



Credit risk in Islamic microfinance institutions: The role of women, groups, and rural borrowers

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ABSTRACT

Using international data, we find that Islamic MFIs experience reduced credit risk by offering more groups loans, serving more women, and serving more borrowers in rural locations. Conventional MFIs benefit from fewer group loans, less loans to rural borrowers, and a greater focus on female borrowers. Our results contribute to microfinance and financial inclusion literature by highlighting the potential of tapping into the social dynamics within Muslim communities. We present encouraging insights for Islamic MFIs donors and managers on the possibility of promoting the financial inclusion of women and rural borrowers without compromising the quality of the credit portfolio.

1. Introduction

The commercial banking system has traditionally been unable to adequately cater to the financing needs of individuals in poverty and micro-entrepreneurs. The small size of financing they typically require tends to be associated with relatively higher transaction costs, and their inability to provide collaterals exposes banks to a greater degree of risk (Armendariz and Morduch, 2005). This has created a need for microfinance institutions (MFIs) that have stepped in to enhance the financial inclusion of such individuals by providing a source of financing to this segment of clients who are otherwise excluded from the commercial financial system. In 2018, MFIs around the world had a total credit portfolio of approximately \$124.1 billion and served 139.9 million borrowers (Convergences, 2019). Financing economically disadvantaged individuals involves a great degree of information asymmetry and enforcement is a relevant challenge, as many MFI clients may have no stable source of income to provide reassurance of their repayment (Chliova et al., 2015). This is commonly coupled with the absence of loan collaterals and weak judicial systems in many developing countries, which places the burden of enforcement in the hands of MFIs (Stef and Dimelis, 2020). Due to the heightened risk profile of their client base and the difficulty of acquiring collaterals, credit risk remains an imperative concern for MFIs (Maes and Reed, 2012). Therefore, the study of credit risk is critical to the discussion on whether the operations of microfinance institutions can be sustained for prolonged periods, and gains importance in light of the recent stream of literature emphasizing the need for microfinance institutions to shift away from dependence on donors and governments to fund their operations towards a more sustainable form of business (e.g.

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Robinson, 2001; Rhyne and Otero, 2006; Hermes and Lensink, 2011; Hudon and Traca, 2011; D'Espallier et al., 2013; Churchill, 2019). While some MFIs boast considerably high repayment rates, it is important to consider that MFIs continue to target the relatively wealthier poor rather than reaching the “poorest of the poor”, who are inherently riskier (Coleman, 2006). As MFIs strive to refocus on their social mission and extend outreach to the poorest communities (Bajde et al., 2021), it is inevitable that their risk exposure will simultaneously increase. A thorough understanding of credit risk will help to prepare MFIs for this focus.

Typically, credit provided by MFIs takes the form of interest-bearing loans that have often been characterized by exorbitant interest rates (Adusei, 2021), making it increasingly difficult for the poor to fulfill repayment. Islamic microfinance is an alternative model of microfinance which prohibits charging interest on loans, and instead proposes financing through partnership, profit-and-loss sharing (PLS), leasing assets, selling assets at a markup, or interest-free lending (Ahmad et al., 2020). This model has enhanced the financial inclusion of poor Muslim populations that have been unable to utilize conventional microfinance for religious reasons (Azmat et al., 2021). As Islamic and conventional MFIs do not operate on the same tenants, and due to the differences in their financial contracts, clients, and their disproportionate ability to take action against delinquent borrowers, it is rational to expect that their credit risk exposure may vary in terms of type, magnitude and determinants as is the case in the banking sector. It is of value to examine whether the factors that affect the credit risk of the two MFIs types differ in order to guide risk mitigation prescriptions.

Several drivers of credit risk in conventional MFIs are well-documented in the literature, including group lending (e.g. Varian, 1990; Sharma and Zeller, 1997; Armendariz de Aghion and Morduch, 2000; Kono and Takahashi, 2010; Al-Azzam et al., 2012; Giné and Karlan, 2014; Lassoued, 2017), lending to women (e.g. Reinke, 1998; Schreiner, 2004; D'Espallier et al., 2011; D'Espallier et al., 2013; El-Komi and Croson, 2013; Lassoued, 2017; Chikalipah, 2018), and lending to rural borrowers (Nelson and Cruz-Letona, 1991; Zamore et al., 2019). To the best of our knowledge, there is no study that examines how these three factors influence the credit risk of Islamic MFIs in comparison to their conventional counterparts. Due to the influence of religiosity on social dynamics and economic behavior (Greif, 1994), there is reason to believe that relevant differences may exist across the two MFI types, which would contribute to informing the risk management decisions of policy makers and managers in Islamic MFIs. Our work addresses this gap in the literature by comparing the determinants of credit risk across 1519 Islamic and conventional MFIs in 54 countries between 1999–2019, in the geographic regions where most Islamic MFIs are located. Another contribution of our work is that we examine three determinants of different aspects of credit risk in Islamic MFIs by using six risk proxies. We examine how these factors influence the effective level of short-term and long-term delinquencies experienced by MFIs (as measured by the portfolio at risk over 30 and 90 days). In addition, we use a measure of credit risk based on the subjectivity of MFIs (write-off ratio). We also use a composite risk measure that is a sum of the preceding two measures. Moreover, we investigate the factors influencing MFIs' relative risk standing by using a relative risk measure (z-score). Finally, we apply a risk measure that reflects local regulatory standards and the judgement of MFIs of their risk exposure (impairment loss allowance).

Using a generalized method of moments (GMM) methodology, we find that Islamic MFIs experience lower levels of credit risk with increased group lending, in line with prior studies suggesting that Muslim groups exhibit enhanced social dynamics and experience greater social pressure to conform (Greif, 1994; Karim et al., 2008), leading to enhanced repayment rates due to religiosity (Al-Azzam et al., 2012). However, the opposite relation is found among conventional MFIs, potentially due to strategic defaults (Besley and Coate, 1995; Giné et al., 2011), which are less likely to occur in religious organizations (Clark et al., 2021). Our findings on lending to women indicate preferable repayment rates among conventional MFIs with a greater female-orientation, and this relationship is amplified in Islamic MFIs, likely attributable to the religiosity of female borrowers (Miller and Stark, 2002) and the role of religiosity in improving repayment rates (Al-Azzam et al., 2012; Nawai and Shariff, 2012; Baele et al., 2014; Clark et al., 2021; Gyapong et al., 2021). We find that conventional MFIs experience higher credit risk as they increase the proportion of their loan portfolio allocated to borrowers in rural areas as suggested by prior studies (Nelson and Cruz-Letona, 1991; Viganò, 1993; Zamore et al., 2019; Möllmann et al., 2020), while Islamic MFIs exhibit more favorable risk outcomes possibly due to traits of honesty among the poor (Chikalipah, 2018). Our results also point towards the presence of higher risk-aversion behavior in Islamic MFIs that contributes to increased write-offs for female and rural borrowers (Gao et al., 2017), despite the positive outcomes in their effective repayment rates.

This study contributes to the literature on Islamic microfinance by presenting insights on three key determinants of credit risk for Islamic MFIs, namely, group lending, lending to women, and lending to rural borrowers. However, our findings also present relevant insights for Islamic MFI policy makers. While conventional MFIs often experience a tradeoff in their ability to attain their social and financial objectives concurrently (Zainuddin and Yasin, 2019), Islamic MFIs in this study do not appear to face such a tradeoff. Islamic MFIs are able to serve disadvantaged communities, including rural and female demographics, without compromising the quality of their credit portfolio. This presents promising potential for Islamic MFIs to enhance the financial inclusion of these populations, which is critical for donors to Islamic MFIs (Mohamed and Elgammal, 2022). Islamic MFIs can also benefit from tapping into the existing social dynamics within Muslim communities in structuring their financial contracts, including the utilization of group lending.

The remainder of this paper is structured as follows. Section 2 introduces relevant background information on credit risk in Islamic financial institutions. Section 3 discusses the literature pertaining to the three factors we explore and develops the research hypotheses. Section 4 proceeds to explicate the data and methodology used in the analysis. A discussion of the results is presented in section 5, and the final section concludes.

2. Background on credit risk in islamic financial institutions

Islam prohibits interest on loans, which excludes religious Muslim borrowers from access to finance through conventional MFIs. By offering financing that is compliant with religious rulings, Islamic financial institutions are able to cater to this religiously-conscious Muslim populace (Azmat et al., 2021). Islamic MFIs provide a variety of financing options extending beyond merely providing interest-

free loans (Manan and Shafiai, 2015). Obaidullah (2008) categorizes the financial contracts of Islamic MFIs into micro-equity and micro-credit. Micro-equity utilizes modes of financing that involve a partnership-based capital contribution by the MFI such as in *mudaraba* (trustee financing) and *musharaka* (partnership). Such contracts involve the sharing of profits and losses by the MFI and client. This financing is particularly relevant for financing micro businesses that have better bookkeeping practices and would expose the MFI to a smaller degree of moral hazard risk. Micro-credit financing utilizes financing modes that create debt such as *murabaha* (cost-plus financing), *ijara* (leasing), and *qard* (interest-free loan). Many Islamic MFIs often do not offer a diverse range of options, with many either exclusively offering *murabaha* or interest-free loans (Obaidullah and Khan, 2008; Cameron et al., 2021).¹

The importance of the comparisons of credit risk across the Islamic and Conventional MFIs emerges from the differences in the financial contracts across Islamic and conventional MFIs, in addition to the nature of their exposure to credit risk and the methods at their disposal to address it. Traditional risk-hedging instruments are not accessible to Islamic institutions as they cannot engage in interest-bearing transactions (Kabir et al., 2015; Lassoued, 2018). This, coupled with the complexity of Islamic financial contracts and the room for moral hazard in profit and loss sharing (PLS) arrangements, is likely to increase the credit risk in Islamic MFIs (Abedifar et al., 2013). Islamic financial institutions are also be unable to take legal action against defaulting clients in the case of honest defaults (Kabir et al., 2015). Nevertheless, the religiosity of borrowers from Islamic financial institutions may be associated with a greater degree of loyalty, which in turn would amount to a lower probability of default and lower credit risk (Al-Azzam et al., 2012; Nawai and Shariff, 2012; El-Komi and Croson, 2013; Baele et al., 2014). While conventional MFIs mostly rely on peer pressure to solicit loan repayment, Islamic microfinance can also rely on pressure from the religious community to appeal to a sense of religious duty in order to induce conformity in repayment schedules (Karim et al., 2008).

Comparisons of credit risk in Islamic and conventional banks in prior literature present conflicting findings (Hassan and Aliyu, 2018). Some studies report similar credit risk in both bank types (Zins and Weill, 2017), with a difference only apparent during crises (Beck et al., 2013). Another part of the literature finds that Islamic banks face lower credit risk than their conventional counterparts (Boumediene, 2011; Abedifar et al., 2013; Baele et al., 2014; Chamberlain et al., 2018; Safiullah and Shamsuddin, 2018). This holds even in institutions that offer Islamic alongside conventional financing facilities (How et al., 2005). In contrast, Lassoued (2018) reports that Islamic banks exhibit higher levels of credit risk, and they are more likely to fail than their conventional counterparts (Alandejani et al., 2017). Kabir et al. (2015) and Zins and Weill (2017) suggest that the difference in credit risk across Islamic and conventional banks depends on the measure of credit risk used. In microfinance, such a comparison is conducted by Fan et al. (2019) who argue that Islamic MFIs have less credit risk than their conventional peers due to greater honesty induced by the religiosity of their client base and the provision of partnership-based financing that allows MFIs greater oversight and involvement in the clients' behavior. El-Komi and Croson (2013) document greater repayment rates among Islamic financial contracts such as PLS arrangements, in comparison to conventional interest-bearing loans. Moreover, investment deposits in Islamic MFIs are often issued on a PLS basis, which motivates depositors to impose greater pressure on the MFI's management to ensure effective oversight of clients (Cihák and Hesse, 2008; Fan et al., 2019).

3. Literature review and hypothesis development

With the exception of Fan et al. (2019), we are not aware of any study that conducts a comparative assessment of credit risk and its determinants for Islamic and conventional MFIs. The analysis of Fan et al. (2019) is focused on examining the relationship between credit risk and a number of financial ratios, MFI age and their target market. Additionally, although not a comparative study, Noomen and Abbes (2018) is among the earlier studies examining the factors influencing the credit risk of Islamic MFIs. Focusing exclusively on a sample of Islamic MFIs, Noomen and Abbes (2018) explores factors including return on assets (ROA), provisions, risk coverage, portfolio yield and the debt ratio. Fianto et al. (2019) also address loan repayment in Islamic MFIs and focus exclusively on Islamic MFIs in Indonesia, considering borrower-level data on borrower age, gender, education, occupation, type of financial contract, loan amount, location, and distance from the MFI. The focus of our study is to examine the impact of three factors on the credit risk of Islamic MFIs in comparison to their conventional counterparts, namely, group lending, lending to women, and rural lending.

The current paper extends upon the work of Noomen and Abbes (2018), Fan et al. (2019) and Fianto et al. (2019). We utilize MFI-level data and contribute to filling the gap in the literature on the comparison of credit risk determinants across Islamic and conventional MFIs, with a particular focus on characteristics pertaining to the group, female and rural constituencies of their credit portfolio. We distinguish our work from Noomen and Abbes (2018), Fan et al. (2019) and Fianto et al. (2019) by being the first study that accounts for the extent of lending to groups, lending to women and lending to rural demographics in Islamic MFIs, which are important characteristics of the MFI loan portfolio which have a notable influence on the repayment rates of MFIs and would provide important insight for policy makers. Although our work overlaps with Fianto et al. (2019) in terms of the consideration of borrower gender, we extend upon their study in a number of respects. While Fianto et al. (2019) examine a sample of 140 clients of Islamic microfinance in Indonesia and examine client-level data, we examine an international sample of MFIs using MFI-level data for Islamic and conventional MFIs.

The conventional microfinance literature has presented extensive insights on the credit risk implications of group lending (eg. D'Espallier et al., 2011; Al-Azzam et al., 2012; Banerjee, 2013), lending to women (Reinke, 1998; Schreiner, 2004; D'Espallier et al., 2011; D'Espallier et al., 2013; El-Komi and Croson, 2013; Lassoued, 2017; Chikalipah, 2018), and lending to rural borrowers (eg.

¹ Murabaha allows MFIs to reclaim the financed asset in case the client does not meet the payment schedule.

Nelson and Cruz-Letona, 1991; Zamore et al., 2019), and they have been recognized as important determinants of risk. To the best of our knowledge, these factors have yet to be explored among Islamic MFIs. The following subsections discuss the literature examining the impact of these variables on credit risk and develop the study's hypotheses.

3.1. Group lending

Group lending involves the collective financing of a self-formed group of individuals. Its highly-applauded success in Grameen Bank proved that group lending can enhance repayment rates particularly in remote areas and in areas with elevated poverty levels (Sharma and Zeller, 1997; Lassoued, 2017). In small, tight-knit communities where individuals know each other well, providing credit to groups allows MFIs to tap into the knowledge of local individuals of their community. Peer monitoring helps MFIs overcome their informational disadvantage, as the information asymmetry between group members tends to be substantially lower than that between the MFI and its clients (Stiglitz, 1990). The group members are able to enact social sanctions (Besley and Coate, 1995; Morduch, 1999), which can effectively induce discipline among group members (Baland et al., 2017). The arrangement also entails that each member of the group is liable for the debt of other members. This draws group members to monitor one another throughout the credit duration (Varian, 1990), which may reduce moral hazard as the resulting peer pressure creates an incentive for individuals to meet their repayment schedule (Giné and Karlan, 2014). Although an individual would incur no monetary cost if they choose to default on their non-collateralized loans, bank pressure and the risk of tainting their reputation and losing social trust constitute nonfinancial costs that can be effective in disciplining borrowers (Armendariz de Aghion and Morduch, 2000; Kono and Takahashi, 2010; Giné and Karlan, 2014).

Such social dynamics are more pronounced in Islamic communities where social pressure is amplified by additional pressure from the religious community (Karim et al., 2008). Drawing on economic game theory, Greif (1994) highlights the inclination of collectivist communities to exhibit more extensive communication within groups, in addition to a greater likelihood of enacting social sanctions and collective moral sanctioning against deviants. This is evident within the context of Muslim societies as opposed to their peers in non-Muslim communities with individualist cultures (Greif, 1994). More recent insight suggests that group lending is particularly effective in societies characterized by low individualism and high power-distance, which are indicative of greater group-centric decision making and social collateral (Ahsan, 2011). These are common characteristics of Muslim communities (Basabe and Ros, 2005), and may amount to a possible difference in the effectiveness of group lending across Islamic and conventional MFIs. Empirical research reinforces this sentiment, finding that repayment rates are enhanced among groups composed of members that are more religious (Al-Azzam et al., 2012). Profit-sharing contracts offered by Islamic MFIs, when coupled with peer-monitoring arrangements, can produce better outcomes than interest-bearing loans (Cameron et al., 2021).

Nevertheless, group lending does not always necessitate better repayment (D'Espallier et al., 2011; Banerjee, 2013). In practice, group members may be hesitant to report their non-compliant peers for fear of losing social capital (Banerjee, 2013). While group lending may incentivize individuals to cover repayment for their fellow group members who are unable to comply, it is also possible that all the group members may strategically default, including those that may have repaid if financed individually (Besley and Coate, 1995; Giné et al., 2011). Such behavior may offset the benefits accruing to MFIs from compliant groups. This is especially the case for conventional MFIs since Islamic MFIs can benefit from more pronounced social dynamics. Social capital developed through religious organizations is associated with lower mortgage defaults, and particularly lower strategic defaults (Clark et al., 2021). Accordingly, while Islamic MFIs are hypothesized to benefit from group lending, the relationship between credit risk and group lending among conventional MFIs is ambiguous:

H1a. There is a significant relationship between group lending and the credit risk of conventional MFIs.

H1b. There is a negative relationship between group lending and the credit risk of Islamic MFIs.

3.2. Lending to women

A substantial amount of research has investigated lending to female borrowers in MFIs, finding evidence that women tend to exhibit better repayment rates than men (e.g. Reinke, 1998; Schreiner, 2004; D'Espallier et al., 2011; D'Espallier et al., 2013; El-Komi and Croson, 2013; Lassoued, 2017; Chikalipah, 2018) and are perceived to be more trustworthy by MFIs (Aggarwal et al., 2015). Women's favorable repayment behavior can potentially be attributed to a number of factors. Women tend to be more financially risk averse than men (Jianakoplos and Bernasek, 1998) and may be warier of aggression and verbal backlash by MFIs staff and fellow group members in the event of default, as opposed to men who may be more defiant and argumentative (Rahman, 1999). Additionally, while men have greater access to both formal and informal credit providers, women may be more inclined to comply as they have less access to credit, leaving them with fewer alternative options of attaining financing in the future in case they default on their current obligation (Ghosh and Vinod, 2017). Women also tend to remain closer to their homes and are thus easier to locate, whereas men may be harder to find if they are having issues with repayment (Armendariz and Morduch, 2005).²

By factoring in a religious-orientation among borrowers, the gender gap in repayment rates may become more pronounced. Women are generally more religious than men (Miller and Stark, 2002), which can translate into better repayment performance. This is

² There are also a few studies where no differences in repayment performance across genders is reported (Godquin, 2004; Dorfleitner et al., 2017).

expected to be amplified when coupled with the religiosity of Islamic MFI clients to induce more compliant behavior and greater commitment to repayment (Al-Azzam et al., 2012; Nawai and Shariff, 2012; Baele et al., 2014; Clark et al., 2021). Religiosity amplifies trustworthiness (Tan and Vogel, 2008), which in turn has a mediating effect on the gender gap in micro loans repayment rates (Shahriar et al., 2020). This would suggest better repayment performance among female borrowers in Islamic MFIs. Although it is worth noting that Gyapong et al. (2021) do not find evidence of improved repayment rates among religious Christian female borrowers. We extend upon the findings of Gyapong et al. (2021) to examine whether women in Islamic religious contexts exhibit similar patterns to those in Christian contexts. The hypotheses we test are:

H2a. There is a negative association between the proportion of female borrowers and the credit risk of conventional MFIs.

H2b. There is a negative association between the proportion of female borrowers and the credit risk of Islamic MFIs.

3.3. Rural lending

Economically disadvantaged clients, who often lack regular streams of income and often have no collateral to offer when obtaining credit, tend to be located in rural areas which can increase the risk of MFIs (Kabeer et al., 2012; Hermes and Hudon, 2018). As suggested by agency theory, greater geographical diversification of MFIs is associated with greater credit risk, as monitoring distant locations becomes more difficult (Zamore et al., 2019). Importantly, microfinancing in rural areas also often focuses on financing agricultural activities, which are characterized by volatile income streams depending on seasonal and climatic contingencies, presenting a challenge for borrowers in meeting repayment schedules. Lending in rural areas subjects MFIs to greater credit risk because borrowers engaged in farming activities are exposed to unexpected natural factors such as crop and livestock illness, floods or droughts, which may hinder timely repayment or result in defaults (Zamore et al., 2019). Farmers with seasonal agricultural output are more prone to insolvency as their income depends on fluctuating weather conditions (Viganò, 1993; Möllmann et al., 2020). Rural smallholders with limited market power may also be forced to sell their products with no control over the price, which could hinder their repayment ability (Hossain et al., 2019). Rural microfinance may thus experience high default rates (Nelson and Cruz-Letona, 1991) and rural firms may experience higher credit risk than urban firms (Chen, 2016). This also holds for rural Islamic financial institutions as they typically cater to smaller and riskier clients than their counterparts in urban settings (Trinugroho et al., 2018).

On the other hand, poor borrowers, who are often located in rural areas (Kabeer et al., 2012; Hermes and Hudon, 2018), tend to exhibit traits of honesty by accomplishing better repayment rates (Chikalipah, 2018). Driven by religious values, we hypothesize that this effect may be pronounced among Islamic MFIs serving rural borrowers. Religious beliefs have been found to contribute to a greater engagement in farmer entrepreneurship by rural households in emerging markets (Miao et al., 2021). As an explanation, Miao et al. (2021) suggest that religious beliefs promote trust and harmonious relationships within communities, which enhances their social capital for entrepreneurship, promotes a sense of social responsibility and prosocial behavior, and may motivate personal development and education, thus building human capital for entrepreneurship in rural contexts. The stronger social and entrepreneurial dynamics among religious, rural communities may provide insight for Islamic MFI outcomes, so we hypothesize the following:

H3a. There is a positive association between the proportion of rural borrowers and the credit risk of conventional MFIs.

H3b. There is a negative association between the proportion of rural borrowers and the credit risk of Islamic MFIs

4. Data, variables, and methodology

4.1. Data description

Firm level data on microfinance institutions is obtained from the Microfinance Information Exchange (MIX), which is available through the World Bank. It is the most widely used database in the literature on microfinance (Reichert, 2018). Our analysis is restricted to the MFIs from the Middle East and North Africa (MENA), South Asia (SA) East Asia and Pacific (EAP), and Eastern Europe and Central Asia (EECA) regions. A list of the countries included in the sample and the number of MFIs in each can be found in Appendix A. These regions are selected as they have both Islamic and conventional MFIs. Data on whether each MFI is Islamic or not is manually collected. First, the list of MFIs is obtained from MIX Market. The websites and published reports on each MFI are then examined to acquire information on the financial products offered by each of the MFIs incorporated in the database. Any MFI found to offer Islamic financial contracts as of the time of the study, is categorized as Islamic. Islamic financial contracts are those that are compliant with Islamic jurisprudence (*shariah*). The MFI is categorized as conventional otherwise. An unbalanced panel dataset of an international sample of 1519 microfinance institutions, located in 54 countries is utilized over 1999–2019.

4.2. Variable definitions

We use six measures of credit risk that are well documented in the literature. The first measure is the portfolio at risk over 90 days which is the value of loans outstanding over 90 days past due as a ratio of the MFI's gross loan portfolio (Chikalipah, 2018; de Oliveira Leite et al., 2020). This provides an appropriate measure of nonperforming loans as the Basel Committee defines non-performing exposures as those which are over 90 days due, indicating a status of delinquency with unlikely repayment (Basel Committee on Banking Supervision, 2016). As MFI's loans generally have shorter terms than those of commercial banks, a shorter period for the portfolio at risk is also considered. Therefore, our second measure is the portfolio at risk over 30 days, calculated as the value of loans

outstanding that are over 30 days past due as a ratio of the gross loan portfolio for each MFI (Möllmann et al., 2020; Tchakoute Tchuigoua et al., 2020; Castellani and Afonso, 2021; Hessou et al., 2021). Our third proxy is the write-off ratio that represents the proportion of an MFI's loans that are removed from its gross loan portfolio balance, as repayment is unlikely. It is computed as the total value of loans written off, as a ratio of the average gross loan portfolio and has been used by studies including Gonzalez (2010), D'Espallier et al. (2011), and Chakravarty and Pylypiv (2015). Our fourth measure is a composite risk measure, composed of the sum of the portfolio at risk over 30 days and the write-off ratio (Gonzalez, 2010; Chakravarty and Pylypiv, 2015; Zamore et al., 2019).

The z-score is used as the fifth measure and is calculated by subtracting the mean composite risk from each MFI's composite risk, divided by the standard deviation of the composite risk. It provides a relative measure of an MFI's credit risk and its divergence from the mean (Zamore et al., 2019). Finally, the impairment loss allowance represents the provisions kept to cover the risk of experiencing losses in the gross loan portfolio arising as a result of defaults, as a ratio of the gross loan portfolio. According to the Financial Accounting Standards Board (FASB), allowances for credit losses are held based on a number of factors including default rates, delinquency rates and the percentage of nonperforming assets (FASB, 2019). Additionally, Principle 18 of the core Basel Standards dictates that provisions and reserves shall be maintained for problem assets (Basel Committee on Banking Supervision and Bank for International Settlements, 2012). Greater provisions tend to be held when the financial quality of a bank's portfolio is weaker (Misman et al., 2015; Banto and Monsia, 2020). Therefore, the allowance holdings are directly proportional to these elements of loan nonperformance and can be considered as an additional measure of credit risk. This measure has been used by prior studies including Zamore et al. (2019).

The first two measures provide insight into the effective level of delinquencies experienced by the MFI. The third includes an element of subjectivity on the part of the MFI, as the MFI concludes that repayment is unlikely. The composite risk measure combines both of these aspects by providing a sum of the second and third measures. To examine how the risk of one MFI compares to its peers, the z-score provides a relative measure, indicating how far an MFI is from the mean. Finally, the sixth measure is also influenced by factors such as local regulatory standards, as well as the judgement of MFIs of their risk exposure and in turn how much would need to be held in provisions.

The three independent variables of interest, namely, lending to women, groups and rural borrowers, are measured as the proportion of an MFI's total active borrowers that are female, the proportion of an MFI's gross loan portfolio allocated to groups, and the proportion of total active borrowers that are in rural locations, respectively. Appendix B lists and defines the variables to be used in the analysis.

4.3. Descriptive statistics and correlations

Table 1 presents summary statistics of the variables. The statistics indicate that approximately 5% of MFIs in the sample are Islamic, constituting a minority of the total number of MFIs. Table 2 indicates that the MENA region is home to the largest concentration of Islamic MFIs. Of the total number of observations in the sample belonging to MFIs in the MENA region, approximately a quarter are Islamic. This number is considerably smaller in the SA, EAP and EECA regions where only 6.89%, 0.89% and 0.55% of observations belong to Islamic MFIs, respectively. Some MFIs in the sample experience considerable levels of credit risk. Long-term delinquencies exceeding 90 days reach up to 64.3% of the gross loan portfolio, while short-term delinquencies exceeding 30 days constitute from 0% up to 71% of loans.³ MFIs also have a write-off ratio reaching up to 19% of their loan portfolio.

Comparing the credit risk measures across Islamic and conventional MFIs using a univariate *t*-test, reported in Table 3, indicates that Islamic MFIs tend to experience higher risk levels than their conventional peers. The same conclusion is arrived at through propensity score matching (Rosenbaum and Rubin, 1983) using a Probit model and the nearest neighbor technique with replacement, where the treatment and control groups are defined as the sample of Islamic and conventional MFIs, respectively, and are matched on the set of controls referred to in section 4.4 and defined in Appendix B.

Table 4 presents the correlations and variance inflation factor (VIF) between the variables. The VIF values are consistently less than 2, which is well below the rule of thumb of 10 (Marquardt, 1970), and the correlations among the explanatory variables are generally low. These results suggests that multicollinearity is not likely to pose a serious concern.

4.4. Methodology

The general specification of the estimated panel models are as follows:

$$CR_{i,t} = \beta_0 + \beta_1 GROUP_{i,t} + \beta_2 FEMALE_{i,t} + \beta_3 RURAL_{i,t} + \beta_4 ISLAMIC_i + \beta_5 GROUP_{i,t} * ISLAMIC_i + \beta_6 FEMALE_{i,t} * ISLAMIC_i + \beta_7 RURAL_{i,t} * ISLAMIC_i + \sum_{j=1}^J \alpha_j X_{jit} + \gamma CR_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

The dependent variable, $CR_{i,t}$, denotes each of the six credit risk measures for MFI i in year t : the portfolio at risk exceeding 30 days overdue ($PAR30$), the portfolio at risk exceeding 90 days overdue ($PAR90$), the write-off ratio ($WRITEOFF$), a composite measure of risk ($COMP$), the z-score ($ZSCORE$) and impairment loss allowances (ILA). The independent variables include the proportion of the MFI's loan portfolio allocated to group lending ($GROUP$), and the proportion of the MFI's active borrowers that are female ($FEMALE$)

³ All variables are winsorized at the 1% level.

Table 1
Descriptive statistics.

	Obs.	Mean	St.Dev	Min	Max	Q1	Median	Q3
PAR30	7616	0.061	0.111	0	0.710	0.005	0.022	0.064
PAR90	6494	0.046	0.097	0	0.643	0.002	0.013	0.043
WRITEOFF	6563	0.013	0.029	0	0.190	0	0.002	0.011
COMP	6284	0.074	0.126	0	0.800	0.009	0.030	0.082
ZSCORE	6284	−0.023	0.753	−0.465	4.304	−0.413	−0.285	0.026
ILA	9106	0.036	0.054	0	0.375	0.008	0.020	0.041
FEMALE	7808	0.685	0.301	0.029	1	0.420	0.747	0.996
RURAL	4218	0.616	0.312	0	1	0.400	0.668	0.889
GROUP	3806	0.446	0.45	0	1	0	0.261	0.992
ISLAMIC	10,067	0.046	0.209	0	1	0	0	0
OFFICERS	7070	2.590	6.259	0.010	44.090	0.130	0.510	0.191
NEW	2427	0.459	0.333	0	1.761	0.226	0.392	0.605
LOANSIZE	9013	−1.237	1.214	−3.747	2.293	−2.119	−1.420	−0.441
YIELD	6749	0.286	0.139	0.021	0.798	0.197	0.256	0.353
TA	9628	15.412	2.204	10.024	20.818	13.863	15.330	16.879
DEPOSITS	7166	0.216	0.277	0	0.910	0	0.043	0.385
GROWTH	7799	0.430	0.826	−0.527	5.638	0.049	0.228	0.517
NGO	10,067	0.294	0.455	0	1	0	0	1
ROA	7809	0.017	0.088	−0.464	0.229	0.002	0.023	0.051

Table 2
Proportion of Islamic MFI observations by region.

Region	Islamic				Conventional
	Percent	Obs. Freq.	Percent	Obs. Freq.	
Middle East and North Africa (MENA)	24.01	182	75.99	576	
South Asia (SA)	6.89	239	93.11	3230	
East Asia and Pacific (EAP)	0.89	23	99.11	2554	
Eastern Europe and Central Asia (EECA)	0.55	18	99.45	3245	

Table 3
Credit risk in Islamic and conventional MFIs.

	Mean		t-stat	ATET
	Conventional	Islamic		
PAR30	0.059	0.091	−5.35***	0.048**
PAR90	0.045	0.067	−4***	0.045**
WRITEOFF	0.013	0.013	−0.1	0.014
COMP	0.073	0.103	−4.05***	0.069**
ZSCORE	−0.031	0.15	−4.05***	0.409**
ILA	0.035	0.062	−10.1***	0.017

This table presents the t-statistics for a univariate t-test comparing the mean value of each of the credit risk measures across Islamic and conventional MFIs. ATET reports the average effect on the treated computed using propensity score matching (Rosenbaum and Rubin, 1983) using a probit model and the nearest neighbor technique with replacement, where the treatment and control groups are defined as the sample of Islamic and conventional MFIs, respectively, and are matched on the set of controls referred to in Section 4.4.

or in rural locations (*RURAL*). The dummy variable *ISLAMIC* takes a value of one for MFIs offering *shariah*-compliant microfinancing facilities, and takes a value of zero otherwise. To compare our variables of interest across Islamic and conventional MFIs, *GROUP*ISLAMIC*, *FEMALE*ISLAMIC*, and *RURAL*ISLAMIC* are interaction terms of *ISLAMIC* with *GROUP*, *FEMALE* and *RURAL*, respectively. *X* denotes a set of *J* control variables. Following Fan et al. (2019), we control for the yield on the MFIs' loan portfolio, total assets, the ratio of deposits to total assets, growth in total assets, return on assets, an indicator for whether the MFI is a non-governmental organization (NGO), in addition to controlling for the number of loan officers, new borrowers, and average loan size for the MFI. β , α , and γ are coefficients and ε is the residual. To minimize the potential of bias arising from outliers, the variables are winsorized at the 1% level.

We use two-step system generalized method of moments (GMM) estimations to account for concerns that variables may not be strictly exogenous (Arellano and Bond, 1991; Blundell and Bond, 1998), which is appropriate given that the number of MFIs in the sample per cross-section is large relative to the number of time periods. Because the data is an unbalanced panel, system GMM is more fitting than difference GMM (Roodman, 2009b). The system GMM model simultaneously executes equations in levels and in differences (Wintoki et al., 2012; Blundell and Bond, 1998), and we use orthogonal deviations, where the average of all future observations that are available for the variable are subtracted from its current value, instead of first differences, which amplify gaps in an

Table 4
Matrix of correlations.

Variables	VIF	(1)	(2)	(3)	(4)	(5)	(6)
(1) FEMALE	1.85	1					
(2) RURAL	1.08	0.218	1				
(3) GROUP	1.42	0.494	0.147	1			
(4) ISLAMIC	1.04	−0.067	−0.105	0.029	1		
(5) OFFICERS	1.71	0.217	0.111	0.115	0.046	1	
(6) NEW	1.31	−0.026	−0.069	0.007	−0.008	−0.041	1
(7) LOANSIZE	1.89	−0.56	−0.144	−0.417	0.05	−0.07	−0.02
(8) YIELD	1.25	0.021	−0.081	0.066	−0.027	−0.049	0.219
(9) TA	1.78	−0.067	−0.006	−0.034	0.091	0.578	−0.072
(10) DEPOSITS	1.12	−0.044	0.042	−0.139	−0.036	0.101	−0.102
(11) GROWTH	1.3	0.107	0.001	0.109	−0.001	0.026	0.44
(12) NGO	1.24	0.314	0.117	0.174	0.052	0.085	−0.079
(13) ROA	1.13	0.014	0.015	0.009	0.029	−0.005	0.069
(7) LOANSIZE	1	(8)	(9)	(10)	(11)	(12)	(13)
(8) YIELD	−0.158	1					
(9) TA	0.232	−0.148	1				
(10) DEPOSITS	0.222	−0.011	0.186	1			
(11) GROWTH	0.001	0.141	−0.021	−0.025	1		
(12) NGO	−0.376	−0.047	−0.117	−0.018	−0.051	1	
(13) ROA	0.036	0.297	0.01	0.021	0.115	0.03	1

Table 4 presents the correlations and variance inflation factor (VIF) between each of the explanatory variables in order to investigate the potential presence of multicollinearity in the regressions. As the correlations are generally low among the explanatory variables and the VIF is consistently below 2, multicollinearity is unlikely to pose a serious concern.

unbalanced panel (Roodman, 2009b). We include lags of the dependent variable as instruments to account for potential endogeneity through instrumentation. Such ‘internal instruments’ would provide consistent results even when different sources of endogeneity are present (Ullah et al., 2018). Following the methodology of Farag and Mallin (2018) and Wintoki et al. (2012), we include three lags of our instruments in the equation in levels and four lags in the differenced equation.

We then verify that the instruments are valid and exogenous using the Hansen J over-identification test and the Difference-in-Hansen tests, respectively (Roodman, 2009a; Roodman, 2009b). The null hypothesis cannot be rejected for either test, providing support for the validity of the instruments. To test the model specification of the GMM estimations, we test and report the Arellano-Bond test serial correlation coefficient of the second-order residuals and find that the second-order serial correlation is statistically insignificant, indicating that there is no evidence of a misspecification (Arellano and Bond, 1991).

5. Results and discussion

5.1. Group lending

Table 5 presents the results for the GMM models using each of the six measures of credit risk. Our results on group lending suggest that conventional MFIs that are more-heavily involved in group lending experience greater levels of credit risk. This result is robust to the measure of credit risk used, and holds consistently across all six measures. This is not striking when considered in light of prior research that also highlights that group lending may not always yield promising repayment outcomes (Besley and Coate, 1995; D’Espallier et al., 2011; Banerjee, 2013). In our sample of conventional MFIs, the advantages of group lending appear to be outweighed, potentially by the presence of strategic defaults as suggested by prior studies including Besley and Coate (1995) and Giné et al. (2011). Borrowers may strategically default if overwhelmed by the financial burden of defaulting group members (Besley and Coate, 1995).

However, by all measures of credit risk, Islamic MFIs exhibit an opposite relationship, where an increased focus on lending to groups is associated with improved repayment rates. This is in line with the prevalent narrative within the literature on group lending and the social dynamics it involves (Varian, 1990; Sharma and Zeller, 1997; Armendariz de Aghion and Morduch, 2000; Kono and Takahashi, 2010; Al-Azzam et al., 2012; Giné and Karlan, 2014; Lassoued, 2017). Our finding for Islamic MFIs can be interpreted by considering prior studies that find better repayment rates among groups with more religious members (Al-Azzam et al., 2012), in addition to the heightened group communication, social sanctioning, and added pressure from the religious community present in Islamic communities (Greif, 1994; Karim et al., 2008).

Overall, our results on group lending are aligned with prior work that suggests that lending to groups of borrowers is not always effective in improving repayment rates (D’Espallier et al., 2011), and that it is more effective in communities with low individualism and high power distance (Ahsan, 2011), which is a characteristic of many Islamic communities (Basabe and Ros, 2005).

Table 5
Main results.

	(1)	(2)	(3)	(4)	(5)	(6)
	PAR30	PAR90	WRITEOFF	COMP	ZSCORE	ILA
ISLAMIC*RURAL	−0.041*** (0.012)	−0.013** (0.005)	0.013*** (0.001)	−0.062*** (0.007)	−0.292*** (0.042)	−0.009*** (0.003)
ISLAMIC*FEMALE	−0.003 (0.015)	−0.096*** (0.014)	0.007*** (0.001)	−0.028*** (0.007)	−0.112*** (0.040)	−0.119*** (0.003)
ISLAMIC*GROUP	−0.171*** (0.007)	−0.128*** (0.004)	−0.023*** (0.001)	−0.158*** (0.003)	−0.989*** (0.020)	0.002 (0.003)
FEMALE	−0.090*** (0.005)	−0.071*** (0.003)	−0.013*** (0.000)	−0.101*** (0.003)	−0.607*** (0.013)	0.008*** (0.002)
RURAL	0.039*** (0.002)	0.038*** (0.002)	0.004*** (0.000)	0.020*** (0.002)	0.099*** (0.012)	0.019*** (0.001)
GROUP	0.012*** (0.002)	0.019*** (0.001)	−0.000* (0.000)	0.004*** (0.001)	0.027*** (0.005)	0.000 (0.001)
ISLAMIC	0.151*** (0.009)	0.160*** (0.008)	−0.004*** (0.001)	0.171*** (0.006)	0.977*** (0.033)	0.107*** (0.004)
OFFICERS	0.001*** (0.000)	0.001*** (0.000)	0.000*** (0.000)	0.001*** (0.000)	0.005*** (0.001)	−0.001*** (0.000)
NEW	−0.024*** (0.003)	−0.021*** (0.002)	0.007*** (0.000)	−0.015*** (0.001)	−0.081*** (0.006)	−0.010*** (0.001)
LOANSIZE	−0.026*** (0.001)	−0.017*** (0.001)	−0.001*** (0.000)	−0.028*** (0.001)	−0.159*** (0.004)	−0.006*** (0.000)
YIELD	−0.121*** (0.004)	−0.121*** (0.003)	0.051*** (0.001)	−0.235*** (0.003)	−1.333*** (0.019)	−0.013*** (0.001)
TA	−0.001 (0.001)	−0.001 (0.001)	0.001*** (0.000)	−0.003*** (0.001)	−0.018*** (0.003)	0.006*** (0.000)
DEPOSITS	0.092*** (0.006)	0.068*** (0.005)	−0.000 (0.001)	0.113*** (0.003)	0.677*** (0.015)	−0.014*** (0.002)
GROWTH	−0.034*** (0.001)	−0.032*** (0.001)	−0.017*** (0.000)	−0.061*** (0.001)	−0.352*** (0.005)	−0.014*** (0.001)
NGO	−0.020*** (0.001)	−0.014*** (0.001)	0.004*** (0.000)	−0.031*** (0.001)	−0.178*** (0.004)	−0.002*** (0.000)
ROA	−0.086*** (0.011)	−0.074*** (0.006)	−0.139*** (0.001)	−0.139*** (0.006)	−0.943*** (0.034)	−0.053*** (0.003)
L.PAR30	0.485*** (0.006)					
L.PAR90		0.503*** (0.005)				
L.WRITEOFF			0.278*** (0.003)			
L.COMP				0.469*** (0.002)		
L.ZSCORE					0.459*** (0.002)	
L.ILA						0.716*** (0.005)
Constant	0.083*** (0.016)	0.074*** (0.013)	−0.008*** (0.001)	0.185*** (0.009)	0.863*** (0.048)	−0.098*** (0.006)
<i>Model Statistics</i>						
Obs.	1367	1359	1204	1164	1164	1495
Wald Chi2	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.304	0.387	0.534	0.560	0.610	0.336
Diff-Hansen	0.668	0.655	0.477	0.637	0.604	0.528
Arellano-Bond: AR(1)	0.014	0.051	0.013	0.018	0.019	0.443
Arellano-Bond: AR(2)	0.584	0.254	0.378	0.701	0.712	0.123

This table presents the estimation results for the GMM models where the measures of credit risk are the dependent variables. Robust standard errors are reported in parenthesis. Wald Chi2 lists the p-value of the Wald Chi-Squared test for model fit. Hansen refers to the p-value from the Hansen J over-identification test where the null hypothesis is that the instruments that are used in the model are valid. Diff-Hansen refers to the p-value of the Difference-in-Hansen test where the null hypothesis is that the instruments that are used in the model are exogenous. AR(1) and AR(2) list the p-values of the Arellano-Bond autocorrelation test which tests for first- and second-order serial correlation. The null hypothesis is that there is no serial correlation. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are in Appendix B.

5.2. Lending to women

In line with an extensive body of literature on MFI lending to women (eg. Reinke, 1998; Schreiner, 2004; D'Espallier et al., 2011; D'Espallier et al., 2013; El-Komi and Croson, 2013; Lassoued, 2017; Chikalipah, 2018), our results indicate that conventional MFIs experience improvements in repayment rates as they increase the proportion of their loan portfolio allocated to female borrowers. We

add to this literature by introducing new insight on the credit risk associated with the female borrowers of Islamic MFIs. Our findings indicate that female borrowers of Islamic MFIs exhibit superior repayment performance in comparison to their conventional peers, which is also consistent with [Fianto et al. \(2019\)](#).

Contrary to the findings of [Gyapong et al. \(2021\)](#) where Christian female borrowers do not exhibit better repayment, we find that women in Islamic religious contexts do exhibit preferable repayment rates. This is a noteworthy addition to the microfinance literature as it indicates that different religious contexts do not translate into uniform outcomes in terms of gender differences in repayment rates. Such discrepancies across religious contexts within different religions have been formerly documented. In an experimental study, [Benjamin et al. \(2016\)](#) find that the behavioral impact of religious salience varies across different religions, particularly with regards to economic behavior including risk aversion. [Gyapong et al. \(2021\)](#) finds that the influence of religiosity on overall repayment rates varies across Protestant-dominated and Catholic-dominated countries. This helps reconcile our results on the outcomes of lending to women on credit risk within Islamic MFIs with those documented by [Gyapong et al. \(2021\)](#) in a Christian context.

Table 6
Recoveries on write-offs.

	(1)	(2)
	Recoveries	Recoveries
ISLAMIC*FEMALE	2.962*** (0.236)	
ISLAMIC*RURAL		15.145*** (0.220)
FEMALE	−3.237*** (0.190)	−2.768*** (0.133)
RURAL	3.737*** (0.053)	3.614*** (0.069)
GROUP	−3.306*** (0.146)	−3.158*** (0.112)
ISLAMIC	1.499** (0.620)	−6.004*** (0.740)
OFFICERS	0.002 (0.005)	0.062*** (0.008)
NEW	−0.818*** (0.062)	−0.534*** (0.096)
LOANSIZE	0.148*** (0.046)	0.096*** (0.028)
YIELD	−1.683*** (0.137)	−4.145*** (0.208)
TA	−0.457*** (0.029)	−1.002*** (0.026)
DEPOSITS	0.248*** (0.069)	1.359*** (0.119)
GROWTH	0.324*** (0.025)	0.591*** (0.022)
NGO	−0.646*** (0.065)	−0.527*** (0.105)
ROA	−3.367*** (0.282)	−2.104*** (0.277)
L.RECOVERIES	0.321*** (0.004)	0.329*** (0.004)
CONSTANT	10.280*** (0.512)	19.386*** (0.482)
<i>Model Statistics</i>		
Obs.	697	697
Wald Chi2	0.000	0.000
Hansen	0.618	0.826
Diff-Hansen	0.435	0.641
Arellano-Bond: AR(1)	0.055	0.057
Arellano-Bond: AR(2)	0.495	0.483

This table presents the estimation results for the GMM models where the dependent variable is the proportion of recoveries on written-off loans collected by the MFIs. Robust standard errors are reported in parenthesis. Wald Chi2 lists the p-value of the Wald Chi-Squared test for model fit. Hansen refers to the p-value from the Hansen J over-identification test where the null hypothesis is that the instruments that are used in the model are valid. Diff-Hansen refers to the p-value of the Difference-in-Hansen test where the null hypothesis is that the instruments that are used in the model are exogenous. AR(1) and AR(2) list the p-values of the Arellano-Bond autocorrelation test which tests for first- and second-order serial correlation. The null hypothesis is that there is no serial correlation. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Variable definitions are in Appendix B.

Our finding is consistent across the different measures of credit risk with the exception of the write-off ratio, which suggests that Islamic MFIs with a greater focus on female borrowers tend to write-off more loans as unlikely to be repaid. As write-offs involve an element of subjectivity on the part of the MFI, it is possible that female borrowers experience greater scrutiny in loan recollections in Islamic MFIs. Discrimination against women in microfinance is not unheard of (Naegels et al., 2022), but we do not have the data in our sample of MFIs to test for this effect. However, our data suggests that Islamic MFIs generally provide more financing to women than men, and the proportion of their loan portfolio allocated to female borrowers is comparable to that of conventional MFIs. Instead, we propose that this result may be attributable to the notion that religiosity results in greater risk-aversion among financial decision makers in financial institutions (Gao et al., 2017). Loan officers in Islamic MFIs may be more risk averse than their conventional peers, and would thus be quicker to deem loans unlikely to be repaid, even if the borrower does eventually fulfill their payment. We test this proposition by estimating another GMM model examining recoveries on written-off loans as a proportion of total write-offs as the dependent variable. The results are presented in Table 6. We find that Islamic MFIs do report greater write-off recoveries with greater lending to women, which may be explained by the risk-aversion hypothesis suggested by (Gao et al., 2017).

5.3. Rural lending

In accordance with prior literature, we find that credit risk exposure increases with the proportion of rural borrowers served by conventional MFIs (Nelson and Cruz-Letona, 1991), possibly due to agency problems (Zamore et al., 2019), farmer income inconsistency arising from exogenous weather and seasonal fluctuations (Viganò, 1993; Zamore et al., 2019; Möllmann et al., 2020), or limited control over produce pricing by rural smallholders (Hossain et al., 2019). However, we find that this relationship is inverted among Islamic MFIs, where rural borrowers exhibit better repayment rates than their urban peers. Chikalipah (2018) finds that poorer MFI clients, who are often located in rural areas (Kabeer et al., 2012; Hermes and Hudon, 2018), behave honestly and perform well in terms of meeting repayment schedules.

We again find that the results for Islamic MFIs based on using write-offs to measure credit risk produce opposite results. Similar to the finding on female borrowers, it is possible this additional scrutiny can be attributed to an element of subjectivity of loan officers and is not supported by the actual level of defaults in the institution. The presence of biases among MFI loan officers against poorer borrowers is not unheard of. Wealthier applicants are more likely to receive credit from MFIs, and loan officers are more likely to approve loans where a higher repayment rate is perceived (Sagamba et al., 2013). A further examination of this finding by exploring write-off recoveries suggests that there are more written-off loans that are eventually recovered and repaid by the borrowers among rural borrowers. The increased write-offs may thus be explained by the theory on risk aversion of religious institutions (Gao et al., 2017). This amounts to greater write-offs due to the perceived riskiness of operating in a rural context by Islamic MFIs, despite lower effective credit risk, as exhibited by the other measures of credit risk. In addition to the insight from Gao et al. (2017) that religiosity results in greater risk-aversion on the institutional level (among financial decision makers), the aforementioned study also finds that this effect is stronger in riskier contexts where decision makers become more prone to mitigate risk. This may contribute to explaining why Islamic MFIs, who are overall more risk averse by this hypothesis, may be even more inclined to increase write-offs in risky contexts such as when catering to rural borrowers.

6. Conclusion

This study investigated the impact of group lending, lending to women, and lending to rural borrowers on credit risk among Islamic and conventional MFIs. To the best of our knowledge, it is the first to examine whether the relationship of credit risk with these factors varies across the two types of institutions. We use two decades of data on an international sample of 1519 MFIs and six proxies for credit risk. Our results extend upon the body of literature on credit risk determinants in microfinance as we find that these factors do not influence credit risk uniformly across the two MFI types, which suggests the possibility of drawing misinformed policy recommendations for Islamic MFIs if the Islamic/conventional divide is overlooked. We find that Islamic MFIs experience reduced credit risk by offering more group loans, serving more women, and serving more borrowers in rural populations. Conventional MFIs, on the other hand, appear to benefit from fewer group loans, less loans to rural borrowers, and a greater focus on female borrowers.

Our results have both statistical and economic significance as they shed light on the social dynamics that are more pronounced in Islamic communities where social pressure is amplified by additional pressure from the religious community (Karim et al., 2008). The reported negative relationship between group lending and Islamic MFIs' credit risk supports conclusions drawn from economic game theory suggesting that collectivist communities can exhibit more extensive communication within groups and a greater likelihood of enacting social sanctions and collective moral sanctioning against deviants within the context of a Muslim society, as opposed to their non-Muslim counterparts (Greif, 1994). The effectiveness of group lending is more pronounced in Islamic communities, which tend to feature low individualism and high power-distance, which in turn is indicative of greater group-centric decision-making and social collateral (Basabe and Ros, 2005; Ahsan, 2011). Similarly, the gender gap in repayment rates is more pronounced in Islamic MFIs likely due to disparities in the religious-orientation of borrowers. Women are generally more religious than men (Miller and Stark, 2002), which can translate into better repayment performance. On the other hand, our results show that poor borrowers, who are often located in rural areas, tend to exhibit traits of honesty by accomplishing better repayment rates, which reduces the credit risk of Islamic MFIs. This finding among Islamic MFIs serving rural borrowers may be attributable to stronger social and entrepreneurial dynamics among religious, rural communities. Religious beliefs that promote trust and harmonious relationships within communities enhance their social capital for entrepreneurship, promote a sense of social responsibility and prosocial behavior, and may motivate personal development and education, thus building human capital for entrepreneurship in rural contexts (Miao et al., 2021).

The absence of a tradeoff (Zainuddin and Yasin, 2019) between the credit risk of Islamic MFIs and their ability to serve female and rural communities holds promising potential for enhancing MFI outreach. While donors to Islamic MFIs are keen on ensuring that their funds reach disadvantaged populations, doing so at the expense of the quality of their credit portfolio would present a challenge for MFI managers (Mohamed and Elgammal, 2022). Our results present encouraging insight for Islamic MFI donors and managers as we find that it is possible to promote the financial inclusion of women and rural borrowers without compromising the quality of their credit portfolio.

Our findings on group lending indicate to policy makers the benefits of tapping into the pronounced social dynamics within Muslim communities. Moreover, while group lending in microfinance is typically discussed in the context of loans, it is possible that the positive outcomes of group lending may be amplified if coupled with the administration of other Islamic financial contracts that involve trust and integrity such as partnership and PLS arrangements. Due to the unavailability of data, it was not possible to consider the mode of Islamic finance provided, which may be an avenue of interest for future research.

CRedit authorship contribution statement

Toka S. Mohamed: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Mohammed M. Elgammal:** Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing, Project administration.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ememar.2022.100994>.

References

- Abedifar, P., Molyneux, P., Tarazi, A., 2013. Risk in Islamic banking. *Rev. Finance* 17 (6), 2035–2096. <https://doi.org/10.1093/rof/rfs041>.
- Adusei, M., 2021. Interest rate and the social performance of microfinance institutions. *Quart. Rev. Econ. Finance* 80, 21–30. <https://doi.org/10.1016/j.qref.2021.01.009>.
- Aggarwal, R., Goodell, J.W., Selleck, L.J., 2015. Lending to women in microfinance: role of social trust. *Int. Bus. Rev.* 24 (1), 55–65. <https://doi.org/10.1016/j.ibusrev.2014.05.008>.
- Ahmad, S., Lensink, R., Mueller, A., 2020. The double bottom line of microfinance: a global comparison between conventional and Islamic microfinance. *World Dev.* 136, 105130 <https://doi.org/10.1016/j.worlddev.2020.105130>.
- Ahsan, R., 2011. Cultural aspects of credit risk management: Certified public accountant. *CPA J.* 81 (8), 56–59. ProQuest Central.
- Alandejani, M., Kutun, A.M., Samargandi, N., 2017. Do Islamic banks fail more than conventional banks? *J. Int. Financ. Mark. Inst. Money* 50, 135–155. <https://doi.org/10.1016/j.intfin.2017.05.007>.
- Al-Azzam, M., Carter Hill, R., Sarangi, S., 2012. Repayment performance in group lending: evidence from Jordan. *J. Dev. Econ.* 97 (2), 404–414. <https://doi.org/10.1016/j.jdeveco.2011.06.006>.
- Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Rev. Econ. Stud.* 58 (2), 277. <https://doi.org/10.2307/2297968>.
- Armendariz de Aghion, B., Morduch, J., 2000. Microfinance beyond group lending. *Econ. Transit.* 8 (2), 401–420. <https://doi.org/10.1111/1468-0351.00049>.
- Armendariz, B., Morduch, J., 2005. *The Economics of Microfinance*. MIT Press.
- Azmat, S., Kabir Hassan, M., Ali, H., Sohel Azad, A.S.M., 2021. Religiosity, neglected risk and asset returns: theory and evidence from Islamic finance industry. *J. Int. Financ. Mark. Inst. Money* 74, 101294. <https://doi.org/10.1016/j.intfin.2021.101294>.
- Baele, L., Farooq, M., Ongena, S., 2014. Of religion and redemption: evidence from default on Islamic loans. *J. Bank. Financ.* 44, 141–159. <https://doi.org/10.1016/j.jbankfin.2014.03.005>.
- Bajde, D., Chelekis, J., van Dalen, A., 2021. The megamarketing of microfinance: developing and maintaining an industry aura of virtue. *Int. J. Res. Mark.* <https://doi.org/10.1016/j.ijresmar.2021.05.004>. S0167811621000392.
- Baland, J.-M., Gangadharan, L., Maitra, P., Somanathan, R., 2017. Repayment and exclusion in a microfinance experiment. *J. Econ. Behav. Organ.* 137, 176–190. <https://doi.org/10.1016/j.jebo.2017.02.007>.
- Banerjee, A.V., 2013. Microcredit under the microscope: what have we learned in the past two decades, and what do we need to know? *Ann. Rev. Econ.* 5 (1), 487–519. <https://doi.org/10.1146/annurev-economics-082912-110220>.
- Banto, J.M., Monsia, A.F., 2020. Microfinance institutions, banking, growth and transmission channel: a GMM panel data analysis from developing countries. *Quart. Rev. Econ. Finance*. <https://doi.org/10.1016/j.qref.2020.06.004>. S1062976920300788.
- Basabe, N., Ros, M., 2005. Cultural dimensions and social behavior correlates: individualism-collectivism and power distance. *Int. Rev. Soc. Psychol.* 1 (18), 189–225.
- Basel Committee on Banking Supervision, 2016. Prudential treatment of problem assets—definitions of non-performing exposures and forbearance. In: *Bank for International Settlements*, 45.
- Basel Committee on Banking Supervision & Bank for International Settlements, 2012. Core Principles for Effective Banking Supervision. Bank for International Settlements. <http://www.bis.org/publ/bcbs230.pdf>.
- Beck, T., Demirgüç-Kunt, A., Merrouche, O., 2013. Islamic vs. conventional banking: business model, efficiency and stability. *J. Bank. Financ.* 37 (2), 433–447. <https://doi.org/10.1016/j.jbankfin.2012.09.016>.
- Benjamin, D.J., Choi, J.J., Fisher, G., 2016. Religious identity and economic behavior. *Rev. Econ. Stat.* 98 (4), 617–637. https://doi.org/10.1162/REST_a_00586.
- Besley, T., Coate, S., 1995. Group lending, repayment incentives and social collateral. *J. Dev. Econ.* 46 (1), 1–18. [https://doi.org/10.1016/0304-3878\(94\)00045-E](https://doi.org/10.1016/0304-3878(94)00045-E).
- Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. *J. Econ.* 87 (1), 115–143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8).
- Boumediene, A., 2011. Is credit risk really higher in Islamic banks? *J. Credit Risk* 7 (3), 34.

- Cameron, A., Oak, M., Shan, Y., 2021. Peer monitoring and Islamic microfinance. *J. Econ. Behav. Organ.* 184, 337–358. <https://doi.org/10.1016/j.jebo.2021.02.001>.
- Castellani, D., Afonso, J.S., 2021. Geographic diversification and credit supply in times of trouble: evidence from microlending. *J. Bus. Res.* 132, 848–859. <https://doi.org/10.1016/j.jbusres.2020.10.071>.
- Chakravarty, S., Pylypiv, M.I., 2015. The role of subsidization and organizational status on microfinance borrower repayment rates. *World Dev.* 66, 737–748. <https://doi.org/10.1016/j.worlddev.2014.09.007>.
- Chamberlain, T.W., Hidayat, S., Khokhar, A.R., 2018. Credit risk in Islamic and conventional banking. *Int. Adv. Econ. Res.* 24 (1), 99–100. <https://doi.org/10.1007/s11294-018-9666-z>.
- Chen, T.-K., 2016. Does geography matter in a geographically small and culturally homogeneous country? Firm location and corporate credit risk. *Int. Rev. Econ. Financ.* 44, 323–348. <https://doi.org/10.1016/j.iref.2016.02.007>.
- Chikalipah, S., 2018. Credit risk in microfinance industry: evidence from sub-Saharan Africa. *Rev. Dev. Finance* 8 (1), 38–48. <https://doi.org/10.1016/j.rdf.2018.05.004>.
- Chliova, M., Brinckmann, J., Rosenbusch, N., 2015. Is microcredit a blessing for the poor? A meta-analysis examining development outcomes and contextual considerations. *J. Bus. Ventur.* 30 (3), 467–487. <https://doi.org/10.1016/j.jbusvent.2014.10.003>.
- Churchill, S.A., 2019. Microfinance financial sustainability and outreach: is there a trade-off? *Empir. Econ.* <https://doi.org/10.1007/s00181-019-01709-1>.
- Cihák, M., Hesse, H., 2008. Islamic banks and financial stability: an empirical analysis. *IMF Work. Pap.* 08 (16), 1. <https://doi.org/10.5089/9781451868784.001>.
- Clark, B., Hasan, I., Lai, H., Li, F., Siddique, A., 2021. Consumer defaults and social capital. *J. Financ. Stab.* 53, 100821 <https://doi.org/10.1016/j.jfs.2020.100821>.
- Coleman, B.E., 2006. Microfinance in Northeast Thailand: who benefits and how much? *World Dev.* 34 (9), 1612–1638. <https://doi.org/10.1016/j.worlddev.2006.01.006>.
- Convergences, 2019. *Microfinance Barometer 2019*, No. 10.
- de Oliveira Leite, R., dos Santos Mendes, L., de Lacerda Moreira, R., 2020. Profit status of microfinance institutions and incentives for earnings management. *Res. Int. Bus. Financ.* 54, 101255 <https://doi.org/10.1016/j.ribaf.2020.101255>.
- D'Espallier, B., Guérin, I., Mersland, R., 2011. Women and repayment in microfinance: a global analysis. *World Dev.* 39 (5), 758–772. <https://doi.org/10.1016/j.worlddev.2010.10.008>.
- D'espallier, B., Guerin, I., Mersland, R., 2013. Focus on women in microfinance institutions. *J. Dev. Stud.* 49 (5), 589–608. <https://doi.org/10.1080/00220388.2012.720364>.
- Dorffleitner, G., Just-Marx, S., Priberny, C., 2017. What drives the repayment of agricultural micro loans? Evidence from Nicaragua. *Quart. Rev. Econ. Finance* 63, 89–100. <https://doi.org/10.1016/j.qref.2016.02.009>.
- El-Komi, M., Croson, R., 2013. Experiments in Islamic microfinance. *J. Econ. Behav. Organ.* 95, 252–269 (asn).
- Fan, Y., John, K., Liu, F.H., Tamanni, L., 2019. Security design, incentives, and Islamic microfinance: cross country evidence. *J. Int. Financ. Mark. Inst. Money* 62, 264–280. <https://doi.org/10.1016/j.intfin.2019.08.002>.
- Farag, H., Mallin, C., 2018. The influence of CEO demographic characteristics on corporate risk-taking: evidence from Chinese IPOs. *Eur. J. Financ.* 24 (16), 1528–1551. <https://doi.org/10.1080/1351847X.2016.1151454>.
- FASB, 2019. Codification Improvements to Topic 326, Financial Instruments—Credit Losses, Topic 815, Derivatives and Hedging, and Topic 825, Financial Instruments (No. 04–2019; Financial Accounting Series). Financial Accounting Standards Board.
- Fianto, B.A., Maulida, H., Laila, N., 2019. Determining factors of non-performing financing in Islamic microfinance institutions. *Heliyon* 5 (8), e02301. <https://doi.org/10.1016/j.heliyon.2019.e02301>.
- Gao, L., Wang, Y., Zhao, J., 2017. Does local religiosity affect organizational risk-taking? Evidence from the hedge fund industry. *J. Corp. Financ.* 47, 1–22. <https://doi.org/10.1016/j.jcorpfin.2017.08.006>.
- Ghosh, S., Vinod, D., 2017. What constrains financial inclusion for women? Evidence from Indian Micro data. *World Dev.* 92, 60–81. <https://doi.org/10.1016/j.worlddev.2016.11.011>.
- Giné, X., Karlan, D.S., 2014. Group versus individual liability: short and long term evidence from Philippine microcredit lending groups. *J. Dev. Econ.* 107, 65–83. <https://doi.org/10.1016/j.jdeveco.2013.11.003>.
- Giné, X., Krishnaswamy, K., Ponce, A., 2011. Strategic Default in Joint Liability Groups: Evidence from a Natural Experiment in India.
- Godquin, M., 2004. Microfinance repayment performance in Bangladesh: How to improve the allocation of loans by MFIs. *World Dev.* 32 (11), 1909–1926. <https://doi.org/10.1016/j.worlddev.2004.05.011>.
- Gonzalez, A., 2010. Is microfinance growing too fast? SSRN Electron. J. <https://doi.org/10.2139/ssrn.1644948>.
- Greif, A., 1994. Cultural beliefs and the Organization of Society: a historical and theoretical reflection on collectivist and individualist societies. *J. Polit. Econ.* 102 (5), 912–950. <https://doi.org/10.1086/261959>.
- Gyapong, E., Gyimah, D., Ahmed, A., 2021. Religiosity, borrower gender and loan losses in microfinance institutions: a global evidence. *Rev. Quant. Financ. Acc.* 57 (2), 657–692. <https://doi.org/10.1007/s11156-021-00958-5>.
- Hassan, M.K., Aliyu, S., 2018. A contemporary survey of Islamic banking literature. *J. Financ. Stab.* 34, 12–43. <https://doi.org/10.1016/j.jfs.2017.11.006>.
- Hermes, N., Hudon, M., 2018. Determinants of the performance of microfinance institutions: a systematic review. *J. Econ. Surv.* 32 (5), 1483–1513. <https://doi.org/10.1111/joes.12290>.
- Hermes, N., Lensink, R., 2011. Microfinance: its impact, outreach, and sustainability. *World Dev.* 39 (6), 875–881. <https://doi.org/10.1016/j.worlddev.2009.10.021>.
- Hessou, H.T.S., Lensink, R., Soumaré, I., Tchakoute Tchuigoua, H., 2021. Provisioning over the business cycle: some insights from the microfinance industry. *Int. Rev. Financ. Anal.* 77, 101825 <https://doi.org/10.1016/j.irfa.2021.101825>.
- Hossain, I., Muhammad, A.D., Jibril, B.T., Kaitibie, S., 2019. Support for smallholder farmers through Islamic instruments: the case of Bangladesh and lessons for Nigeria. *Int. J. Islam. Middle East. Financ. Manag.* 12 (2), 154–168. <https://doi.org/10.1108/TMEFM-11-2018-0371>.
- How, J.C.Y., Karim, M.A., Verhoeven, P., 2005. Islamic financing and bank risks: the case of Malaysia. *Thunderbird Int. Bus. Rev.* 47 (1), 75–94. <https://doi.org/10.1002/tie.20041>.
- Hudon, M., Traca, D., 2011. On the efficiency effects of subsidies in microfinance: an empirical inquiry. *World Dev.* 39 (6), 966–973. <https://doi.org/10.1016/j.worlddev.2009.10.017>.
- Jianakoplos, N.A., Bernasek, A., 1998. Are women more risk averse? *Econ. Inq.* 36 (4), 620–630. ProQuest Central; Research Library.
- Kabeer, N., Mahmud, S., Isaza Castro, J.G., 2012. NGOs and the political empowerment of poor people in rural Bangladesh: cultivating the habits of democracy? *World Dev.* 40 (10), 2044–2062. <https://doi.org/10.1016/j.worlddev.2012.05.011>.
- Kabir, Md.N., Worthington, A., Gupta, R., 2015. Comparative credit risk in Islamic and conventional bank. *Pac. Basin Financ. J.* 34, 327–353. <https://doi.org/10.1016/j.pacfin.2015.06.001>.
- Karim, N., Tarazi, M., Reille, X., 2008. Islamic Microfinance: An Emerging Market Niche (No. 49).
- Kono, H., Takahashi, K., 2010. Microfinance revolution: its effects, innovations, and challenges. *Dev. Econ.* 48 (1), 15–73. <https://doi.org/10.1111/j.1746-1049.2010.00098.x>.
- Lassoued, N., 2017. What drives credit risk of microfinance institutions? International evidence. *Int. J. Manag. Financ.* 13 (5), 541–559. <https://doi.org/10.1108/LJMF-03-2017-0042>.
- Lassoued, M., 2018. Comparative study on credit risk in Islamic banking institutions: the case of Malaysia. *Quart. Rev. Econom. Finance.* <https://doi.org/10.1016/j.qref.2018.05.009>.
- Maes, J.P., Reed, L.R., 2012. State of the Microcredit Summit Campaign Report 2012. Microcredit Summit Campaign.
- Manan, S.K.A., Shafai, M.H.B.M., 2015. Risk management of Islamic microfinance (IMF) product by financial institutions in Malaysia. *Int. Account. Business Conf.* 2015, IABC 2015 31, 83–90. [https://doi.org/10.1016/S2212-5671\(15\)01134-X](https://doi.org/10.1016/S2212-5671(15)01134-X).
- Marquardt, D.W., 1970. Generalized inverses, ridge regression, biased linear estimation, and nonlinear estimation. *Technometrics* 12 (3), 591. <https://doi.org/10.2307/1267205>.

- Miao, S., Chi, J., Liao, J., Qian, L., 2021. How does religious belief promote farmer entrepreneurship in rural China? *Econ. Model.* 97, 95–104. <https://doi.org/10.1016/j.econmod.2021.01.015>.
- Miller, A.S., Stark, R., 2002. Gender and religiousness: can socialization explanations be saved? *Am. J. Sociol.* 107 (6), 1399–1423. <https://doi.org/10.1086/342557>.
- Misman, F.N., Bhatti, I., Lou, W., Samsudin, S., Rahman, N.H.A., 2015. Islamic banks credit risk: a panel study. *Proc. Econom. Finance* 31, 75–82. [https://doi.org/10.1016/S2212-5671\(15\)01133-8](https://doi.org/10.1016/S2212-5671(15)01133-8).
- Mohamed, T.S., Elgammal, M.M., 2022. Are Donor Funds Used Effectively? An Examination of Islamic and Conventional Microfinance Institutions [Working Paper].
- Möllmann, J., Buchholz, M., Kölle, W., Musshoff, O., 2020. Do remotely-sensed vegetation health indices explain credit risk in agricultural microfinance? *World Dev.* 127, 104771 <https://doi.org/10.1016/j.worlddev.2019.104771>.
- Morduch, J., 1999. The microfinance promise. *J. Econ. Lit.* 37 (4), 1569–1614. JSTOR.
- Naegels, V., Mori, N., D'Espallier, B., 2022. The process of female borrower discouragement. *Emerg. Mark. Rev.* 50, 100837 <https://doi.org/10.1016/j.ememar.2021.100837>.
- Nawai, N., Shariff, M.N.M., 2012. Factors affecting repayment performance in microfinance programs in Malaysia. *Procedia Soc. Behav. Sci.* 62, 806–811. <https://doi.org/10.1016/j.sbspro.2012.09.136>.
- Nelson, G.C., Cruz-Letona, R., 1991. The importance of default risk to agricultural development banks: an example from El Salvador. *Savings Dev.* 15 (1), 19–38. JSTOR.
- Noonen, N., Abbes, M.B., 2018. The determinants of credit risk management of Islamic Microfinance Institutions. *IUP J. Financ. Risk Manag.* 15 (1), 7–22. ProQuest Central.
- Obaidullah, M., 2008. An Introduction to Islamic Microfinance. IBF Net.
- Obaidullah, M., Khan, T., 2008. Islamic microfinance development: challenges and initiatives. *SSRN Electron. J.* <https://doi.org/10.2139/ssrn.1506073>.
- Rahman, A., 1999. Women and Microcredit in Rural Bangladesh: An Anthropological Study of Grameen Bank Lending, 1st ed. Routledge.
- Reichert, P., 2018. A meta-analysis examining the nature of trade-offs in microfinance. *Oxf. Dev. Stud.* 46 (3), 430–452. <https://doi.org/10.1080/13600818.2018.1427223>.
- Reinke, J. (1998). How to lend like mad and make a profit: a micro-credit paradigm versus the start-up fund in South Africa. *J. Dev. Stud.*, 34(3), 44–61. eoh.
- Rhyne, E., Otero, M., 2006. Microfinance through the Next Decade: Visioning the Who, What, where, when and how. ACCION International, Boston, MA.
- Robinson, M.S., 2001. The Microfinance Revolution. World Bank, Open Society Institute.
- Roodman, D., 2009a. How to do xtabond2: An Introduction to Difference and System GMM in Stata (No. 1); The Stata Journal. Center for Global Development, pp. 86–136.
- Roodman, D., 2009b. A note on the theme of too many instruments. *Oxf. Bull. Econ. Stat.* 71 (1), 135–158. <https://doi.org/10.1111/j.1468-0084.2008.00542.x>.
- Rosenbaum, P.R., Rubin, D.B., 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70 (1), 41–55. <https://doi.org/10.1093/biomet/70.1.41>.
- Safiullah, M., Shamsuddin, A., 2018. Risk in Islamic banking and corporate governance. *Pac. Basin Financ. J.* 47, 129–149. <https://doi.org/10.1016/j.pacfin.2017.12.008>.
- Sagamba, M., Shchetin, O., Yusupov, N., 2013. Do microloan officers want to lend to the less advantaged? Evidence from a choice experiment. *World Dev.* 42, 182–198. <https://doi.org/10.1016/j.worlddev.2012.06.019>.
- Schreiner, M., 2004. Scoring arrears at a microlender in Bolivia. *J. Microfin. ESR Rev.* 6 (2).
- Sharma, M., Zeller, M., 1997. Repayment performance in group-based credit programs in Bangladesh: an empirical analysis. *World Dev.* 25 (10), 1731–1742. [https://doi.org/10.1016/S0305-750X\(97\)00063-6](https://doi.org/10.1016/S0305-750X(97)00063-6).
- Shahriar, Abu Zafar M., Unda, Luisa A., Alam, Quamrul, 2020. Gender differences in the repayment of microcredit: The mediating role of trustworthiness. *J. Bank. Financ.* 110, 105685.
- Stef, N., Dimelis, S., 2020. Bankruptcy regime and the banking system. *Econ. Model.* 87, 480–495. <https://doi.org/10.1016/j.econmod.2019.12.012>.
- Stiglitz, J.E., 1990. Peer monitoring and credit markets. *World Bank Econ. Rev.* 4 (3), 351–366. JSTOR.
- Tan, J.H.W., Vogel, C., 2008. Religion and trust: an experimental study. *J. Econ. Psychol.* 29 (6), 832–848. <https://doi.org/10.1016/j.joep.2008.03.002>.
- Tchakoute Tchuigoua, H., Soumaré, I., Hessou, H.T.S., 2020. Lending and business cycle: evidence from microfinance institutions. *J. Bus. Res.* 119, 1–12. <https://doi.org/10.1016/j.jbusres.2020.07.022>.
- Trinugroho, I., Risfandy, T., Ariefianto, M.D., 2018. Competition, diversification, and bank margins: evidence from Indonesian Islamic rural banks. *Borsa Istanbul Rev.* <https://doi.org/10.1016/j.bir.2018.07.006>.
- Ullah, S., Akhtar, P., Zafarian, G., 2018. Dealing with endogeneity bias: the generalized method of moments (GMM) for panel data. *Ind. Mark. Manag.* 71, 69–78. <https://doi.org/10.1016/j.indmarman.2017.11.010>.
- Varian, H.R., 1990. Monitoring agents with other agents. *J. Inst. Theoret. Econ. (JITE) / Zeitschrift Für Die Gesamte Staatswissenschaft* 146 (1), 153–174. JSTOR.
- Viganò, L., 1993. A credit scoring model for development banks: an African case study / un Modèle De "credit scoring" pour les Banques De Développement: Une étude De Cas Africain. *Savings Dev.* 17 (4), 441–482. JSTOR.
- Wintoki, M.B., Linck, J.S., Netter, J.M., 2012. Endogeneity and the dynamics of internal corporate governance. *J. Financ. Econ.* 105 (3), 581–606.
- Zainuddin, M., Yasin, I.Md., 2019. The trade-off debate in microfinance: a review of the theoretical and empirical literature. *Enterpr. Dev. Microfin.* 30 (1), 36–54. <https://doi.org/10.3362/1755-1986.18-00027>.
- Zamore, S., Beisland, L.A., Mersland, R., 2019. Geographic diversification and credit risk in microfinance. *J. Bank. Financ.* 109, 105665 <https://doi.org/10.1016/j.jbankfin.2019.105665>.
- Zins, A., Weill, L., 2017. Islamic banking and risk: the impact of Basel II. *Econ. Model.* 64, 626–637. <https://doi.org/10.1016/j.econmod.2017.05.001>.