<i>FinSocEff</i>
Data	<i>Full</i>	$\geq 3\text{Years}$	$\geq 5\text{Years}$	<i>Full</i>	$\geq 3\text{Years}$	$\geq 5\text{Years}$
Observations	4,292	4,292	4,292	4,292	4,292	4,292
R ²	0.062	0.043	0.041	0.132	0.632	0.627
Adjusted R ²	-0.171	-0.196	-0.198	0.126	0.629	0.624
F Statistic (df = 28; 3434)	8.173***	5.496***	5.297***	261.800***	407.700***	333.400***

Note:

*p<0.1; **p<0.05; ***p<0.01

10.3 QQ Plots for Financial and Social Efficiency

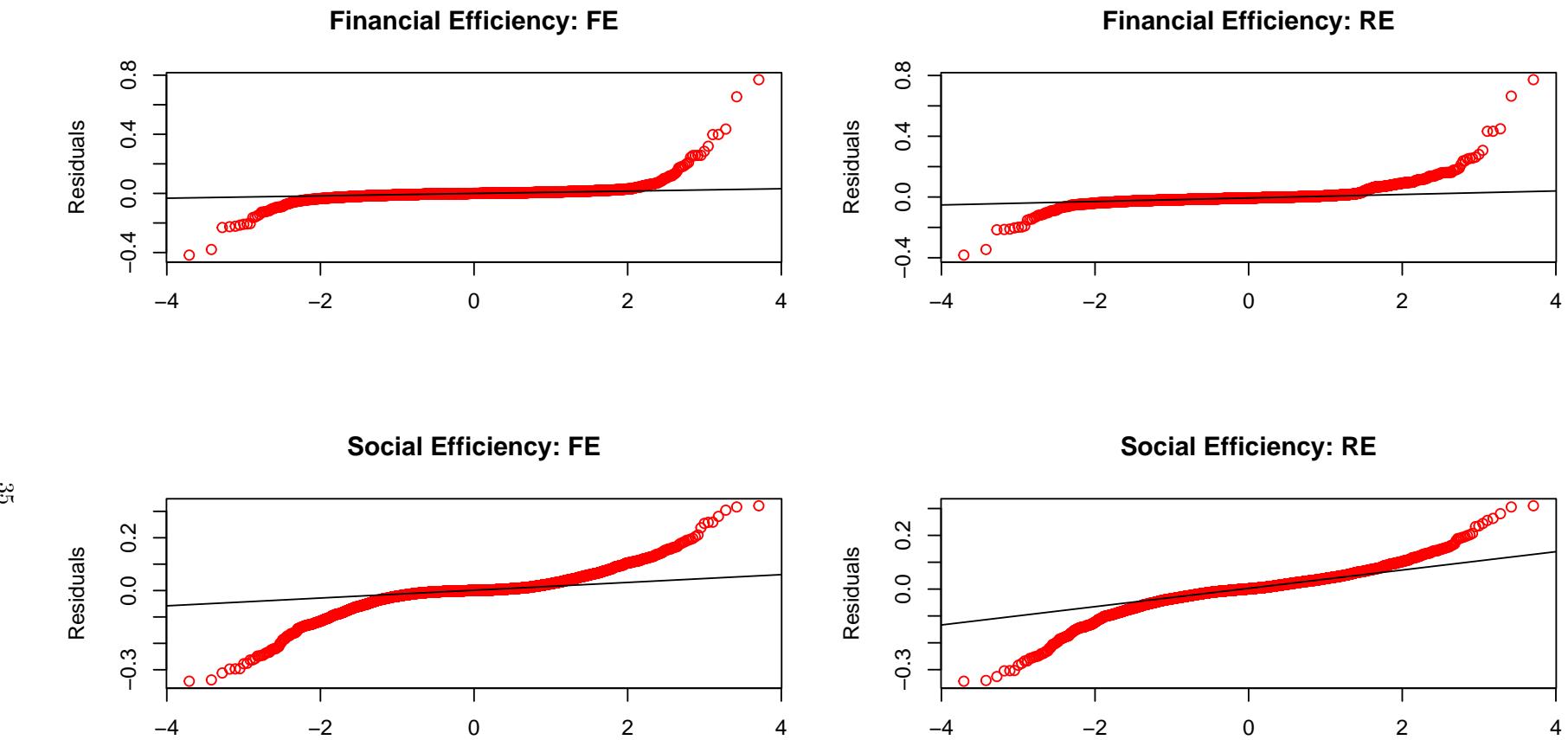


Figure 7: residual QQ-plots for Fixed and Random Effects Regression Models

10.4 QQ-Plots for Financial and Social Efficiency with Winsorised Data

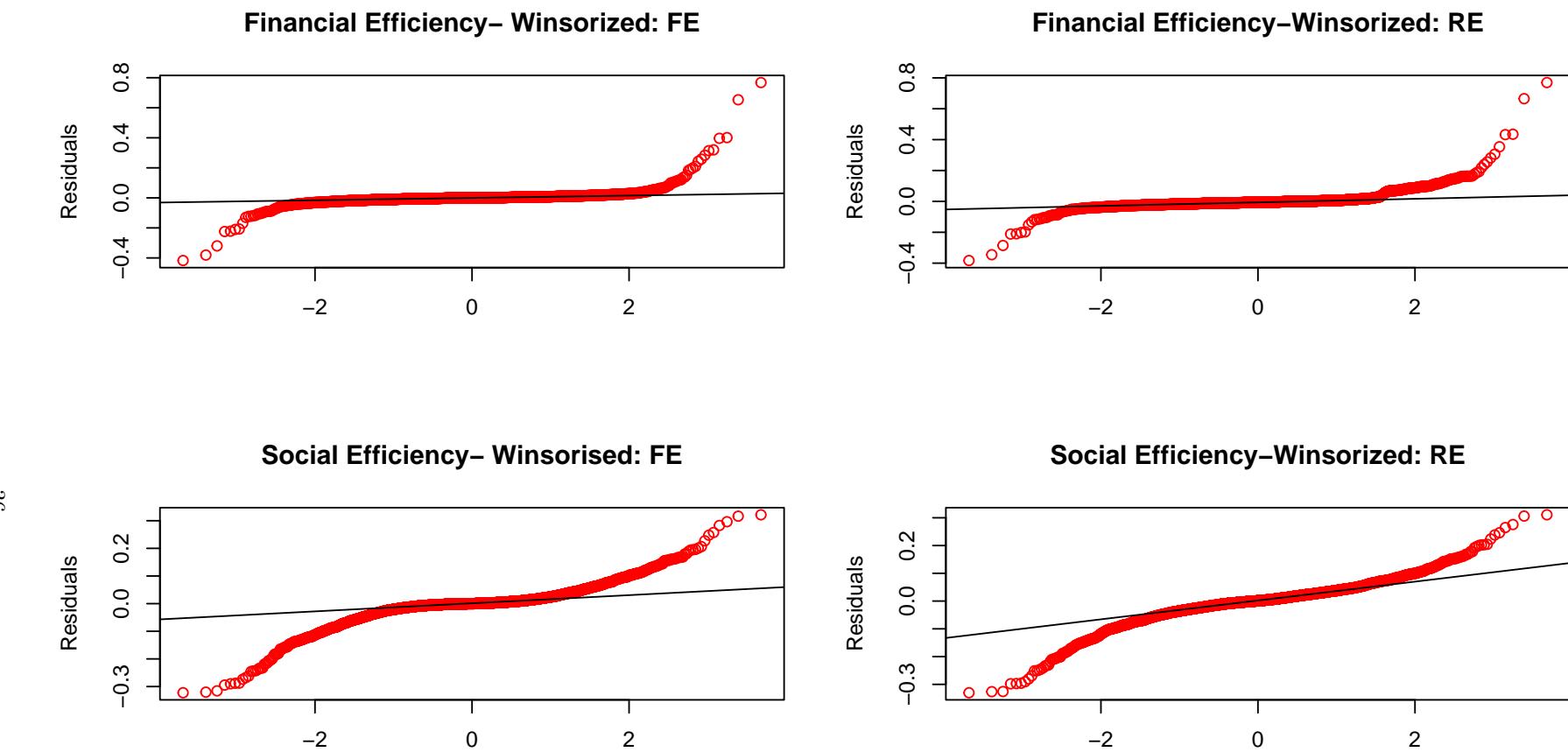
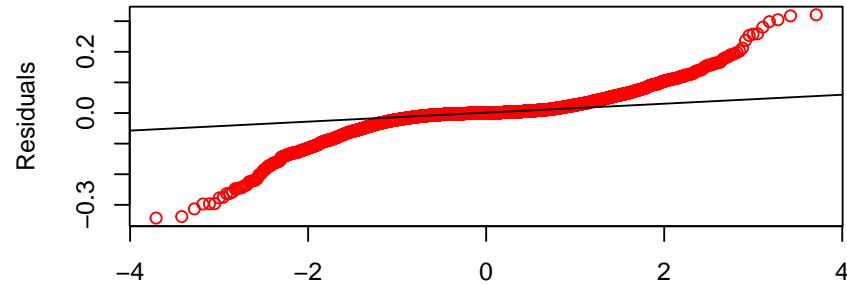


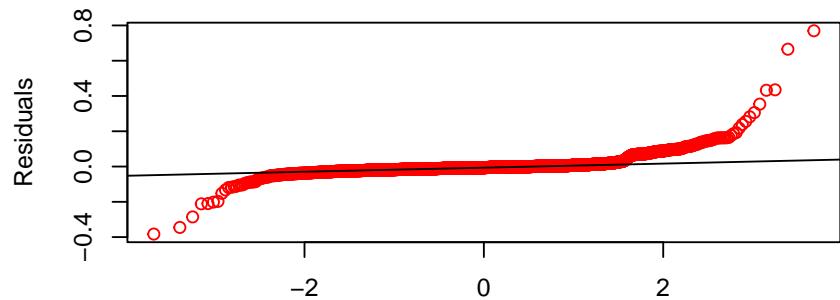
Figure 8: residual QQ-plots for Fixed and Random Effects Regression Models

10.5 QQ-Plots for Socio-Financial Efficiency

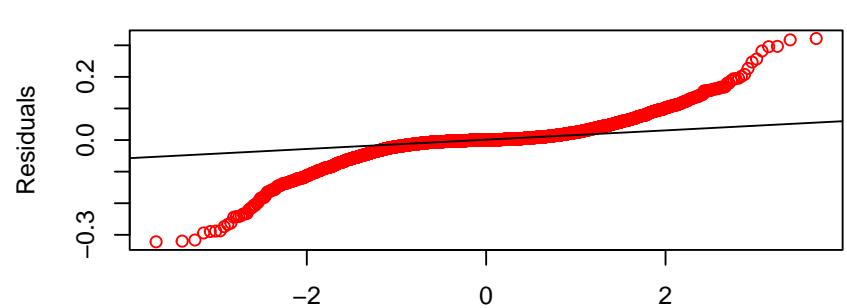
Socio-Financial Efficiency: FE



Socio-Financial Efficiency: RE



Socio_Financial Efficiency- Winsorised: FE



Socio_Financial Efficiency-Winsorized: RE

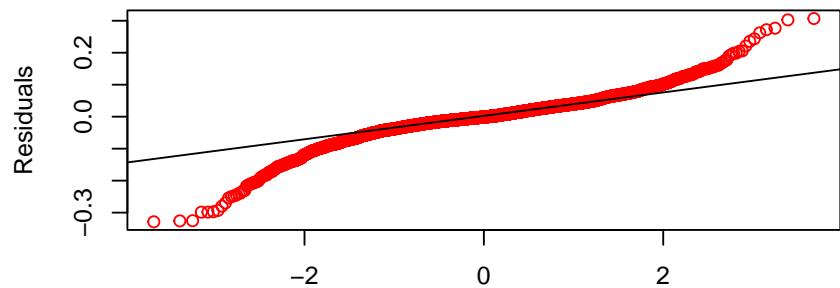


Figure 9: residual QQ-plots for Fixed and Random Effects Regression Models