

Impact of Geographical Diversification on Credit Risk of Microfinance Organizations in Armenia

Aram Mkhitarian

European University,
10, D. Anhaght str., Yerevan, Armenia, 0037.
E-mail: mkhitarian.aram@yahoo.com

This paper analyzes the existence of relationship between credit risk and the geographical diversification of financial institutions, originating from emerging countries. Due to economic unstable situation in the world caused by Covid-19, credit portfolios of banks and MFIs caused negatively which in some situations can lead to default. In the current situation, it became necessary to discover new approaches to credit risk management and new researches to be done. For this purpose, financial indicators of MFIs operating in Armenia were evaluated and Pearson analysis of MFIs data, risks & profitability efficiency calculation was made to take out impact of diversification of MFIs on credit risk reduction. Both international literature and practical data of MFIs operating in Armenia were identified. Another research was made for taking out the number of branches and credit risk correlation. Our findings show that geographic diversification is statistically significant with the expansion of gross loans. In contrast, empirical results suggest that the geographical diversification of MFIs does not have a significant correlation with the size of the credit risk reserve, which means that the representation of MFIs in different regions in the form of branches will not always lead to credit risk reduction, and in some cases may lead to operational risks and additional costs. We adopt cost funding and assets size variables impact assessment evaluation through instrumental variables method. Our results confirm the endogenous nature of those variables with risk level of MFIs.

Key words: microfinance; credit risk; microloan; risk; efficiency; diversification.

JEL Classification: G21, G24, G34, G38.

DOI: 10.17323/1813-8691-2023-27-1-103-121

Aram Samvelovich Mkhitarian – Ph.D, Associate professor, Department of Management.

The article was received: 05.05.2022/The article is accepted for publication: 26.01.2023.

For citation: A. Mkhitarian. Impact of Geographical Diversification on Credit Risk of Microfinance Organizations in Armenia. *HSE Economic Journal*. 2023; 27(1): 103–121.

1. Introduction

The remarkable expansion of the microfinance industry stems from a disappointing situation; the incessant failures of many traditional banks, if not all, to extend their financial services to the poor in society [Allen et al., 2011]. Not only microfinance industry has been grown rapidly recent years, but other services such as agricultural insurance, technological solutions for those who has no access of banking products started to arise in different regions of emerging countries. In Armenia, agricultural insurance become available for farmers so far from recent couple of years. Technologies has also become popular from 2018–2020. Nowadays people living in far-off regions can do various transactions through cash terminals which are located in almost all villages.

Against this evaluation, providing microcredit to the poor lead to affluent credit risks. The credit risks in the microfinance industry are often presumptive, mostly, by two main factors. The main cause of credit risk is absence of collateral, which is actual especially in rural areas. Farmers and rural habitants either don't have any collateral, or they have real estate located in villages which is not considered as a liquid collateral for financial institutions. Microloans without any pledged collateral, combined with weather risks and unstable profit becomes very risky borrowers. The second problem is the information imbalance between borrowers and lenders. Access to information is extremely important for decision making. The problem is, that often micro borrowers doesn't have any credit history and supporting documents which can assume about creditworthiness of the client. In this situation loan officer takes in account information about the borrower gathered from different sources. Theoretically, these two problems are alleviated by regular monitoring, and group lending [Emekter et al., 2015]. Besides that, empirical evidence in the microfinance industry indicates that targeting female borrowers significantly reduces credit risk [Agier, Szafarz, 2013; D'Espallier et al., 2011, 2013; Strøm et al., 2014].

Credit risk has a significant role in finance and it is often considered to be the oldest type of risk in the financial markets, dating back to BC in 1800, from the time of ancient Egypt [Caouette et al., 2008]. As per [Zamore et al., 2018], credit risk arises when the borrower does not make the payments under the loan agreement or the next repayment is completely or partially delayed. Nowadays, when the competition in the microfinance industry is very high and the global economics is unstable, the regulatory requirements are very strict and sometimes become an obstacle to the provision of a variety of microfinance services in many countries, studying the possibility to lower risk of the activities of microfinance institutions (hereby MFIs) becomes a leading topic [Mkhitarian, 2021]. From the mid-1990s until the year of 2008, the internationalization of financial institutions increased rapidly which leads to market changes. Following the global financial crises in 2008, capital flows have declined greatly among countries, and many developed countries' financial institutions started to reduce in its sizes. At the same time, banks from emerging and developing countries continue to expand abroad, and banking has become more regional [Claessens, van Horen, 2012; Claessens, 2017]. One of the contributing factors to this evidence was the globalization and noninterference of financial markets, the higher demand for international financial services and the relief of geographic distance effects on bank efficiency through technological improvements [Berger et al., 2004].

One of the classic approaches to credit risk management is portfolio diversification, which can reduce potential losses in a variety of situations. When loans are provided to people in different professions in divers' regions, it is obvious that crises such as the closure of a local plant or a bad agricultural year, natural disasters, will reduce the creditworthiness of only a part of the borrowers. In this prospect, portfolio diversification can be one of the most efficient ways to reduce credit risk. Diversification plays a vital role in risk management and consequently financial performance of MFIs. At the same time, diversification mitigates systemic risk facing a commercial bank and thus reduces the probability of bank failure [Ndungu, Muturi, 2019].

First microfinance organizations were established in mid 90s in Armenia. Most of them were NGOs and only few were profit seeking organizations. After the legislative reforms made in early 2003, the microfinance organizations operating in Armenia were registered in Central Bank of Armenia and obtained license to provide financial services (credit & savings unions, leasing organizations, factoring organizations and universal credit organizations). As of June 1, 2021, one of the 44 MFIs registered in RA is a credit union; three of them are leasing organizations, one is a factoring company, two are refinancing credit unions, and the rest are universal credit organizations [Mkhitryan, 2022].

The purpose of this study is to identify whether geographical diversification of MFIs has the same positive influence on credit risk mitigation than the diversification of the portfolio. The research was based on the study of international literature, as well as the analysis of data carried out from MFIs operating in Armenia.

Although microfinance is a relatively new financial instrument, it has aroused great interest among economist researchers; there are a number of studies on this financial sector. The concept of microfinance as a comprehensive financial support tool for small businesses has been studied by scholars such as T.S. Kamenskaya, O.V. Madatova, S.A. Malkova, V.A. Rub, M. Goetz and others. However, at the same time, there are a number of issues on which researchers and practitioners do not have apparent approaches. We have tried to select the impact of factors on credit risk mitigation that have not yet been extensively researched, although these factors may have a significant impact on risk management.

Earlier researchers promote the benefits of geographical diversification based on two competing theories. First, theory based on the delegated monitoring argument originates from the traditional banking literature suggests that a well-diversified organization is an optimal one [Sharma, Anand, 2020]. Being lack of modern risk management instruments, many theorists and practitioners recommend diversification as one of the easiest and most efficient ways to minimize risks. Second theory originates from the corporate finance literature. Researchers of that period suggests that in order to control the financial and operational risks and to optimally utilize the core competencies of managers, an organization should diversify. Empirical studies across different geographies have reported mixed results and given alternate arguments on the optimal degree of geographical diversification, as discussed under [Gomes, Livdan, 2004; Rajan et al., 2000].

There are different approaches to defining credit risk. In Morocco, for example, when considering the activities of the microfinance sector, the distinction between good and bad customer is based on the main factor that measures the customer's ability to repay the loan, which is the number of days. In this context, the customer is considered bad if he/she accumulates more than 30 days in the loan cycle. By the way, a good customer is one who never has a repayment delay of more than 30 days [Bennouna, Tkiouat, 2019]. Researchers have previously argued that

credit risk is the most important risk that MFIs should consider. Other scholars point out that credit risk is even greater for MFIs than for universal banks [Duho et al., 2021]. Both, researchers and practitioners would assure with the arguments, that credit risk is crucial for MFIs. Despite the fact that the law allows them to carry out various other financial transactions, the main activity of MFIs is the provision of small loans. Macroeconomic prospects of recent years make it difficult to manage credit risk, which leads to the necessity of discovery of new management approaches.

The most common risk, which leads to the deterioration of the quality of the loan portfolio and consequently the decline in the income of the financial institution is the incomplete analysis of the MFIs clients and the provision of low-quality loans. One of the main concerns faced by microfinance institutions is the non-transparency of information for the assessment of loan applicants. Often the opacity of information is due to the fact that the population served by MFIs consists of women entrepreneurs or individuals who have no credit history, no previous borrowing experience, and are among the poorest in society. It is difficult to evaluate the latter by the objective criteria's for providing loans. This is especially true for MFIs with small branch networks, where the risk of improper oversight is high. As per [Blanco-Oliver et al., 2021], the same problem exists with the provision of microloans, when the provision of the loan does not require a thorough analysis of the borrower's data and the loan is provided within hours or in one day. However, in contrast to this idea, the findings of some researchers show that small loans are less risky than larger loans [Chikalipah, 2018].

Armenia is a small country with almost 3 million of population. Being part of Soviet Union Armenia based its economy mostly on industrial production. At the same time, agriculture employed 35% of the labor force in 2022, which becomes the biggest sector of employment. Around 56% of agricultural labor was provided by women. Recent years, agricultural sector to GDP has declined from 18% in 2012 to 13% in 2022. 33% of the country's population is centered in Yerevan where trade and services are considered as the main activity of the employees. Only few banks finance agriculture in Armenia and mostly MFIs operate in that field providing micro business loans and agricultural loans to rural habitants and small-scale farmers.

The impact of MFIs geographical diversification on the level of credit risk has been little studied in international research materials, and no analysis has been conducted on this topic in Armenia. Numerous researchers work on different theories which can lead to better credit risk management, but most of the findings were not practically useful for the MFIs operating in the Caucasian region. MFIs located in Armenia haven't changed the traditional methods of risk management, even though, diverse new mechanisms arise. Recent political and health challenges even worsen the situation concerning risk management for financial institutions in emerging countries. That was the reason why it becomes important to evaluate the influence of different variables on credit risk management for financial institutions and especially for MFIs as they operate in the high-risk markets.

Based on the provisions of the portfolio theory, a diversified financial institution is less risky than centralized banks and MFIs due to the diversification of the loan portfolio [Bebczuk, Galindo, 2008]. Supporting this position, another group of researchers analyzed 105 Italian banks from 6 years of empirical data and concluded that the geographical diversification of bank branches generally has a positive impact on the development of the bank [Acharya et al., 2006]. On the other hand, the presence of many branches carries the risk of a lack of effective control. If senior management is able to effectively oversee the operations of individual branches,

it is possible to expect best practices in the branch. If top management does not control the branch properly, the efficiency of local branches will be inefficient [Berger et al., 2001].

There is an opinion that small financial institutions, all of which have branches in the same region, can be more profitable than those that have branches outside the region. This result is consistent with the view that small financial institutions may have good reasons for remaining relatively geographically diversified [Whalen, 2001]. Confirming the same view, another researcher found that managers of small, less-scattered financial institutions tend to have shares of the MFIs they work for, and this made them more motivated to work, and managers of branches of large financial institutions are less motivated to work harder to gather more customer information and provide good quality loans [Sullivan et al., 2007; Berger et al., 2005; Brickley et al., 2003]. In addition, for small financial institutions, a branch network can be an additional cost burden and reduce profitability. A huge research was made by a group of economists going back from 1994 till 2008 years of U.S. banks with single location to interstate area. Results of the paper shows, that while geographic diversification was beneficial in terms of risk-adjusted returns, the effects are non-linear and depend on bank size [Meslier et al., 2016].

It is obvious that when assessing credit risk, it is not possible to define a single model that will reduce the credit risk of all MFIs, as MFIs differ in their size, type of activity, staff, geographical location, structure, and a number of other factors. For this reason, we have chosen a direction that can have a significant impact on the quality of the loan portfolio and consequently on credit risk, which, at the same time, has been little studied by researchers.

Theoretically, as per [Emmons et al., 2004] through diversification, the financial institution can cut down the risk of loan portfolio possible default without reducing the expected return. Geographical diversification is a type of diversification where the activities of a financial institution are scattered in different cities, regions, countries [Zamore et al., 2019]. Here comes the question whether geographical diversification in like manner efficient as the portfolio diversification. To enhance financial institutions' performance, financial managers try to diversify both credit products and geography of financial institution to new markets [Baele et al., 2007; Meslier et al., 2016]. Taking into consideration this tendency of geographic expansion, many developing countries' financial institutions started to go along opening branches in regions. In some countries, this phenomenon brings to positive results. Nevertheless, in Vietnamese banking sector, this trend brings to multiple obstacles for financial institutions as lots of barriers arise when opening branches in farther regions of the country.

2. Methodology

This work consists of a methodology section, which presents the main approaches to the implementation of the work, analysis section, where the study of international literature was made and especially researches in emerging countries were taken out as indicators and similar markets which can be comparable with Armenian financial market and the relationship between geographical diversification and credit risk was discovered. Simultaneously, correlation analysis was made based on data taken out from MFIs operating in Armenia. The main results of the work are presented in the Conclusions section.

The study conducted in this article is based on identifying the factors influencing the credit risk of microfinance organizations through the analysis of information collected from various international scholarly articles and other sources. The methodology of the article is based on

the aspect approach, in which the method of calculating the impact of a specific parameter on the change of the situation is used. The analysis of international experience was carried out on the basis of existing publications, studies, analyses and generalization of the works of foreign scientists. Within the framework of the work, both the international experience and the data of MFIs operating in Armenia were studied. The main source for the collection of secondary data for the study of international experience was the scientific articles published in peer-reviewed journals. In order to identify the impact on the credit risk of branches and representative offices in microfinance organizations, articles on current issues were analyzed.

In order to extract primary data, 32 out of 43 MFIs existing in Armenia were analyzed. As the number of MFIs in Armenia was not big, sampling was made excluding only those, who were not providing traditional credit products or services and are significantly different from others in the nature of their activity. Mainly, the list does not include the two state-owned refinancing credit organizations, First Factoring Company & Export Finance, which do not operate in Armenia, G&A, Unileasing, Goodcredit, Varks AM, which actually do not provide lending, and Fides, OK Credit, Now & Digisafe MFIs, which are newly established, Gazelle Finance, which has no data shown on the website. The data collected from the MFIs operating in Armenia was based on the information collected from the official websites of these companies. Some data which was concerning to revenues of the MFIs was collected for two years as the last years have been characterized by financial instability and two years of data may give a more accurate data. The statistical data was extracted in the form of tables and analyzed using SPSS software. Pearson analysis method was used for econometric analysis of data. Correlating the results received from the actions above, an instrumental variables approach was also implemented to eliminate the possible effect of omitted variables on the main results obtained.

3. Results and Discussions

In order to understand the level of credit risk of MFIs operating in Armenia, as well as to study the factors influencing it, an analysis was carried out and a table was compiled comparing financial indicators, in particular, loan portfolio, profitability, loan loss reserves and cost indicators (Appendix 1).

As defining an irregular sampling, three MFIs with small, medium and large loan portfolios were randomly selected for analysis. Net interest income and Net loan loss reserves of the selected nine MFIs shows that net loan loss reserves are significant for MFIs. Taking into account the average net interest income-net reserves of 9 MFIs, we get 55%, which means that MFIs lose more than half of their main income due to bad quality loans provided. The same analysis was made also for the whole group of MFIs (Appendix 1). This simple analysis approves the importance of research topic and the existence of an issue of a credit risk among MFIs.

For the purpose to capture the significance of indicators of MFIs operating in Armenia, another presentation of the summary of financial indicators of MFIs operating in Armenia was made. In particular, the total non-interest expenses were used as variables, in the calculation of which administrative and other operating expenses has been included, as well as return on assets and capital ratios (Appendix 2).

Regarding the factors such as portfolio size and number of branches, it is indisputable that there is significant interrelation between them. In comparison of the data in Appendix 2 with the MFIs that have a wide branch network and those who doesn't have any branches, it is

obvious that those with wide branch network have significantly higher operating costs, but they do not result in a larger revenue indicator. Given these arguments, the question again arises as to whether it is profitable for MFIs to have a branch network in terms of profitability and risk. Despite that fact, that coming from early 1980s, researchers were convicted in the force of diversification, but, in contrast, it is not always true, especially in terms of geographical diversification. In order to have coefficients on the data, to analyze them, a regression analysis of the selected indicators was performed (Table 1).

Table 1.**Regressive Analysis of MFIs Branches, Risks & Profitability Efficiency**

	Branch	Risk	Number of branches	Reserves	Return on equity (ROE)	Return on equity (ROE)	Return on assets (ROA)	Return on assets (ROA)
					2021	2020	2021	2020
N								
Valid	32	32	32	32	32	32	32	32
Missing	0	0	0	0	0	0	0	0
Mean	2.3750	4.0938	5.3750	83.6156	-3.4853	-4.1950	-0.6288	0.3299
Median	1.5000	5.0000	0.5000	31.4000	2.1550	3.4800	0.6850	1.2100
Std. Deviation	1.60141	1.92370	9.56388	209.27718	32.03985	26.17578	7.95668	6.09749
Skewness	0.594	-0.664	2.069	4.540	-2.036	-2.528	-2.473	-2.043
Kurtosis	-1.349	-1.208	3.379	23.145	4.876	8.328	8.175	7.060

Table 1 presents estimation results of the empirical analysis between MFIs diversification and revenue variables. Medium-yield data, and the presence of the lowest and highest revenue data show that there is a wide range of both high-performing and low-performing MFIs in Armenia. The data provide some arguments which can lead to conclusions, however there is no strong evidence that the data are skewed at both ends, although there are some differences between the mean and median variables. The measure of diversification shows the existence of significant variations in the degree of diversification among MFIs operating in Armenia.

Regarding the geographical representation of MFIs, the results of various studies show that there is a significant positive relationship between geographical diversification and credit risk in the field of microfinance. In particular, diversification is likely to lead to a larger share of non-performing loans, larger write-offs and larger loan loss reserves. In terms of risk, this disclosure shows that diversification is not in the best interest of MFIs, especially taking into consideration that it is quite costly. Working with multiple branches makes MFI management more difficult, and probably weakens the monitoring capacity of both the owners and the head office. Taking into consideration the monitoring argument, the findings suggest that the impact of diversification on risk can be mitigated by applying group lending methodology [Zamore et al., 2019]. Taking into account this hypothesis put forward by the researchers, we have tried to find out from the data of MFIs operating in Armenia whether there is a positive connection between geographical diversification and the wide presence of branches.

Another analysis of the geographical diversification of MFIs operating in Armenia through the data collected in the previous tables were made (Table 2). The reason why we compare branches and reserves/net interest income ratios were analyzed is that different scholars find important branch representations and their locations for efficient credit distribution. On the other hand, contributions to Reserves can be another good indicator to measure effectiveness of credit distribution. Thus, the comparison of the branch representatives and reserves of Armenian MFIs can answer to question whether the quantity and widespread representative of an MFIs can positively influence on credit distribution.

Table 2.

**MFIs operating in the Republic of Armenia & their branches
and representations as of 31.12.2021¹**

		Branch	Representation	Reserves/ Net interest income, %
1	Acba Leasing	0	0	27.7
2	First Mortgage	0	0	2.1
3	Agroleasing	0	1	51.3
4	Aniv	0	1	37.7
5	Aregak	35	10	1
6	Arfin	0	0	1.6
7	Card Agrocredit	4	2	-8.4
8	Bless	5	0	-34.6
9	Global Credit	0	0	200
10	Gladzor	0	0	44.1
11	Garni Invest	2	0	120
12	Eclof	0	5	-36.8
13	Express Credit	0	0	226
14	Credit Corp	0	0	20.7
15	Kamurj	16	0	19.2
16	My Credit	1	0	-78
17	Credo Finance	0	0	1150
18	Nor Horizon	4	1	242
19	SEF International	20	0	34.4
20	Universal Credit	2	0	212

¹ The table was compiled by the author on 27.01.2022, based on the information posted on the official websites of the companies.

Continues

		Branch	Representation	Reserves/ Net interest income, %
21	DICA	0	0	32
22	Farm Credit Armenia	9	0	-3.8
23	Fast Credit Armenia	27	0	-3.7
24	Finca	30	0	40.7
25	Mogo	5	0	33.6
26	Premium Credit	0	0	40
27	Mikro Kapital	0	0	102
28	Smart Credit	0	0	121
29	Armenian Leasing Company	0	0	15.4
30	Aes Credit	0	0	8.2
31	Normal Credit	0	0	27.5
32	Credit Concept	0	0	30.8

Notably, only half of the 32 MFIs surveyed have registered branches or representative offices, but almost all MFIs provide lending in the provinces (Table 3).

Table 3.

Regional distribution of MFI branches and representations operating in the Republic of Armenia as of 31.12.2021²

List of MFIs	Yerevan	Ararat region	Armavir region	Gegharkunik region	Aragatsotn region	Lori region	Vayots dzor region	Syunik region	Tavush region	Kotayk region	Shirak region
Aregak	1	4	2	5	3	4	2	3	4	3	4
Finca	2	4	2	3	2	4	1	3	3	2	4
Agroleasing	1						1				
Aniv	1							1			
Card Agrocredit	1	1	1		1			1		1	1
Bless	3							1			
Garni Invest	1										1
Eclof		1	1	1		1	1				

² The table was compiled by the author on 27.01.2022, based on the information posted on the official websites of the companies.

Continues

List of MFIs	Yerevan	Ararat region	Armavir region	Gegharkunik region	Aragatsotn region	Lori region	Vayots dzor region	Syunik region	Tavush region	Kotayk region	Shirak region
Kamurj	1			2	1	2	1	4	3	1	1
My Credit	1										
Nor Horizon	1			1		1		1	2		
Universal Credit	1			1							
SEF International	1	3	2	1	2	2	1	4	2	1	2
Farm Credit Armenia	1	2	3		1		1	1		1	
Fast Credit Armenia	12	3	2	1	1	1		2	1	2	2
Mogo	3					1					1

A glance at the results from the Table 2, the contributions to the loan loss reserves differ significantly in MFIs, ranging from negative indicators to several hundred percent positive result. This data can be influenced by a number of factors, including the recovery of poor quality loans in previous years. Some MFIs have a large number of branches, but looking at their net reserves, we see that in some cases MFIs with a large branch network have large contributions, in some cases not. In the scope of a simple analysis, it is not possible to unequivocally assess the significant impact of the branches' number on net reserves. On the other hand, comparing the data collected with the information from Table 1, we see that those MFIs who have larger branch network, has significant more operational costs.

As it was not clear whether the MFI branches were located in the capital or in the regions, the regional distribution of the branches were studied. From Table 5 it is clear that most of the MFI branches are located in the regions, which indicates their geographical expansion and approves the results obtained from the sample of the previous data analyzed. Less than 10% of branches are located in the capital, which also go along with the theory, that MFIs are serving people mostly from villages and far-off regions in emerging markets. The same we see in Armenia, where mostly all financial institutions are focused on providing financial services in regions.

Following the empirical estimation of previous tables, to find out whether there is a link between geographical diversification and credit risk, we have performed a data analysis using a correlation tool (Table 4).

Interestingly, using Pearson's correlation formula, we see that there is no significant correlation between the number of branches and the loan loss reserve: $r(30) = -0.171$, $p = 0.349$, ie $p < 0.01$ and is actually higher than alpha, and Pearson's coefficient is negative. In fact, geo-

graphical diversification in the form of branches can not have a significant impact on reducing the risk of MFIs.

Table 4.

**Pearson correlation coefficient calculation based on the data
in the previous tables data**

		Number of branches	Reserves
Number of branches	Pearson Correlation	1	-0.171
	Sig. (2-tailed)		0.349
	N	32	32
Reserves	Pearson Correlation	-0.171	1
	Sig. (2-tailed)	0.349	
	N	32	32

Taking into consideration the fact, that different parameters can affect on risk measurement calculations of Armenian MFIs geographic diversification factor, and since MFIs vary in size and other characteristics, the question arises whether the data obtained are valid for all size of MFIs operating in the regions. In particular, larger MFIs have access to cheaper financial resources and therefore can afford to offer loans at lower rates and thus attract more solvent clients. At the same time, smaller companies, which, on equal terms, have more expensive sources of funding and, as a result, are forced to charge higher interest rates, have to deal with clients who are more likely to become insolvent.

In his work, Levine R. et al. (2021) used regression analysis to evaluate the size and regional dispersion of financial institutions and provide sufficient evidence for the analysis of geographic diversification and banking system risk and return data. At the same time, Favara G., Imbs J. (2015) finds instrumental variables approach efficient for calculating potential omissions in regression analysis. Thus, an instrumental variables analysis is made to evaluate the probability for a false positive relationship if the company size parameter is omitted.

As a variable, *Total assets*, *Total cost of funds* & *Capital-asset ratio* were analyzed. These controls account for differences in MFI size, leverage, and profitability, respectively.

We apply different estimation techniques to verify the justification and robustness of the chosen variables. As a justification for the selected variables, the research of different authors concerning the impact of asset size relation on risks were taken into consideration.

Demirgüç-Kunt A., Huizinga H. (2011) find out, that larger banks tend to be more profitable, while they also have lower risk ratios. On the other hand, Hughes J.P., Mester L.J. (2013) couldn't find evidence between larger assets consistent with capturing economies of scales and even can have larger risks because of too-big-to-fail considerations. Parvin et al. (2020) analyzed the influence of capital structure on the organizational performance of MFIs and discovered, that total cost of funds has positive impact on the size of assets of MFIs. Moreover, Liñares-Zegarra J., Wilson J.O. (2018) also finds that the variability of growth rates differs across the size distribution of microfinance institutions.

The validity of the chosen instrumental variables is supported also with the F-test results. The F-test produces an F test value > 10 which is higher than 14.62 and 16.01 respectively. For

both sets of instrumental variables, the F-test is above ten, meaning that significant demand-side endogeneity exists. Thus, we present the results of geographic diversification and cost of funds by the formula below.

$$\begin{aligned} \text{Ln (Cost of funds)}_{mrt} = & \beta(1 - \text{Herfindahl index of assets across regions})_{mt} + \\ & + \theta X'_{mrt} + \delta_m + \delta_{rt} + \varepsilon_{mrt} \end{aligned}$$

where the dependent variable, $\text{Ln (Cost of funds)}_{mrt}$, represents the natural logarithm of the *Total cost of funds*, m represented region r in quarter t . The key explanatory variable, $1 - \text{Herfindahl index of assets across regions}$, stands for the extent to which an MFI m diversifies its branch office assets across regions over quarter t , as measured by $1 - \text{Herfindahl index of assets across regions}$. X'_{mrt} is a vector of time-varying characteristics for MFI m , headquartered in region r , at the end of the quarter t : *Total assets*, *Capital-asset ratio*, and *Return on assets*.

To test the sensitivity of our results, geographic diversification and three elements separated were analyzed within instrumental variables approach in Table 5.

Table 5.

**Geographic diversification and cost of funds:
Instrumental variables approach**

Variables	Ln (Total cost of funds)	
	(1)	(2)
<i>1-Herfindahl index of assets across states</i>	-1.648** (0.382)	-1.527** (0.354)
<i>Capital-asset ratio (lag)</i>		-0.921** (0.0399)
<i>Return on assets (lag)</i>		-0.834* (0.331)
<i>Total assets (lag)</i>		-3.03e-07 (0.00992)
Regional fixed effects	Yes	Yes
Observations	10,345	9,221
R-squared	0.899	0.907
F-test results	14.62	16.01

Table 5 reports the regression results from 2SLS analysis. The dependent variable is the natural logarithm of cost of total funds in columns 1–2. Total cost of funds is the ratio of *Total interest expenses/Interest-bearing liability* at the end of a period. The endogenous variable is *1-Herfindahl index of assets across regions*, defined as one minus the sum of squared share of assets held in different regions. MFI controls include *Capital-asset ratio (lag)*, *Return to assets (lag)*, *Total assets (lag)*, all measured at the end of a period, the same periods taken in the table

from Appendix 2. *MFIs fixed effects and regional fixed effects* are included throughout the table. Standard errors are heteroskedasticity robust and clustered at the region and quarter, and reported in parentheses. *, and ** indicate significance at 5% and 1%.

Furthermore, the use of alternative method of estimation propose that geographic diversification materially lowers MFIs funding costs which is opposite to outcomes found on the first part of the article. Moreover, the results are consistent with the view that lowering funding costs will decrease credit risk of MFIs.

4. Conclusions

The analysis of the diversification of MFIs shows that in practice a set of strategies and methods of risk management should be applied to achieve sustainable development of the financial system. Research has shown that contributions to the credit risk loss reserve in Armenia for recent years average more than 50% of net interest income, which means that it is necessary to review the classical approaches to credit risk management. On the other hand, previous authors state that higher credit risk in terms of risk-return can improve the financial performance of MFIs by attracting new customers. Even if these customers increase their credit losses, the impact on their final net income can still be positive [Zamore et al., 2019]. Additional research is needed to confirm this hypothesis.

Portfolio diversification is one of the most effective ways to decrease credit risk [Van Duong Ha, 2022]. The impact of MFI geographical diversification on credit risk was considered to study the factors influencing credit risk to understand whether geographical diversification has also significant impact on credit risk reduction. A review of the international literature and data shows that the presence of MFI branches complicates the management of the financial institution, which leads to operational risk, as well as increases credit risk, but the presence of a small number of branches can have a positive impact on credit risk management as it helps to gather more subjective data about the customer. The analysis of the primary data showed that there is no significant correlation between the presence of branches and the contributions to the credit loss reserves. At the same time, fewer branches, which are easily managed from the head office, can have a positive impact on credit risk management, as they will provide additional information, which will contribute to better lending experience.

The analysis of the effect of cost funds and size of assets on geographic diversification and risk of MFIs through estimating instrumental variables approach shows that there is an inverse relationship between three parameters. On the other hand, there is positive relationship between the cost of funds and asset size of the MFIs, which can cause lower funding cost and risk. Cheaper access to funding would allow MFIs to carry out less risky customers and, therefore get better financial indicators.

Appendix 1.

**Financial indicators of MFIs in 31.12.2021
(million drams)³**

	List of MFIs	Credit portfolio	Net interest income	Net loan loss reserve	Operational & other costs	Net profit
1	Acba Leasing	40,202,070	1,877,599	(521,126)	570,807	1,756,372
2	First Mortgage	7,949,362	274,681	(5,984)	243,516	37,124
3	Agroleasing	1,818,678	167,219	(85,780)	55,679	5,930
4	Aniv	946,081	110,623	(41,732)	87,929	(54,334)
5	Aregak	17,960,488	4,600,470	(45,340)	2,058,267	2,115,892
6	Arfin	1,116,986	52,313	(24,496)	72,810	52,313
7	Card Agrocredit	10,887,729	695,753	58,917	587,117	192,825
8	Bless	15,465,302	776,545	268,792	427,530	562,009
9	Global Credit	25,994,431	1,409,324	(2,802,156)	1,590,603	(653,815)
10	Gladzor	2,800,061	374,206	(165,042)	131,694	(6,811)
11	Garni Invest	2,280,543	608,944	(798,070)	191,908	(464,475)
12	Eclof	1,927,051	261,283	96,173	207,792	91,526
13	Express Credit	3,543,521	328,182	(743,309)	182,798	(595,678)
14	Credit Corp	968,258	92,088	(17,649)	108,326	(39382)
15	Kamurj	12,430,562	1,484,880	(160,544)	1,208,536	182,397
16	My Credit	2,095,271	126,132	98,490	149,067	84,676

³ The table is created by the author on 27.01.2022, based on the information posted on the official websites of the MFIs. Official websites of MFIs are: www.acbaleasing.am, www.firstmortgage.am, www.agroleasing.am, www.aniv.am, www.aregak.am, www.arfin.am, www.agrocredit.am, www.bless.am, www.globalcredit.am, www.gladzoruco.am, www.garniinvest.am, www.eclof.am, www.ecredit.am, www.creditcorp.am, www.kamurj.am, www.mycredit.am, www.credofinance.am, www.norhorizon.am, www.sefmicro.org, www.universalcredit.am, www.dica.am, www.fca.am, www.fastcredit.am, www.finca.am, www.mogo.am, www.premiumcredit.am, www.mikrokapital.am, www.smartcredit.am, www.armleasing.am, www.aescredit.am, www.normancredit.am, www.creditconcept.am

Continues

	List of MFIs	Credit portfolio	Net interest income	Net loan loss reserve	Operational & other costs	Net profit
17	Credo Finance	985,813	198,461	(77,893)	197,621	689
18	Nor Horizon	461,410	40,294	(97,572)	147,936	(150,480)
19	SEF International	8,892,026	2,084,968	(718,555)	1,665,976	(4,958)
20	Universal Credit	1,742,496	79,307	(168,160)	73,175	(117,354)
21	DICA	24,513,054	429,549	(966,383)	180,720	(814,682)
22	Farm Credit Armenia	13,835,036	817,176	31,187	694,023	59,929
23	Fast Credit Armenia	61,514,548	9,871,381	1,093,516	3,255,211	7,020,059
24	Finca	18,261,000	4,250,208	(1,723,712)	2,698,551	82,443
25	Mogo	4,018,678	1,373,598	(462,330)	1,562,508	(853,565)
26	Premium Credit	915,044	191,980	(76,570)	130,800	38,712
27	Mikro Kapital	2,352,900	115,708	(118,082)	205,404	22,219
28	Smart Credit	676,006	87,584	(62,355)	80,800	(79,358)
29	Armenian Leasing Company	1,790,006	85,747	(13,245)	142,027	(20,337)
30	Aes Credit	3,117,906	193,332	(15,992)	133,343	35,060
31	Norman Credit	5,101,715	543,388	(149,616)	349,100	7,114
32	Credit Concept	740,030	40,422	(12,487)	56,934	(52,381)

Appendix 2.

Summary indicators of MFIs operating in the Republic of Armenia (thousand AMD)⁴

	List of MFIs	Total Non-interest expense 31.12.2021	Total Non-interest expense 31.12.2020	Return on assets (ROA) 31.12.2021	Return on assets (ROA) 31.12.2020	Return on equity (ROE) 31.12.2021	Return on equity (ROE) 31.12.2020
1	Acba Leasing	570,807	431,241	4,36	0,79	26,3	4,5
2	First Mortgage	198,727	331,125	3,45	3,61	6,72	6,38
3	Agroleasing	55,679	45,520	0,32	6,18	1,65	25,27
4	Aniv	87,929	80,666	4,75	3,03	15,95	13,96
5	Aregak	2,012,927	1,908,761	4,01	5,02	4,68	5,96
6	Arfin	72,809	73,328	6,20	3,93	13,20	9,33
7	Card Agro-credit	587,117	506,573	1,77	1,33	13,78	11,35
8	Bless	427,530	410,400	3,63	0,89	13,74	3,36
9	Global Credit	1,590,603	1,199,467	-0,23	-2,04	-110,1	-41,05
10	Gladzor	131,694	117,138	-0,24	10,36	-0,27	12,30
11	Garni Invest	185,227	223,180	-4,08	2,50	-12,79	7,41
12	Eclof	207,792	200,763	4,74	7,87	9,77	16,98
13	Express Credit	182,798	182,520	-13,99	3,24	-61,85	10,20
14	Credit Corp	108,326	104,662	-4,06	-2,18	-8,59	-5,36
15	Kamurj	1,208,536	1,184,537	-0,76	-0,82	-0,26	-0,01
16	My Credit	149,067	163,637	4,04	1,18	9,63	3,21
17	Credo Finance	197,621	186,745	0,06	-6,53	0,28	-36,96

⁴ The table is created by the author on 21.02.2022–26.02.2022 based on the information posted on the official websites of the MFIs.

Continues

	List of MFIs	Total Non-interest expense 31.12.2021	Total Non-interest expense 31.12.2020	Return on assets (ROA) 31.12.2021	Return on assets (ROA) 31.12.2020	Return on equity (ROE) 31.12.2021	Return on equity (ROE) 31.12.2020
18	Nor Horizon	147,936	157,627	-32,61	4,35	-94,53	14,49
19	SEF International	1,665,976	1,549,369	-0,04	-2,89	-0,20	-20,23
20	Universal Credit	156,064	186,522	-3,06	0,06	-14,84	0,40
21	DICA	445,061	577,778	3,83	2,16	6,99	3,37
22	Farm Credit Armenia	661,405	797,719	0,43	1,24	2,66	7,82
23	Fast Credit Armenia	3,255,211	2,862,758	11,85	6,24	33,58	22,42
24	Finca	2,698,551	3,062,516	0,39	-3,44	1,39	-12,73
25	Mogo	1,562,508	1,716,157	4,17	-23,74	21,65	-111,25
26	Premium Credit	130,800	132,695	2,62	3,51	3,05	4,04
27	Mikro Kapital	205,404	309,228	0,94	-8,06	5,45	-42,99
28	Smart Credit	80,800	61,712	-16,57	-2,47	-6,32	-9,28
29	Armenian Leasing Company	142,027	133,992	-1,13	-8,42	-4,50	-35,29
30	Aes Credit	133,343	140,123	1,12	0,82	3,02	1,83
31	Normal Credit	349,100	302,710	1,10	3,03	1,47	3,59
32	Credit Concept	56,934	26,650	-7,13	-0,93	-34,36	-6,26

* *
*

References

- Allen F., Otchere I., Senbet L.W. (2011) African Financial Systems: A Review. *Review of Development Finance*, 1, 2, pp. 79–113.
- Agier I., Szafarz A. (2013) Microfinance and Gender: Is There a Glass Ceiling on Loan Size? *World Development*, 42, 0, pp. 165–181.
- Acharya V., Hasan I., Saunders A. (2006) Should Banks be Diversified? Evidence from Individual Bank Loan Portfolios. *The Journal of Business*, 79, 3, pp. 1355–1412.
- Baele L., De Jonghe O., Vander Vennet R. (2007) Does the Stock Market Value Bank Diversification? *Journal of Banking & Finance*, 31, 7, pp. 1999–2023.
- Bennouna G., Tkiouat M. (2019) Scoring in Microfinance: Credit Risk Management Tool – Case of Morocco. *Procedia Computer Science*, 148, pp. 522–531.
- Bebczuk R., Galindo A. (2008) Financial Crisis and Sectoral Diversification of Argentine Banks, 1999–2004. *Applied Financial Economics*, 18, 3, pp. 199–211.
- Berger A.N., De Young R. (2001) The Effects of Geographic Expansion on Bank Efficiency. *Journal of Financial Services Research*, 19, 2, pp. 163–184.
- Berger A.N., Buch C.M., De Long G., De Young R. (2004) Exporting Financial Institutions Management via Foreign Direct Investment Mergers and Acquisitions. *Journal of International Money and Finance*, 23, 3, pp. 333–366. <https://doi.org/10.1016/j.jimonfin.2004.01.002>
- Berger A.N., Miller N.H., Petersen M.A., Raghuram G.R., Stein J.C. (2005) Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks. *Journal of Financial Economics*, 76, pp. 237–69.
- Blanco-Oliver A., Reguera-Alvarado N., Veronesi G. (2021) Credit Risk in the Microfinance Industry: The Role of Gender Affinity. *Journal of Small Business Management*, 59, 2, pp. 280–311.
- Brickley J.A., Linck J.S., Smith C.W.Jr. (2003) Boundaries of the Firm: Evidence from the Banking Industry. *Journal of Financial Economics*, 70, pp. 351–83.
- Caouette J.B., Altman E.I., Narayanan P. (2008) *Managing Credit Risk: The Great Challenge for Global Financial Markets*. Hoboken, New Jersey: Wiley.
- Claessens M.S., Van Horen N. (2012) *Foreign Banks: Trends, Impact and Financial Stability*. International Monetary Fund, pp. 1–10.
- Claessens S. (2017) Global Banking: Recent Developments and Insights from Research. *Review of Finance*, 21, 4, pp. 1513–1555. <https://doi.org/10.1093/rof/rfw045>
- Chikalipah S. (2018) Credit Risk in Microfinance Industry: Evidence from Sub-Saharan Africa. *Review of Development Finance*, 8, 1, pp. 38–48.
- D’Espallier B., Guérin I., Mersland R. (2011) Women and Repayment in Microfinance: A Global Analysis. *World Development*, 39, 5, pp. 758–772.
- D’Espallier B., Hudon M., Szafarz A. (2013) Unsubsidized Microfinance Institutions. *Economics Letters*, 120, 2, pp. 174–176.
- Demirgüç-Kunt A., Huizinga H. (2011) *Do We Need Big Banks? Evidence on Performance, Strategy and Market Discipline*. European Banking Center Discussion Paper, pp. 1–51.
- Duho K.C.T., Duho D.M., Forson J. A. (2021) Impact of Income Diversification Strategy on Credit Risk and Market Risk among Microfinance Institutions. *Journal of Economic and Administrative Sciences*, July.
- Emekter R., Tu Y., Jirasakuldech B., Lu M. (2015) Evaluating Credit Risk and Loan Performance in Online Peer-to-Peer (P2P) Lending. *Applied Economics Journal*, 47, 1, pp. 54–70.
- Emmons W.R., Gilbert A.R., Yeager T.J. (2004) Reducing the Risk at Small Community Banks: Is it Size or Geographic Diversification that Matters? *Journal of Financial Services Research*, 25, 2–3, pp. 259–281.

- Favara G., Imbs J. (2015) Credit Supply and the Price of Housing. *American Economic Review*, 105, 3, pp. 958–992. DOI: 10.1257/aer.20121416
- Gomes J., Livdan D. (2004) Optimal Diversification: Reconciling Theory and Evidence. *The Journal of Finance*, 59, 2, pp. 507–535.
- Hughes J.P., Mester L.J. (2013) Who Said Large Banks Don't Experience Scale Economies? Evidence from a Risk-return-driven Cost Function. *Journal of Financial Intermediation*, 22, 4, pp. 559–585. <https://doi.org/10.1016/j.jfi.2013.06.004>
- Levine R., Lin C., Xie W. (2021) Geographic Diversification and Banks' Funding Costs. *Management Science*, 67, 5, pp. 2657–2678. <https://doi.org/10.1287/mnsc.2020.3582>
- Liñares-Zegarra J., Wilson J.O. (2018) The Size and Growth of Microfinance Institutions. *The British Accounting Review*, 50, 2, pp. 199–213. <https://doi.org/10.1016/j.bar.2017.11.006>
- Meslier C., Morgan D.P., Samolyk K., Tarazi A. (2016) The Benefits and Costs of Geographic Diversification in Banking. *Journal of International Money and Finance*, 69, pp. 287–317.
- Mkhitaryan A.S. (2021) A Comparative Review of the Efficient MFI Ecosystem with its Financial Services. *Scientific Review: Theory and Practice*, 11, 4, pp. 1073–1090. DOI: 10.35679/2226-0226-2021-11-4-1073-1090.
- Mkhitaryan A. (2022) Critical Evaluation of Organizational Structure and Culture Impact on the Productivity of MFIs within the Example of Agroleasing Leasing Credit Company LLC in Armenia. *Review of Applied Socio- Economic Research*, 24, 2, pp. 106–120.
- Ndungu J.G., Muturi W. (2019) Effect of Diversification on Financial Performance of Commercial Banks in Kenya. *International Journal of Current Aspects*, 3(V), pp. 267–285.
- Parvin S.S., Hossain B., Mohiuddin M., Cao Q. (2020) Capital Structure, Financial Performance, and Sustainability of Micro-finance Institutions (MFIs) in Bangladesh. *Sustainability*, 12, 15, 6222. <https://doi.org/10.3390/su12156222>
- Rajan R., Servaes H., Zingales L. (2000) The Cost of Diversity: The Diversification Discount and Inefficient Investment. *The Journal of Finance*, 55, 1, pp. 35–80.
- Sharma S., Anand A. (2020) Geographical Diversification and Bank Performance: Evidence from Indian Banks. *International Journal of Productivity and Performance Management*, 69, 3, pp. 583–596.
- Sullivan R.J., Spong K.R. (2007) Managers Wealth Concentration, Ownership Structure, and Risk in Commercial Banks. *Journal of Financial Intermediation*, 16, pp. 229–48.
- Strøm R.Ø., D'Espallier B., Mersland R. (2014) Female Leadership Performance, and Governance in Microfinance Institutions. *Journal of Banking and Finance*, 42 (0), pp. 60–75.
- Van Duong Ha T.T.N. (2022) The Geographical Diversification, Depth of Outreach and Credit Quality Affecting the Financial Sustainability of Formal Microfinance Institutions in Vietnam. *Specialusis Ugdymas*, 2, 43, pp. 1515–1528.
- Whalen G. (2001) *The Impact of the Growth of Large, Multistate Banking Organizations on Community Bank Profitability*. US Office of the Comptroller of the Currency.
- Zamore S., Beisland L.A., Mersland R. (2019) Geographic Diversification and Credit Risk in Microfinance. *Journal of Banking & Finance*, 109, 105665.
- Zamore S., Ohene Djan K., Alon I., Hobdari B. (2018) Credit Risk Research: Review and Agenda. *Emerging Markets Finance and Trade*, 54, 4, pp. 811–835.