U.PORTO

FEP FACULDADE DE ECONOMIA
UNIVERSIDADE DO PORTO

Impact of Currency Risk on the Performance of Microfinance Institutions in Emerging Economies

Nino Manchkhashvili

Dissertation
Master in Finance

Supervised by

Ana Paula Serra, PhD

2024

Acknowledgments

I would like to express my gratitude to my family for allowing me to pursue enriching academic and professional experiences. I will be forever grateful for their encouragement, support, and love.

To my closest friends, thank you for your constant encouragement and understanding during challenging times and for always believing in me. Thank you to my companion during this journey, Nino Gergeshelidze. Your support has been invaluable.

I extend my heartfelt thanks to my supervisor, Professor Ana Paula Serra, for her insightful guidance, recommendations, and critical analysis, which have significantly enriched my work.

I also wish to express my appreciation to the Faculty of Economics of the University of Porto. To all the professors, thank you for imparting your knowledge and for your assistance.

I extend my gratitude to the Faculty of Finance and Accounting of the Prague University of Economics and Business. To the professors and employees who were involved in cooperating in the Double Degree program. Thank you for giving me the opportunity to be one of the first participants in the program.

To all of you who have been a part of my journey, I deeply appreciate your help and guidance. Thank you.

Abstract

Microfinance Institutions play an important role in providing financial services to the underserved population. However, operating in volatile economic environments, such as emerging markets, exposes them to foreign exchange risk. This dissertation explores the drivers of the financial performance of Microfinance Institutions (MFIs) in emerging and developing countries, focusing on the impact of foreign exchange risk and country-specific factors on their return on assets (ROA). The study examines the role of foreign exchange risk-related variables, MFI-specific characteristics, and macroeconomic factors.

The study sample consists of data for 154 MFIs of 47 emerging and developing countries over the period 2018-2022. The data was collected from the Orbis, Passport databases, and the International Monetary Fund (IMF). The study examines the impact of foreign exchange risk, country-specific factors, and MFI characteristics on the performance of Microfinance Institutions using ordinary least squares, fixed effects, random effects, between models, and robust regression methods. We also estimate and compare the results for two subsamples of MFIs in hard/peg exchange rate regimes and floating-rate regimes.

We find that MFIs operating in countries with higher interest rate differentials have lower ROA. Moreover, the ratios of Loans to Total assets, Interest Income over Loans, Impaired and Non-performing Loans over Loans, as well as GDP Growth and Rule of Law significantly influence MFI's financial performance. The results suggest that MFIs operating in pegged exchange rate regimes seem to have a higher sensitivity to (unexpected) exchange rate changes. The results underline the importance of effective risk management strategies.

Key-words: Microfinance Institutions, Emerging Markets, Return on Assets, Foreign Exchange Risk, Exchange Rate Regimes, Financial Performance, Risk Management.

Sumário

As instituições de microcrédito (MFIs) desempenham um papel vital na prestação de serviços financeiros à população carenciada. No entanto, muitas destas instituições opera em ambientes económicos voláteis, como os mercados emergentes, e estão expostas a risco cambial. Esta dissertação explora o desempenho financeiro (ROA – Return on Assets) das Instituições de Microcrédito em países emergentes e em desenvolvimento, concentrando-se no impacto do risco cambial e de outros características das instituições e do país onde operam.

A amostra do estudo consiste em dados de 154 MFIs que operam em 47 países emergentes e em desenvolvimento no período entre 2018 e2022. Os dados foram recolhidos das bases de dados Orbis, Passport e do Fundo Monetário Internacional (FMI). O estudo examina a relação entre ROA e variáveis relacionadas com o risco cambial nesses países, controlando pelas características MFIs e por outros factores macroeconómicos e de contexto do países em que operam, através de regressões multivariadas, usando mínimos quadrados ordinários, efeitos fixos, efeitos aleatórios, entre modelos e regressão robusta.

Os resultados revelam que variáveis como os rácios entre Crédito Concedido sobre Ativos Totais, Rendimentos de Juros sobre Crédito Concedido, Imparidades e Empréstmos Não Produtivos sobre Ativos Totais influenciam significativamente o desempenho dos MFIs. Além disso, as MFI em países com maiores diferenciais de taxa de juro e com maior depreciação da moeda local exibem menores ROA. O desempenho financeiro é também afectado por outros factores ao nível do país onde operam como crescimento do PIB e *Estado de Direito*. Além disso, o impacto do risco cambial (variações inesperadas das taxas de câmbio) parece ser mais importante para MFIs que operam em regimes de taxas de câmbio fixas ou indexadas.

Os resultados do estudo sustentam a importância de estratégias eficazes de gestão de risco.

Palavras chave: Instituições de Microcrédito, Mercados Emergentes, Rendibilidade do Ativo, Risco Cambial, Regimes Cambiais, Desempenho Financeiro, Gestão de Riscos.

Table of Contents

List of Tables

List of Figures

Appendixes

Acronyms

DM: Developing Market

EM: Emerging Market

FX: Foreign Exchange

FXLAG: Foreign Exchange Rate Lag

FXVOL: Foreign Exchange Volatility

GDP: Gross Domestic Product

IMF: International Monetary Fund

IRD: Interest Rate Differential

IRP: Interest Rate Parity

MFI: Microfinance Institution

LCY: Local Currency

NDF: Non-Deliverable Forward Contracts

OLS: Ordinary Least Squares

ROA: Return on Assets

ROL: Rule of Law

1. Introduction

The liberalization of capital flows over the last decades and the enormous increase in the scale of cross-border financial transactions increased exchange rate movements (Clark *et al.,* 2004). Some currencies unveil more volatility than others because of underlying economic and political conditions(Madura, 2013). Currency crises in emerging market economies are notable cases of large exchange rate volatility (Clark *et al.,* 2004). As such, institutions operating in emerging markets face substantially higher currency risk.

Microfinance Institutions (MFIs) play an important role in providing financial services such as loans, insurance, and savings to underserved populations in low-income and developing countries. Even though MFIs are growing rapidly in emerging and frontier markets, they still face great challenges, such as managing foreign exchange risks that stem from foreign-denominated debt funding. Since MFIs' mission is to provide financial services to economically disadvantaged individuals and communities, managing and mitigating currency risk is important for their financial sustainability and success.

Usually, it is common that MFIs make use of cross-border international loans from foreign Microfinance Investment Funds or Vehicles (MIV) denominated in hard currency (the US dollar or euro), which exposes MFIs to the risk of devaluation of their local currency (Abrams, 2011). In case the local currency depreciates against these foreign currencies, the cost of these loans increases and leads to financial strain, distress, and potential default. Another possible consequence of currency risk is the impact of local currency devaluations on MFIs lending conditions, given that MFIs grant loans to their clients in local currency.

In Emerging Markets, MFIs face substantial challenges to hedge currency risk. Usually, there are limited risk management tools that MFIs can use to tackle currency fluctuations, and when available for their local currency, these are costly hedging solutions. Even though there are several potential hedging strategies namely through foreign exchange hedging financial instruments, such as forwards, swaps, futures, and options, for MFIs operating in emerging markets, the use of these hedge instruments is not yet commonplace (Abrams and Schneider-Moretto, 2007). Lastly, the regulatory environment and restrictions that can affect the ability of MFIs to manage currency risk.

Previous literature has explored different aspects related to the financial performance of Microfinance Institutions and foreign exchange risk exposure. Previous work analyzed the impact of firm characteristics on foreign currency borrowings and the drivers of foreign currency debt allocation by MFIs. Studies like Brown et al. (2011) and Al-Azzam et al. (2016) have provided insights into microeconomic determinants of foreign currency borrowings and the influence of exchange rate regimes on microfinance operations. Other studies highlighted the impact of the macroeconomic environment on the performance of microfinance institutions.

Considering the fact that currency volatility is substantially higher in developing countries (Clark *et al.,* 2004), my research tries to investigate further the impact of foreign exchange risk on MFI performance. Since there is a lack of theoretical or empirical evidence on the relationship between exchange rate regimes, foreign exchange risk, and the financial performance of MFIs, this study aims to help fill the gap by providing new evidence. This dissertation analyzes the determinants of the financial performance of microfinance institutions across various emerging and developing countries, focusing on how foreign exchange risk impacts the return on assets (ROA) of MFIs.

The topic of evaluating currency risk in emerging markets bears relevance for several reasons. The currency risk is greater in Emerging Markets than in Developed Markets due to higher swings in exchange rate returns. Thus, there is a high potential impact of adverse currency changes even in hard or pegged exchange regime countries. Moreover, exposure to currency risk may be higher given that there are fewer hedging tools to manage foreign exchange risk, and, if available, these are expensive either to the client or banking institutions (Crabb, 2004).

The significance of this study is to emphasize the importance of risk management strategies for MFIs operating in different exchange rate regimes. The study provides insights into these institutions' challenges and opportunities by examining how MFIs in pegged and floating exchange rate regimes are affected by foreign exchange risk-related variables.

The contribution of this paper is diverse. It extends the existing literature by providing a comprehensive analysis of MFIs' performance under different exchange rate regimes and also highlights the significance of foreign exchange risk for these institutions. The proposed research contributes to the existing literature by evaluating over time how MFI

performance has been impacted by currency movements. Unhedged currency risk exposures could lead to MFIs' distress and ultimately damage microcredit lending and economic growth. The dissertation examines both large and small MFIs in a sample of 154 MFIs operating in 47 emerging and developing countries over the period from 2018 to 2022. The study tries to ensure the reliability of the findings using robust empirical methods.

The evidence is suggestive of some interesting relationships: MFIs operating in countries with higher interest rate differential have lower ROA. Ratios such as Loans to Total assets, Interest Income over Loans, Impaired and Non-performing Loans over Loans, as well as GDP growth, and Rule of Law significantly influence MFI's financial performance. Moreover, the results suggest that MFIs operate in pegged exchange rate regimes. seem to have a higher sensitivity to (unexpected) exchange rate changes.

Overall, the results underline the importance of effective risk management strategies.

The outline of the paper is as follows. Chapter 1 presents the introduction. Chapter 2 discusses the institutional and conceptual framework of the paper. Chapter 3 reviews the relevant literature and presents the testable hypotheses. Chapter 4 introduces the empirical model and variables, describes the data, and presents the descriptive statistics for the sample and subsamples. Chapter 5 presents the univariate and multivariate analyses and discusses the results. Chapter 6 includes the main conclusions and the limitations of the study.

2. Institutional and Conceptual Framework

2.1 MicroFinance Institutions (MFIs)

MicroFinance Institutions provide loans, savings, and other financial services to companies and households in low-income countries. Their main purpose is to build inclusive banking operations, offering intermediating services and ultimately providing access to capital.

The high growth environment in emerging markets drives microfinance investors to combine poverty alleviation and profit-making, exploiting value creation opportunities.

Microfinance institutions have been created to serve new and growing clienteles, such as micro companies in emerging and frontier markets implementing innovative models targeting their various needs (Dominice, 2012).

The number of borrowers who benefited from MFI intermediation increased by 43 % between 2008 and 2018. Assets under management increased from 98 million to 139.8 million euros worldwide, with an estimated loan portfolio of circa 114 billion euros (Microfinance Barometer, 2019). The global microfinance sector has demonstrated continued growth in 2022 in line with the trends from last year, the median growth in gross loan portfolio (GLP) by Microfinance Institutions reached 13.7% in 2022 compared to 9.6% in 2021 (Impact Finance Barometer, 2023). The number of borrowers who benefited from microfinance increased to 173 million by 2024, showing a year-over-year growth of 5% (Finance Derivative, 2023).

Over the last decade, the landscape of MFIs has evolved significantly. The sector is particularly dominant in emerging markets such as South Asia, Latin America, Africa, and parts of Eastern Europe and Central Asia. South Asia remains the dominant region, accounting for 70.6% of global borrowers, with countries like India, Bangladesh, and Vietnam being major hubs for microfinance activities (Impact Finance Barometer, 2023). The global microfinance loan portfolio is projected to reach close to 500 billion US dollars by 2030, with an average annual growth rate of approximately 12% (Finance Derivative, 2023).

Regardless of the rapid growth of MFIs, particularly in Emerging Markets, there are several threats to the sector's sustainability, among which are local regulations and legislation that struggle to keep up with the development of the financial sector.

While MFIs are more common in developing and emerging economies, they do exist and operate in developed economies as well. Their role in developed economies is much narrower as they focus on providing financial services to underserved populations, such as immigrants, low-income families, and small businesses that are not able to access credit through conventional banks. In developing countries, MFIs commonly operate where funding is scarce. Given that in these markets, there is a high risk of currency depreciation, and that there is often a mismatch between the assets denominated in local currency and liabilities denominated in foreign currency, many MFIs are likely exposed to currency risk that could potentially hurt their financial performance.

Since participating in the foreign exchange (FX) markets is not the primary activity of MFIs or even common, they only engage in fulfilling funding needs. Their lack of experience and resources in managing FX risk makes these institutions vulnerable to local currency depreciations. As such, understanding and measuring FX risk exposure and choosing the right strategy to hedge currency risk is one of the fundamental tasks of MFIs (Diamantini, 2010). Yet, particularly in emerging markets, where exchange rate markets are not liquid and/or competitive, expenses associated with hedging may surpass the anticipated currency devaluation. This is due to liquidity premia or high transaction costs that result from a limited number of available hedging counterparties (Dominice, 2012).

As such, MFIs may decide to leave risk unhedged. Since their domestic currencies fluctuate over time (freely or as a result of government interventions), it is debatable whether the results of exchange rate changes wash out losses and gains associated with funding at lower interest rates. According to Diamantini (2012), over a long-term horizon of 8 to 10 years, exchange rates tend to create an equilibrium level, even if short-term deviations are large and could even generate bankruptcy risk.

Yet, while this could be true in some more developed countries, in developing countries, given their high inflation rates, their currencies are expected to devalue over the long term. This is a direct implication of relative purchasing power parity (Relative PPP) in that exchange rate changes and inflation rates in two countries should cancel out over time.

In the short-term, Interest Rate Parity (IRP) would also dictate that the exchange rate devaluation for countries that have higher interest rates. Yet the evidence on this relationship is not established as future spot rates deviate from forward rates.

2.2 Emerging Markets

Among several other risks and restrictions, such as regulatory constraints, weak governance indicators, lack of independence by central banks, and generally poorly developed financial markets, emerging market economies often display unpredictable fluctuations in their foreign exchange rates. The collection of those and other factors creates a heightened level of risk for emerging markets. They are generally characterized as economies that have growth potential but are, at the same time, extremely volatile.

As such, investing in emerging markets is generally riskier than investing in developing countries when risk is measured by the total volatility of returns, including currency risk (Bodie *et al.,* 2014). Regarding currency risk, even though there are some methods and tools for hedging currency risk exposure, the availability of such instruments is notably constrained.

Many foreign investors, such as hedge funds, are specialized in investments that are associated with developing countries, given their growth potential. Generally, they invest in stocks that are traded on local exchanges, or have American Depository Receipts (ADR) direct listings in major exchanges (Hull, 2015). Public or private debt, issued by emerging market countries or companies, is another type of investment. Sovereigns and companies issue Eurobonds and Local Currency Bonds. Unlike Local Currency Bonds, Eurobonds are bonds denominated in hard currency, such as the U.S. dollar or euro (Hull, 2015). Many of these bonds are high-risk and sovereigns, such as Russia, Argentina, Brazil, and Venezuela, have defaulted several times on their debt (Hull, 2015).

At the same time, alternative vehicles for investment, such as MFIs. These institutions act as intermediaries between local borrowers and international debt investors or banks that provide funding to MFIs. The global microfinance loan portfolio has been growing steadily across several world geographies, with significant contributions from MFIs

in Asia, Africa, and Latin America. Yet several challenges such as high interest rates, financial literacy gaps, and foreign exchange risk continue to affect their growth and performance.

2.3 Exchange Rate Regimes

MFIs operate in countries that have different exchange rate regimes.

An exchange rate regime is an agreement that sets methods of exchange rates between two or more countries (Diamantini, 2010). It is a set of rules that govern how a country's exchange rate is determined, and it has a significant effect on a country's monetary policy, trade competitiveness, and overall economic stability.

Exchange rate regimes define whether exchange rates are fixed or floating. In the case of fixed exchange rates, central banks will exchange one currency for another at a fixed price. Alternatively, in the case of floating rates, exchange rates are set by supply and demand. Many countries choose a mixture of these two regimes (Diamantini, 2010).

The International Monetary Fund publishes regular reports on exchange rate arrangements and exchange rate restrictions. According to the latest report (IMF, 2022), the pace of foreign exchange market liberalization has slowed in 2021 and 2022 years, particularly due to an increase in tightening measures in Ukraine and Turkey. According to the latest methodology (IMF, 2009), which has been effective since February 2, 2009, the following exchange rate arrangements exist:

- Hard Peg: No separate legal tender; Decisions are made by a Currency board.
- Soft Peg: This includes Conventional peg; Stabilized arrangement; Crawling peg; Crawl-like arrangement; Pegged exchange rate within horizontal bands.
- Floating: Floating; free floating.
- Residual: Other manager arrangements.

Exchange rate regimes can influence the level of foreign exchange risk to which MFIs are exposed. As they are dealing with the mismatches between their funding and lending, this variability of exchange rate regimes can impact the financial performance of MFIs. Microfinance Institutions operating in countries with floating regimes might need to employ

more sophisticated financial risk management strategies compared to those in countries with hard pegs with more predictable currency values.

2.4 Foreign Exchange Risk (Currency Risk)

2.4.1 Definition and Types of Foreign Exchange Risk Exposure

Microfinance institutions that operate in emerging markets, where there is a high likelihood of currency depreciation, are distinctly sensitive to currency risk. Exchange rates are measured as the value of one currency unit expressed in another currency. The market convention for emerging market currencies quotes are indirect quotes, i.e., the number of national currency units required to acquire a unit of foreign currency (1 USD or 1 EURO). Currency risk is about unexpected changes in spot exchange rates. Several factors affect exchange rate movements that could arise from changes in expected inflation rates, changes in relative interest rates, changes in relative income or GDP levels, government interventions, market expectations, etc. (Madura, 2013).

For companies operating internationally, such as MFIs, that often fund their operations with foreign funding, it is essential to closely monitor exchange rates to assess exchange rate risk, and exchange rate risk exposures that can be broadly defined as the impact of (unexpected) exchange rate changes in cash-flows, assets and ultimately firm value (Madura, 2013). Currency risk management practices enable companies to identify, measure their exposure to exchange rate fluctuations such as they can then decide upon hedging strategies, to protect their operations from such exposure. Measuring the impact of exchange rate movements on a company engaged in foreign currency-denominated transactions (and contractual agreements) requires identifying the risk they are exposed to and the exposure to that risk (gross and net after hedging).

Commonly, the exchange rate exposures are categorized as (Madura, 2013) Transaction exposure, Translation Exposure, and Economic Exposure. There could be other exposures, such as contingent exposures, but this categorization is broadly accepted. Below, I briefly define each type.

Transaction exposure

This exposure stems from contractual transactions invoiced/denominated in foreign currency. Transaction exposure is the sensitivity of domestic currency payables/receivables of the company's contractual cash flows denominated in foreign currencies to unexpected exchange rate changes (Eun and Reskin, 2015). Usually, companies focus on transaction exposure over the short-term by estimating their net cash flows in each currency and measuring the possible effects of their exposure to those currencies (Madura, 2013). In a world where exchange rates change randomly, transaction exposure arises from foreign currency fixed-price contracting.

Translation exposure

This exposure reflects the potential that a company's consolidated financial statements will be affected by the changes in exchange rates (Eun and Reskin, 2015). Translation exposure is commonly used to determine the effect that exchange rate changes will have on the consolidated balance sheet of a company as it shows, for each asset/liability that on the consolidated balance sheet, the amount of foreign exchange exposure that exists for every currency that a company has. Consolidation involves the translation of subsidiaries' financial statements from local currencies to the home currency. Since exchange rates vary over time, the translation of the subsidiaries' financial statements into a different currency is affected by exchange rate movements (Madura, 2013).

Economic exposure

This exposure is the extent to which the value of the company may be affected by unanticipated changes in exchange rates (Eun and Reskin, 2015). Exchange rate changes can have an impact on a company's cash flows if it executes transactions in foreign currency, receives revenue from foreign customers, or is subject to foreign competition. Transaction exposure is a subset of economic exposure, but the latter also reflects how a cash flows are affected in the medium-long term by exchange rate movements (Madura, 2013).

MFI currency risk exposure stems primarily from contractual exposure, especially the one that arises from the liability side of the balance sheet. Microfinance organizations may be severely affected by exchange rate fluctuations when they have funding denominated

in foreign currency while their assets (micro loans) and related income are in local currency. This creates a mismatch that raises derived from currency risk transaction exposure.

2.4.2 Managing Foreign Exchange Risk Exposure

Microfinance institutions operating in emerging economies can protect themselves against the effects of currency volatility. Below, we briefly review the tools available for MFIs to hedge against currency risk.

Financial institutions may engage in a wide amount of derivative trading across a diverse range of financial instruments. Companies may approach risk management either using risk decomposition strategy, whereas risks are identified one by one and handled separately. Alternatively, companies aggregate risk exposures, considering possible netting and diversification benefits and hedge only the net positions (Hull, 2015).

As for hedging tools, futures, forwards, swaps, and options are the most common derivatives used for hedging currency risk (Hull, 2015). Generally speaking, hedging involves reducing risk, speculation involves taking risks, and arbitrage involves attempting to lock in profit while at the same time trading in two or more markets.

Currency derivatives are used as a common way for companies to hedge their exposure to exchange rate risk. These are financial contracts whose price is partially derived from the value of the underlying currency that it represents (Madura, 2013). They traded on organized exchange-traded and/or traded on OTC (over-the trade-counter).

Many MFIs lack access to traditional hedging solutions mentioned above, due to regulatory constraints or underdeveloped financial markets. Alternative hedging strategies are offered in these environments. A commonly used technique for currencies in emerging markets is non-deliverable forward contracts (NDF), where traditional forward contracts are not easily accessible or practical. Similar to the forward contract, it is an agreement regarding a position in a specified amount of a specified currency, a specified exchange rate, and a specified future settlement date (Madura, 2013). The difference between NDF and future contracts is that NDF does not result in an actual exchange of currencies at the future date.

Alternatively, one party to the agreement makes a payment to the other party based on the future date exchange rate (Madura, 2013).

Specifically with regard to foreign currency debt liabilities, foreign exchange swaps allow for an exchange of a stream of cash flows (interest or principal payments) denominated in foreign currencies (Bodie *et al.,* 2014). Another relevant derivative contract is cross-currency swaps, which offer hedging against currency and interest rate risk. These are commonly used in the case of loans denominated in foreign currency, when the principal amount is paid either at maturity or following a defined amortization schedule, and interest payments in two currencies are exchanged over the life of the contract (Diamantini, 2010).

These financial instruments are hedging solutions to mitigate or eliminate the currency risk that MFIs face given they resort to foreign-currency funding of their operations. Yet, in many emerging markets, the availability of such instruments is scarce.

3. Literature Review and Testable Hypotheses

3.1. Previous Research

A set of papers has looked at the drivers of the performance of MFIs and a few have looked into how foreign-currency funding, through currency risk, affects MFI's financial performance and the pricing on micro loans.

Kuisat and Priberny (2015)investigate the drivers of foreign currency debt by MFIs for a sample of 869 MFIs, suggesting that MFIs operating in less developed financial markets face greater credit restrictions and rely on more debt denominated in hard currency. Their study shows a high levels of exchange rate volatility are indeed reflected in increased currency risk exposures of MFIs. Moreover, there is no evidence that MFIs engage in carry trading strategies, *per se*.

An article in Women's World Banking (2004) looks at the exchange rate fluctuations of 23 developing countries from 1998 to 2002, with the aim to derive overall insights into the behavior of emerging markets exchange rates. The evidence suggests that over 50% of studied currencies have depreciated over the period of analysis and all countries except for Thailand, experienced significant depreciation against the US dollar, averaging 7.8% annually. Moreover, nine out of 23 currencies witnessed consistent depreciation each year during the 5-year span. These descriptive statistics are illustrative of the most common behavior of EM currencies.

In that setting, Berlee (2014) addresses the rationale for hedging currency risk due to the high volatility and unpredictability of exchange rate movement. Currency movements were analyzed for a 10-year time frame. The results confirm that most EM currencies were fairly volatile and presented a depreciating trend towards the euro. Findings also suggest limited diversification benefits in forming portfolios with local currency debt. Investigation into the relationship between foreign interest rates, short-term interest rate benchmarks and currency depreciation indicates that linking MFI loan lending rates to local benchmarks worked well.

Related to this, Al-Azzam *et al.,* (2016) analyze 481 MFIs operating in 73 countries from 2003 to 2010. This paper was the first to specifically test the relationship between

exchange rate regimes and MFI interest rates. According to their results, MFIs that operate in countries with fixed exchange rate systems tend to charge lower interest rates than those operating in countries with floating exchange rate regimes. Moreover, they provide evidence that exchange rate changes are a strong predictor of microcredit lending rates. Their results show thus that exchange rate risk is a significant determinant of microcredit lending rates on top of other factors identified in the literature such as the cost structure of MFIs or the gender of borrowers, with relevant implications for MFIs funding source composition, in local or foreign-currency-denominated.

Al-Azzam and Mimouni (2017) have expanded their research and revealed that MFIs in countries with floating exchange rate regimes face a higher risk of currency devaluation, which is translated into higher microcredit lending rates.

Gietzen (2015), based on a manually compiled dataset on exchange rate positions and on the maturity profiles of assets and liabilities among the largest global MFIs, indicates that, on average, exposure to FX risk is lower than commonly perceived.

Brown *et al.* (2011), examine the firm characteristics on foreign currency borrowings using a sample of 3,101 bank loans across 25 transition countries in the period of 2002-2005. While these companies are not MFIs, the results could shed light on a set of regularities that inform the determinants of foreign-currency funding by MFI. They show that a one standard deviation increase in the interest differential between the domestic currency and the euro raises the probability of having a foreign currency loan by less than five percentage points. In particular, their results do not support the idea that currency carry-trade is the key driver of foreign currency borrowing.

Roberts (2012) examine the drivers of financial performance of MFIs and lending interest rates using data for 358 MFIs, from the Financial and Social Performance Reports on the Microfinance Information Exchange (MIX) database. The study shows that financial performance is associated with MFI size and that larger MFIs have higher operational efficiency. Further, the largest and more efficient MFIs charge lower lending rates.

Another strand of the literature examines the drivers of operating performance and how it impacts MFIs lending rates. For example, Gonzalez (2007) examines how MFI characteristics, country infrastructure, availability and prices of inputs, macroeconomic

variables, and doing business environment variables impact operating performance. Using a sample of 1,003 MFIs in 84 countries over the period from 1999 to 2006, they identify three main drivers of the operating expense ratio: average loan size, age, and scale (measured by the size of the loan portfolio). Yet cost reduction seem to faded away once microfinance institutions surpass borrower count of 2,000 (Gonzalez, 2007). In terms of the *doing business* environment, they find a small negative statistically significant relationship between operating expense ratio and a few specific business conditions. Gonzalez (2007) also looks at relationship between macroeconomic shifts and some asset quality of indicators of MFIs (Portfolio at Risk, Loan Loss Reserves, and Loan Write-Off Rates). The results consistently show that economic crises are characterized by higher delinquency but results are not significant.

Ahlin *et al.* (2011) evaluate other macroeconomic determinants associated with the performance of MFISs. Their results reveal several robust predictors, often indicating complementary relationships. High macroeconomic growth is linked with improved cost coverage by MFIs, and this seems to be driven by reduced default rates and lower operating costs. Moreover, the paper uncovers insights into the relationship between MFI growth and various economic factors such as higher manufacturing share, increased foreign direct investment, and greater workforce participation.

Reducing funding rates, fostering competition, and increasing the efficiency of MFIs are suggested as three policies to reduce lending interest rates. Empirical analysis reveals a non-negative correlation between funding rates and lending interest rates which leads to the recommendations to reduce funding costs. Even though fostering competition can be considered as the means to reduce lending interest rates, measuring competition intensity across a diverse set of MFIs operating in different local markets is a challenge (Cotler and Almazan, 2013). Furthermore, to enhance efficiency, factors such as technology adaptation and management quality should also be considered. The effectiveness of efficiency is also aligned with the initial size of the MFI since larger institutions potentially benefit more from mergers and acquisitions (Cotler and Almazan, 2013).

Other papers look into specific aspects of financial performance or focus on specific countries. For example, Pelegrina *et al.* (2024) conducted a survey for the years 2016-2017 on 159 MFIs operating in 38 European countries. They find that revealed that microfinance

institutions that pursue social sustainability objectives or lend to female bowers are more likely to do well financially. Cotler and Almazan (2013) examine how high-interest rates charged by microfinance institutions may diminish the impact of their financing in the economy. Several other papers have reviewed the link between financial and non-financial performance, but these are out of the scope of this research.

3.2 Research Questions and Testable Hypotheses

The previous section shows that only a few studies have addressed the drivers of the performance of MFIs. From the empirical works reviewed above, some papers have tried to model microcredit lending rates and MFIs performance (Gonzalez, 2007; Ahlin *et al.,* 2011; Roberts, 2012; Al-Azzam *et al.,* 2016; Al-Azzam and Mimouni, 2017, among others) testing micro and macro determinants but only a few analyzed the role of foreign exchange risk factors.

The central research question of my dissertation is how foreign exchange risk influences the financial performance of MFIs. To answer that question, I will empirically evaluate the key determinants of the performance of a sample of microfinance institutions across various emerging economies, controlling for MFI characteristics and country-specific factors. Moreover, given that there are conflicting findings in the literature, for example, between MFI characteristics and performance, we reexamine those relationships using a different sample of MFIs and data for the most recent years.

My first set of hypotheses addressed the main research question.

As defined above, different exchange rate regimes could mean different foreign exchange risk to MFIs. In countries with floating currency, volatility is higher implying a higher risk for MFIs. On the other hand, countries with soft peg regimes, MFIs can better anticipate the domestic value of their foreign currency liabilities payments (interest and principal). Yet a hard peg regime does not imply necessarily a lower risk of (discrete) currency devaluation moves.

MFIs that operate in countries with floating exchange rate regimes can better deal with foreign currency exposure with hedging instruments. For soft or hard pegging

currencies, these derivatives are not available. Yet, even in emerging countries with floating exchange rate regimes, with shallow financial markets have limited access to these hedging tools. Therefore, while MFIs that operate in countries with floating exchange regimes could, in principle, better access hedging instruments, but in practice, this may not be the case.

We, therefore, test how the exchange rate regime drives financial performance.

Accordingly, our first hypothesis is:

H1: *Exchange rate regimes have an impact on the financial performance of MFIs, leading to a negative effect on MFIs operating in countries with floating exchange rate regimes.*

Foreign currency debt brings MFI growth opportunities and various advantages that may not be available domestically. Yet funding with foreign-denominated (USD or Euro) debt exposes them to foreign exchange risk. When MFIs hold debt in foreign currency and grant loans in domestic currency, there is a mismatch between the currencies in which assets and liabilities are denominated. Transaction exposure is one of the main risks faced by MFIs when they access funding in international capital markets.

The more volatile their currency is, the higher the likelihood of losses. MFIs may transfer higher currency risks to their borrowers by charging higher microcredit interest rates. On the other hand, since the interest rates of foreign debt are lower, this would allow lower microcredit lending rates as well (Al-Azzam and Mimouni, 2017). Moreover, MFIs could balance their funding sources (local currency and foreign-denominated debt) and hedge currency risk.

Hence, the effect of foreign exchange changes and volatility on financial performance can be ambiguous. I analyze whether changes in foreign exchange rate volatility and depreciations are associated with changes in performance. The results of the tests will shed light on the importance of managing the currency risk.

Based on these considerations, we test the following hypothesis:

H2: *The ROA of MFIs is significantly influenced by foreign exchange rate volatility and foreign exchange rate changes, negatively impacting the financial performance of MFIs.*

Finally, there is no consensus on how financial performance is affected by MFI size. Understanding the role of size will shed light on whether larger MFIs are better equipped to manage foreign exchange risk in emerging markets.

Hence, the following hypothesis can be formulated:

H3: *MFI Size significantly impacts the financial performance of MFIs.*

4. Methodology and Data

4.1 Empirical Model Specification and Variables

To test the hypotheses defined above we set the following specification model to estimate the determinants of MFIs' financial performance:

$$ROA_{ij,t} = \beta_0 + [\beta_1][FXRisk_{j,t}] + [\beta_2][MFI_{i,t}] + [\beta_3][Country_{j,t}] + \varepsilon_{ij,t}$$

where $ROA_{ij,t}$ is the return on assets of MFI *i* located in country *j* at time *t*; $[FXRisk_{j,t}]$ is a vector that includes the set of variables that proxy the foreign exchange risk of a country *j* at time *t*; $[MFI_{i,t}]$ is a vector that includes the set of variables that characterize each MFI *i* at time *t*; and $[Country_{j,t}]$ is a vector that includes other country-specific variables for a country *j* at time *t*. ε represents the error term capturing unobserved factors affecting *ROA*.

Following our discussion in the previous section, our parameters of interest are associated *FX Risk* variables and with the scale of MFIs. The other variables are control variables suggested by previous literature.[1]

Given that we do not have data on MFIs use of foreign-denominated debt or hedging positions, we cannot measure the actual foreign exchange exposures of MFIs. As such, the parameters associated to the FX risk variables reflect rough estimates of the average exposure of MFIs to FX risk.

The estimation techniques are presented in Chapter 5.

The variables in the model were defined following previous related studies and data availability.

Dependent Variable

Return On Assets (ROA)

I measure net income as a percentage of average assets. *ROA* is used as a proxy of the measure of general profitability of the MFIs (Pelegrina *et al.,* 2024). ROA is a comprehensive and widely used indicator of financial performance.

[1] Table A1 in the appendix summarizes the explanatory variables that were used in related papers and the associated metrics.

Explanatory Variables

Foreign Exchange Risk

The focus of my research is to evaluate how foreign currency changes affect the performance of MFIs. I use four variables to proxy foreign exchange risk. These are Exchange Rate Regimes (*ExRegime*), Interest Rate Differential (*IR Differential*), FX Volatility (*FXVOL*) and FX lagged changes (*FXLAG*). We measure these variables as follows:

Exchange Rate Regimes (*ExRegime*)

The exchange rate regime in a country reflects how foreign exchange rates are determined, based on market prices or defined by government authorities that peg the currency to one or more foreign currencies, exhibiting varying degrees of flexibility. The International Monetary Fund categorizes exchange rate regimes based on the actual arrangements of its members, considering the level of flexibility and the presence of formal and informal commitments to exchange rate paths (Al-Azzam *et al.,* 2016). The IMF identifies the following exchange rate regimes: (1) exchange arrangement with no separate legal tender; (2) currency board arrangement; (3) conventional peg arrangement; (4) stabilized arrangement; (5) crawling peg; (6) crawl-like arrangement; (7) pegged exchange rates within horizontal bands; (8) other managed arrangements; (9) managed floating with no pre-announced path for the exchange rate; and (10) free floating.[2] Higher flexibility of the exchange rates from hard pegs to floating, would mean, in principle, higher currency risk and higher currency risk exposure if MFIs resort on funding that is denominated in foreign currency. Yet, in fixed or pegged exchange rates, currencies might be also influenced by discretionary government or central bank decisions, with unexpected discrete exchange rate changes.

The ultimate effect of exchange regime on financial performance is therefore an open question.

For the purpose of analysis, *ExRegime* takes values from 1 to 3, where 1 represents the hard peg and 3 represents free-floating regimes. Table 1 shows the distribution of exchange rate regimes into the 3 categories, according to the IMF categorization. Other managed arrangements, which in this sample are the case of Venezuela and Zimbabwe, are

[2] International Monetary Fund- annual reports on exchange arrangements and exchange restrictions

categorized as 2 and 3, respectively, since the *de jure* exchange rate for Venezuela is a conventional peg against the US dollar, and for Zimbabwe, a floating exchange rate arrangement holds. After categorizing exchange rate regimes, I compute the respective logarithmic values.

TABLE 1. *CATEGORIZATION OF EXCHANGE RATE REGIMES*

This table represents the categorization of exchange rate regimes from hard peg to floating regimes. The 10 regimes are according to the latest IMF classification system.

	IMF Classification of Regimes		Categorization
1	No separate legal tender	Hard Peg	1
2	Currency board	Hard Peg	1
3	Conventional peg	Soft Peg	2
4	Stabilized arrangement	Soft Peg	2
5	Crawling peg	Soft Peg	2
6	Crawl-like arrangement	Soft Peg	2
7	Pegged exchange rate within horizontal bands	Soft Peg	2
8	Other managed arrangement	Residual	
9	Floating	Floating Regimes	3
10	Free floating	Floating Regimes	3

Source: own processing

Interest Rate Differential (*IR Differential)*

This variable measures the difference between annual nominal interest rates of the domestic currency and the US dollar, lagged one year. According to the theory of interest rate parity (IRP), the size of the forward premium (discount) should be equal to the interest rates differential between two countries (Madura, 2013). Arbitrage assures that the forward premium equals the interest rate differential. Yet, the future spot rate may deviate from forward rates. By including the interest rate differential in the model, since companies care about the departures from interest rate parity (Brown *et al.,* 2011), I explore how forward rates influence MFI performance. While, in some cases, a high interest rate differential could lead to increased profitability for MFI, reflecting cheaper funding, it can also indicate higher FX risk (Al-Azzam and Mimouni, 2017). The expected effect on financial performance is an open question.

FX Volatility (*FXVOL*)

This variable captures foreign exchange rate volatility and is proxied by the standard deviation of monthly returns of historical domestic exchange rates against the US dollar[3]. I used a rolling method, where the rolling window is 5 years. Microfinance institutions operating in different economies with different currencies are affected by the volatility of exchange rates if they use foreign-denominated debt yet their choice to use foreign denominated debt could also be influenced by the volatility of their exchange rates. According to Basso et al. (2007), that examined foreign currency lending in Emerging European countries, exchange rate volatility affects loan dollarization. On the other hand, Brown *et al.* (2011) do not find any significant relationship between exchange rate volatility and foreign currency borrowing. The parameter associated to this variable could be interpreted either as an estimate of foreign currency risk exposure, providing insights into how the performance of MFIs is influenced by currency risk or reflect that higher volatility is a deterrent to use foreign-denominated debt (higher volatility would dictate lower foreign debt and therefore lower exposure). The ultimate effect of FX volatility on financial performance is an open question.

FX lagged change (*FXLAG)*

This variable is measured as the lagged percentage change of the currency value of emerging country relative to US dollar. The literature is not consensual about the impact of exchange rate fluctuations on the profitability of MFIs. A depreciation of the domestic currency against the US dollar increases the value of foreign currency denominated debt costs. The parameter associated in this variable will reflect if and how MFI performance is affected by lagged changes in FX rates.

The expected effect on financial performance is negative.

[3] We do not have data on foreign-currency debt denomination so we assume that the US dollar is the reference foreign currency.

MFI Characteristics

Size

The logarithm of the total assets is used as a proxy for MFI size, and its impact on efficiency is positive. Total assets are measured in thousands of US dollars. As discussed above, the size of the MFI may affect the financial sustainability of the MFIs since it reflects the firm's ability to compete with the peers in the industry due to economies of scale (Pelegrina *et al.,* 2024). Given economies of scale, larger MFIs should be more efficient and therefore more profitable (Gonzalez, 2007), so I expect a positive relationship between size and performance.

Other control variables are Age, Operating Expense Ratio, Loan/Total Assets, Interest Income/Loans, Impaired Loans/Total Loans.

Age

We use the log of the number of years since the establishment of the MFI. This variable is a proxy for MFI's experience and managerial ability (Pelegrina *et al.,* 2024). Older and more experienced MFIs should better manage short-term losses than younger ones since their knowledge of clients is deeper and managerial experience is higher. Nevertheless, there are conflicting findings about the impact of the MFI age on its financial sustainability. While some earlier studies, such as Ledgerwood (1998), find that financial performance is positively associated with the maturity of MFIs, Hermes *et al.* (2011) indicate a potential negative relationship. The ultimate effect on financial performance is an open empirical question.

Operating Expense Ratio

The operating expense ratio is calculated as total operating expenses divided by the average gross loan portfolio. Total operating expenses consist of the sum of staff expenses, other administrative expenses, and other operating expenses and are expressed in thousands of US dollars. The average gross loan portfolio is expressed as the average gross amount of mortgage loans, consumer loans, corporate loans, and other loans, also expressed in thousands of US dollars. Operating expenses are one of the main components of financial performance, even if more efficient MFIs may charge lower microcredit lending rates (Ahlin *et al.,* 2011). The expected effect on financial performance is positive.

Loans/Total Assets

This variable is measured by the gross amount of mortgage loans, consumer loans, corporate loans and other loans divided by total assets. This ratio can give insights into the profitability of MFIs. A higher loan-to-asset ratio reflects that a larger portion of MFI assets generate income through lending activities and, thus, are the source of interest income that increases profitability. The effect on financial performance is therefore positive.

Interest Income/Loans

This variable is measured by interest income divided by the gross amount of loans. The ratio proxies the interest yield earned by MFI on its loan portfolio. A higher ratio suggests that MFIs are earning higher levels of interest income and that their loan portfolios are well-performing. However, a disproportionately high ratio could indicate that MFI is taking a higher credit risk or charging excessively high interest rates, which can lead to increased default and borrower distress. Yet the expected net effect on financial performance is positive.

Impaired & Non-performing Loans/Loans

This variable is measured as gross impaired & non-performing loans on customer loans and advances divided by the gross amount of loans. This could be a proxy for default issues in the loan portfolio and expected effect on financial performance negative.

Other Country Characteristics

Gonzalez (2007) and Al-Azzam, and Mimouni (2016) find that the performance of MFIs depends on country-level macroeconomic and institutional features. I have included the following country-specific variables: Inflation Rate, GDP Growth per capita and the Rule of Law index.

Inflation Rate

This is defined as the annual percentage change in the domestic consumer price index. Unexpected inflation lowers real rates of return of MFI, prompting reactions such as building conservatively large inflation premia into interest rates (Ahlin *et al.,* 2011). It may also affect the MFIs' cost of funds along with the default and borrowers' incentives for delay.

High inflation can diminish the real value of loan repayments, leading to a decrease in real income for MFIs. It also results in rising operational costs. According to Ahlin *et al.* (2011), MFIs appear to cope well with inflation by raising rates. Al-Azzam and Mimouni (2017) claim that higher inflation is associated with higher microcredit lending rates, meaning that MFIs can adjust their interest rates based on inflation expectations and pass on higher costs to borrowers. The ultimate effect of inflation on financial performance is an open question.

GDP Growth

This is the annual percentage growth of GDP. High GDP growth should increase demand for MFIs, ultimately resulting in better financial performance (Al-Azzam, Mimouni, 2017). The expected on financial performance is positive.

Rule of Law

This variable measures the extent to which agents have confidence in and abide by the rules of society. This is one of the Worldwide Governance Indicators (WGI)[4]. This variable is intended to capture some aspects of a country's institutional environment and encloses factors such as the effectiveness of contract enforcement, property rights, the efficiency of law enforcement, the judiciary system, and the probability of crime and violence. The variable spans from -2.5 (indicating a weak rule of law) to 2.5 (indicating a strong rule of law). For the purpose of the statistical tests, I added a constant value (2.5) to each figure and then proceeded with logarithmic values. While the rule of law can create a stable environment micro borrowers need to succeed, and therefore lower required funding premia by foreign investors, it may make it harder for MFIs to operate (Ahlin *et al.,* 2011). The expected on financial performance is an open question.

4.2. Data

The data was collected from the Orbis and Passport databases and from the International Monetary Fund (IMF) for the years 2018-2022. The data on MFI-specific variables, such as return on average assets, total assets, the date on the incorporation of MFI, total operating expenses, gross loans and advances to customers, interest income, impaired

[4] These are: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption.

/ non-performing loans on customer loans, and advances, is available on Orbis. The data on country-specific and foreign exchange risk variables such as inflation, GDP growth, rule of law, exchange rates against the US dollar, and annual lending rates is available on Passport. Data about exchange rate regimes are collected from the International Monetary Fund (IMF). The values of all variables are expressed in US dollars. All the companies retrieved from the Orbis database have a specialization in micro-financing institutions and belong to the same sector - banking, insurance, and financial services.

The companies were selected according to the latest available data from 2018 to 2023. In total, I use the data for 154 MFIs operating in 47 emerging and developing countries. The breakdown by region is as follows: 11 from Eastern Europe, 92 from Far East and Central Asia, 29 from Africa, and 22 from South and Central America. North America and the Middle East were expelled from the data because there were no country-specific statistics available. In addition, information about the incorporation date of MFIs was missing for 66 companies. For the analysis, data was manually collected from the companies' websites, indicated on Orbis, or from other sources. Only for 3 companies I was unable to detect the date of incorporation of MFI, in result I have excluded them from the analysis. Additionally, I have excluded the companies with only 1 observation period and the ones with an interval between data in the study period.

4.3 Descriptive Statistics

The descriptive statistics of dependent and independent variables are shown in Table 2. *ROA*, *Loans/ Total Assets*, *IR Differential*, *FXLAG*, *Inflation*, and *GDP Growth* were winsorized at the 5% and 95% levels. Despite this, there is still substantial variability in the variables, as shown in the minimum and maximum values.

Figure 1 plots in the *ROA* of Microfinance Institutions from 2018 to 2022. As is evident from the graph, *ROA* has reached its lowest point in 2020 with a sharp decline. This can be the reflection of the adverse economic conditions impacting MFIs, such as the global economic downturn caused by the COVID-19 pandemic affecting financial institutions worldwide. We observe a sharp increase in 2021, suggesting strong recovery and stabilizes in 2022.

Figure 2 reveals a slight change in the loan portfolio structure of the Microfinance Institutions over the five-year sample period. Similar to the *ROA*, the average proportion of loans to total assets decreased significantly in 2020. Steady growth from 2020 could reflect increasing confidence in the loan market. Similar trends were notable in the ratio of Interest Income/Loans in 2019 and 2020; however, in 2022, this ratio drops again.

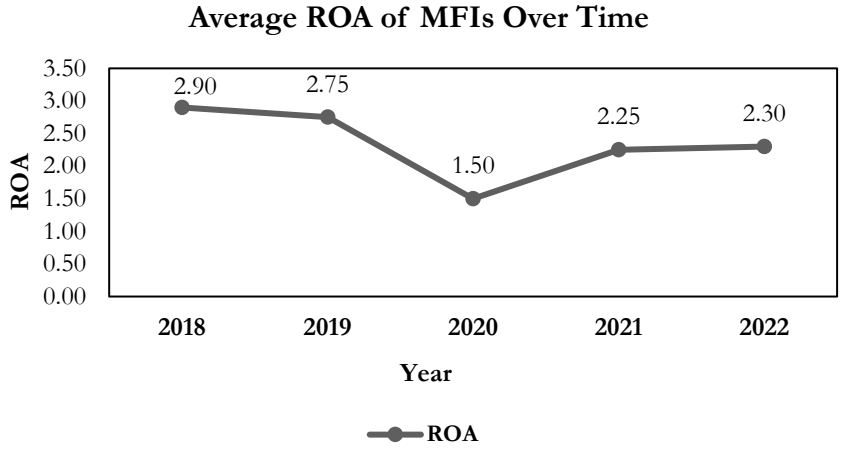

FIGURE 1. ***Average ROA (%) of MFIs over Time***

This figure plots changes in average return on assets for Microfinance Institutions from 2018 to 2022. Mean values for return on assets are calculated for each year. The sample data were obtained from the Orbis database.

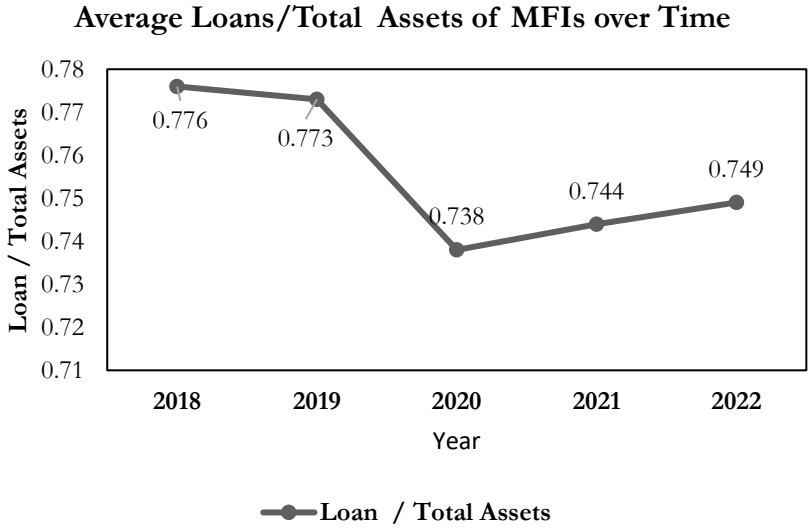

FIGURE 2. ***Average Loans/Total Assets of MFIs over Time***

This figure plots changes in the Loan / Total Assets ratio for Microfinance Institutions from 2018 to 2022. Mean values for the ratio are calculated for each year. The sample data were obtained from the Orbis database.

The descriptive statistics in Table 2 show that, on average, over the sample period, Microfinance Institutions in this dataset have positive returns of approximately 2.23%. However, a minimum value of -4.65 indicates that some MFIs experienced negative returns on their assets. The disparity between the mean and median in the dependent variable can be interpreted as a large variety in the profitability of MFIs in this sample, as it is evident in the maximum and minimum columns.

For the variable *Size*, the median is 11.85 (circa 140 million US dollars). The median age is 2.74, which is closer to the upper quartile (75th percent) than the lower quartile (25th percent). For the Operating Expense Ratio, the median of 2.3% is significantly lower than the mean (6.0%), indicating that a large part of MFIs have relatively low operating expense ratios, but there are few outliers.

The median value of 0.78 for the Loans/Total Assets variable indicates that for the median microfinance institution, loans constitute approximately 80% of its total assets. This reflects that lending is the core function of MFIs. Interest income/Loans median values stand at around 0.18 of the total loan portfolio. The range of values for the variable Impaired & non-performing Loans reveals considerable variability in the ratio across different MFIs

over time. Yet the median value of 0.02 suggests a moderate level of credit risk exposure for microfinance institutions.

The descriptive statistics of foreign exchange risk variables give us insight into the impact of currency exposure on MFIs in this sample. A median value of 0.69 suggests that a substantial portion of MFIs operate in exchange rate regimes that are pegged regimes.

IR Differential is used as a proxy to give insight into forward exchange rates. The median value of 5.4 can suggest a moderate level of interest rate spread between domestic and foreign interest rates and signal expected currency devaluation moves.

Results reveal positive values of the nominal interest rate differential in almost every country. Only Serbia and Bosnia and Herzegovina showed some negative values. A comparison of the interest rate differential to exchange rate differences against the US dollar revealed that while the majority of currencies depreciated against the USD, the magnitude of this depreciation was substantially lower than the nominal interest rate differential. This difference suggests that taking foreign currency-denominated loans could prove advantageous when compared to local currency debt (Brown *et al.,* 2011). Yet this apparent interest rate advantage varies across countries and over time.

As for the variables *FXVOL* and *FXLAG* the range of values from the minimum to maximum indicates substantial volatility across countries/currencies. Median values are 1.34% (annualized circa 4.7%) and 2.95%, respectively, but, for example monthly volatility figures, vary from 0.006% to 17.8%, reflecting the different exchange regimes.

TABLE 2. *DESCRIPTIVE STATISTICS*

The table includes the descriptive sample statistics of the dependent and independent variables. The sample comprises 154 MFIs operating in 47 countries from 2018 to 2022. *ROA*, *Loans/Total Assets*, *IR Differential*, *FXLAG*, *Inflation*, and *GDP Growth* were winsorized at the 5% and 95% levels. The sample data were obtained from Orbis and Passport databases. Exchange rate regimes were obtained from the IMF.

Variable	Min.	25th percent	Median	Mean	75th percent	Max.	Std. Dev.	Obs.
Dependent Variable								
ROA (%)	-4.65	0.603	2.091	2.323	3.795	8.794	3.157	691
MFI Characteristics								
Size (ln, US dollar)	4.244	10.498	11.852	11.800	13.138	16.581	1.862	693
Age (ln)	0.000	2.197	2.740	2.603	3.091	3.829	0.690	770
Operating Expense Ratio	0.000	0.005	0.023	0.060	0.071	0.960	0.109	678
Loans/Total Assets	0.312	0.636	0.778	0.734	0.876	0.910	0.178	679
Interest Income/Loans	-0.00	0.131	0.178	0.209	0.256	0.954	0.144	683
Impaired&non-performing Loans/Loans	0.000	0.000	0.023	0.054	0.065	0.850	0.092	686
Foreign Exchange Risk-related variables								
ExRegime (ln)	0.000	0.693	0.693	0.762	1.099	1.099	0.279	770
IR Differential (%)	-0.90	1.100	5.400	6.921	11.700	22.300	6.446	587
FXVOL (%)	0.006	1.041	1.343	1.680	1.846	17.774	1.551	728
FXLAG (%)	-6.55	-0.220	2.950	3.109	5.432	15.314	5.372	717
Other Country-Specific Variables								
Inflation	0.981	2.419	3.843	4.894	6.623	13.831	3.428	755
GDP Growth	-6.48	2.239	4.838	3.802	6.750	9.050	4.129	770
Rule of Law	-1.61	0.588	0.742	0.665	0.875	1.065	0.378	770

Source: own processing

As for country-specific variables, the data for inflation and GDP growth was winsorized to prevent the analysis from being skewed from extremely high values. Descriptive statistics for both variables reveal a large range between minimum and maximum values. The standard deviations of 3.43 and 4.13 support the idea of wide variation across countries. The minimum value -6.48% shows negative GDP Growth, which indicates economic downturns or recessions. This can have a significant effect on MFIs since economic growth fosters a favorable environment for lending and repayment, while contraction can increase credit risk and default.

In our dataset, the average value of this variable is -0.51, signifying a relatively weak rule of law. The minimum value in the case of the Rule of Law variable also reveals that some countries have weak or non-existent Rule of Law. This suggests a challenging environment with increased risk for MFIs due to weaker legal protections. However, the quartile values suggest that the majority of countries have a positive Rule of Law.

We also compute descriptive statistics for subsamples of different regions. We divided the sample in 4 regions: Africa, Eastern Europe, Far East and Central Asia, and South and Central America. The results are presented in Appendix(Table A2). This statistics is a rich source for comparative analysis and sheds light on regional dynamics in the microfinance industry. It also serves as the foundation for further analysis.

The descriptive statistics for the subsamples suggest that MFIs have similar characteristics.

Looking at *ROA*, we observe that MFIs in Africa and South and Central America are larger compared to the aggregate sample. MFIs in Eastern Europe and Far East and Central Asia appear to be larger and more established than those in Africa and South and Central America. As for the Foreign Exchange Risk- related variables, there is significant variation within and across regions, which indicates the prevalence of the different Exchange Rate Regimes.

Table A3, in the appendix, shows the correlation matrix among the independent variables. We observe a high positive correlation between inflation and exchange rate changes, as expected, and a strong negative correlation between the Rule of Law index and the Interest Rate Differential. correlation.

5. Empirical Results

5.1 Univariate Analysis

Univariate analysis was performed to find some patterns in the data and examine the impact of some independent variables on the financial performance of MFIs. We test whether MFIs operating in floating exchange regimes are more exposed to foreign exchange risk than those operating in peg regimes using an independent sample t-test. This test was performed to compare the mean *ROA* between the two subgroups of MFIs operating in countries with a floating exchange rate regime and MFIs operating in countries with a fixed exchange rate or peg regime.

Before performing the test, Shapiro-Wilk and Levene's tests were used to test for normality and homogeneity of the independent variable (Shapiro and Wilk, 1965).

For Levene's test, the *p*-value is 0.5887, indicating that there is no significant difference between the two groups of MFIs. A *p*-value greater than the significance level (0.05) satisfies the assumption of homogeneity of variables for the independent samples. As for the Shapiro-Wilk normality test, the results show *p*-values less than the common alpha significance level (0.05), which indicates that *ROA* for both groups does not follow a normal distribution. To consider the violation of the normality assumption, I have further performed a Mann-Whitney U test. This is the non-parametric counterpart to the *t*-test for independent samples to compare the medians of the two groups.

The results of the tests are provided in Tables 3 and 4.

TABLE 3. *COMPARISON BETWEEN PEG AND FLOATING EXCHANGE RATE REGIMES*

This table represents the results of the Shapiro-Wilk normality and Mann-Whitney U tests were performed on two groups of MFIs divided into free-floating and fixed/pegged exchange rate regimes. The *p*-value represents the statistical significance value. 'W' refers to the test statistic value in the Shapiro-Wilk Normality Test. In the Mann-Whitney U test, the "W" is the test statistic based on the sum of ranks for the two subgroups.. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	Shapiro-Wilk normality test		**Mann-Whitney U test**
	Peg	**Floating**	
W	0.8952	0.8652	41661
p-value	2.20E-16***	6.34E-11***	0.0007***

Source: own processing

Based on the independent samples t-test, a negative value of t-statistics suggests that the mean ROA for the MFIs with a floating exchange rate regime is lower than the MFIs with a peg regime. The p-value of 0.0007 indicates that the difference between the two groups is statistically significant (Ross and Willson, 2017). The sample mean for the group with a floating exchange rate regime is 1.6980, and the mean for a group with a peg exchange rate regime is 2.5860. MFIs in countries with a floating exchange rate regime have a lower mean ROA compared to those in countries with a pegged exchange rate regime. This could imply that when there is volatility associated with a floating exchange rate, the performance of MFIs is affected negatively.

TABLE 4. *INDEPENDENT SAMPLES T-TEST*

This table represents the results of the univariate analysis for the 154 MFIs operating in 47 countries from 2018 to 2022. Independent Samples t-test compares the mean *ROA* between two groups divided by floating and pegged exchange rate regimes. Sample Estimates represent the mean values for each of the two groups being compared. t-Statistic refers to the calculated value from the t-test formula. Degrees of Freedom (df) reflects the amount of information available to estimate variability. The p-value represents the statistical significance level. Confidence Interval provides an interval estimate for the difference between the two group means. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	Peg	**Floating**
Sample Estimates	2.5860	1.6980
t-statistic	-3.4035	
Degrees of Freedom (df)	689	
p-value	0.0007***	
Confidence Interval	95%	

Source: own processing

The Mann-Whitney U test (also known as Wilcoxon rank sum test) shows a p-value of 0.0007, given this it is less than the alpha significance level, it indicates that the difference between the two groups is statistically significant. Given that the data violated the assumption of normality, as indicated by the Shapiro-Wilk test, results from the Mann-Whitney U test are particularly important since it is a way of validating the difference in means between the two groups found by the independent samples t-test. This adds robustness to the finding that the exchange rate regime could impact the financial performance of MFIs.

Based on both parametric and non-parametric test outcomes, there is preliminary evidence of a differences in performance related to the exchange rate regime of the countries in which the MFIs operate. These results are supportive of the H1 hypothesis.

To analyze the potential interaction effects with other variables, I created distinct subsamples using the median split of some of the independent variables (*Size,Interest Income/Loans, IR Differential, FXVOL, Inflation, and GDP Growth*). The Welch Two Sample t-test, which is an unequal variances t-test, was performed on the sub-samples (above and below the median) to evaluate whether these have different *ROA*. Table 5 summarizes the results for some of the independent variables.

TABLE 5. *WELCH TWO SAMPLE T-TEST*

This table represents the results of The Welch Two Sample t-test was performed on different sub-sample above and below the median of the variables: *Size*, *Interest Income/Loan*, *IR Differential*, *FXVOL, Inflation*, and *GDP Growth*. Mean in group Above represents the average value of ROA for the the subsample of MFIs that have above the median values . *Mean in group Below* represents, for each of the independent variables, the average value of the sample data for the MFIs whose values were below the median split. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	Size	***Interest Income / Loans***	***IR Differential***	***FXVOL***	***Inflation***	***GDP Growth***
Mean in group Above	2.0379	2.0960	1.5625	2.0243	1.9236	2.4434
Mean in group Below	2.6064	2.5213	2.7461	2.5607	2.6339	2.2000
t- Statist	(2.3762)**	(1.7685)	(4.0175)***	(2.1856)**	(2.9641)***	1.0125

Source: own processing

Based on the Welch Two Sample *t*-test results, for *Size*, that MFIs in the "Above" group have a lower mean return (2.04) compared to the "Below" group (2.61), suggesting that smaller MFIs perform better in terms of ROA Results also reveal MFIs with *IR Differential* above median have notably lower average return than those with below the median *IR Differential* and this difference is significant at the 1% level. This significant difference in ROA may be caused by lower funding costs for MFIs operating in an environment with a lower interest rates.

Greater foreign exchange rate volatility is associated with lower *ROA*, potentially due to increased financial risks. As we can see, MFIs in the "Above" group have a lower mean ROA (2.02) than those in the "Below" group (2.56) and the difference is significant at the 5% level. We also find that MFIs operating in higher inflation countries have lower ROAs and this result is significant at the 1% level. This could reflect broader economic challenges (such as higher interest rates) associated with high inflation as discussed above. Finally, for e *GDP Growth*, we observe a slight difference between means but it is not statistically significant

These univariate tests reveal interesting insights into the relationship between some independent variables and *ROA of MFIs* suggesting that MFIs operating in floating exchange rate regimes have lower ROAs than in MFIs operating in pegged exchange rate regimes. At this stage, this is only suggestive evidence that exchange rate risk plays a role in the performance of MFIs. Moreover, these preliminary results show that *Size*, *IR Differential*, *FXVOL*, and *Inflation* could also play a role.

5.2 Multivariate Analysis

5.2.1Estimation Methods

We estimate the model specified above, in section 4.1, for an unbalanced panel sample of 154 MFIs using annual data from 2019 to 2022.

The first estimation method that I use is ordinary least squares (OLS) pooled regressions using the Huber-White sandwich estimators clustered at the institution level (Al-Azzam *et al.,* 2016). Yet, given that we have pooled data (i.e., a combination of cross-sectional

and time series data), and OLS does not control the likely correlation of errors over time for a given MFI, I use alternative estimation methods.

The second estimation method to potentially use could be a fixed or random effects model to accommodate unobserved individual heterogeneity that could potentially correlate with the independent variables.

The random effects model is used to lessen potential omitted variable bias, since there is possibility of being some unobserved factors that can be related either to *ROA* or other variables. In a situation when time-invariant variables are correlated with independent variables, random effect models yield inconsistent results, and fixed effect models are used (Al-Azzam et al., 2016). The omitted variables in the fixed effects models are assumed to have time-invariant values and, therefore, time invariant impact.

However, fixed effects models may not work well, or even at all, not allowing to capture within-cluster variation (Al-Azzam and Mimouni, 2017). This is a potential disadvantage of the fixed effects model whereas it is fitted to capture the relationships between variables with high frequency. So instead, I also use is between MFI models, which, contrary to the fixed effect model, allows capturing low frequency relationships. This estimator performs OLS on an aggregated data set where all data are converted into panel averages (Al-Azzam *et al.,* 2016).

Robust regression (Robust) is used to strike a balance between the complete exclusion of outlier points and the indiscriminate inclusion of all data points with equal weighting in ordinary least squares regression. It employs a process called iteratively reweighted least squares or (IRLS), where each data point is initially given equal weight in the first iteration, and coefficients are estimated using OLS (Al-Azzam and Mimouni, 2017). The next step involves assigning less weight to points that deviate significantly from the model's predictions in previous iterations, and coefficients are recalculated using weighted least squares. This iterative process continues until the weights and coefficient estimates converge within a specified tolerance level (Al-Azzam and Mimouni, 2017).

The problem of heteroskedasticity and within MFIs error's correlation in the robust regressions is addressed by Arellano robust standard errors and confidence intervals

clustered by the institution. The mentioned methodology does not have to assume homoscedasticity or independence of error terms within MFIs (Al-Azzam *et al.,* 2016).

To summarize, five regression techniques are considered: ordinary least squares, fixed and random effects, between models, and robust regressions.

Several tests were performed to reveal the most reliable model among ordinary least squares, fixed and random effects, between models, and robust regressions. After adjusting for outliers and heteroscedasticity, the robust regression model revealed that variable Interest Income/Loans, which is significant in the OLS model, is only marginally significant, suggesting some sensitivity to outliers or leverage points in how interest income ratios affect returns. In the case of other variables, results are more or less similar, but given the model's adjustments for outliers and its more conservative error metrics, robust regressions seem more reliable.

The Lagrange Multiplier test for random effects was conducted, which revealed significant random variation across entities in this panel data. The extremely small *p*-value suggests that we can reject the null hypothesis of no random effects at any conventional significance level. A test revealed that the random effects model is more appropriate for this data than a simple pooled OLS model. Subsequently, to compare fixed and random effects models and check if the unique assumptions of the random effects model lead to biased estimators when the specific effects correlate with the regressors, I computed the Hausman test statistic. The test statistic (*chi-squared* statistic= 21.513, *p*-value = 0.04335) suggests that the fixed effects model provides a more consistent and unbiased estimate of the effects due to time-invariant characteristics of the MFIs, which are not captured in the random effects model.

Based on tests above, the fixed effects model and the robust regression are considered the best models. The results of the ordinary least squares, fixed effects, and robust regressions are shown in Table 6.

5.2.2 Multivariate Results

TABLE 6. REGRESSION RESULTS

This table presents the results of the OLS, fixed effects, and robust regressions for a sample of 154 MFIs operating in 47 countries from 2018 to 2022. The independent variable is ROA (in %). Standard errors are in parentheses. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	OLS	**Fixed Effects**	**Robust**
Intercept	3.903*		3.975*
	(1.739)		(1.970)
MFI Characteristics			
Size	-0.184	0.609	-0.146
	(0.102)	(0.434)	(0.113)
Age	-0.148	-1.082	-0.094
	(0.232)	(0.799)	(0.213)
Operating Expense Ratio	0.673	2.058	0.762
	(0.789)	(1.899)	(1.101)
Loans/Total Assets	3.684***	3.324*	4.562***
	(0.893)	(1.492)	(1.138)
Interest Income/Loans	6.253***	11.396***	5.462
	(1.081)	(1.489)	(3.259)
Impaired&non-performing Loans/Loans	-9.323***	-9.791***	-11.062***
	(1.261)	(1.746)	(1.265)
Foreign Exchange Risk-related variables			
ExRegime	-0.326		0.179
	(0.563)		(0.617)
IR Differential	-0.163***	-0.101	-0.207***
	(0.030)	(0.090)	(0.038)
FXVOL	0.143	0.683	0.104
	(0.122)	(0.348)	(0.091)
FXLAG	-0.076**	-0.054*	-0.068*
	(0.029)	(0.024)	(0.034)
Other Country-Specific Variables			
Inflation	-0.070	0.066	-0.074
	(0.048)	(0.045)	(0.047)
GDP Growth	0.146***	0.122***	0.153***
	(0.035)	(0.028)	(0.029)
Rule of Law	-2.175**	-4.940	-3.803***
	(0.763)	(2.715)	(0.974)
Number of observations	770	770	770
Number of MFIs	154	154	154
R2	0.270	0.321	0.346
Adjusted R2	0.250	0.092	0.328

Source: own processing

Foreign Exchange Risk-related variables

We first discuss the estimates associated with the impact of foreign exchange risk-related variables on the financial performance of MFIs, measured by *ROA*. These are the main focus of my work and relate to hypotheses H1 and H2 above.

Starting with the variable *ExRegime*, no significant relationship is found in any of the estimation methods that we use. This indicates that the type of exchange rate regime an MFI operates under may not directly influence its profitability or is captured by other variables such as *FXVOL*. Differently, Al-Azzam and Mimouni (2017) find that exchange rate regimes are important drivers of MFI performance.

Since *ExRegime* is a variable that does not change over time for a given panel entity and the fixed model is sensitive to this kind of variables, it was dropped from the FE given it does not provide any within-entity variation. Even though univariate analysis revealed consistent evidence of a difference in performance related to the exchange rate regime classification of the countries where the MFIs operate, multivariate analysis does not support this idea and thus does not support H1.

As for *IR Differential*, the associated parameter estimate suggests supports a significant negative impact on *ROA*. Based on robust regression, *ROA* is expected to decrease by approximately 0.21% for every one-unit increase (1% change) in the interest rate differential. This suggests that greater disparities between local interest rates and USD rates negatively affect the profitability of Microfinance Institutions. This could be caused by adverse effects on foreign exchange rates since higher differentials potentially reflect a riskier FX environment.

With regard to *FXVOL*, the parameter estimates are not significant, suggesting that on average, ROA does not respond to changes in FX volatility. This suggests that on average, net exposures to currency risk are not significant. MFIs may hedge or pass-through this risk into microcredit lending rates.

For *FXLAG*, the results reveal that there is negative significant relationship between *FXLAG* and *ROA*. Therefore, a recent depreciation of the local currency against USD induces lower profitability, possibly through increased costs related to foreign-denominated liabilities. stressing the need for effective foreign exchange risk management strategies.

Altogether results are mixed regarding H2.

MFI Characteristics

Starting with *Size*, we cannot reject H3: in our sample, size does not seem to significantly impact the *ROA* of MFIs. The literature showed conflicting effects and the evidence here does not clarify whether large funds are indeed more profitable, given economies of scale.

According to the regression results, we cannot reject the null of no impact of *Age* on the ROA of MFIs. The results are not directly comparable but Ahlin et al. (2011) and Al-Azzam and Mimouni (2017) report that age does not impact microcredit lending rates.

The results also cannot reject the null of no significant relation between *Operating expense ratio* and *ROA*. does not reveal significance in any model performed. These findings are similar to those found in previous literature,

*Loans/Total Asset*s show a positive and statistical relationship with *ROA*, suggesting that MFIs with a higher proportion of assets allocated to loans tend to have higher profitability. A high significance level was found for the variable Interest Income/Loans for OLS and FE estimates. However, after adjusting for outliers and heteroscedasticity, the variable is no longer significant.

Impaired&non-performing loans/Loans, unlike previous work, shows a highly significant negative relationship with *ROA*. According to the results, higher impairments are associated with lower *ROA*. Since high levels of non-performing loans are detrimental to the financial health of MFIs, it highlights the importance of lending practices and credit risk management.

Other Country Characteristics

The impact of country characteristics differs across models. The most consistent result was revealed by *GDP Growth* and *Rule of Law*. A stronger Rule of Law, which often includes stricter regulations and enforcement, impacts negatively the *ROA* of MFIs. The impact of *GDP Growth* on *ROA* is significant in all models and the coefficient is positive. suggesting *ROA* improves in environments of economic growth due to better financial conditions and lending opportunities. Results regarding *Inflation* are not significant.

5.2.3 Currency Exposure Under Different Exchange Rate Regimes

Even though the type of exchange rate regime does not directly influence the profitability of MFIs, I analyze whether there are significant differences in results for MFIs operating in pegged (soft peg and hard peg) and floating exchange rate regimes. To analyze possible differences, I have divided the sample into two sub-samples based on whether a given MFI is located in a country with a fixed or pegged exchange rate regime or in a country with a free-floating exchange rate regime. Table 7 shows the impact of foreign exchange risk and other variables on ROA in countries with pegged exchange rate regimes, and Table 8 shows this impact on countries with floating exchange rate regimes.

Table 7 shows the results for the subsample of 109 MFIs, operating in countries with hard peg and soft peg classification of exchange rate regimes. Based on the Hausman test results, the preferred estimation model for this data was the random effect model, which is more consistent and efficient.

As for the foreign exchange risk-related variables, the significant negative effect of *IR Differential* on *ROA* holds as in Table 6. While MFIs in pegged currency countries do not bear exchange rate fluctuations in the short term, Interest rate differentials increase the risk of currency devaluation due to interest rate parity conditions (Al-Azzam and Mimouni, 2017). In the case of FXLAG, the results indicate, as in Table 6, that lagged (discrete) managed devaluations impact *ROA*.

The parameters associated with *Operating Expense Ratio, Loans/Total Assets, Interest Income/Loans, Impaired&non-performing Loans/Loans, GDP Growth, and Rule of Law* are statistical significant and economic meaningful except for *Rule of Law*, that suggest that more stringent rules can be detrimental for *ROA*.

Table 8 shows the results for the 45 MFIs operating in countries with floating exchange rate regimes. The robust regression model, which is adjusted for outliers and heteroscedasticity, makes it particularly suitable for this context, since it can more effectively account for the additional variability introduced by the floating exchange rate regime. Based on Hausman test results, we use the fixed effects model Unlike before, the parameter associated with the variable *Size* is positively and statistically significant, suggesting that larger MFIs display higher *ROA*. As for the exchange rate risk-related variables, the results for this

subsample suggest that currency risk does not impact on ROA, may be mitigated by the availability of risk management tools in countries with floating exchange rates.

Overall, the results of this work highlight that, while some MFI characteristics like Loan-to-Assets and Impaired&Non-Performing Loans ratios are important drivers of profitability, external macroeconomic factors, including exchange rate changes, also play a relevant role. In particular, I find a statistically significant impact of some foreign exchange risk-related variables, such as *IR Differential* on *ROA*. While the results highlight some of the drivers of profitability of MFIs, there are some puzzles associated with the lack of significance of important variables such as *Size*, *Age* or *Operational Performance* ratios. Further work is needed based on more detailed data on MFI funding sources, FX exposures and financial hedging.

Results also suggest that MFIs operating in pegged exchange rate regimes may face more significant exchange rate risk than the ones operating in floating exchange rate regimes. This could be explained by several factors. Pegged exchange rate regimes provide apparent currency stability by fixing the local currency's value to a major currency like USD or EUR. This can create a false sense of security and lead MFIs to engage in more foreign currency-denominated transactions, exposing them to significant risk if the peg is adjusted or fails. In contrast, MFIs operating in floating regimes might have access to and employ more sophisticated hedging and risk management practices to deal with exchange rate volatility, reducing the impact of foreign exchange risk on ROA and try to.

Results also suggest the importance of effective financial and operational management practices in the microfinance sector. These include credit risk management but also other financial policies to mitigate the impact of currency and interest rate fluctuations.

TABLE 7. MFIS OPERATING IN PEGGED EXCHANGE RATE REGIMES

This table presents the results of the OLS, random effects, and robust regressions for the 109 MFIs operating in pegged (hard and soft peg) exchange rate regimes. The independent variable is ROA (in %). Standard errors are in parentheses. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	OLS	**Random Effects**	**Robust**
Intercept	0.200	0.492	0.870
	(2.350)	(3.125)	(2.529)
MFI Characteristics			
Size	0.157	0.119	0.051
	(0.133)	(0.191)	(0.129)
Age	-0.550	-0.640	-0.805*
	(0.334)	(0.471)	(0.367)
Operating Expense Ratio	-7.673***	-6.926*	-6.043***
	(2.167)	(3.086)	(1.513)
Loans/Total Assets	5.465***	5.366***	6.209***
	(1.075)	(1.343)	(1.536)
Interest Income/Loans	11.254***	11.159***	11.043***
	(1.664)	(1.781)	(1.612)
Impaired&non-performing Loans/Loans	-10.104***	-9.820***	-10.300***
	(1.291)	(1.474)	(1.326)
Foreign Exchange Risk-related variables			
IR Differential	-0.269***	-0.244***	-0.237***
	(0.041)	(0.051)	(0.043)
FXVOL	0.034	0.056	-0.002
	(0.122)	(0.175)	(0.082)
FXLAG	-0.091*	-0.081**	-0.087*
	(0.038)	(0.029)	(0.038)
Other Country-Specific Variables			
Inflation	0.052	0.069	0.057
	(0.058)	(0.047)	(0.050)
GDP Growth	0.177***	0.125**	0.172***
	(0.047)	(0.038)	(0.050)
Rule of Law	-3.450***	-3.020*	-2.769**
	(0.869)	(1.259)	(1.065)
N	545	545	545
MFIs	109	109	109
R2	0.429	0.358	0.481
Adjusted R2	0.405	0.333	0.460

Source: own processing

TABLE 8. MFIS OPERATING IN FLOATING EXCHANGE RATE REGIMES

This table presents the results of the OLS, random effects, and robust regressions for the 45 MFIs operating in floating exchange rate regimes. The independent variable is ROA (in %). Standard errors are in parentheses. (*), (**) and (***) represent the statistical significance at 10%, 5%, and 1%, respectively.

	OLS	**Fixed Effects**	**Robust**
Intercept	-8.576*		-7.444*
	(4.037)		(2.906)
MFI Characteristics			
Size	0.182	1.660*	0.570***
	(0.202)	(0.647)	(0.140)
Age	0.988**	-2.124	0.785***
	(0.332)	(1.208)	(0.187)
Operating Expense Ratio	1.678	2.951	1.429*
	(1.046)	(2.238)	(0.589)
Loans/Total Assets	0.761	-0.442	0.949
	(1.533)	(2.483)	(1.315)
Interest Income/Loans	6.037***	11.196***	2.739
	(1.560)	(2.008)	(1.737)
Impaired&non-performing Loans/Loans	-10.057***	-8.639**	-16.866***
	(2.735)	(2.949)	(2.352)
Foreign Exchange Risk-related variables			
IR Differential	0.128	-0.131	-0.002
	(0.065)	(0.162)	(0.053)
FXVOL	-0.063	0.887	0.168
	(0.354)	(0.654)	(0.263)
FXLAG	0.022	-0.032	-0.004
	(0.043)	(0.041)	(0.033)
Other Country-Specific Variables			
Inflation	-0.050	-0.007	-0.120*
	(0.086)	(0.080)	(0.051)
GDP Growth	0.122*	0.144***	0.114***
	(0.049)	(0.038)	(0.030)
Rule of Law	2.766	-5.930	-1.549
	(2.044)	(5.686)	(1.617)
N	225	225	225
MFIs	45	45	45
R2	0.255	0.382	0.592
Adjusted R2	0.206	0.144	0.565

Source: own processing

6. Conclusions and Limitations

6.1 Conclusions

The dissertation aimed to analyze the performance of Microfinance Institutions in emerging and developing countries, with a specific focus on the impact of foreign exchange risk and other country-specific factors on their return on assets. Since MFIs operate in volatile economic environments, they are widely exposed to foreign exchange risk. Microfinance Institutions are affected by exchange rate fluctuations since they commonly have loans denominated in foreign currency while they grant microcredit loans to individuals in local currency. We perform several univariate and multivariate tests to gain a thorough understanding of the determinants of MFI financial performance and the impact of currency risk therein.

The univariate analysis results show that there are significant differences in the performance of MFIs operating in floating and pegged (hard peg and soft peg) exchange rate regimes. MFIs operating in countries with floating exchange rate regimes revealed lower mean ROA. Moreover, the ROA of MFIS operating in countries with higher Interest Rate Differentials was significantly lower. Similarly, greater foreign exchange rate volatility was linked with lower ROA.

Multivariate analyses confirmed some of the preliminary results: a higher interest rate differential seems to be associated with lower ROA. Moreover, exchange rate changes had a significant negative effect on ROA, suggesting that devaluations hurt ROA. This highlights the importance of hedging strategies to mitigate foreign exchange risks. While the univariate analysis showed a significant difference between floating and pegged exchange rate regimes, multivariate analysis did not find a significant direct relationship between exchange rate regimes and ROA. Yet further analysis revealed that MFIs operating in hard or pegged exchange regimes face significant foreign exchange risks due to potential currency unexpected devaluations.

Other findings are that the ratios Loans to Total assets, Interest Income over Loans, and Impaired and Non-performing Loans over Loans impact financial performance, highlighting the fact that efficient lending practices are critical for MFI profitability

Finally, the results for other country's characteristics Show that the Rule of Law has a negative relation with the ROA, suggesting that a stricter regulatory environment limits operational flexibility for MFI. GDP growth resulted to be beneficial for MFIs performance, since growing economies provide better lending opportunities.

To sum up, I conclude that the performance of MFIs in emerging and developing economies is influenced by a complex relationship of institution-specific characteristics, foreign exchange risks, and broader macroeconomic factors. The findings suggest the necessity for effectively managing credit risks, interest income, and foreign exchange exposure. that could ultimately influence the financial sustainability of MFIs by mitigating financial risk.

6.2 Limitations

The limitations of this study are first related to the data. This study relies on secondary data, which is obtained from the Orbis, Passport, and IMF databases. Yet, data collection can be challenging in emerging and developing markets. Moreover, some datasets contain voluntarily filled information.

The sample may not capture all the challenges and regional differences that MFIs face globally. The generalization of the findings is not possible due to the exclusion of Central America and the Middle East from the analysis.

The analysis covers a five-year period from 2018 to 2022. The time frame is short and may not be sufficient for identifying trends or effects related to cycles. Therefore, a longer period could provide a more thorough understanding of the impacts of foreign exchange risk and economic conditions on MFI performance.

One of the major limitations of this work is that we miss data on MFIs funding structure, in, particular how much foreign-currency denominated debt exists in their balance sheet. We also miss off-sheet balance items related to interest rates and currency hedges. , These have very important implications for the findings of the study, given that we do not control for these across MFIs, and therefore, we only estimate average effects associated with foreign exchange risk.

Other unobserved variables, such as political stability, technological improvements, and specific changes in regulations, are not included in the study, while their impact on MFI performance could be noteworthy.

Future studies could address these limitations by integrating more diverse and comprehensive datasets, extending the analysis period, and exploring additional variables that may influence MFI performance.

Bibliography

Abrams, J. and Schneider-Moretto, L. (2007), "From Dollar to Dinar: The Rise of Local Currency Lending and Hedging in Microfinance", *Part 2 of WWB's Foreign Exchange Risk Management in Microfinance Series.* **[Women's World Banking]**

Abrams, J. (2011), "An Empirical Analysis of Foreign Exchange Risk Exposure in Microfinance," *Microfinance Analytics.*

Ahlin, C.; Lin, J. and Maio, M. (2011), "Where does microfinance flourish? Microfinance institution performance in macroeconomic context", *Journal of Development Economics,* 105–120.

Al-Azzam, M. A.; Mimouni, K. (2017), "Currency risk and microcredit interest rates", *Emerging Markets Review 31.* **[Emerging Markets Review]**

Al-Azzam, M. A.; Mimouni, K. and Sanargi, S. (2016), "Foreign Exchange Risk in Microfinance: Empirical Evidence," *Research in International Business and Finance.*

Basso, H.S.; Calvo-Gonzalez, O. and Jurgilas, M. (2007), "Financial Dollarization and the Role of Banks and Interest Rates," *Working Paper. ECB.*

Berlee, M. (2014), "Managing currency risk in emerging markets - A case study of Triodos Investment Management," *Financial Economics - Erasmus School of Economics.*

Bodie, Z.; Kane, A. and Marcus, A.J. (2014), "Futures, Swaps, and Risk Management," *Investments, tenth edition,* 799–834. **[Investments]**

Brown, M.; Ongena, S. and Yeşin, P. (2011), "Foreign currency borrowing by small firms in the transition economies" *Journal of Financial Intermediation*, Vol. 20(3): 285–302. **[Journal of Financial Intermediaries]**

Clark, P.; Tamirisa, N. and Wei, S.J. (2004), "Exchange Rate Volatility and Trade Flows - Some New Evidence," *International Monetary Fund, Prepared* with Sadikov, A. and Li Zeng, L.

Cotler, P. and Almazan, D. (2013), "The Lending Interest Rates in the Microfinance Sector: Searching for its Determinants", *The Business and Economics Research Journal,* Vol. 6 (1): 69–81.

Crabb, P.R. (2004), "Foreign Exchange Risk Management Practices of Microfinance Institutions", *Exchange Risk Management Practices*, School of Business and Economics, Vol. 6(2). **[Journal of Microfinance]**

Diamantini, S. (2010), "Foreign Exchange Market*," A Primer on Currency Risk Management for Microfinance Institutions*, J.P. Morgan projects with Grameen Foundation's Bankers without Borders.

Dominice, R. (2012), "Financial Institutions (MFIs)," *Microfinance Investments,* symbiotics, ISBN: 978-2-8399-1093-4.

Eun, C.S. and Resnik, B.G. (2015), "Foreign Exchange Exposure and Management," *International Financial Management, seventh edition,* 198–258. **[International Financial Management]**

Gietzen, T. (2015), "The Exposure of Microfinance Institutions to Financial Risk," *Swiss Institute of Banking and Finance,* working papers on finance NO. 2015/06. **[Review of Development Finance]**

Gonzalez, A. (2007), "Efficiency Drivers of Microfinance Institutions (MFIs): The Case of Operating Costs," *MicroBanking Bulletin*, *No. 15*.

Gonzalez, A. (2007), "Resilience of Microfinance Institutions to National Macroeconomic Events: An Econometric Analysis of MFI Asset Quality," *MIX Discussion Paper No. 1*.

Hermes, N.; Lensink, R. and Meesters, A. (2011), "Outreach and efficiency of microfinance institutions," *World Development*, Vol. 39(6): 938–948.

Hull, J.C. (2015), "Trading in Financial Markets," *Riks Management and Financial Institutions*, fourth edition, 93–114. **[Risk Management and Financial Institutions]**

IIIangakoon, G. (2024), "Risk Management and Performance of Microfinance Industry," *South Asian Journal of Social Studies and Economics,* Vol. 21(3): 1–17.

IMF – Annual report on Exchange Arrangements and Exchange Restrictions, (2022). Available at: https://www.imf.org/en/Publications/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions/Issues/2022/07/19/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions-2021-465689

Impact Finance Barometer (2023) – "Key Figures on Impact Finance Worldwide", 3rd edition:2-3. Available at: https://www.convergences.org/wp-content/uploads/2023/09/BFI-2023_EN-min.pdf

Kuisat, C. and Priberny, C. (2015), "Why do microfinance institutions use foreign currency debt?," *31st Australasian Finance and Banking Conference 2018*. **[International Finance]**

Ledgerwood, J. (1998), "Sustainable banking with the poor microfinance handbook: an institutional and financial perspective," *Sustainable Banking with the Poor*, Microfinance Handbook: An Institutional and Financial Perspective. Available at: https://doi.org/10.1596/978-0-8213-8927-0

Madura, J. (2013), "International Financial Markets", *International Financial Management, 12th edition*, 63–98. **[International Financial Management]**

Finance Derivative (2023), "Microfinance Trends 2023: Driving Financial Inclusion and Social Impact", available at: https://www.financederivative.com/comply-or-say-goodbye-the-rise-of-ai-powered-compliance-in-payments/

Pelegrina, L.D.; Diriker, D.; Landoni, P.; Moro, D. and Wijesiri, M. (2024), "Financial and social sustainability in the European microfinance sector," *Springer Nature journal*, Small Bus Econ (2024): https://doi.org/10.1007/s11187-023-00850-7

Roberts, P.W. (2012), "The Profit Orientation of Microfinance Institutions and Effective Interest Rates," *World Development*, Vol. 41: 120–131.

Ross, A. and Willson, V.L. (2017), "Independent Samples T-Test," In *Basic and Advanced Statistical Tests* (pp 13–16). **[SensePublishers]**

Shapiro, S. S. and Wilk, M. B. (1965), "An analysis of variance test for normality (complete samples)," *Biometrika*, 52(3–4), 591–611.

Women's World Banking (2004), "Foreign Exchange Risk Management in Microfinance," Financial products and Services, occasional paper. **[Women's World Banking]**

Appendixes

TABLE A 1. ***MEASUREMENTS OF EXPLANATORY VARIABLES***

The table includes a description of the measurements of explanatory variables in related papers compared to the presented research.

Variables	*Measured by other authors*	*Measured in this research*
MFI Characteristics		
Size	**Pelegrina *et al.*, 2024; Al-Azzam and Mimouni, 2017; Gietzen, 2015; Roberts, 2012** - measure as the value of total assets in USD, expressed in logarithm. **Gonzalez, 2007** - measures as gross loan portfolio expressed in million US dollars. **Cotler and Almazan, 2013** - use both the value of firms' financial assets and loan portfolios, which are measured in real terms and expressed in logarithms. **Ahlin *et al.*, 2011** - proxies MFI size into three quantities: the number of borrowers, the average loan size, and the ratio of assets to loans, i.e., assets to the loan portfolio. All are measured in logarithms.	The logarithm of total assets measured in thousands of US dollars.
Age	**Pelegrina *et al.*, 2024; Al-Azzam and Mimouni, 2017; Gietzen, 2015; Cotler and Almazan, 2013; Ahlin *et al.*, 2011** - measure as number of years since MFIs establishment, calculated as the difference between the year the MFI started it operation and data was sumbitted on database. **Gonzalez, 2007; Roberts, 2012; Brown *et al.*, 2011** - use the same calculation but expressed in logarithm.	The logarithmic value of the difference between MFI started its operations, and data was submitted to the database.
Operating Expense Ratio	**Ahlin *et al.*, 2011; Gonzalez, 2007** - measure as annual operating costs divided by the year-average size of the loan portfolio. **Cotler and Almazan, 2013** - measure operational cost - per peso, adjusted by the portfolio default rate and by the relative size of loans granted by the institution. **Al-Azzam and Mimouni, 2017** - use total cost - financial cost, operating cost, and the impairment loss relative to total assets.	Total operating expenses are divided by the average gross loan portfolio (Average gross amount of mortgage loans, consumer loans, corporate loans, and other loans).

Loan / Total Assets	**Ahlin *et al.*, 2011** - use the measurement of assets per loan (t-1) - the total of all net asset accounts divided by the gross loan portfolio. **Gonzalez, 2007** - uses the ratio of Gross Loan Portfolio divided by assets.	The gross amount of mortgage loans, consumer loans, corporate loans, and other loans divided by total assets.
Interest Income / Loans	**Cotler and Almazan, 2013** - use the lending interest rate, which is measured as the portfolio yield: all interest and fee revenue from loans divided by the average gross loan portfolio.	Interest income divided by the gross amount of mortgage loans, consumer loans, corporate loans and other loans.
Impaired, non-performing loans / Loans	**Ahlin *et al.*, 2011; Gonzalez, 2007** - measure as the value of loans written-off (loan loss provision expense) divided by average gross loan portfolio.	Gross Impaired / non-performing loans on customer loans and advances divided by the gross amount of mortgage loans, consumer loans, corporate loans, and other loans.
Foreign Exchange Risk		
Exregime	**Al-Azzam and Mimouni, 2017** - measure according to IMF classification that takes values ranging from 1 to 8. A value of 1 reflects a hard peg, 2 reflects a slightly soft peg, 3 reflects a soft peg, and so on until 8 which reflects a market-determined exchange rate. **Brown *et al.*, 2011** - use it as a dummy, where 1 = country has a crawling peg, fixed peg, or currency board exchange rate regime, 0 = otherwise.	The exchange rate regime takes values from 1 to 3, where 1 represents the hard peg, 2 represents the soft peg, and 3 represents floating regimes. The logarithmic value of the exchange rate regime values.
Interest Rate Differential	**Brown *et al.*, 2011** - calculates as the difference between nominal benchmark interest rates in the domestic and foreign financial sectors for the past quarter, namely the domestic Treasury bill rate and the Eurepo rate.	The nominal value of the one-year lagged the difference between annual interest rates of domestic currency and the US dollar.
FXVOL	**Brown *et al.*, 2011** - measures as the variance of monthly changes in the real exchange rate versus the Euro, in%, during the past 4 quarters.	Calculated as the standard deviation of monthly returns of historical currency rate movements of emerging markets currency against the US dollar.
FXLAG	**Brown *et al.*, 2011** - measures the depreciation of local currency versus the Euro, nominal, in%, during the past quarter.	Percentage change of the currency value of emerging country relative to US dollar
Country Characteristics		

Inflation Rate	**Al-Azzam and Mimouni, 2017; Ahlin *et al.*, 2011; Brown *et al.*, 2011; Gonzalez, 2007** - use as an annual percentage change in the Consumer Price Index	Annual percentage change in the consumer price index.
Real GDP Growth	**Al-Azzam and Mimouni, 2017; Ahlin *et al.*, 2011; Gonzalez, 2007** - use as the annual percentage growth of GDP	Annual percentage growth of GDP
Rule of Law Index	**Al-Azzam and Mimouni, 2017** - uses Rule of Law Index. **Ahlin *et al.*, 2011** - uses Stability and Corruption index. **Roberts, 2012** - uses the average of the six dimensions of the World Bank's Worldwide Governance Indicator.	Rule of law (Index: -2.5 to 2.5).

Source: own processing

TABLE A 2. *DESCRIPTIVE STATISTICS OF DEPENDENT AND INDEPENDENT VARIABLES ACROSS REGIONS*

The table includes sample characteristics of dependent and independent variables across regions, the data utilized in the descriptive analysis. It consists of min, median, mean, and other statistical information of the financial measurements given for the 154 MFIs operating in 47 countries from 2018 to 2022. ROA, Loan / Total Assets, IR Differential, FXLAG, Inflation and GDP Growth were winsorized at the 5% and 95% levels. The sample data were obtained from Orbis and Passport databases. Exchange rate regimes were obtained from the IMF.

Region	*Variable*	*Min.*	*25th percent*	*Median*	*Mean*	*75th percent*	*Max.*	*Std. Dev.*	*Obs.*
Africa	*ROA*	-4.65	0.288	1.298	1.745	3.616	8.794	3.308	145
Africa	*Size*	8.709	10.355	11.095	11.388	12.473	16.255	1.537	145
Africa	*Age*	0.000	2.485	3.045	2.759	3.219	3.738	0.770	145
Africa	*Operating Expense Ratio*	0.003	0.012	0.023	0.084	0.048	1.632	0.261	145
Africa	*Loan / Total Assets*	0.312	0.544	0.632	0.646	0.774	1.004	0.184	145
Africa	*Interest Income / Loans*	0.098	0.219	0.270	0.336	0.396	2.390	0.254	145
Africa	*Impaired, non-performing loans / Loans*	0.000	0.000	0.048	0.074	0.123	0.276	0.075	145
Africa	*ExRegime*	0.693	0.693	0.693	0.805	1.099	1.099	0.182	145
Africa	*IR Differential*	2.200	8.200	11.700	10.875	13.350	22.300	4.366	145
Africa	*FXVOL*	0.152	0.996	1.594	2.204	3.191	17.774	2.352	145
Africa	*FXLAG*	-6.55	-0.608	3.001	3.484	7.507	15.314	5.784	145
Africa	*Inflation*	0.981	3.142	4.690	5.794	7.445	13.831	3.661	145
Africa	*GDP Growth*	-6.48	1.910	4.700	3.543	5.648	9.050	3.438	145
Africa	*Rule of Law*	0.182	0.642	0.742	0.688	0.833	0.993	0.212	145
Eastern Europe	*ROA*	-1.189	0.621	1.409	1.689	2.431	5.219	1.512	55
Eastern Europe	*Size*	8.452	10.778	13.205	12.356	13.747	14.529	1.924	55
Eastern Europe	*Age*	1.609	2.741	2.890	2.809	3.021	3.258	0.351	55
Eastern Europe	*Operating Expense Ratio*	0.002	0.016	0.029	0.035	0.056	0.093	0.026	55
Eastern Europe	*Loan / Total Assets*	0.595	0.706	0.764	0.783	0.885	0.951	0.103	55
Eastern Europe	*Interest Income / Loans*	0.000	0.037	0.050	0.068	0.077	0.235	0.055	55
Eastern Europe	*Impaired, non-performing loans / Loans*	0.000	0.000	0.015	0.015	0.023	0.069	0.018	55

Eastern Europe	*ExRegime*	0.000	0.000	0.000	0.252	0.693	0.693	0.336	55
Eastern Europe	*IR Differential*	-0.900	-0.400	0.300	0.696	1.700	3.100	1.274	55
Eastern Europe	*FXVOL*	1.408	1.466	1.802	1.704	1.865	2.070	0.213	55
Eastern Europe	*FXLAG*	-6.550	-3.671	-1.774	1.686	5.441	12.692	6.554	55
Eastern Europe	*Inflation*	0.981	1.149	1.982	4.256	3.956	13.831	4.726	55
Eastern Europe	*GDP Growth*	-6.481	2.634	3.822	2.917	4.676	9.050	3.795	55
Eastern Europe	*Rule of Law*	0.742	0.788	0.833	0.852	0.875	1.065	0.083	55
Far East and Central Asia	*ROA*	-4.65	0.753	2.273	2.537	3.977	8.794	3.130	460
Far East and Central Asia	*Size*	7.347	10.614	11.810	11.874	13.056	16.581	1.676	460
Far East and Central Asia	*Age*	0.000	2.197	2.485	2.527	2.996	3.829	0.583	460
Far East and Central Asia	*Operating Expense Ratio*	0.000	0.004	0.016	0.056	0.074	0.731	0.101	460
Far East and Central Asia	*Loan / Total Assets*	0.312	0.697	0.840	0.793	0.924	1.004	0.173	460
Far East and Central Asia	*Interest Income / Loans*	-0.001	0.131	0.162	0.175	0.225	0.687	0.079	460
Far East and Central Asia	*Impaired, non-performing loans / Loans*	0.000	0.000	0.022	0.061	0.063	1.000	0.128	460
Far East and Central Asia	*ExRegime*	0.693	0.693	0.693	0.817	1.099	1.099	0.187	460
Far East and Central Asia	*IR Differential*	-0.90	0.900	4.600	5.639	7.900	22.300	5.917	460
Far East and Central Asia	*FXVOL*	0.131	1.041	1.302	1.455	1.573	10.556	1.226	460

Far East and Central Asia	*FXLAG*	-6.55	-0.101	2.950	2.926	5.229	15.314	4.881	460
Far East and Central Asia	*Inflation*	0.981	2.419	3.945	4.773	6.323	13.831	3.115	460
Far East and Central Asia	*GDP Growth*	-6.48	2.951	5.950	4.610	7.240	9.050	3.857	460
Far East and Central Asia	*Rule of Law*	-0.51	0.588	0.788	0.714	0.875	1.030	0.231	460
South and Central America	*ROA*	-4.65	0.539	2.121	2.424	3.990	8.794	3.598	110
South and Central America	*Size*	4.244	10.052	12.189	11.683	13.509	15.305	2.658	110
South and Central America	*Age*	0.000	2.485	3.045	2.616	3.248	3.689	1.002	110
South and Central America	*Operating Expense Ratio*	0.000	0.006	0.059	0.188	0.198	1.946	0.338	110
South and Central America	*Loan / Total Assets*	0.312	0.651	0.800	0.719	0.837	1.004	0.207	110
South and Central America	*Interest Income / Loans*	0.000	0.169	0.253	0.349	0.385	1.424	0.295	110
South and Central America	*Impaired, non-performing loans / Loans*	0.000	0.006	0.021	0.047	0.054	0.570	0.086	110
South and Central America	*ExRegime*	0.000	0.693	0.693	0.733	1.099	1.099	0.393	110
South and Central America	*IR Differential*	2.000	6.300	9.400	11.943	22.300	22.300	7.464	110
South and Central America	*FXVOL*	0.006	0.700	1.208	2.069	3.749	6.315	1.693	110
South and Central America	*FXLAG*	-5.63	0.798	3.588	4.664	10.198	15.314	6.174	110
South and Central America	*Inflation*	0.981	1.819	3.636	4.473	6.443	13.831	3.436	110

South and Central America	*GDP Growth*	-6.48	-3.182	2.241	1.203	4.235	9.050	4.981	110
South and Central America	*Rule of Law*	-1.61	0.405	0.642	0.339	0.742	0.875	0.767	110

Source: own processing

TABLE A 3. CORRELATION MATRIX

This table shows the correlation between independent variables. These relate to our sample observations of 154 MFIs operating in 47 countries from 2018 to 2022. The sample data are from Orbis and Passport databases. Exchange rate regimes were obtained from IMF reports.

	Size	*Age*	*Operating Expense Ratio*	*Loans/Total Assets*	*Interest Income/Loans*	*Impaired, &non-performing Loans/Loans*	*ExRegime*	*IR Differential*	*FXVOL*	*FXLAG*	*Inflation*	*GDP Growth*	*Rule of Law*
Size	1.000												
Age	0.187	1.000											
Operating Expense Ratio	0.504	0.160	1.000										
Loan / Total Assets	(0.068)	(0.076)	(0.078)	1.000									
Interest Income / Loans	(0.220)	0.063	0.115	(0.378)	1.000								
Impaired, &non-performing Loans/Loans	(0.096)	(0.062)	(0.000)	(0.018)	0.044	1.000							
ExRegime	0.072	0.004	0.213	(0.146)	0.320	0.107	1.000						
IR Differential	(0.210)	0.019	(0.066)	(0.328)	0.430	(0.062)	0.253	1.000					
FXVOL	(0.122)	(0.037)	0.055	(0.158)	0.477	0.053	0.130	0.391	1.000				
FXLAG	(0.039)	(0.069)	0.017	(0.181)	0.210	(0.041)	0.159	0.208	0.249	1.000			
Inflation	(0.018)	0.066	(0.036)	(0.251)	0.259	(0.065)	0.189	0.349	0.293	0.488	1.000		
GDP Growth	0.040	(0.025)	(0.077)	0.129	(0.121)	(0.011)	0.023	0.007	(0.134)	(0.238)	0.034	1.000	
Rule of Law Index	0.213	(0.063)	0.049	0.399	(0.212)	0.103	0.086	(0.507)	(0.176)	(0.115)	(0.196)	0.207	1.000

Source: own processing