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Microfinance and Financial Literacy: a quantitative analysis from the developing world

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ABSTRACT

In this paper we looked to investigate the relationship between microfinance prevalence and financial literacy in developing countries. Sources from the IMF and the S&P FinLit Survey are used to create a dataset of such countries with data on microfinance prevalence, microfinance growth and financial literacy scores. An unexpected negative relation is found between almost all individual pillars of financial literacy and microfinance prevalence. Further analysis into deposit taking and non-deposit taking institutions, showed that deposit taking institutions had positive effect on scores for risk diversification and compound interest with a negative effect on numeracy. Whereas non-deposit taking institutions have a positive effect on numeracy but a negative effect on compound interest. The study shows interesting associations however is not able to make causal claims due to data unavailability and a small sample size, promoting further research into the topic.

Keywords: Microfinance, Financial Literacy, Microcredit, Microsavings

JEL codes: O16, O43, O50

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CHAPTER 1 Introduction

Microfinance institutions are banking organizations, that work specifically, to provide financial services to the underprivileged members of a community. After being introduced in 1983 in Bangladesh, the idea has sprouted numerous organizations around the world and financed over 100 million individual microloans (Roodman, 2012).
Due to their focus on the less privileged; these institutions often contain large customer bases with low levels of financial literacy (Sayankar & Mali, 2022). Financial Literacy is described as the ability to use one's knowledge and skills to effectively manage financial resources (*Financial Literacy – Helping Citizens Make Smart Financial Choices*, n.d.). These organizations are therefore the first point of contact for their customers--with financial products such as credit, interest-bearing accounts, and non-cash savings. Microfinancing institutions focus particularly on the financial needs of the poorer population; however, the customer needs competence in basic financial literacy to put the products to efficient use. Posing a challenge that has plagued policy makers in the developing world and economists alike (Cohen & Nelson, 2011).

Microfinance is regarded by some as the key driver of financial literacy in rural areas of the developing world (Cohen & Nelson, 2011). Previous literature has even shown microfinance to be a catalyst for greater financial empowerment in often marginalized groups of the community such as women (Nawaz, 2015). Most of the previous research focuses on overall financial empowerment for women and poverty alleviation; both of which showed positive relationships to microfinancing activities (Kabeer, 1997; Khandker, 2005). Financial Literacy rates are also seen as a key force to alleviate poverty and drive financial inclusion for women, especially in middle income countries (Karakurum-Ozdemir et al., 2019).
Financial literacy rates; however, still lingers at surprisingly low levels even for developed economies; where only about 30% of adults fully grasp basic concepts such as interest rates and inflation (Lusardi, 2019). This severe lack of financial literacy is expected to be even further exaugurated for developing economies, thus putting the core clientele of microfinancing institutions severely at risk of ill-intentioned banking institutions.

Throughout academic literature; the direct causal effect of the presence of microfinance institutions on the rates of rural financial literacy; however, is widely unmentioned. Therefore, our study looks at the research question; What is the effect of microfinance

institutions on the financial literacy rate in developing countries? Keeping in mind that, accounting for financial literacy along with the increasing levels of microfinancing activity is a key factor towards working to prevent banking institutions from taking advantage of their ill-educated customers (Sayankar & Mali, 2022).
Most studies on the effects of microfinancing are also geographically limited as they use data from just 1 or 2 countries. The biggest example comes from a collection of case studies from Asia and the Pacific; still without a comprehensive aggregate use of the dataset (Remenyi & Quiñones, n.d.). The use of a wider dataset here would allow for a much bigger sample size of developing countries with microfinancing institutions, making the results less specified to the intricacies of a nation and more robust for varied, real-world applications.

The study will follow the use of a standard OLS regression, regressing the presence and growth rates of microfinance institutions on the various indicators representative of financial literacy. The selection of these indicators will be based on the academic majority used in previous studies, including knowledge of basic financial concepts, concepts of saving/investing and borrowing concepts (Huston, 2010).
The dataset used is the Financial Access Survey, provided by the IMF (International Monetary Fund). The survey is held every year; but due to restricted data availability on financial literacy, the data from 2014 and 2013 will be used here. The dataset includes over 190 countries; however, the focus of this study will be on developing economies as the purposes of microfinance as are more widely served there. The selection of developing economies is made based on the classifications of low-income and low-to-middle income used by the World Bank. Data on an aggregate level must be used; with indicators serving as proxies, as personal questionaries would restrict the scope of the study. The earlier dataset will be added to, by using the Standard & Poors Global FinLit Survey from 2014 (for data on the financial literacy on adults) as it provides the most region comprehensive dataset available.

We hypothesize a higher prevalence's of microfinancing institutions, to increase the levels of financial literacy, on an aggregate level, in the communities where they are present. Since access to these financial products is expected to act as a driver towards learning about them and putting them to use. We also expect higher growth rates to represent a positive trend in microfinance popularity, prompting higher financial literacy levels with a similar intuitive explanation to overall microfinance prevalence.

Alongside, with more competition in the growing microfinance industry; we expect a further increase of the social benefits towards financial literacy as microfinance institutions look to improve their services and attract more customers. The results: if aligned with our expectations, could provide further evidence for microfinancing institutions to spread further across developing nations.

It would work; to remove the negative connotations often connected with the banking industry, of seeking to take advantage of its customer--rather than helping them. A belief that is even more widely held in the developing world due to historic instability in government and institutions.

If the opposite of our expectation is found; it could highlight a key structural issue in microfinancing--whereby-- its customers are performing financial transactions without being aware of the consequences. This would require a reconsideration on the structure of these institutions.

CHAPTER 2 Theoretical Framework

2.1.1 Microfinance Institutions

Microfinance institutions is a term; usually used to describe small-scale financial institutions, offering credit and deposit services to the low-income customers. The customers often include small scale enterprises; where goods are produced, recycled, repaired, or traded (Robinson, 1998). Most of them are based in low-income countries and are seen as a means of poverty alleviation.

The institutions are a way, for the previously unbanked, to gain access to the wider financial system. The institutions often provide a mix of loaning (microcredit) and/or saving (microsaving) services. The most popular side of this equation is microcredit.
These bank operations are different as compared to banking systems in other developed economies in some key fields.
Firstly, the size of individual transactions, the average loan sizes, as of 2018, were $1839, with the median at $684 (Dhib & Ashta, 2021). The small size of these transactions means that; for traditional banks, the loans are not worth the costs and trouble needed to issue them, thus causing the low-income population to be excluded.
Secondly, the need for collateral and repayment periods-- traditional banks favour large loans spanning longer repayment periods, as it allows the bank to maximize the return on the work done in issuing the loan. The microfinance space focuses on smaller loan amounts that are issued, keeping in mind the repayment over short time periods. These often act as a means of providing liquidity in time of cashflow shortages instead of long-term investments. These loans are often; also provided with no collateral, as many of their customers often lack personal assets. The loans are rather governed using community-based measures, where the entire customer base polices the repayment of loans between each other to ensure the future presence of the microfinance institution.
The institutions often replace unethical, high-interest rate moneylenders; who basically operated to trap their financially illiterate customers (Dowling, 2011).

2.1.2 Historical Context

Small-scale finance institutions; as defined in the previous section, have existed for a long time. The earliest form of financing, provided especially for the poor, can be seen in Asia-- with the concept of the previously mentioned moneylenders. Quoted as far back as around

200BC to 300AD; moneylenders would provide loans from their private assets to poor residents in villages for high-interest rates (Zainuddin & Yassin, 2020). The lenders would operate in a ruthless manner; often coercing the poor villagers into debt traps, through entering financial contracts which they did not fully understand or have a realistic chance to pay back. Banking based on the outrageous interest payment charges, that would balloon over time for the loaner.

As moneylenders provided microcredit, micro savings were often organised through rotating organised savings and credit associations (ROCSA). The members of an ROCSA contribute a specific amount to a fund at predefined intervals (usually every month or at every paycheck cycle). The money is then re-distributed in whole or in-part to a different rotating member at each interval. Each new joining member is added to the end of the repayment list, having to contribute for multiple cycles before receiving the value of their contributions in lump sum at the end. The association serves as means of inducing savings, building in a level of community responsibility and fiscal awareness. The concept is based on regularity and rotation, in both the benefits and responsibility of handling the sum (Kurtz, 1973). The associations however operate without any interest gain on the savings of the group members, rather than just as means to inducing setting aside money on a pre-defined basis. Participation is also often linked to factors such as age, sex, profession, religion, or economic status.

The above mentioned non-formal community financing measures are still present and popular in many parts of the world, where people are deemed un-bankable by the formal banking system. Thus, these systems provide an alternative. Formal microfinance institutions of today focus on this very customer base; looking to educate and provide formal banking system access to these previously ignored communities.
Multiple governments tried to tackle this, using subsidized credit for deprived populations, between the 1950's and 1970's. However, a lack of proper institutions in these nations meant that the allocation of subsidized credit would fall into corrupt hands, with funds reaching the political elite rather than it's intended recipients (Dallimore, 2013).

A breakthrough in the field came with the success of the Grameen Bank in Bangladesh. The proprietor of the program, Muhammad Yunus received a Nobel Prize for the program in 2006. The program started when Yunus was approached by a lady who sold bamboo stools in a

village nearby his university and explained the way in which moneylenders exploited the poor.

The Grameen Bank started with a mere loan of $27 to 42 participants, on the terms of paying it back when they were able to (Yunus, 1998). What started as a small charitable loan, eventually turned into the most successful microfinance institution of all time.

The bank works by lending out small loans to borrowers that are asked to form groups of around 5 people. The group acts as peer-monitors ensuring repayment, to allow for continued access to cheap credit, with the system resulting in repayment rates over 90% (Khandker et al., 1995). The bank aims to be financially sustainable, with aims to further reduce its reliance on subsidized credit while continuing to expand. The concept of the bank has also been replicated around the world due to its popularity, with similar concepts emerging in parts of South-East Asia, Africa, and Latin America. As the microfinance trend emerges; there have also been opponents of the concept; with many citing the bi-goaled agenda of the bank in poverty alleviation and financial sustainability, as having produced mixed results in empirical studies (Zainuddin & Yasin, 2019).

2.1.3 Microsavings and Microcredit

The terms microcredit and microfinancing are often used interchangeably in articles and online blogs, while forgetting the other side of the microfinancing activities in microsavings. What is often being referred to using the term microfinancing is the process of giving out small loans; referred to academically, as microcredit.

Microcredit enjoys the more popular naming due to its popularity having blown up with the popularisation of Muhammad Yunus' Grameen Bank. Therefore, it has also long been the centre of academic research in microfinance with many having shown a positive impact of loans in improving financial outcomes such as entrepreneurial ability and profits (Attanasio et al., 2014; Demirgüç-Kunt & Singer, 2017).

On the other hand, many researchers have also shown a lack of transformational effect with microcredit banking (Banerjee et al., 2015) with some even criticizing the practice, comparing the practice to poverty traps (Bateman, 2010).

Microsavings on the other hand has not enjoyed the same level of popularity, in either offerings through microfinance institution or academia. Although research exists on the positive effects of saving for the poorest in a population, this was often done via ROCSA's

rather than interest-bearing savings accounts (Collins et al., 2009). Savings were also shown to boost the chance of entrepreneurial endeavours and act as the main source of start-up financing (Gunu, 2010). One of the main reasons that microsavings has lagged so much as compared to its counterpart; is due to the lack of financial incentive that banks get, when they offer this service. Studies show that offering microsavings actually has a statistically significant negative impact on the profitability of a microfinance institution, due to the high costs of operating such an affair with minimal margins available (Chikalipah, 2018).
As microfinance institutions look to find their place between providing positive social benefits and financial stability; the difference between microfinance and microsavings becomes crucial. One provides a more concrete solution with lower financial benefit. The other has proven to be a successful business model, sold with the promise of social benefit, the existence of which is doubtful.

2.2.1 Financial Literacy

Financial Literacy has had multiple definitions in academic writing from around the world. The terms financial literacy, knowledge and education are often used interchangeably, while simultaneously referring to a wide variety of concepts.
For the purposes of this paper, we start with the concept being defined as measure. Then we look to use the definition as provided in a literary analysis by Kimiyaghalam and Safari. The paper looks at multiple definitions over academia and finds 4 pillars around which all the definitions are structured:
The knowledge of financial concepts,
Ability to manage personal finances,
Skill in making financing decisions and
Confidence in future financial planning (2015).

Financial literacy is a widening concept, as more and more people around the world gain access to a central banking system. Thus, it's important to ensure protection for these customers against possibly ill-intentioned banks. The lack of financial literacy can also be alarmingly dangerous. Customers who are less educated about debt, tend to be the ones that incur the highest debt costs and take on the highest debt loads (Lusardi & Tufano, 2009).

Financial literacy rates also vary highly among countries, with values ranging between 71% to 13% of the total adult population (Klapper et al., n.d.). Western Europe and North America pose numbers in the >50% range whereas much of South Asia poses the lowest values, often under 25%. In emerging economies, we see that average difference shows 5% higher rates for men. Income also acts as determinant here; in BRICS nations the low-income populations sit at 23% compared to the affluent population at over 66%. Even though women on average are less financially literate they are more likely to use the option "don't know", showing higher honesty and eagerness to learn (Lusardi & Mitchell, 2014).

As access to complex financial products grows in emerging economies, insufficient financial literacy might lead to economic ruin for families already struggling to make ends meet. The question of whether; financial literacy follows, is a pre-cursor to, or even presents together with financial inclusion is key to this study.

2.2.2 Financial Literacy and Economic Development

The link between financial literacy and economic development has been a topic of extensive academic analysis in recent years. With much of the historic research focusing on the demographics of different financial literacy levels, rather than the macro-economic effects that can result from aggregate changes in these figures.

Recent research from India suggests there might be a positive correlation between financial literacy and rural development, through increased financial inclusion (Gautam et al., 2022). Financial Inclusion could also add a level of resilience to the economy of a country. Research in Indonesia showed that as the other local economies suffered from the trade-wars and political instability in South-East Asia around 2018-2019, greater financial literacy kept Indonesia's economic growth stronger than others (Trivena & Aini, 2021). Bucci et al. look to connect the topics in an indirect means, as financial literacy increases the level of financial inclusion, it argues that economic return increases through financial returns and human capital accumulation (2023). The model presented, is based on financial literacy improving the efficiency of the financial system; as more people have formal bank accounts, transfers, savings, and loans can be executed much faster than in pure cash transactions. The paper does; however, focus on long-term equilibrium growth levels rather than immediate growth, providing further argumentation for government intervention to increase financial literacy. In addition to economic development, financial literacy is also seen as a means of economic empowerment, through which previously marginalized groups, often due to their sex, religion,

race etc. can be offered better opportunities. A US study into women that survived IPV (Intimate Partner Violence) incidents showed that greater financial literacy programs led to higher levels of economic empowerment, self-efficacy for economic factors and economic self-sufficiency (Postmus et al., 2013). Thus, proving that even in more economically developed nations, financial literacy provided better opportunities for outcomes and served as a factor of economic development. With microfinance often being presented as a means of promoting economic development, it is interesting to note it's connection with the factor of financial literacy, which is analysed in the paper further.

CHAPTER 3 Data

3.1 Microfinance Institution Prevalence

The study will use data from the IMF Financial Access Survey (FAS) of 2013 and 2014. The data can be accessed via the IMF Databank. With over 160 countries available; FAS is one of the biggest databanks, for information on the prevalence and usage of microfinance institutions. The database includes key figures for microfinance penetration in the country; showing how prevalent the institutions/their branches are and how actively they participate in the economy. Additionally, we look at the growth rate of microfinance prevalence in the country with data from the years 2013 and 2014.

Since the study is specified/specific to the developing world; I will only be using data that the World Bank classifies as originating from low- or low/middle-income countries. These are defined as countries with a GNI per capita of $1085 or less and between $1086 and $4255 respectively (*World Bank Country and Lending Groups – World Bank Data Help Desk*, n.d.). Sorting on income levels leaves us with a subset of 86 countries that can possibly be used. The sample reduces further as microfinance prevalence for both 2013 and 2014 must be available, alongside the distinct prevalence of deposit taking and non-deposit taking institutions. Out of the 86 possibly usable income level countries, 45 include the complete dataset for the year 2014 and only 37 for the year 2013, 34 of these countries are the same. Since we include the use of the growth variable, the 34 countries that include the full dataset from 2013 and 2014 become the complete usable dataset. Financial literacy data is available for the 34 countries in the dataset, preventing any further reductions to the sample size. The lack of data availability is expected for the study as we focus on developing counties. The data used here is often collected via government institutions, the strength of which is severely lacking in low and middle-low-income countries. With low levels of record keeping and often secretive government regulations on data sharing, or mere lack of research in the field in the country, the chance to find suitable data is low. The niche research topic of microfinance also means that the likeliness of available data is further reduced.

The descriptive statistics for the microfinance institution prevalence variables is presented in the table below.

Table 1 Descriptive statistics for the variables mfiprev, gr_mfiprev, dtmfiprev and ndtmfiprev

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Microfinance Prevalence (mfiprev)	34	3.918	1.439	6.508	.097	34.927
Growth of microfinance prevalence (gr_mfiprev)	34	1.047	1.06	.429	0.57	2.3
Deposit taking microfinance prevalence (dtmfiprev)	34	25.618	7.5	44.876	0	212
Non-Deposit taking microfinance prevalence (ndtmfiprev)	34	27.648	1	63.661	0	284

The first dependent variable is the number of all microfinance institution branches per 1,000 km^2 *(mfiprev),* defined in the glossary as denoting the number of deposit taking and non-deposit taking microfinance institutions and their branches for every 1,000 square kilometres in the reporting jurisdiction (*Financial Access Survey: Glossary of Indicators*, n.d.). A low value in this case point towards a less prevalent presence of microfinance institutions since the average distance to a microfinance branch then becomes longer and thus less accessible. For example, a value of 1 would imply a much larger average distance as compared to the max of 34.9 per 1000km^2. With more branches present around, a higher prevalence can be assumed.

The second variable is defined as the growth rate of microfinance institutions prevalence between the year 2013 and 2014 (*gr_mfiprev*). The variable looks at the growth of microfinance, pointing towards the level of popularity and general trend of the microfinance market in the sample country. The variables look at the combined effects of microfinance prevalence, but as mentioned above, distinction between microsavings and microcredit can be crucial, which are/is considered in the next paragraph. The variable measures the growth multiple compared to the year before, with a value of 1 serving as the baseline. For example, a 20% growth would be represented as 1.2 in the dataset.

Due to this consolidation in the first section of the study; for microsavings and microlending institutions, we use 2 more proxies and run a similar analysis to the initial. These proxies are number of deposit-taking microfinance institutions *(dtmfiprev)* and number of non-deposits

taking microfinance institutions *(ndtmfiprev).* The first variable measures the number of institutions that offer the service of microsavings in the given jurisdiction within the given period (hereby 2014). The second measures other banks that offer microlending, and/or other small-scale financial services such as insurance coverage, investing advice or special governmental banking institutions (also active within the given jurisdiction in 2014). The data availability for these proxies differs slightly from the previous; thus, the sample size of available data is 40 countries and 34 and respectively for both. However, only countries with the complete dataset are considered therefore the final sample hold the 34 common countries between the two datasets.

The variables are used only for secondary analysis since they are weaker proxies of the actual prevalence and availability of microfinance. This is due to the possibility of claustration of these institutions in the bigger cities or areas with already higher levels of financial literacy. These values also refer to the number of nationally registered companies that offer the service rather than branches. This data can, however, be useful in consideration of; how competition in these markets, measured through the number of firms actively participating, can change the effect these institutions have on financial literacy. Answering, whether a more competitive market improves the social benefits of these institutions. For the reasons stated above, the growth rates for these variables are also not considered since in most cases the number of institutions offering these services does not change between the year 2013 and 2014. The minimal changes point towards a lack of growth factor in these values. With these minimal changes, analysis into growth levels do not seem to provide additional explanatory value.

3.2 Financial Literacy Measures

The data on financial literacy comes from the 2014 S&P FinLit survey; conducted through Gallup Inc, The World Bank Research Group and The Global Financial Literacy Excellence Center. The survey provides the most current and complete dataset on financial literacy for developing economies.

The study included a basic question set of just 4 questions (one for each financial subject) asked to respondents. Additionally, the survey also makes distinctions for gender and age. For overall financial literacy (*finlit*), a person is considered financially literate if they answered 3 of the 4 questions correctly. The 4 measured financial subjects include: risk diversification (riskdiv), inflation (*inflat)*, numeracy (interest) (*numera)*, and compounding interest

(*compint)*. The questions of the survey itself can be found in Appendix A. Therefore, separate scores are also published for the sub-scores on each financial subject.

The descriptive statistics for the total financial literacy and each sub score are as follows:

Table 2 Descriptive statistics for the variables finlit, riskdiv, inflat, numera and compint

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Financial Litreacy (finlit)	34	.311	.300	.105	.182	.713
Risk Diversification (riskdiv)	34	.389	.345	.163	.143	.784
Inflation (inflat)	34	.484	.499	.109	.258	.700
Numeracy (numera)	34	.442	.443	.107	.226	.714
Compound Interest (compint)	34	.471	.464	.125	.233	.726

The responses are measured as a value between 0 and 1; for *finlit,* representing the percentage of respondents that answered at least 3 of the 4 the questions correctly. The individual variables for *riskdiv, inflat, numera and compint* are similarly measured between 0 and 1 and represent the percentage of respondents that answered the question on that topic correctly.

The respondents were randomly assigned and asked; along with substitution methods incorporated for the chosen participants that did not respond. Sampling was done based on population sizes. The dataset combines data from 146 countries; including the 34 used in our sample. The interviews were conducted face-to-face in economies with low cell phone coverages, while others were done online/via telephones.

Aggregated dataset values are used for this investigation, for the sake of the necessary analysis and due to data availability. Since we want to look at the overall effects on financial literacy and see if one of the financial subjects is seen to have a heterogenous effect to the others.

3.3 Controls

The study also incorporates the use of control variables, as to reduce the effects of external variables on the investigation of the relationship, in question. Special attention must be paid, as to find control variables, that are relevant in helping find more accurate results for the variable of interest. The two control variables used here are both derived from the World Bank World Development Indicators dataset for the year 2014. The dataset is used as it contains values for over 266 countries, as to maximize chances for data availability. The variables are GDP per Capita (*gdppc*) and Primary Completion Rate (*pcc*), the descriptive statistics for the data are provided below with institutions for their usage followed next.

Table 3 Descriptive statistics for the variable gdppc and pcc

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
GDP per Capita (gdppc)	45	1824.53	1343.4	1210.461	257.8	5495.4
Primary Completion Rate (pcc)	37	79.95	78.6	18.398	48.8	109.2

GDP per capita is used, as a positive correlation exists between countries with higher levels of income and rates of financial literacy (OECD, 2017). The correlation can be intuitively tied to the ability for students with higher incomes to have more time and exposure in dealing with financial sums that require an understanding of basic financial concepts. Notable exceptions exist within this correlation; however overall, the correlation stands.
Primary Completition Rate is used as a second control variable. The variable measures the percentage of the population aged 14 that has completed primary education. It can be intuitively argued that for an individual to be considered financially literate; a primary level of literacy and numeracy is required. The intuitive claims are backed by data from the FinLit survey, used in this study, that found financial literacy to be highly correlated with educational attainment. The data, showing a 15-point difference, in the prevalence of financial literacy between educational levels in adults.

Additional control variables were considered, however their effect on the sample size would be insignificant, reducing it even further due to the lack of data availability in sample set of developing countries. Examples such as mortality rate and mean age provided very little explanatory power, similarly to land area.

CHAPTER 4 Method

4.1 Regression Equations

The study follows the use of an ordinary OLS regression. The sample of 34 countries is constructed using the compared data availability for financial literacy and microfinance institution data from both the datasets. Countries with missing values for the variables in question were eliminated. The regression looks to investigate whether the presence of more microfinance institutions created a higher level of financial literacy.
The regression equation for the initial analysis is as follows:

$$(1)\ finlit_i = \beta 0 + \beta 1\, mfiprev_i + \varepsilon 1$$

Then, a similar regression is run for each of the 4 questions that were asked during the study, to investigate the correlation among the individual pillars of financial literacy and the prevalence of microfinance institutions, constructing the following regression equations.

$$(2)\ riskdiv_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \varepsilon 1$$
$$(3)\ inflat_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \varepsilon 1$$
$$(4)\ numera_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \varepsilon 1$$
$$(5)\ compint_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \varepsilon 1$$

Following this analysis, the control variables of GDP per capita, Literacy Rate and Primary Completion Rate are added to the following regression equations, as to account for the differing factors, that could influence the differences in financial literacy; other than the prevalence of microfinance institutions. These then create the following regression equations:

$$(6)\ finlit_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \beta 3\, controls_i + \varepsilon 1$$

$$(7)\ riskdiv_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \beta 3\, controls_i + \varepsilon 1$$
$$(8)\ inflat_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \beta 3\, controls_i + \varepsilon 1$$
$$(9)\ numera_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \beta 3\, controls_i + \varepsilon 11$$
$$(10)\ compint_i = \beta 0 + \beta 1\, mfiprev_i + \beta 2\, gr\_mfiprev_i + \beta 3\, controls_i + \varepsilon 1$$

Finally, another regression is run; keeping in mind the controls but looking at the difference between the numbers of deposit-taking and non-deposit-taking microfinance institution prevalence, to see the differing effect of those on financial literacy. The regression is also run with each individual pillar of financial literacy, to investigate the possible differentiated effect among the sub-variables of financial literacy.
The analysis is carried out using the two regression equations, as follows.

$$(11)\ finlit_i = \beta 0 + \beta 1\ dtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(12)\ finlit_i = \beta 0 + \beta 1\ ndtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$

$$(13)\ riskdiv_i = \beta 0 + \beta 1\ dtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(14)\ inflat_i = \beta 0 + \beta 1\ dtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(14)\ numera_i = \beta 0 + \beta 1\ dtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(16)\ compint_i = \beta 0 + \beta 1\ dtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$

$$(17)\ riskdiv_i = \beta 0 + \beta 1\ ndtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(18)\ inflat_i = \beta 0 + \beta 1\ ndtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(19)\ numera_i = \beta 0 + \beta 1\ ndtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$
$$(20)\ compint_i = \beta 0 + \beta 1\ ndtmfiprev_i + \beta 2\ controls_i + \varepsilon 1$$

The results for all the above regressions are run using Newey-West heteroskedasticity and autocorrelation robust standard errors, the significance is measured at a confidence level of 0.05.

The regressions are run with dt*mfiprev and ndtmfiprev* as the sole explanatory variables used alongside each measure of financial literacy individually. This is a result of the small sample size resulting from data availability, additionally allowing for the explanatory power of each of the variables to be individually assessed, adding to the reliance of such an estimation. This also allows for comparisons between the individual variables on where the variables have higher explanatory power and effect. These findings are discussed in detail alongside their interpretations in the following chapter.

4.2 OLS Assumptions

Additionally, since the analysis employs the use of OLS regressions, it is important to consider the assumptions used to make sure a model is accurate. The paper tries to evaluate its regressions, keeping in mind the low sample size but still in the spirit of being genuine as to the strength of the conclusions.

Assumption 1 requires that the regression model is linear in parameters. Since the analysis uses a simple linear regression, without any logarithmic or exponential manipulations on the beta variables. The regressions are conducted as specified above and thus the first assumption can be considered satisfied.

For assumption 2, the observation must be collected using random sampling, this is satisfied by the methodology of the dataset explained earlier in the data section. The dataset for financial literacy uses random sampling in the selection of participants while simultaneously accounting for population sizes. The regression also follows the expected causal direction of the relationship. A problem factor here could be that a known causal relationship direction is not precedented in literature. Therefore, increasing the possibility of a reverse causal or simultaneous causality relationship, where microfinance and financial literacy effect each other's value. Therefore, this assumption can only be considered partly satisfied.

The 3rd assumption of an OLS model requires that the conditional values of the error terms be equal to 0, this can be checked by the means of a plot of the residuals and fitted values of the final models. This is done below for regressions 6, 11,16.

For the first plot, we see that the points form a band of values between the lines of 1 and -1, the datapoint seem to be somewhat equally distributed above and below 0, with an outlier

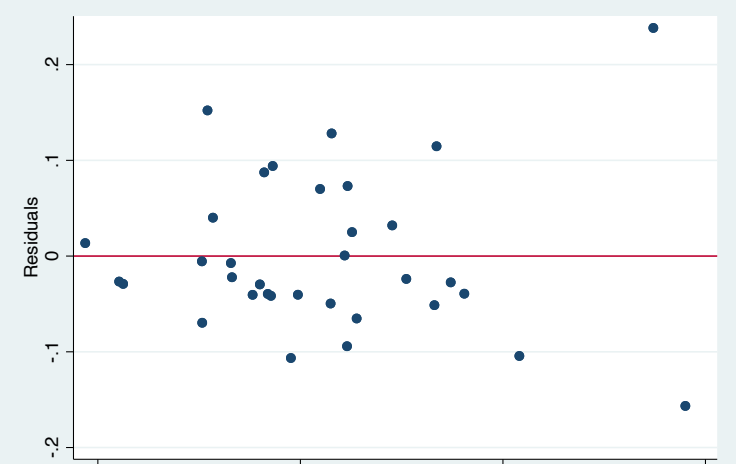

Figure 1. fitted vs residual values plotted for regression 6, done for checking if assumption 3 is satisfied.

each on both the positive and negative sides, the plot suggests that the regression meets the conditions to satisfy the assumption of zero conditional means.

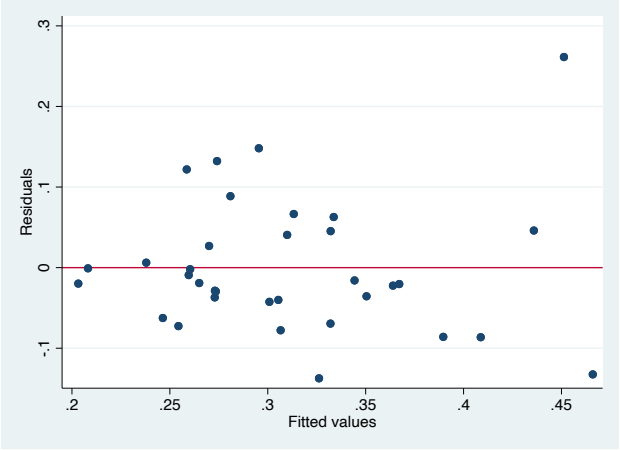

Figure 2. fitted vs residual values plotted for regression 11, done for checking if assumption 3 is satisfied.

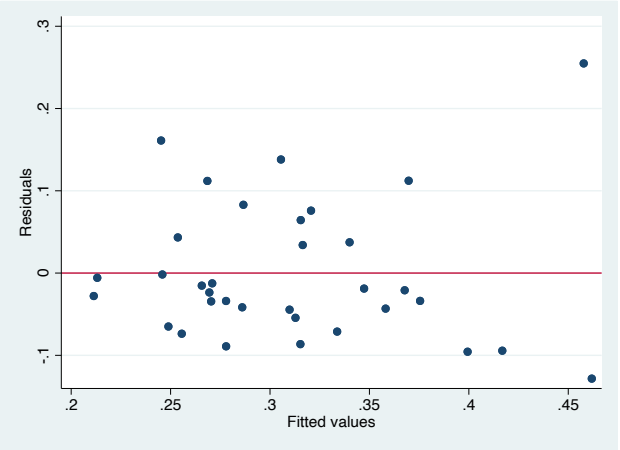

Figure 3. fitted vs residual values plotted for regression 16, done for checking if assumption 3 is satisfied.

A slightly different story is seen for the plot using dtmfiprev and ndtmfiprev, the plots seem to show a slight downward curve in the placement of the points, this could point towards a slightly curved relationship between the variables. As mentioned before the proxies for these variables are weaker and therefore less harsh conditions are used to be able analyze them, however with the considerations of their quality kept high in mind before drawing any conclusions. These two variables then, show that the do not fully satisfy the zero conditional means assumption.

Additionally for assumption 4, the requirement states that the independent variables must not be correlated with each other, regression 6-10 are the only regressions with multiple independent variables in the shape of mfiprev and gr_mfiprev both being used to explain financial literacy measure, therefore they are checked. The independent variables used to investigate the relationships also show a slight level of negative correlation of -0.2962. The variables are far from perfectly multicollinear but the presence of does exhibit some doubt on the p-values and co-efficient. The severity of the multicollinearity is moderate, when accounted for with the small sample size, it can still allow for statistical analysis to be conducted. The overall condition is not fully satisfied however, and the possibility of these errors must be considered along with the conclusions of the study.

Assumption 5 requires no heteroskedasticity and no autocorrelation. The issues of heteroskedasticity are fixed with the use of Newey-West standard errors that can account for

any possible discrepancies. Additionally, since the data only deals with one year of observations, autocorrelation becomes inapplicable. Thus, satisfying assumption 5.

CHAPTER 5 Results & Discussion

5.1 Results

The results of the study are measured using Ordinary Least Squares (OLS) regressions, with the use of robust standard errors. The tables below present the estimated coefficients for each variable, the p-value of the coefficients is mentioned in the parenthesis below. Each table also include the no. of observations used to estimate the coefficients and the adjusted r-squared value representing the level of overall variance that can be explained using the variables included in the model. This study employs the use of adjusted r^2 values, as multiple regressors are added into the regression. Normal r^2 values can be easily manipulated as they increase with the number of regressors in the analysis. Adjusted values are robust to these additions and provide a more accurate measure of the explanatory power of the model.

The variables are used as is, therefore the coefficients can be interpreted as the estimated change in the dependent variable (finlit, riskdiv, inflat, numera or compint) when the independent (mfiprev, gr_mfiprev. dtmfiprev, ndtmfiprev) increases by one unit. For the variable mfiprev, this refers to an increase in the amount of microfinance institution branches per 1000km^2. For dtmfiprev and ndtmfiprev, this refers to an additional institution joining the market for microfinance services in the country.

Table 4 OLS regressions result for regression (1), regressing the overall level of financial literacy on mfiprev, gr_mfiprev.

	(1)
	Total Financial Literacy
mfiprev	-.0050059**
	(0.035)
gr_mfiprev	-.1380138**
	(0.032)
_cons	.4749989***
	(0.000)
Observations	34
Adj. R-squared	.22547135

Robust standard errors are in parentheses.
**** p<.01, ** p<.05, * p<.1*

Regression (1) (Table 4) simply regresses the level of total financial literacy in a country (finlit) on the overall level of microfinance prevalence and the growth rate of microfinance prevalence. The regression produces a coefficient that is statistically significant (at the 5% level) and negative for both mfiprev and gr_mfiprev, with values -.0050059 and -.1380138 respectively. The variables can be interpreted as an increase of 1 unit in the variable mfiprev, reduces the overall level of financial literacy by 0.0050059. The estimate is statistically significant but with an average of 0.31 for financial literacy, a decrease of 0.0050059 can still be economically significant considering the population sizes in most of these developing nations. As for gr_mfiprev, the coefficient shows that as the growth percentage of microfinance institutions increases by 1, the overall financial literacy is associated with a reduction of ~13.8%. The effects seen here provide a similarly sized effect to mfiprev, as with the average growth rate of around 4.7%, the economic prevalence reveals a change of around 0.006, showing a 0.6% increase in financial literacy overall if the sample's average growth take place in the country. The adj. R^2 of the regression is 0.225, showing some but not extreme explanatory power in the model. The regression shows an opposite effect as to what was expected through the hypothesis, however the relatively low R^2 and lack of controls present areas of improvement for the regression, which is performed further in regression (6).

Regressions (2,3,4,5) look to run a similar analysis to Regression (1), however instead of overall financial literacy, the regressions look to investigate the effect of microfinance prevalence on each individual pillar of financial literacy, under the variables (riskdiv, inflat, numera and compint). The regressions show varying degrees of R^2 values, from a negative value for numeracy, which can be interpreted as a 0 value to 0.183 for the variable for inflation, representing differing explanatory powers of the mfiprev and gr_mfiprev variables within the financial literacy pillars. The variables are similarly interpreted to the previous regression, with coefficients pointing to the level of change in the individual pillar, when the variables increase by 1 unit. The same sample of 34 observations is used for this analysis.

Table 5 OLS regressions result for regression (2-5), regressing each individual financial literacy pillar on mfiprev and gr_mfiprev.

	(2)	(3)	(4)	(5)
	Risk Diversification	Inflation	Numeracy	Compound Interest
mfiprev	-.0068991***	-.0022471	-.0001602	-.004981**
	(0.006)	(0.268)	(0.952)	(0.033)
gr_mfiprev	-.1886193***	-.1208777***	-.0356837	-.0810697**
	(0.002)	(0.001)	(0.616)	(0.031)
_cons	.6137044***	.6190018***	.4796817***	.5755605***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	34	34	34	34
Adj. R-squared	.14642996	.18288053	-.04171867	.02787913

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Interestingly, all the regressions in Table 5 present negative estimated coefficients, mfiprev shows statistically significant effects for risk diversification and compound interest, while gr_mfiprev shows statistical significance for inflation alongside risk diversification and compound interest. The magnitude of the coefficients stays low for mfiprev while for gr_mfiprev, points to a score up to ~18.9% less with the increase of growth by 100%. The on average higher coefficients for gr_mfiprev must also be considered with the variable's average values, accounting for the fact that a 1 unit increase in mfiprev (a new branch for microfinance services) is a more realistic scenario compared to 100% year on year growth in microfinance institutions in a country. The economic significance is also maintained in this analysis, as the small changes in mfiprev must be considered alongside populations in millions. Each variable providing a negative estimate also points in the opposite direction to what was expected in the hypothesis. The low R^2 values once again provide reasons for concern regarding the overall explanatory power of the variable, however the results are still

insightful. The 5 regressions above are run again with the available controls as to get more accurate estimations of the size and sign of the coefficients. Even as the coefficients show statistical insignificance, considering the low sample size, interesting correlations could still prove as inspiration for future research into these relationships.

The next set of regression from Table 6, incorporate the control variables of GDP per Capita (gdppc) and Primary Completion Rate (pcc). The controls are added, in order to account for the previously unobserved factors that can influence the sign and magnitude of the estimated coefficients. We see here that none of the coefficients for mfiprev prove to be statistically significant. As for gr_mfiprev, risk diversification and inflation show negative and statistically significant effects. The adj. R^2 values for these variables shows much higher values for this regression. The values being significantly higher points to the controls holding high explanatory power for the variables being investigated.

Continued on the following page…

Table 6 OLS regressions result for regression (6-10), regressing overall financial literacy and each individual financial literacy pillar on mfiprev, gr_mfiprev and the controls of gdppc, pcc.

	(6) Financial Literacy	(7) Risk Diversification	(8) Inflation	(9) Numeracy	(10) Compound Interest
mfiprev	-.0037576*	-.0040941	-.0023246	-.0008105	-.0034581
	(0.086)	(0.101)	(0.206)	(0.774)	(0.222)
gr_mfiprev	-.1229444*	-.1552952***	-.117785***	-.0442943	-.0665181*
	(0.054)	(0.004)	(0.003)	(0.527)	(0.067)
gdppc	-5.32e-06	-.0000172	.0000393**	-4.58e-06	-.0000436***
	(0.684)	(0.310)	(0.019)	(0.758)	(0.007)
pcc	-.0017115*	-.0037768**	-.0004098	.000989	-.0015969
	(0.065)	(0.024)	(0.707)	(0.477)	(0.183)
_cons	.5978242***	.8933205***	.5843022***	.4207966***	.7511769 ***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)
Observations	37	37	37	37	37
Adj. R-squared	.3085081	.36723419	.28407602	-.09279219 (0)	.26625726

Robust standard errors are in parentheses.
**** p<.01, ** p<.05, * p<.1*

The insignificant values for all the estimated mfiprev coefficient's points towards a rejection of the initial hypothesis, that the level of microfinance institution prevalence has a positive effect on the levels of financial literacy. Since the effects are not statistically significant, the economic significance is not considered. As for microfinance growth rates, coefficients for risk diversification and inflation are statistically significant. The coefficients show an expected decrease in the aggregated scores by ~15.5% for risk diversification and ~11.7% for inflation, if the growth rates increase by 1 unit, implying a growth of 100%. The effects can be seen as significant and worth further investigation; however, they offer refuting results to the earlier hypothesis. Furthermore, the negative coefficients even

suggesting a negative effect in the variables correlations with financial literacy compared to the expected positive relationship.

In the proceeding regressions (Table 7), we look to investigate the differences in the effect between deposit taking (microsavings) and non-deposit taking (microcredit) institutions, as is mentioned in Chapter 2.1.3, the differences between the two types of microfinance institutions makes an interesting research realm, with little previous research on the topic. The regressions are run similarly to the previous tables, this time with the incorporation of the controls used in regressions (6-10). Table 5.4 presents the same correlations as Table 5.3 but now with deposit taking microfinance institutions (dtmfiprev) as the variable of interest, instead of total microfinance prevalence (mfiprev). Table 5.5 takes a similar approach as well, but with non- deposit taking microfinance institutions (ndtmfiprev) as the variable of interest.

Table 7 OLS regressions result for regression (11-15), regressing overall financial literacy and each individual financial literacy pillar on dtmfiprev, gr_mfiprev and the controls of gdppc, pcc.

	(11)	(12)	(13)	(14)	(15)
	Financial Literacy	Risk Diversification	Inflation	Numeracy	Compound Interest
dtmfiprev	-.0000167	.0008912***	.000387	-.0012519***	.000816***
	(0.962)	(0.027)	(0.251)	(0.002)	(0.023)
gdppc	4.21e-06	1.41e-06	.0000459**	-.0000109	-.0000255
	(0.809)	(0.948)	(0.013)	(0.468)	(0.222)
pcc	-.002747**	-.0044957***	-.0010893	-.0002033	-.0012914
	(0.067)	(0.020)	(0.432)	(0.875)	(0.253)
_cons	.520429***	.7168726***	.4821978***	.5080753***	.5988766***
	(.000)	(.000)	(.000)	(.000)	(.000)
Observations	37	37	37	37	37
Adj. R-squared	.2662985	.39740029	.27809397	.22557317	.31548838

Robust standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

The regressions reveal very interesting findings. We notice that the coefficients for the dtmfiprev variable in this case are all positive, except for total financial literacy and numeracy. The numeracy variable having a statistically significant value along with a higher magnitude than any other variables explain the negative sign of the overall financial literacy measure. The coefficients from the regressions for risk diversification and compound interest are highly interesting, as they present positive and statistically significant coefficients of .0008912 and .000816 respectively. The interpretation for these variables is slightly different to the previous regression and must be kept in mind while looking at table 5.4 and 5.5.
Since the proxies of dtmfiprev and ndtmfiprev use the total number of active institutions rather than branches, the coefficient represents the level of increase in each financial literacy pillar, when the number of firms offering microcredit/microsavings services in the country increases by 1. The economic significance can be considered when looking at the average value of dtmfiprev for example at 25.6, considering that this denotes the total amount of these institutions in the country and an increase of 1 has an effect of .0008912 to the total financial literacy. Since the number of total institutions can be easily changed by the government, through the use of policy and sector promotion, the results still pose economic significance, especially in countries with very low current values. The results for these specific variables (riskdiv & compint) partly support the hypothesis that more firms in competition would improve the levels of financial literacy, whereas the other insignificant coefficients point towards the null hypothesis of no causal relationship.

Looking further at the regressions using ndtmfiprev (Table 8); we notice that there are two variables that show statistical significance--these being numeracy and compound interest. An interesting note here is that the numeracy variable for ndtmfiprev is significant with a positive sign on the effect, compared to the negative effect seen from dtmfiprev. The opposite is seen for compound interest, which shows a negative sign for its significant coefficient, compared to a positive one for dtmfiprev. The coefficients for the two variables are .000725 and -.0006107, both significant at a 5% level. As for economic significance again, the numbers might seem small but once again must be considered alongside the population sizes of the sample countries, when represented in total number of people turned towards financial literacy, they provide significant effects. The positive relationship shown between ndtmfiprev, and numeracy also show support for the previously stated hypothesis.

The significant negatively signed coefficient for compound interest however draws back the hypothesis support, added to by the non-statistically significant coefficients seen for the other pillars of financial literacy.

However, the overall hypothesis is still rejected as the statistically significant improvements are only seen for a sub-set of the pillars, while the overall effect on financial literacy and the effect on other variables such as inflation remains statistically no different to 0. The claim of causality is also hard to make in this case as similarly to regressions (1-10), the small sample size and large amount of possibly unobserved variables mean the results must be interpreted carefully.

Table 8 OLS regressions result for regression (16-20), regressing overall financial literacy and each individual financial literacy pillar on ndtmfiprev, gr_mfiprev and the controls of gdppc, pcc.

	(16)	(17)	(18)	(19)	(20)
	Financial Literacy	Risk Diversification	Inflation	Numeracy	Compound Interest
ndtmfiprev	.0001723	-.0005359	.0004494	.0007259***	-.0006107***
	(0.419)	(0.125)	(0.251)	(0.038)	(0.016)
gdppc	6.08e-06	-6.54e-06	.0000497***	-4.84e-08	-.000034**
	(0.729)	(0.745)	(0.013)	(0.997)	(0.075)
pcc	-.002814***	-.0049202***	-.0015887	.0004054	-.0016247
	(0.030)	(0.003)	(0.432)	(0.727)	(0.111)
_cons	.5174684***	.8018494***	.5133524***	.3889222***	.6777024***
	(.000)	(.000)	(.000)	0.000)	(.000)
Observations	37	37	37	37	37
Adj. R-squared	.29478536	.37326398	.38291178	.12727825	32771635

Robust standard errors are in parentheses.
**** p<.01, ** p<.05, * p<.1*

5.2 Discussion

The findings of this paper show that the level of microfinance institution prevalence shows some level of negative correlation with financial literacy, especially under specific pillars. The findings do not support to the hypothesis originally mentioned. In additional consideration, there is not enough evidence to reasonably conclude any form of relationship between the two variables. More research is required into the subject, alongside the use of more comprehensive datasets. The lack of data available on financial literacy provides little in terms of comparable studies. The results of the study, vaguely follow those of Banerjee et al., 2015. The 2015 study found a severe lack of transformational differences brought about by microcredit institutions; however, the study was based specifically on economic empowerment. The results also follow the opposition of microfinance as a force for good from studies such as Zainuddin & Yasin, 2019.
The study poses opposing views to other studies predicting the positive connection between microfinance and financial literacy. Most follow through their thinking economic empowerment as from Khandker et al. 1998. It is possible that our study omits variables important to studying this relationship or that the relationship between microfinance on financial literacy follows a lagged effect, only coming into place multiple years after initial booms in microfinance prevalence.

Due to the low sample size, the possibility of reverse causality can also be seen in the analysis. Reverse causality when the causal direction of the investigated relationship is opposite to what was expected in the regression. The chances of such an effect are increased when the relatively small samples must be used to investigate complex relationships, such as the case in this analysis. Looking at regressions 6-10, the negative estimates of beta 2 could point to microfinance institutions being more present in place with lower levels of financial literacy. With financial literacy dictating the amount of microfinance presence rather than the other way around. Intuitively, it makes sense that some level of financial literacy must exist for microfinance to be properly used, however it may be that lower literacy areas require more institutions, since the customers of these banks require more assistance. Considering the objective of these banks is to promote the use of these product, it possible that lower literacy areas are the ones that require more of these banks, opposite to what we expected. For critics of microfinance, another possible explanation could be that the banks are able to operate with better margins and more profitably where people are less literate on the products they are

interacting with. Allowing for more exploitative behaviour from ill-intentioned banks. The analysis points towards the possibility of such a relation however the explanations for them are purely meant to be thought practices, encouraging further research on the direction of the causal relationship.

To reiterate, the low sample size and lack of data availability, however, must also be considered while drawing claims from this analysis. The lack of data disallows any causal claims to be made or refuted based on this research. The research looks more towards pointing at observed phenomenon in the hope of inspiring and garnering future research. Therefore, with the discussion on the studies the stated research follows, it is important to remember it calls for more research and data to be collected on this topic.

CHAPTER 6 Conclusions & Limitations

6.1 Conclusions

The study looked to investigate the relationship between microfinance institutions and levels of financial literacy in the developing world. In recent years, the amount of microfinance institutions has skyrocketed in developing countries like Bangladesh and India. The levels of financial literacy in the target markets of these banks remain low, putting people at risk of exploitation by ill-intentioned banks. Microfinance in addition to direct benefits in terms of credit availability and financial inclusion, posed potential benefits in exposing new customers to previously restricted financial knowledge. Until this paper, little research had been undertaken to investigate the relationship between these factors. Therefore, the research question of this paper is: How does microfinance prevalence effect the levels of financial literacy in a developing country? Additionally, the paper also looks at how this effect is differentiated between microcredit and microsavings institutions.

The paper used data from the S&P FinLit survey for 2014 and the IMF Financial Access Survey from 2013 and 2014. A sample of 34 developing countries was created and regressions were done using the Ordinary Least Squares method. The analysis found that no statistically significant effects could be found between microfinance prevalence and financial literacy. The study does find some statistically significant relationships between microfinance institution growth and financial literacy; however, they are negatively correlated, opposing the expected the values of the previous literature. As for microcredit and microsavings institutions, there were a variety of observed effects on individual pillars of financial literacy, but again no causal claims could be made. Microcredit and microsavings institutions do however show positively correlates and statistically significant associations in the results.

Therefore, this study concludes that no direct causal relationship can be found between microfinance prevalence and financial literacy from this study. The study does, however, also deal with issues regarding a small sample size due to low data availability. Therefore, the results call for further research into the topic and higher levels of data collection about financial literacy.

6.2 Limitations

Considering the small sample size of the study, major improvements can be made to the analysis in case of improved data availability in the future. The restricting factor in this case was the data availability on financial literacy. Even almost 10 years after its initial release, the 2014 S&P FinLit survey still serves as the most widespread and comprehensive dataset for financial literacy data sourced from low and low-middle income countries. Additionally, the dataset is only available for the year 2014, when the study was initially conducted. More modern datasets are available for more developed nations such as the Netherlands (van Rooij et al., n.d.) and the US (T.Lin et al., 2022) however, microfinance prevalence and usage in these nations is nearly obsolete, making them unusable for this research.

If financial literacy data for multiple years were available, a possible addition could be the use of a panel dataset rather than the single cross section used for this analysis. A panel dataset includes observations of the same variable from the same individuals (in this case the aggregated values from each country) over multiple years. A dataset as such would allow us to derive much stronger conclusions, as the construction of this dataset would allow better control over the unobserved heterogeneity. When looking at aggregated results from samples meant to be representative of a whole country, the number of unobserved variables that can affect your data could be immense. If looking to draw claims of causal effects, ??such as dataset would be an absolute requirement to drawing a realistic conclusion.
A panel dataset would also allow additional conclusions to be drawn about the size and sign of the effect, with more datapoints in the sample. The panel could then also be split and investigated separately based on the size of this effect. We could look at countries with specific growth rates of financial literacy in initial stages of the dataset and investigate the causes of these and possible network effects to other neighbouring regions for example. A panel dataset would also allow the implementation of lagged of variables, allowing research into the time a possible causal effect takes to show in the general population.
A possible example could be that the increase of microfinance institutions today, takes 3 years to affect the financial literacy levels as people slowly find out about the services being offered, learn about them, and start to use them etc. With just one year of data available, drawing such a claim is impossible. Considering the possible positive effects of financial literacy highlighted in this paper, research into the actual causal relationship it has with other variables, is rarely seen.

Improved data availability on the factors of microfinance prevalence could also improve the knowledge on the relationship, discussed in this study. The use of proxies poses its own restrictions on the possible drawn conclusions, from its analysis. The availability of variables that more directly record the usage of microfinance such as the number of accounts, frequency of loaning and saving activities etc. are not recorded comprehensively and with the same methodology in any dataset available. The availability of such a dataset in the future could solve issues of precision and measurement error as they would be more representative of the actual values of the variable of interest. It would also improve the generalizability of the conclusions such that the effects of microfinance institutions could be better predicted, allowing for better informed policy decisions from governments. Proxy variables in this study served as means to estimate the actual variables of interest. However, the improvements mentioned with actual data available, would immensely improve the conclusions from the study.

The incorporation of additional factors could also be used to improve the analysis, such as looking at the level of government intervention in the microfinance market and controlling for financial literacy education spending by each government in the sample set, as that could be a possible omitted variable responsible for changes in financial literacy levels.

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APPENDIX A [Financial Literacy Survey Questions]

- ***Risk Diversification***

Suppose you have some money. Is it safer to put your money into one business or investment, or to put your money into multiple businesses or investments? [one business or investment; **multiple businesses or investments**; don't know; refused to answer]

- ***Inflation***

Suppose over the next 10 years the prices of the things you buy double. If your income also doubles, will you be able to buy less than you can buy today, the same as you can buy today, or more than you can buy today? [less; **the same**; more; don't know; refused to answer]

- ***Numeracy (Interest)***

Suppose you need to borrow 100 US dollars. Which is the lower amount to pay back: 105 US dollars or 100 US dollars plus three percent? [105 US dollars; **100 US dollars plus three percent**; don't know; refused to answer]

- ***Compound Interest***

Suppose you put money in the bank for two years and the bank agrees to add 15 percent per year to your account. Will the bank add more money to your account the second year than it did the first year, or will it add the same amount of money both years? [**more**; the same; don't know; refused to answer]
Suppose you had 100 US dollars in a savings account and the bank adds 10 percent per year to the account. How much money would you have in the account after five years if you did not remove any money from the account? [**more than 150 dollars**; exactly 150 dollars; less than 150 dollars; don't know; refused to answer]

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