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# The Exposure of Microfinance Institutions to Financial Risk

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# The Exposure of Microfinance Institutions to Financial Risk

## ABSTRACT

This study examines the exposure of microfinance institutions to liquidity, interest rate and foreign exchange (FX) risk. It builds on a manually collected set of data on the maturity structure of assets and liabilities of the 309 largest microfinance institutions (out of which 112 actually report the maturity structure). The data suggests that, on average, microfinance institutions in the sample face virtually no liquidity risk and that exposure to FX risk is lower than generally assumed. Linking risk exposure to institutional characteristics, I find that legal status and regional affiliation are correlated to risk exposure while regulatory quality is not.

Keywords: Microfinance, Financial Risk, Liquidity Risk, FX Risk, Ownership, Regulation

# 1 Introduction

Modern microfinance, in the form of specialized institutions that target their lending activities to groups otherwise barred from financial services, has been widely accepted as a viable business-model. After the very successful initial years and the absence of major crises, the microfinance community had even come to believe that microfinance, due to its peculiar business-model, is resilient to most traditional risks in banking (Winkler and Wagner 2012). However, a recent concourse of crises - among others, crises in Bosnia and Herzegovina (2008), Pakistan (2008/09) and India (2010) - has brought down the level of optimism.

In particular, three prominent types of risk - liquidity risk, interest rate risk and FX risk - that are of great concern in the standard banking literature, have gained little attention from the microfinance research community. Given the importance of these risks in standard banking but also the resources the practitioner community has devoted to mitigate them, the apparent lack of quantitative evidence concerning the sector's risk exposure is surprising.<sup>1</sup>

The practitioners' view on the three risks usually rests on the general perception of the type of business-model standard microfinance institutions (MFIs) run, which often differs substantially from that of more commercially oriented banks. MFIs offer shorter-term loans with smaller lot sizes (Winkler and Wagner 2012). MFIs are also eligible for concessionary and

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<sup>1</sup>The Centre for the Study of Financial Innovations' yearly survey among professionals (CSFI 2011) is an attempt to rank the importance of different risk categories in microfinance. Out of the total 24 risk categories liquidity risk ranks 16th, interest rate risk 21st and FX risk 24th.

long-term funding from development financial institutions (DFIs) that usually presupposes the targeting of small and medium enterprises or granting microcredit to customers, and which classical banks hence cannot obtain. Following the perception that many MFIs rely to a considerable extent on concessionary funding from foreign DFIs, which tend to lend in their own hard currency, and at the same time maintain primarily short-term, low-volume, local-currency loan portfolios, MFIs seem to be inherently prone to FX and interest rate risk but little affected by liquidity risk.<sup>2</sup>

There are, however, opposing arguments that suggest treating this common narrative with care. Recently, deposit taking MFIs have increased their share of funding from deposits (Lützenkirchen and Weistroffer 2012). Local currency deposits hedge against FX risk in case MFIs grant local currency loans. At the same time, there is little evidence on the role of deposits in determining liquidity risk for MFIs in developing countries, where deposit insurance mechanisms might not always be available or fully effective to stabilize core deposits. Littlefield and Kneiding (2009) argue that deposits are less of a source of liquidity risk and regard funding from international investors to be more volatile than deposits. A potential game changer with regard to FX risk is the fact that many MFIs operate in widely euroized or dollarized economies in which large parts of all assets - and not only liabilities - are denominated in hard currency to balance the effect of hard currency borrowing (examples include Bosnia and Herzegovina or Ecuador).

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<sup>2</sup>Liquidity risk, however, is not only a concern for individual financial institutions (FIs) but is also important from a financial inclusion perspective. Cornett et al. (2011) show that FIs facing higher liquidity risk prior to the financial crisis reduced lending activities significantly more than FIs that were maintaining a more liquid balance sheet.

Hence, customers in many economies consign deposits in both hard and local currency (examples include Serbia for the Euro and Cambodia for the US Dollar).

Using a manually collected data set on assets' and liabilities' maturity structure and FX positions of MFIs, this study disentangles common narratives and sheds light on the true risk exposure of MFIs to liquidity, interest rate and FX risk. For that matter, I construct simplified risk measures that are adjusted to study the risk exposure of MFIs while ensuring comparability in a global sample of institutions. A first result concerns the determinants of a more detailed risk reporting of MFIs. In dividing the base sample of 309 institutions into MFIs that report sufficiently detailed data to construct the financial risk measures and MFIs that do not, I find that NGOs, Credit Unions and Cooperatives<sup>3</sup> are on average less likely to report than Banks. A stronger stance of local regulation on external auditing procedures and being an Eastern European MFI makes MFIs more likely to report details on financial risk exposure. Results on the overall risk exposure of the microfinance sector using a large subset of all MFIs in the market show that concerns about MFIs' liquidity risk exposure are not warranted. MFIs' short term assets ( $\leq 30$  days) surpass short-term liabilities threefold, on average (suggesting a negative level of maturity transformation). Due to the imbalanced maturity structure of MFIs' balance sheets, exposure to interest rate risk is substantial. The average difference between interest repricing assets and liabilities over the one year horizon stands at 27% of total assets. Re-

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<sup>3</sup>The three legal statuses are grouped together to achieve more powerful estimates.

sults also show that average exposure to FX risk is lower than most market observers tend to believe. Low FX risk exposure is the result of counterbalancing asset and liability positions. MFIs fund a considerable share of their assets with FX liabilities (28%). However, the share of FX assets also stands at 28% and offsets exposure to FX funding. Using a most conservative way to measure FX risk, i.e. not netting out differences between single currencies, MFIs are only exposed to an average total difference between their foreign currency assets and liabilities (Net Open Position) of 4.5% of total assets. While there are a few MFIs with considerable exposure, most exhibit only very low levels of FX risk.

Finally, I provide novel evidence on whether institutional features of MFIs are systematically correlated to certain levels of risk exposure. Thus, results contribute to the discussion on which institutional features of MFIs are most suitable to attain social outreach while at the same time maintaining financial viability of MFIs. I find, in line with most previous research, that the strength of local regulation plays no role in determining exposure to financial risks. An MFI's legal status, however, does correlate with the exposure to liquidity and FX risk. Banks face higher liquidity risk than Non-Banking Financial Institutions (NBFIs), mostly due to their larger share of funding by deposits. NGOs, Credit Unions and Cooperatives are exposed to more FX risk, although their share of funding via FX liabilities is lower, which suggests an inferior ability to mitigate FX risk. I also find that regional affiliation is correlated to levels of risk exposure. Results on total risk exposure suggest that an extension of current systemic policy measures against liquidity and FX risk would not work to relax actual constraints

that keep MFIs from extending their lending towards microfinance clients on volume or in longer-term credit.

## 2 Literature

A considerable amount of the aggregate microfinance sector's liabilities is cross-border, public, long-term funding. In 2011, the amount of cross-border funding for the sector was (depending on the source of the estimates) between 15 to 25 billion US Dollars and constituted about one fifth of the sectors total asset size (Reille, Rozas, and Forster 2011; Lahaye, Rizvanolli, and Dashi 2012). By far the largest share of cross-border funding comes in debt-type instruments (55%). In 2004, more than 90% of all cross-border debt funding towards MFIs was denominated in Euro or US Dollar, i.e. generally in non-local currency for the MFIs (Lahaye, Rizvanolli, and Dashi 2012). However, literature that translates the funding structure into quantitative estimates of financial risk in the microfinance industry has so far been almost non-existent. In particular, there is no reliable evidence on whether the microfinance industry's exposure to the three financial risks should be a matter of concern at all. Abrams and Prieur (2011) is a practically-oriented exception with regard to FX risk. Their study concludes that FX risk in the sector is considerable, but does not show the sensitivity of results to its very conservative definition of prudent levels of exposure. The lack of evidence is most likely due to data restrictions. The existing databases feature standard indicators on credit risk but fall short with respect to measures of other financial risks. In particular, the composition of funding (the share

of deposits and borrowings) is easily computed from existing databases, but the actual maturity patterns of the types of funding and of MFIs' assets are unknown. Empirical evidence is additionally hampered by accounting standards and quality of publications, which differ widely among microfinance providers globally. Hence, most of the literature on financial risk in microfinance is exclusively concerned with MFIs' management practices and hedging tools for risk. There is a particularly large body of literature on FX risk management. Crabb (2004) notes that conventional methods of hedging FX risk are often inapplicable for MFIs. This shortage of classic countermeasures against FX risk gave rise to alternative instruments MFIs use to manage FX risk (Featherstone, Littlefield, and Mwangi 2006). Brom (2009) is a practitioner-focused example concerned with basic risk exposure measurement of the three financial risks of this study.

Despite conflicting narratives on risk exposure and an apparent lack of empirical evidence, the international community has taken systemic actions to mitigate exposure with regard to financial risks. For example, DFIs have recently pushed to develop methods of local currency borrowing for MFIs. One example is the TCX fund that provides OTC derivatives to hedge FX risk and spans 70 currencies ([www.tcxfund.com](http://www.tcxfund.com)). Another example is the African Local Currency Bond Fund ([www.alcbfund.com](http://www.alcbfund.com)) that promotes local currency borrowing for African MFIs. With regard to liquidity risk, many investors tilt refinancing for MFIs towards very long-term borrowing or equity-type instruments in order to explicitly alleviate MFIs' burden of maturity transformation, often in the hope of therewith promoting more and more long-term lending.



Studying risk in microfinance is additionally complicated by the variety of institutional setups of MFIs. The microfinance mission-drift literature is concerned with the effect of commercialization (by profits etc.) on outreach (share of female clients, rural clients etc.) and has spurred a discussion that links institutional features of MFIs and their business environment to outreach and profitability measures. Looking at the effects of bank regulation, lending techniques and profit-status on financial performance and outreach of MFIs, Mersland and Strøm (2009), using a data set of MFI ratings, find that regulation does not affect outreach and financial performance. Similarly, Hartarska and Nadolnyak (2007) find no effect of bank regulation, whereas Cull, Demirgüç-Kunt, and Morduch (2011) suggest indirect effects via different levels of capitalization for MFIs of different legal status. Because practitioners often argue for the superiority of shareholder-owned firms over NGOs, special attention has been given to the effect of legal statuses on performance and outreach. Mersland and Strøm (2009) find only small differences between private, shareholder firms and non-profit institutions with respect to outreach and performance. Trying to consolidate the co-existence of different legal statuses among MFIs, Mersland (2009) finds, however, that cost structures vary among legal statuses and that a co-existence of different ownership types might serve microfinance clients best. Nevertheless, the existing literature suggests only small effects of the regulatory environment and MFIs' legal statuses (two key policy variables) on outreach and performance. Performance and outreach, however, should always be weighed against risk and so far studies have focused on credit risk. Results of this study thus complement previous analyses by linking MFIs' liquidity, interest

rate and FX risk exposure to institutional characteristics.

## **3 Risk Measures**

### **3.1 Liquidity Risk**

To establish a measure of liquidity risk, this study defines liquidity risk to be the risk that an FI is unable to meet its immediately outstanding obligations or fund increases in the volume of its assets without incurring unacceptable losses, following the Basel Committee on Bank Supervision (BCBS 2008). The BCBS definition tacitly comprises a demand and supply side of liquidity. To form an idea of future expected cash outflow (i.e. liquidity demand) and expected cash inflow (i.e. liquidity supply), regulators have increasingly been using maturity profiles instead of simple static measures of liquidity (Van Greuning and Brajovic-Bratanovic 2009). Maturity profiles group assets and liabilities (A&L) into different time bands to capture the timing of expected (or on a simpler notion: contractual) future cash in- and outflows. Additionally, the Basel regulation weighs A&L by the liquidity of the respective security markets. In light of this, the most recent regulatory guideline, Basel III, defines two complementary minimum standards on liquidity risk provision (BCBS 2013a). The Liquidity Coverage Ratio (LCR) is intended to measure and promote short-term resilience to liquidity problems, while the Net Stable Funding Ratio (NSFR) intends to measure long-term ( $\geq$  one year) liquidity needs and supply.

To study liquidity risk in microfinance, I establish a liquidity risk measure that relies on maturity profiling according to the logic of Basel III's LCR but that can be composed solely from public financial reporting data and is attuned to capture the risk from the prevailing business-model in microfinance in a comparable way among a global sample of MFIs. For most MFIs, short-run liquidity supply on the asset side of the balance sheet is mainly the amount of loans that mature over the short-term, cash and balances with the central bank. Most of the MFIs' assets are on balance sheet, fixed-maturity loans. Securitization in this sector is still underdeveloped, especially for the smaller MFIs (Brom 2009) and most MFIs do not hold considerable amounts of marketable securities, sovereign debt or corporate debt that could be sold off in a liquidity crunch. Hence, I use the remaining contractual maturity of all assets with a uniform weighting, instead of determining single market liquidity for each asset class. The type of liquidity risk captured in this study is thus closely related to the concept of funding risk. On the liability side, the crucial difference between expected and contractual maturity concerns deposits. While Basel III assumes a share of demand deposits to stay with the FI for longer than the earliest contractual draw-down date (core deposits), using contractual maturity results in the full amount of demand deposits to be possibly due in the short-run. However, the history of banking crises shows that even conservative assumptions on core deposits can collapse quickly in a particularly dire business environment, in particular in the absence of effective deposit insurance mechanisms.

Finally, the Liquidity Coverage ( $LC$ ) that resembles Basel III's LCR, is the ratio of short-term (by remaining time to contractual maturity) assets and short-term liabilities within a one month time band:

$$LC = \frac{\text{Short-Term Assets (one month)}}{\text{Short-Term Liabilities (one month)}} \quad (1)$$

Short-term assets notably include maturing loans, central bank reserves, cash and all other current financial assets as well as short-term investments. If listed on the balance sheet, I exclude property and equipment, provisions, deferred tax assets, the residual category of other assets, restricted funds, intangible assets and goodwill, and investments in associates from the liquidity coverage measure due to their largely unclear role in liquidity provision and varying accounting standards. In any case, these positions never constitute a sizable share of the total asset volume. For the denominator, I do not exclude any liability classes from the measure of short-term liquidity. The ratio does not consider off-balance sheet (OBS) exposure. A value of one indicates a perfect match of A&L maturities and higher values indicate lower liquidity risk.

### **3.2 Interest Rate Risk**

Interest rate risk is the exposure of an FI to movements in the interest rate from either an economic value or a cash flow (earnings) perspective (BCBS 2004). This study focuses on the earnings perspective and therefore on repricing risk. Repricing risk is the most basic form of interest rate risk

and arises from a mismatch of maturities of so-called rate-sensitive assets and liabilities (RSA and RSL), for which interest rates are repriced within a certain time period. Repricing occurs because fixed-rate positions mature, interim or partial payments are due, interest payments change on a contractual basis or for floating-rate instruments (Koch and McDonald 2009).

I employ the so-called Gap Method (also: Repricing Model) which is a simple cash flow based approach to measure interest rate risk. I construct the Cumulative Interest Gap (*CIG*) using the absolute value of the cumulated gap between RSA and RSL over a one year horizon:<sup>4</sup>

$$CIG = \frac{|(\text{Repricing Assets } \leq 1 \text{ year}) - (\text{Repricing Liab. } \leq 1 \text{ year})|}{\text{Total Assets}} \quad (2)$$

The gap is normalized by the total amount of assets. A higher gap between repricing A&L indicates a higher exposure to interest rate risk, although MFIs featuring the same *CIG* are still exposed to more or less volatile interest rate environments. BCBS (2004) discusses other dimensions of interest rate risk.

Determining a repricing profile requires (1) defining RSA and RSL and (2) grouping of RSA and RSL into their repricing time bands.<sup>5</sup> To deter-

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<sup>4</sup>The literature that popularized using Gap measures between RSA and RSL dates back to the early 1980's. For an early example see Brewer (1985). Gap measures are commonly used as a basis for Earnings Sensitivity Analysis that extends static Gap Models with assumptions on future interest rates, A&L volume and composition, and OBS positions.

<sup>5</sup>In the final sample for interest rate risk 75 MFIs do not report A&L according to their repricing date but with respect to contractual time to maturity only. For those MFIs, I use data on A&L grouped according to remaining time to contractual maturity. This procedure leaves the measure of interest rate risk prone to some error. Floating rate instruments

mine the amount of RSA and RSL, the same asset classes as before remain excluded and I additionally exclude cash holdings. All liabilities are considered to be rate-sensitive, in particular demand deposits, in accordance with the measure of liquidity risk.

### **3.3 FX Risk**

Basic FX risk arises due to mismatches between the volumes of A&L within different foreign currency sub-portfolios of an FI's balance sheet. From an economic value perspective a depreciating foreign currency reduces the value of foreign currency A&L (an appreciating foreign currency does the opposite). Thus, an open long position in one foreign currency (i.e. a larger total volume of assets and FX forwards bought than liabilities and FX forwards sold) will decrease the economic value measured in local currency of an FI once the foreign currency depreciates vis-a-vis the local currency. In addition to the risk caused by the different volumes of FX positions, the timing on FX positions is important. Any FX position due in the long-run bears a different amount of risk than an equivalent position due soon if exchange rate movements feature some sort of predictability (mean reversion). In the presence of convertibility risk and transfer risk, MFIs also bear an additional amount of liquidity risk on the FX sub-portfolios (see Featherstone, Little-

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that reprice before maturity might be grouped into later (and thus wrong) time windows according to their date of maturity. However, the dominant repricing positions on the asset side are unproblematic maturing loans and rate-sensitive holdings with the central bank. On the liability side, the MFIs mainly hold deposits that are anyways rate-sensitive over the shorter-term. The most serious error in using maturity profiles is the fact that interim interest rate payments on borrowings from DFIs are often repriced according to LIBOR or EURIBOR before maturity. The comparability is further supported by the fact that, for MFIs reporting both maturity and repricing profiling, the two profiles generally do not differ significantly over the one year horizon.

field, and Mwangi 2006). Another aspect of FX risk is settlement risk in FX transactions (BCBS 2013b).

I rely on the Net Open Position (*NOP*), a common method to measure FX risk exposure and use the difference of all on-balance sheet FX assets and FX forwards bought and all FX liabilities and FX forwards sold in the single foreign currencies (Net Exposure). I employ the most conservative aggregation method by adding up the absolute values of all net positions, both positive and negative. This method rests on the assumption that exchange rates move potentially unfavorably so as to create losses for all single Net Exposures. While on an individual level this is a fair and comparable measure of FX risk exposure, it likely overstates (just like some other methods potentially understate) FX risk on an aggregate level.<sup>6</sup>

$$NOP = \frac{\sum_{n=1}^N |\text{Net Exposure}_n|}{\text{Total Assets}} \quad \text{with } n = 1, \dots, N \text{ single currencies} \quad (3)$$

The resulting sum of Net Exposures is normalized by the amount of total assets. The choice of the actual foreign currency is not always straightforward. A few of the countries in the sample (e.g. Kosovo, Ecuador) have adopted the Euro or the US Dollar as their primary currency without a separate legal tender. In these cases, a supposedly hard currency (Euro or US

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<sup>6</sup>34 MFIs in the sample report all their various FX positions aggregated into a single currency right away. In particular, 32 Latin American MFIs report all FX positions translated and aggregated into US Dollars only. Aggregation among various currencies (i.e. netting out the differences) is likely to understate true FX exposure. However, the error from this type of aggregation for Latin American MFIs is supposedly small as FX positions in Latin America consist primarily of US Dollars in the first place.

Dollar) was defined to be the local currency and does not enter the *NOP*. In all other cases, the local currency is the currency not entering the *NOP* no matter the share of A&L being held in hard currencies.

## 4 Methodology

The main explanatory variables (also widely perceived to be the most relevant policy variables) I use to estimate the effect of institutional characteristics on risk exposure are an MFI's legal status and the quality of local regulation. I control for factors that can reasonably be expected to influence risk taking and/or be correlated with an MFI's legal status or regulatory quality. Age and size capture the effects of an MFI's maturing process. I expect larger and older MFIs to have a more sound risk-management and thus lower average exposure. To proxy managerial quality, but also competition effects, the return on assets (ROA) is included as a control variable. Lower competition will generally allow MFIs to generate a higher ROA. However - at least in the short-run - riskier business models might also be correlated with a higher ROA. I additionally include regional dummies to capture the effects of different MFI business models across regions that might correlate with MFIs' risk preferences and/or a different attitude of investors towards certain regions. Different exchange rate volatilities suggest different prudent levels of FX risk exposure. In order to control for different exchange rate volatilities caused by exchange rate regimes, I include a dummy for non-floating currencies in the *NOP* regressions.



*CIG* and *NOP* are fractions bounded by the unity interval. Hence, the determinants of interest rate and FX risk exposure cannot be consistently estimated using a linear model. An increasingly popular method of modeling dependent variables defined on the standard unit interval is the fractional-logit approach introduced by Papke and Wooldridge (1996). Their approach imposes the following assumption on the conditional mean and chooses  $G(\cdot)$  to be the logistic function.

$$\mathbb{E}(Y|\mathbf{X}) = G(\mathbf{X}\beta)$$

For the *LC* regression, I use a simple linear model that is nested in this more general assumption on the conditional mean using the identity link function. As an alternative to the fractional-logit approach, I employ beta regressions and the results are not sensitive to this choice.<sup>7</sup>

## 5 Data

In order to cover a sample that is as relevant as possible, the base sample for which financial reporting files are considered consists of the 309 largest (by total assets) MFIs in 2011 from the MIX database. The sample covers more than 60% of the total asset volume of MFIs registered with the MIX database (even excluding one outlier at the top). The MIX database is the most extensive and widely used set of data in the microfinance industry.

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<sup>7</sup>A good introduction into fractional regression models and both methods can be found in Ramalho, Ramalho, and Murteira (2011) and the sources within. For details of the estimation procedure see the STATA commands *glm* and *betafit*.

However, the database does not contain data on the maturity structure of A&L or in any closer detail on FX positions of MFIs. Hence, I manually extract data from publicly available (available either via the MIX service or via any other online source) audited financial reporting files of MFIs to construct the risk measures. Data on the MFIs' legal statuses, other controls and regions are obtained from MIX. All data is from fiscal year-end 2011.<sup>8</sup>

To measure the impact of regulatory quality, I rely on the data provided by Barth, Caprio Jr., and Levine (2013). Their database on bank regulation and supervision covers 180 countries in four surveys between 2000 and 2011, whereby I always use the most recent data available. In particular, I use the database's sub-category on Official Supervisory Power that aims to capture "whether the supervisory authorities have the authority to take specific actions to prevent and correct problems". The bank regulation database is naturally focused on institutions governed by banking laws. In order to not miss effects of regulation on legal statuses other than banks by construction, I use an alternative broader measure of regulatory quality provided by the Worldwide Governance Indicators (WGI) Project (Kaufmann, Kraay, and Mastruzzi 2010). Their governance indicator, which is available for all countries in the sample, covers six dimensions that concern not only banks: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. As a third alternative I consider data from the 2011 Global Microscope on the business environment in microfinance in 55 countries (EIU 2011), a

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<sup>8</sup>I use dummy coding for the categorical variables and define Africa and Banks as the baseline categories for region and legal status. I perform F-tests to test for the joint significance of the categorical variables on the mean of the outcome variables.

joint initiative of the Economist Intelligence Unit (EIU) and other DFIs. For countries that have no rating in the report, I use their regional average. Importantly, the main results do not change for any of the three alternatives (only results for the bank regulation database are reported, other results are available upon request). The data on currency regimes, where a value of one is assigned to non-free-floating currencies, was taken from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions in April 2012 (available at [www.imf.org/external/pubs/ft/ar/2011/eng/pdf/a2.pdf](http://www.imf.org/external/pubs/ft/ar/2011/eng/pdf/a2.pdf)).

Table 1 summarizes the availability of financial reporting files and whether they contain detailed information on liquidity, interest rate or FX risk. I am able to construct at least one of the risk measures for about half of the original sample.

[Insert Table 1 here]

Table 2 summarizes descriptive statistics separately for the sample of MFIs that report details on at least one of the three risks (the selection) and those that do not publish audited financial statements at all or do not report on any of the risks in detail.

[Insert Table 2 here]

Interestingly, reporting MFIs and non-reporting MFIs are quite similar with respect to most of their characteristics. Using t-tests for the continuous variables, the hypothesis of an equal mean between the two groups is only

rejected for the regulatory quality score. If we accredited a monitoring role to depositors, we would also expect deposit-taking MFIs to be more likely to report details on their risk exposure. However, there is no such effect to be found in the data.

[Insert Table 3 about here]

Table 3 presents results from a Probit model on the differences between MFIs reporting and MFIs not reporting in detail on any of the risks measures (results for the single risk measures are similar). To achieve a more targeted measure of regulatory quality on detailed risk reporting, I additionally include the Strength of External Audit category from the bank regulation database, which is the sum of affirmative answers to seven questions on the effectiveness of external audits of banks (Barth, Caprio Jr., and Levine 2013).

NGOs, Credit Unions or Cooperatives are on average less likely to report on any of the three risk measures than Banks. Being an Eastern European MFI significantly increases the likelihood of reporting compared to other regions for all risk categories. I suggest that the high reporting quality of Eastern European MFIs might be an outcome of their close ties with European investors.<sup>9</sup> Due to a lack of consistent data on how closely an MFI is linked to foreign investors, I am not able to directly test this hypothesis. Results indeed suggest that whenever local regulation on external auditing procedures is stricter, the likelihood of detailed reporting increases (a one standard deviation increase of the Strength of External Audit score, 0.8

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<sup>9</sup>Only the difference with respect to African MFIs is inferred from the table but the effect remains highly significant for all other choices of base categories as well. F-tests for joint significance of the categorical variables show that the region has a significant effect on the likelihood of being part of the selection at the 1% level.

points, suggests an increase of about 10% points in the likelihood of reporting on at least one risk in detail). Other than that, differences between the reporting and non-reporting groups of MFIs are uncorrelated with all basic MFI portfolio characteristics.

The sample at hand necessarily suffers from selection bias. However, similarity of MFIs with regard to most portfolio characteristics suggests that selection bias in the final sample of reporting MFIs is contained. This is further supported by the idea that it seems unlikely for an MFI to adjust reporting behavior to the level of exposure to liquidity, interest rate or FX risk and as such immediate selection bias should also be limited. Results from a Heckman selection correction model (using the reporting quality index on MIX, the diamonds, as an instrument) for the final liquidity risk estimation setup also do not suggest the presence of significant selection bias (results are available upon request).

## 6 Results

Results on the risk measures for the sub-samples of MFIs that report sufficiently detailed data are shown in Table 4.<sup>10</sup>

[Insert Table 4 here]

MFIs' short term assets ( $\leq 30$  days) surpass short-term liabilities - both by contractual due date - threefold, on average. MFIs in the sample would

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<sup>10</sup>Since  $LC$  is a ratio it has the tendency to generate outliers when the denominator approaches zero. To account for this, I censor the upper 5% of the observations that are about 10 times larger than the standard deviation of the censored sample.

thus easily pass the liquidity requirement established in Basel III that will eventually require FIs to maintain an LCR of at least one, albeit constructed somewhat differently. On average, MFIs in the sample face a mismatch of 26.9% of total assets in absolute value between RSA and RSL over the one year horizon. Even in the absence of a clear benchmark to compare with, this seems to be a rather substantial exposure towards interest rate risk. MFIs are, on average, exposed to a Net Open Position of 4.5% of their total assets. The average *NOP* is driven by some MFIs' exposure to large amounts of FX risk and by most MFIs facing only small *NOP* (distributions of the risk measures can be found in the appendix). OBS FX positions (in many cases credit commitments) are not always reported. Including OBS positions whenever reported, however, does not change the result. Normalizing by the total amount of equity, average exposure stands at 23%. Brom (2009) suggests that 25% *NOP* with respect to total equity is still a prudent level considering only net negative positions. Given that I aggregate both positive and negative positions (maximum exposure would thus double), most MFIs pass this prudence test easily while about 15% of all MFIs feature a non-prudent exposure. However, non-prudent exposure is often merely a result of very low levels of equity. While the average *NOP* is low, the average total share of FX A&L is considerable and stands at 28% for both assets and liabilities. The usual narrative that MFIs are to a considerable extent indebted in foreign currency is true, but counterbalancing FX asset positions largely offset the effect of FX liabilities. Some authors suggest that FX assets are indicative of MFIs passing FX risk on to their clients by giving out foreign currency loans, e.g. Crabb (2004). It is, however, not obvious to which

extent microfinance clients who obtain FX loans actually receive income or have expenses in foreign currencies and are thus exposed to FX risk themselves. Comparing total FX assets and total FX liabilities instead of summing over single currencies' Net Exposures (i.e netting out the difference for all currencies of one MFI), I find that exactly half of all MFIs keep more FX assets than liabilities on their portfolio and the other half vice versa. Accordingly, the average *NOP* after netting out the differences stands at less than 1% of total assets. The use of FX A&L varies considerably between regions. Not-reported regression-results on the determinants of FX A&L exposure show that regional variation explains all differences in volumes of FX A&L between different institutional characteristics (results are available upon request). Eastern European and Central Asian MFIs maintain the most FX A&L, while African MFIs keep little FX A&L in their portfolios (the appendix contains the distribution of FX risk among different regions).

Table 5 states the pairwise correlation of the risk measures and MFI features. The correlation structure is an indicator of whether MFIs might be trading off one risk for another. In particular, we might expect MFIs to trade off liquidity risk for FX risk by either relying on long-term hard currency financing or local currency deposits for funding. However, I find only weak support for this hypothesis in the data. The correlation between *NOP* and *LC* is 0.262 (the appendix further contains scatterplots that demonstrate the correlation between the three risk measures).

[Insert Table 5 here]

Not reported summary statistics show that the level of deposits is related to an MFI's legal status, as Banks are almost always deposit taking. On average, Banks in the sample fund 56% of their total assets by deposits, NBFIs 26% and NGOs, Credit Unions or Cooperatives on average 31%. Whether an MFI is a for- or non-profit organization is almost perfectly determined by its legal status; in particular, all Banks operate for-profit. To avoid multi-collinearity, the MFI's profit status and whether an MFI accepts deposits or not have thus been discarded as control variables. The correlation structure of other controls does not suggest multi-collinearity problems.

Table 6 states the summary statistics for the risk measures by different legal status. Banks are exposed to the highest level of liquidity risk (the lowest *LC*) and fund the highest share of their assets with FX liabilities. However, Banks also hold more FX assets than other legal types. NGOs, Credit Unions or Cooperatives feature the most unbalanced balance sheets with respect to RSA and RSL, while Banks are exposed to the lowest level of interest rate risk among all legal statuses.

[Insert Table 6 here]

Table 7 reports estimation results on the determinants of risk exposure for the three different risk measures. Results for the baseline *LC* regression suggest that the group of Non-Banking Financial Institutions (NBFIs) features a lower liquidity risk (i.e. higher *LC*) than Banks do (results suggest that the liquidity coverage more than doubles). The difference between



Banks and NGOs, Cooperatives and Credit Unions is not significant.<sup>11</sup> The difference between NBFIs and Banks seems not to be fully explained by the fact that Banks in the sample rely much more on deposits than NBFIs do. Repeating the same regression for the sub-sample of only deposit-taking institutions, NBFIs still feature significantly less liquidity risk than Banks (results are reported in Table 8 the appendix). Additionally including the level of deposits the difference remains significant. Only in the fully specified model including regions the difference between NBFIs and Banks turns insignificant. The coefficient on regulatory quality is insignificant in all specifications. Adding controls, I find that larger MFIs are exposed to a higher level of liquidity risk; liquidity coverage decreases about 2.5% for every 10% increase in assets. In the full specification, risk exposure varies significantly between regions and regions explain part of the difference between NBFIs and Banks. The economical size of the effect of the regions obviously depends on the choice of the base category Africa. The regional dummies are, however, jointly significant at the 5% level (F-test).

[Insert Table 7 here]

Baseline results on interest rate risk suggest that NGOs, Cooperatives and Credit Unions feature significantly higher levels of interest rate risk, but again no effect of the regulatory quality on risk exposure. In the full specification, marginal effects show that an increase in the ROA of 1% point is accompanied by an increase in the *CIG* of about 1.6% points. With

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<sup>11</sup>I apply a log-transformation to achieve more efficient estimates. Results in columns (1)-(3) thus report exponentiated coefficients. Values smaller than one indicate a negative, values larger than one a positive influence.

respect to interest rate risk there is thus some evidence that higher returns and better financial performance - or lower competition - are accompanied by larger risk taking (using profit margins instead of ROA delivers very similar results). In some situations a larger *CIG* is indeed rational given larger differences on the interest spread between A&L. An F-test for a uniformly zero effect of all regions is rejected at the 5% level. Most importantly, however, by including the full set of controls, significant effects of the legal status on *CIG* are fully captured by the controls.

The *NOP* specifications show that alternative legal statuses are exposed to a higher level of FX risk of about 7% - 13% points than Banks, despite the fact that NGOs, Cooperatives and Credit Unions maintain less FX liabilities (see Table 6). This suggests that NGOs, Cooperatives or Credit Unions are not as well equipped to offset exposure with matching FX asset positions. There is no significant difference between Banks and NBFIs and regulatory quality is again unrelated to risk exposure. Currency arrangements have the expected impact on FX risk exposure. MFIs operating in non-floating currency economies are exposed to a higher level of FX risk (regional dummies are highly correlated with currency regimes and pick up the effect in the full specification). Dollarization and euroization, i.e. the use of hard-currency assets in the economy and therewith also the level of hard-currency deposits or assets on the balance sheets vary strongly across regions. An F-test shows that regional affiliation is jointly significant at the 1% level.

A few salient patterns of results on the influence of institutional features on risk emerge across the three risk classes. On the one hand, results suggest

no significant link between the quality of local regulation and risk exposure. Results are supportive of Mersland and Strøm (2009) and of much of the related literature in that regulatory quality seems to play only a minor role in determining MFIs' business-models. Nonetheless, given the seemingly low level of liquidity risk for the sector in total it might well be that regulators simply do not see sufficient necessity for intervention (which is however somewhat contradictory to the plethora of measures taken by DFIs). On the other hand, results show that differences in risk exposure other than credit risk can matter when comparing the performance and outreach of different types of legal statuses of MFIs. The data shows that Banks are exposed to a higher level of liquidity risk than NBFIs, which is likely the composite effect of Banks relying more on deposits for funding but also of other institutional features. On a first view, the fact that Banks are exposed to less FX risk than NGOs, Cooperatives or Credit Unions could be the result of different investors' attainment towards MFIs of different legal status. However, the fact that Banks actually fund a higher share of assets via FX liabilities but are still exposed to less FX risk suggests that Banks might have access to better management tools to mitigate FX risk.

Regional affiliation has a significant impact on all measures of risk exposure. Given that an MFI's region is not a policy variable on a micro level, most previous research has naturally focused on the influence of legal status or regulatory institutions. The neglect of regional effects might be unwarranted in cross-regional data sets. At first glance, strong regional effects are surprising given that supra-regional investor initiatives like ProCredit or Finca have been implementing highly similar institutions across the world

for about 30 years now. It seems that the standardization in microfinance is still outweighed by different banking traditions in different parts of the world.

## 7 Conclusion

This study offers novel evidence on the exposure of the microfinance sector to liquidity, interest rate and FX risk by presenting descriptive evidence on the sector's overall risk exposure and by estimating which institutional features correlate with higher levels of risk.

A higher level of liquidity risk comes with larger institutions that rely more strongly on deposits for funding. Nonetheless, from a developmental point of view (other than from a risk management perspective), a higher liquidity coverage is not always desirable. Currently, the sector does not actively engage in traditional maturity transformation and, on average, the world's largest MFIs face no liquidity risk. Due to the unbalanced maturity structure in MFIs' portfolios, exposure to interest rate risk is considerable. Exposure to FX risk is - due to offsetting FX asset positions - lower than most market observers tend to believe. Particularly Banks are well equipped to counterbalance their large share of FX liabilities within their portfolios. Despite the exposure of single institutions to considerable FX or liquidity risk, calls for an expansion of systemic actions against these risks in microfinance seem to be lacking foundation in the actual data. On an aggregate level, I find it highly unlikely that liquidity risk or FX risk effectively constrain MFIs from expanding their lending activities towards larger

and more long-term microfinance portfolios. The data at hand is obviously silent about whether low levels of risk exposure are merely the success of effective measures against financial risk in the past. Still, without much doubt, the development community should expect larger benefits from policy measures that are targeted towards risks that effectively constrain MFIs from expanding their lending activity both in volume and towards longer-term credit. Further research attempts on financial risk in microfinance will highly profit from an increase in cross-regional data availability, mostly in data on the actual sources of funding grouped into DFI, commercial bank and/or local sources, and the standardized reporting of A&L maturities to MIX.

## References

- Abrams, Julie and Jerome Prieur (2011). *An Empirical Analysis of Foreign Exchange Risk Exposure in Microfinance*. MFX and FMO. URL: [www.microrate.com/media/docs/investment/MFX\\_Risky-Business\\_2011.pdf](http://www.microrate.com/media/docs/investment/MFX_Risky-Business_2011.pdf).
- Barth, James R., Gerard Caprio Jr., and Ross Levine (2013). “Bank regulation and supervision in 180 countries from 1999 to 2011”. In: *Journal of Financial Economic Policy* 5(1), pp. 111–219. DOI: 10.1108/17576381311329661.
- BCBS (2004). *Principles for the Management and Supervision of Interest Rate Risk*. Bank for International Settlements. URL: [www.bis.org/publ/bcbs108.pdf](http://www.bis.org/publ/bcbs108.pdf).
- (2008). *Principles for Sound Liquidity Risk Management and Supervision*. Bank for International Settlements. URL: [www.bis.org/publ/bcbs144.pdf](http://www.bis.org/publ/bcbs144.pdf).
- (2013a). *Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools*. Bank for International Settlements. URL: [www.bis.org/publ/bcbs238.pdf](http://www.bis.org/publ/bcbs238.pdf).
- (2013b). *Supervisory Guidance for Managing Risks Associated with the Settlement of Foreign Exchange Transactions*. Bank for International Settlements. URL: [www.bis.org/publ/bcbs241.pdf](http://www.bis.org/publ/bcbs241.pdf).
- Brewer, Elijah (1985). “Bank Gap Management and the Use of Financial Futures”. In: *Economic Perspectives, Federal Reserve Bank of Chicago* 9(2), pp. 12–22.

- Brom, Karla (2009). “Asset and Liability Management for Deposit-Taking Micro-finance Institutions”. In: *CGAP Focus Note* (55).
- Cornett, Marcia Millon et al. (2011). “Liquidity Risk Management and Credit Supply in the Financial Crisis”. In: *Journal of Financial Economics* 101(2), pp. 297–312. DOI: 10.1016/j.jfineco.2011.03.001.
- Crabb, Peter R. (2004). “Foreign Exchange Risk Management Practices of Microfinance Institutions”. In: *Journal of Microfinance* 6(2).
- CSFI (2011). *Microfinance Banana Skins 2011: Losing its Fairy Dust*. Centre for the Study of Financial Innovation. URL: [www.citigroup.com/citi/microfinance/data/news110125b.pdf](http://www.citigroup.com/citi/microfinance/data/news110125b.pdf).
- Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch (2011). “Does Regulatory Supervision Curtail Microfinance Profitability and Outreach?” In: *World Development* 39(6), pp. 949–965. DOI: 10.1016/j.worlddev.2009.10.016.
- EIU (2011). *Global Microscope on the Microfinance Business Environment 2011*. Economist Intelligence Unit. URL: [www.eiu.com/microscope2011](http://www.eiu.com/microscope2011).
- Featherstone, Scott, Elizabeth Littlefield, and Patricia Mwangi (2006). “Foreign Exchange Rate Risk in Microfinance: What is it and how can it be managed?” In: *CGAP Focus Note* (31).
- Hartarska, Valentina and Denis Nadolnyak (2007). “Do Regulated Microfinance Institutions Achieve Better Sustainability and Outreach? Cross-country Evidence”. In: *Applied Economics* 39(10), pp. 1207–1222. DOI: 10.1080/00036840500461840.

- Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi (2010). “The World-wide Governance Indicators: Methodology and Analytical Issues”. In: *World Bank Policy Research Working Paper* (5430).
- Koch, Timothy W. and Scott S. McDonald (2009). *Bank Management*. 4th ed. Harcourt Brace & Company, Orlando.
- Lahaye, Estelle, Ralitsa Rizvanolli, and Edlira Dashi (2012). “Current Trends in Cross-Border Funding for Microfinance”. In: *CGAP Brief*.
- Littlefield, Elizabeth and Christoph Kneiding (2009). “The Global Financial Crisis and Its Impact on Microfinance”. In: *CGAP Focus Note* (52).
- Lützenkirchen, Cédric and Christian Weistroffer (2012). *Microfinance in Evolution. An Industry between Crisis and Advancement*. DB Research. URL: [www.dbresearch.com](http://www.dbresearch.com).
- Mersland, Roy (2009). “The Cost of Ownership in Microfinance Organizations”. In: *World Development* 37(2), pp. 469–478. DOI: 10.1016/j.worlddev.2008.03.006.
- Mersland, Roy and Reidar Øystein Strøm (2009). “Performance and Governance in Microfinance Institutions”. In: *Journal of Banking & Finance* 33(4), pp. 662–669. DOI: 10.1016/j.jbankfin.2008.11.009.
- Papke, Leslie E. and Jeffrey M. Wooldridge (1996). “Econometric Methods for Fractional Response Variables with an Application to 401(K) Plan Participation Rates”. In: *Journal of Applied Econometrics* 11(6), pp. 619–32. DOI: 10.1002/(SICI)1099-1255(199611)11:6<619::AID-JAE418>3.0.CO;2-1.
- Ramalho, Esmeralda A., Joaquim J.S. Ramalho, and José M.R. Murteira (2011). “Alternative Estimating And Testing Empirical Strategies For



Fractional Regression Models”. In: *Journal of Economic Surveys* 25(1), pp. 19–68. DOI: 10.1111/j.1467-6419.2009.00602.x.

Reille, Xavier, Daniel Rozas, and Sarah Forster (2011). “Foreign Capital Investment in Microfinance: Reassessing Financial and Social Returns”. In: *CGAP Focus Note* (71).

Van Greuning, Hennie and Sonja Brajovic-Bratanovic (2009). *Analyzing Banking Risk*. 3rd ed. World Bank Publications.

Winkler, Adalbert and Charlotte Wagner (2012). “The Financial Crisis a Microfinance Perspective”. In: *Swiss Journal of Business Research and Practice* 66(4), pp. 324–339.

## Figures and Tables from the Text

**Table 1.** Availability of Audited Financial Statements

Yes (information on any of the risks available)	150 (49%)
Yes (no information on any of the risks available)	89 (29%)
No	57 (18%)
Other Language (other than English, Spanish, French, German)	13 (4%)

Baseline Sample: 309 largest MFIs, by total asset volume in MIX in 2011



**Table 3.** Selection Model

	(1) Selection Dummy
NBFI	0.0250 (0.35)
NGO/CreditUnion/Cooperative	-0.211* (-2.52)
Regulatory Quality	0.0176 (1.32)
External Audit Strength	0.132** (2.75)
ln(Assets)	0.0300 (1.22)
AGE (in years)	-0.000687 (-0.27)
ROA	0.00116 (0.28)
East Asia and the Pacific	0.0230 (0.19)
Eastern Europe and Central Asia	0.442*** (4.59)
Latin America and the Caribbean	0.0469 (0.48)
Middle East and North Africa	-0.305* (-2.50)
South Asia	0.00771 (0.07)
Observations	287
Pseudo $R^2$	0.188

Table reports results from a Probit model on which MFIs report detailed data for any of the single risk measures. NBFIs are Non-Banking Financial Institutions. Baseline categories are Bank for legal status and Africa for regions. Results are marginal effects. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ,  $t$ -statistics in parentheses.

**Table 4.** Summary Statistics - Risk Measures

Variable	Obs	Mean	Std. Dev.	Min	Max
Liquidity Coverage (LC)*	117	3.10	4.64	0.19	25.09
Cumulative Interest Gap (CIG)	132	0.27	0.20	0.00	0.80
Net Open FX Position (NOP)	97	0.050	0.08	0.00	0.42
Net Open FX Position incl. OBS positions	95	0.051	0.08	0.00	0.42
Share of FX Assets to Total Assets	93	0.275	0.251	0.00	0.91
Share of FX Liabilities to Total Assets	93	0.280	0.236	0.00	0.80

\*For the LC measure the upper 5% percentile is censored.

**Table 5.** Pairwise Correlations of Main Variables and Controls

	<b>LC</b>	<b>CIG</b>	<b>NOP</b>	<b>Regul</b>	<b>Peg</b>	<b>Assets</b>	<b>Age</b>	<b>De/As</b>
<b>LC*</b>	1							
<b>CIG</b>	0.402	1						
<b>NOP</b>	0.262	0.148	1					
<b>Regul</b>	-0.126	-0.029	0.046	1				
<b>Peg</b>	-0.070	0.039	0.270	-0.227	1			
<b>Assets</b>	-0.213	-0.204	-0.181	0.030	0.033	1		
<b>Age</b>	-0.188	-0.052	-0.178	0.024	0.006	-0.019	1	
<b>De/As</b>	-0.487	-0.442	-0.395	0.203	0.005	0.126	0.274	1
<b>ROA</b>	0.100	0.234	-0.029	-0.006	0.110	-0.016	0.014	-0.056

\*For all correlations involving LC, values above the 95th percentile are being censored. Abbreviations are: Regul = Regulatory Quality, Peg = Dummy for Non-Free-Floating Currencies, Dep/As = Deposits to Assets Ratio

**Table 6.** Summary Statistics - Risk Measures by Legal Status

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Legal Status: Bank</b>					
LC*	51	1.34	0.97	0.19	4.13
CIG	54	0.21	0.18	0.00	0.80
NOP	36	0.03	0.04	0.00	0.20
FX Assets (share)	35	0.35	0.25	0.00	0.79
FX Liabil. (share)	35	0.35	0.25	0.00	0.80
<b>Legal Status: NBF1</b>					
LC*	47	5.01	6.42	0.27	25.09
CIG	57	0.28	0.20	0.00	0.74
NOP	49	0.04	0.08	0.00	0.36
FX Assets (share)	46	0.21	0.22	0.00	0.73
FX Liabil. (share)	46	0.22	0.21	0.00	0.72
<b>Legal Status: NGO/CreditUnion/Cooperative</b>					
LC*	19	3.12	3.53	0.23	13.65
CIG	21	0.37	0.19	0.09	0.75
NOP	12	0.13	0.13	0.00	0.42
FX Assets (share)	12	0.29	0.33	0.00	0.91
FX Liabil. (share)	12	0.33	0.24	0.00	0.67

\*For the LC measure values above the 95th percentile are being censored.

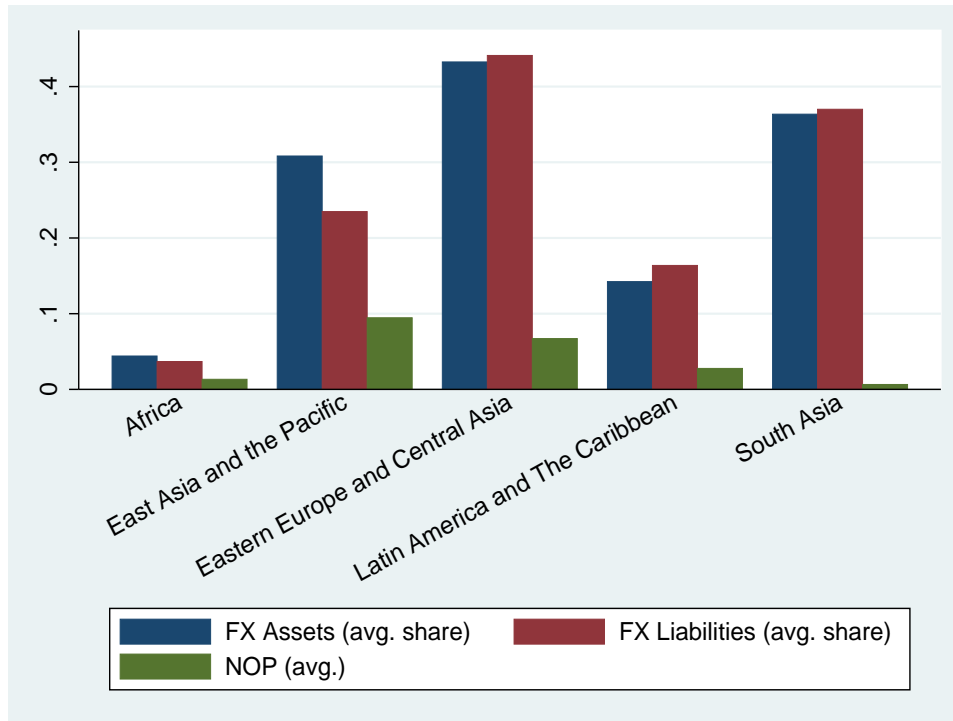
Table 7. Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ln(LC)	ln(LC)	ln(LC)	CIG	CIG	CIG	NOP	NOP	NOP
NBFI	2.537*** (4.60)	1.943*** (3.47)	1.674* (2.26)	0.0674 (1.80)	0.00835 (0.17)	0.00642 (0.12)	0.00669 (0.49)	0.00886 (0.52)	0.0236 (1.21)
NGO/CreditUnion/Cooperative	1.483 (1.25)	1.115 (0.33)	0.937 (-0.21)	0.153** (3.14)	0.0633 (1.05)	0.0666 (1.01)	0.0712* (2.44)	0.0886* (2.09)	0.134** (2.76)
Regulatory Quality	0.936 (-1.33)	0.947 (-1.13)	0.986 (-0.30)	-0.00266 (-0.32)	0.00169 (0.24)	0.00343 (0.50)	0.00282 (0.74)	0.00311 (0.78)	0.00315 (0.88)
ln(Assets)		0.752*** (-3.58)	0.763** (-3.35)		-0.0495* (-2.33)	-0.0443 (-1.89)		-0.00635 (-0.64)	-0.00171 (-0.19)
AGE (in years)		0.979* (-2.31)	0.984 (-1.37)		-0.00169 (-1.18)	-0.000168 (-0.09)		-0.00398** (-3.26)	-0.00231 (-1.70)
ROA		1.024 (0.67)	1.063 (1.60)		0.0115 (1.56)	0.0163* (2.44)		-0.00388 (-1.46)	-0.00515 (-1.59)
East Asia and the Pacific			2.222* (2.17)			0.0158 (0.21)			0.0568 (1.53)
Eastern Europe and Central Asia			2.071* (2.08)			0.0136 (0.19)			0.0399 (1.55)
Latin America and the Caribbean			2.480** (2.97)			-0.0233 (-0.31)			-0.00640 (-0.36)
South Asia			4.692*** (3.40)			0.159 (1.86)			-
Middle East and North Africa			-			-0.0320 (-0.46)			-
Non-Free-Floating Dummy							0.0402* (2.05)	0.0475** (2.63)	0.0231 (1.51)
Observations	114	113	113	129	128	128	94	94	94
$R^2$ (1-3) - $BIC$ (4-9)	0.159	0.278	0.366	-582.3	-565.0	-547.2	-396.7	-384.6	-371.8

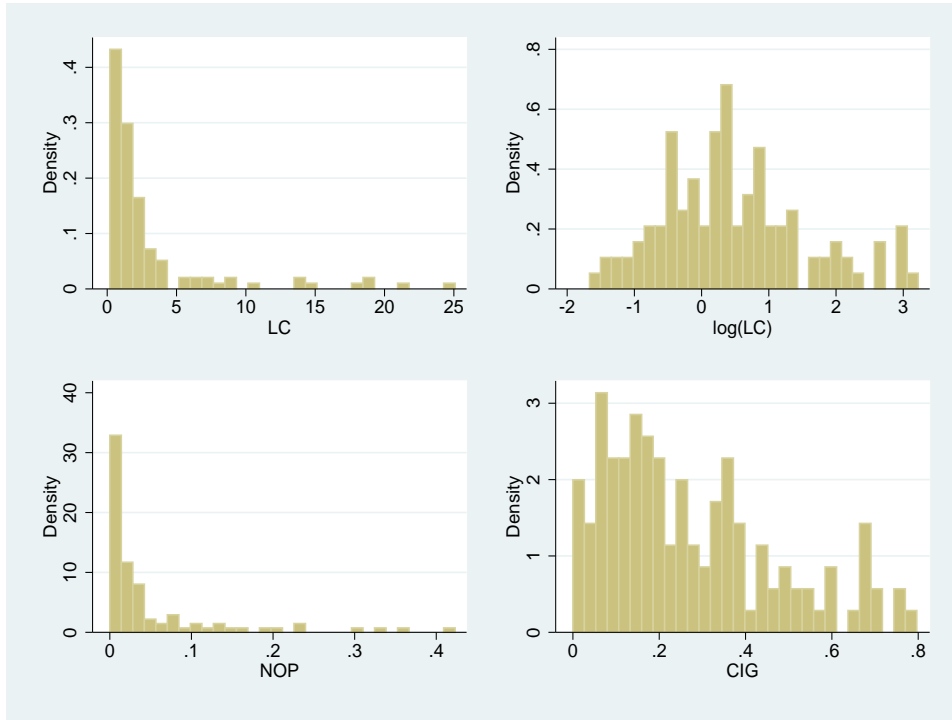
Columns (1)-(3) report results for OLS estimation. Coefficients are exponentiated. Values smaller than one indicate negative effects. Columns (4)-(9) report results for a fractional logit estimation. Reported Coefficients are marginal effects. NBFIs are Non-Banking Financial Institutions. Baseline categories are Bank for legal status and Africa for regional dummies. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , t-statistics in parentheses. The model was estimated including a constant term.



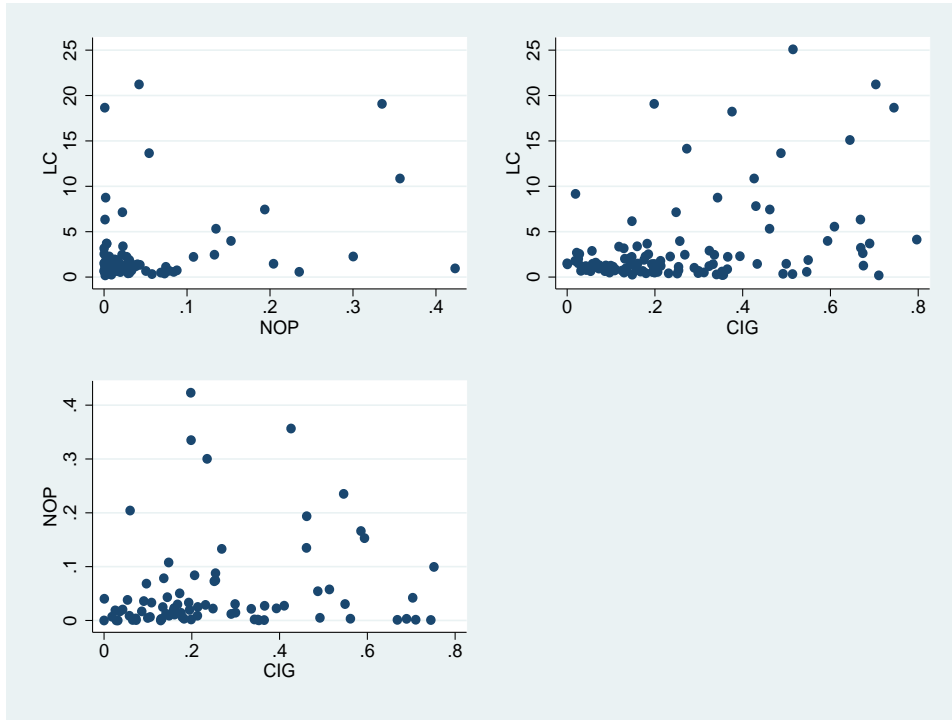
## Appendix



**Figure 1**  
FX Exposure by Region



**Figure 2**  
Densities of the Risk Measures



**Figure 3**  
Scatterplots for the Risk Measures

**Table 8.** Results - Deposit Taking Only

	(1) ln(LC)	(2) ln(LC)	(3) ln(LC)
NBFI	2.119*** (3.56)	1.628* (2.57)	1.544* (1.99)
NGO/CreditUnion/Cooperative	0.889 (-0.28)	0.652 (-1.02)	0.577 (-1.57)
Regulatory Quality	0.941 (-1.40)	0.946 (-1.33)	0.983 (-0.43)
ln(Assets)		0.742*** (-3.62)	0.781** (-3.06)
AGE (in years)		0.988 (-1.37)	0.997 (-0.27)
ROA		1.097 (1.80)	1.130* (2.62)
East Asia and the Pacific			2.528* (2.64)
Eastern Europe and Central Asia			2.414** (2.91)
Latin America and the Caribbean			2.293** (2.96)
South Asia			5.576*** (3.65)
Constant	2.019 (1.48)	673.7*** (3.84)	53.16* (2.34)
Observations	89	89	89
$R^2$	0.145	0.272	0.423

Columns (1)-(3) report results for OLS estimation. Coefficients are exponentiated. Values smaller than one indicate negative effects. NBFIs are Non-Banking Financial Institutions. Baseline categories are Bank for legal status and Africa for regional dummies. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , t-statistics in parentheses.