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Are people living with HIV discriminated by the microfinance market?
Evidence from Uganda

Microfinance has considered to be the key to end world poverty by serving the poor and vulnerable. In Uganda, the microfinance market has been on a steady rise since 1980; a time when HIV prevalence peaked. When voices are questioning whether microfinances work as efficiently as supposed, organizations in Uganda claims that HIV positive people might be excluded in various ways from financial services. This paper aims to investigate if people living with HIV are being excluded from the microfinance market in Uganda. To do so, we use two OLS-models to analyze data from the Ugandan Bureau of Statistics, the Association of Microfinance Institutions of Uganda, and the U.S Agency for International Development. By analyzing the estimates on existence- and number of MFIs, HIV prevalence, control variables and regional effects, we find evidence suggesting that HIV positive people might be excluded from the microfinance market in the Central region of Uganda, but no statistical evidence from the Western, Eastern or Northern regions. But exclusion might occur in other ways that were not possible to examine statistically in this report, such as self-exclusion and stigmatization. Due to data limitation and sample size bias, we welcome further research on the topic.

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Abbreviations

AIS	AIDS Indicator Surveys
AMFIU	Association of Microfinance Institutions of Uganda
DFID	Department for International Development
DHS	Demographic and Health Surveys
HIVOS	Humanist Institute for Cooperation
MDI	Micro-deposit institution
MDP	Multidimensional poverty
MF	Microfinance
MFI	Microfinance institution
NGO	Non-governmental organization
NSP	National HIV and AIDS Strategic Plan
OLS	Ordinary least squares
PAD	Poverty Alleviation Department
PEAP	Poverty Eradication Action Plan
PLWH	People living with HIV
SACCO	Savings and credit cooperative organization
SE	Standard Error
SEEP	Social and Economic Empowerment Programme
TASO	The AIDS Support Organization
UBOS	Uganda Bureau of Statistics
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development

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1. Introduction

In Uganda, 35% of the population lives below the income poverty line of $1.90, which places the country among the top poorest in the world according to the United Nations Development Program (UNDP). This widespread poverty is also linked to high levels of illiteracy (28%) and the very high level of people depending on subsistence farming[1], which is 42% (UBOS, 2014). The World Bank states that the financial inclusion is low, with an uneven distribution and outreach of financial services in the regions of Uganda. Most of the financial sector is concentrated in the central part of the country, whereas some districts in the northern part are fully excluded from financial services. Despite the uneven distribution, the microfinance (MF) sector in Uganda was considered to be a great success in the early 2000s. Many of the branches had a large outreach and a substantial client base (Carlton et al., 2001). However, organisations like the Association of Microfinance Institutions of Uganda (AMFIU), a Ugandan umbrella organisation for MFIs, are questioning whether the MF industry includes the most economic and socially vulnerable, which was claimed to be one of the main goals when MF first was introduced.

In Uganda, 7,1% of the adult population is infected with HIV (UNAIDS, 2016). Being infected with HIV can cause social exclusion, weakened health and increasing health- and food expenses. People living with HIV (PLWH) are therefore considered a vulnerable group in the society. Working proactively by informing people about the risk of infection, and actively by providing HIV treatment for free, the country achieved to impede the HIV-spread and bring down the HIV prevalence from 18% in 1991, to approximately 7% today.

Recently, several microfinance institutions (MFIs) and AIDS support organisations has been launching MF programs targeting PLWH, claiming that this vulnerable group has special needs and might be underrepresented on the MF market. There is a lack of statistical research if PLWH are financially excluded in Uganda, and if so, in what ways. Our contribution with this paper will be an attempt to investigate this more closely. To do this, we present three possible theories through which HIV-positive people are excluded from the MF market. The

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[1] A farmer who consumes most of the produce he or she grows, leaving little or nothing to be marketed.

first theory is the main focus of this paper, and the theory we statistically test. The two remaining theories about why PLWH might be excluded from the MF market, are briefly presented in this paper, but not statistically tested. They should therefore be seen as a compliment to our results, and an attempt to explain this claimed problem.

Our hypothesis is that PLWH are being excluded from the MF market and that this exclusion will be visible through the distribution of MFIs in the different districts. We find this hypothesis important because we think it can contribute to the understanding of the MF market in Uganda for vulnerable groups, like HIV positive people. We wish that our findings spur further research about the distribution of MFIs on regional level and its links to HIV prevalence, which might contribute to a more effective MF market. Our paper might interest institutions working with MF- and HIV related questions, in order to better understand the needs of all the groups in the society.

To investigate this subject, we will begin with a contextual framework to deepen the knowledge about the environment the MFIs work within. Thereafter follows a literature review which describes the theory of MF and previous research about living with HIV. A presentation about the method will be followed, as well as a data description. The analysis will begin with a study of correlations between MFI distribution and HIV prevalence. We will thereafter add a variation of control variables to investigate if they affect the output, in order to determine the strength of our model. We will also analyse the regional differences between the four regions of Uganda. The output will be presented in the result section. In the discussion part, we will further discuss the findings from our data analysis, and try to point out other plausible reasons that could explain our results. Since this paper is written under a constrained time and budget, there is also a part covering the limitations we found the most distributing for the validity of our models.

2. Contextual framework

In this section, we present general information about Uganda as well as more detailed information about the HIV outbreak and the history of MFs in the country.

Uganda is a landlocked country situated in East Africa with borders toward the Democratic Republic of the Congo, Rwanda, Kenya, South-Sudan and Tanzania. The Sub-Saharan country with its approximately 39 million inhabitants is considered a low-income country by the World Bank. Uganda consists of 112 districts divided into four regions: Northern, Eastern, Western and Central. Despite large improvements in health, education and poverty reduction during the recent years, Uganda remains one of the poorest countries in the world, with approximately 35% of the population living under the poverty line ($1.90) and 70% living in multidimensional poverty (MDP)[2], according to UNDP.

Poverty alleviation has been a main objective for the government of Uganda since the creation of the Poverty Alleviation Department (PAD) in 2000 and the launch and implementation of the Poverty Eradication Action Plan (PEAP). PEAP was formed due to the HIV crisis, in the 1990s when Uganda hit its highest levels of HIV, 18%. Since then, the Ugandan government has launched several policies and strategic plans to reduce the HIV prevalence, which today is stable around 7%. The National HIV and AIDS Strategic Plan (NSP) 2015/2016-2019/2020 state that one of the government's primary goals is social support and protection for PLWH; advocating for reducing stigmatization and discrimination of vulnerable groups. Reducing gender inequality and gender based violence through the strengthening of female bargain power could be one of the most critical and important strategies in mitigating the effects of HIV, according to the NSP.

Financial inclusion in Uganda is low; only 13% of the poorest 40% had a formal financial account in 2013 (World Bank, 2017). In the 1980s, different non-governmental organizations

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[2] Multidimensional poverty includes three main dimensions: health, education and standard of living. Each dimension take in different sets of equally weighted deprivation indicators to explain a wider range of poverty than income based poverty (UNDP, 2017).

(NGOs) started the first MFIs, which during the last years have grown tremendously in Uganda, involving hundreds of banks, NGOs and other institutions. Yet, MFIs only reach out to about 16% of the total client base in the country, with an uneven distribution in the regions (UBOS, 2010). Because of the long history of MFIs working in Uganda and the combination of an effective HIV decline, we have chosen to focus on this specific country. Uganda has also a great amount of statistical data and is also the country of focus for many international research projects.

The Association of Microfinance Institutions of Uganda (AMFIU) is an umbrella organization for MFIs with 123 members. Their mission is to assemble their members into professionalism, sustainability and responsibility in the MF market. AMFIU address issues related to HIV where MF is one potential strategy to mitigate the impacts of the disease. The organisation believes that the needs of PLWH are not met in the most effective way. They therefore collaborate with the Humanist Institute for Cooperation (HIVOS) and Aidsfonds to integrate HIV competence among MFIs in Uganda, as well as reducing stigmatization and promoting awareness of the disease. However, only a few MFIs in Uganda are actively working with the implementation of HIV related strategies. AMFIU stress that MFIs should address the needs of people living with HIV. The prevalence of HIV by district therefore plays an important role when it comes to reducing the negative impacts of HIV.

3. Literature review

In this section, we present the theory about MFs and the recent studies about its impact on people and societies, as well as a description of HIV and its impact on MF.

3.1. Microfinance

The term microfinance refers to financial services to people who lack collateral and are therefore excluded from the formal financial market, usually people with low income. The financial services provided are most commonly credits and savings, but can also include insurance and other services. The idea behind MFs is that they shall aim to target households which are unable to obtain financial services from the formal sector. Note the difference between microcredit and microfinance; Sinha (1998) states that "microcredit refers to small loans, whereas microfinance is appropriate where NGOs and MFIs supplement the loans with other financial services (savings, insurance, etc)". Microfinance is a more general term which, among other services, includes microcredit. A microfinance client is often provided more than one service, and not only microcredit loans. In addition to that, the data available does not differentiate the subgroups of services. This leads us to focus on the broader term, microfinances.

MF was first implemented in the 1970s by banks like Grameen Bank in Bangladesh and Bank Raykat in Indonesia. These programs were the first ones to be commercially funded, and therefore independent from both governments and NGOs. The client profitability and repayment rate quickly became satisfying, leading to that these pioneer banks could provide a large reach-out and focus on households left out from the formal financial sector (Robinson, 2001). The idea behind the Grameen Bank microfinancing was to test whether it was feasible that the poorest of the poor could generate self-productive income if financial resources were available. These clients did not possess any form of collateral; social ties were used instead.

To lend money (among other financial services) borrowers were requested to form groups of five. If any of the group members failed to repay the loan, there were no additional loans granted and the rest of the group was held accountable for the repayment. Thus, people chose

to join groups with peers they perceived as creditworthy, which reduced the bank's credit risk. Muhammad Yunus, who founded Grameen Bank in 1970, received the 2006 Nobel Peace Prize for "[...] the efforts to create economic and social development from below".

When MF reached the world market it was said to be one of the most promising instruments to poverty alleviation. However, later studies show various results of the impact. For example, Banerjee et al. (2015) find in a randomized evaluation of a MF program in India no increase in consumption nor changes in education, health or female empowerment, but small profit and investment increases of pre-existing businesses. Likewise, Banerjee et al. (2015) find in another randomized study of six different countries evolved in MF no statistical evidence of increases in household income or consumption expenditure for all the targeted MF groups, but small positive increases in business activity. However, the authors stress that MF might mitigate the negative impacts of being poor, and grant more freedom of choice for poor people across the world. Crépon et al. find in 2015 a large rise in livestock- and agricultural investments for farmers in Morocco, as well as a profit increase, but no changes in income or consumption.

MFIs offer a wide range of different loan products, micro insurances and other services, with loans being the most popular and requested financial service. These products are provided by hundreds of different banks, NGOs and MFIs, both commercial and non-commercial. It is argued that one of the problems with business growing loans, for example, is that very few microenterprises that receives financial services experience capital accumulation and output growth (Carlton et al., 2001). However, it is important to note that MF can enable clients to diversify their income generating activities. People in developing countries tend to rely on only one source of income, making them financially vulnerable (Banerjee, et al., 2015).

3.2. HIV and AIDS

According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), households affected by HIV could face an income drop of 30-60%, due to loss of working hours. The large increases in health expenditure if one or several family members becomes sick, does also have a negative impact on the disposable income. The lower income could in turn affect

food expenditure and school fees. UNAIDS found that these two expenditures fell by almost half in households affected by HIV. Further on, Tekola et al. (2008) found, for instance, that the indirect costs associated with death was 58% higher for people who died from AIDS than for people who died of other causes in Ethiopia. However, it is important to stress that there is no clear relationship between increasing HIV prevalence among poor people. Contrary, studies have shown that the probability of being infected with HIV rises as the median income of a household rises (Durevall and Lindskog, 2012; United Nations Population Division, 2005).

In Uganda, HIV prevalence is higher among women than men, and the prevalence is also highest among more wealthy households (MOH/ICF International, 2012). HIV prevalence is negatively correlated with education, where higher educated women are less likely to have HIV than less educated. A study made by Damien de Walque (2007), used random households from a cluster of villages in Uganda to investigate the effects of HIV/AIDS information campaigns on the HIV spread. The households were followed from early 1990 to 2000, where the final results showed that higher educated females are less likely to be infected with HIV. When the study began, there were no clear relationship between education and HIV.

It is also important to stress that the statistics do not say anything about how recently people got infected. It could be the case that wealthier people infected by the virus have more means to treat their disease and thereby live longer, which conduce to higher numbers of HIV prevalence in certain areas.

3.3. Stigmatization

The Ugandan Ministry of Health stress that HIV can lead to social stigmatization which in turn could affect the ability of finding a job, receiving a loan or even trade goods. Stigmatization is defined as a suspecting attribute that reduces a person to someone that is tainted and thus can be slandered (Goffman, 1963). The stigma concept consists of four components. Ascribing negative attributes and labelling differences to other people is one of them. Another component is creating a "us" and "them", and thereby the labelling amplifies

the social status loss the afflicted person experiences. Stigmatization can be described as a usage of power since its main effect is a reduction of a person's social, economic and/or political influence (Link and Phelan, 2002). Stigmatization of people living with illness is a rather well-documented phenomenon. People affected by cancer, mental illness, tuberculosis, leprosy and other diseases have also been victims for stigmatization throughout the modern human history (Sontag, 1988).

When it comes to stigmatization related to HIV it is often amplified by other stigmas connected to race, gender, sexuality, drug use, promiscuity and prostitution (Lee, Kochman and Sikkema, 2002). It is possible for a person to experience multiple stigmatization because he or she belongs to more than one stigmatised group, which deepens the burden (Gilmore and Somerville, 1994).

HIV are by some groups in the society claimed to be related to sinful livelihood; there is a not uncommon opinion that some people "deserve it" more than others. Children who are born HIV positive and those who contract HIV through a blood transfusion or an unfaithful partner, are sometimes seen as "innocent". The other group is seen as "guilty" and are thus worse judged by the society (Schellenberg, Keil & Bem, 1995).

According to the research done by Mathews et al. (1990) and Strebel and Perkel (1991), questionnaires show that many respondents want PLWH separated from the rest of the population or let out from schools, work and social institutions. One study from South Africa shows that a majority of HIV positive labour workers got an immediate dismissal when their employers were told about their HIV status (Altenroxel, 2001). In Uganda, 68% of women and 56% of men would want to keep secret that a family has HIV and only 36%, respectively 43% has comprehensive knowledge about the disease[3] (MOH/ICF International, 2012).

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[3] Comprehensive knowledge about HIV means knowing that consistent use of condom during sexual intercourse and having just one uninfected faithful partner can reduce the risk of getting HIV; knowing that a healthy-looking person can have HIV and rejecting the two most common local misconceptions about HIV transmission or prevention.

The scapegoating of the disease and the amplification of "us" and "them" provides HIV-negative people a false sense of security that they cannot get infected. (Douglas, 1995; van der Vliet, 1996). The stigma, together with unawareness, does also prevent people from getting tested since a common perception is that being HIV-positive is equal to death (Abdool Karim et al., 1992). In some contexts, people are more afraid of stigmatization than the actual disease, which can cause a hesitation to get tested and treated (Lie and Biswalo, 1994).

Although the probability of being infected with HIV rise with the median income, the literature show that it is likely that HIV positive people are considered a vulnerable group that face stigmatization and discrimination. Muhammad Yunus founded the idea that MFIs should serve vulnerable groups in a society; groups that are discriminated and excluded from the financial market.

4. Theoretical Framework

As mentioned in the literature review, there is empirical evidence showing that PLWH are excluded from various social contexts. However, the statistical research about discrimination of PLWH in the MF sector in Uganda is not fully satisfying. Therefore, we find it interesting to investigate this by using statistical data.

Uganda Cares, one of the largest antiretroviral therapy providers in Uganda, imply that "microfinance institutions have shown reluctance to reach out to HIV-infected individuals, resulting in nongovernmental- and HIV-care organizations providing these services" (Balya et al., 2016). If MFIs, intentionally or unintentionally, avoid serving PLWH, there is evidence that this group is excluded from the market and therefore in need of programs specifically targeting them. We believe, supported by the previous research presented in our literature review, that there are reasons to suspect that PLWH are excluded to some extent. The AIDS Support Organization (TASO) states in a report by Mills et al. (2009) regarding MFs to PLWH that: "in many parts of Africa, microcredit opportunities are not available to patients living with HIV/AIDS as there is a generalized stigma of patients and an expectation that they will be unable to repay the loans".

To investigate whether PLWH are excluded from MFs, we propose three different theories about the driving mechanisms behind the low participation rate. The first theory is possible to examine using available statistical data, and will be the focus of this paper. The two other theories are not included in our dataset due to data limitations, and should therefore be seen as a complement to the results from our first theory. They are briefly presented in this section, and further discussed under "Discussion" together with the results from our regressions.

4.1. Theory 1: Active discrimination from MFIs

The first theory is supply side orientated, with two approaches. The first approach is an individual approach; e.g. the MFIs actively choose not to provide their services to HIV positive people because they might be seen as a risky and economic vulnerable group, with

higher default rates than other people. MFIs might therefore choose not to offer their products to certain people, even though there might exist one or several MFIs in the district.

The second approach is based on the geographical location of a MFI, where districts with high HIV prevalence might have fewer MFIs because they choose not to establish in these districts. This approach will be the focus of this paper. By analysing the distribution of MFIs and the HIV prevalence on district level, we will test if HIV prevalence is strongly and significantly correlated with the presence of MFIs or not; e.g. if HIV prevalence is an important determinant for establishing a MFI in a district, on the basis that MFIs are aware of the needs of financial services for PLWH. This theory is based on concepts derived from organizations working with either MFs or HIV related questions, like AMFIU who, together with HIVOS and Aidsfonds, launched the "Microfinance and HIV"-programme, and Uganda Cares with its Social and Economic Empowerment-programs (SEEP). Microfinance institutions are not entitled to inquire client's HIV-status, and it is therefore plausible that HIV-prevalence at district level is a strong determinate for the distribution.

4.2. Theory 2: Self exclusion

Our second theory suggest that direct and personal reasons impede PLWH from participating in MF programs. This demand orientated theory is based on the mental and physical impacts of living with HIV. The absence of effective treatment for a HIV positive person will ultimately result in AIDS, which eventually will invalidate one's physical ability, as a result of the different diseases that will arise when the immune system shut down in the last stages of AIDS. The physical aspects of being sick might therefore hinder people to apply for MF because they are too sick. Yet, even if one receive effective treatment, the mental burden of living with HIV might be another reason for people not participating in MF programs. Mental health includes emotional, psychological and social well-being. The negative mental impacts of HIV might result in stress, fatigue and depression (hiv.gov, 2017). It might also affect one's cognitive ability and simply the strength and energy needed for applying for a loan or insurance and, if granted, maintain and repay it. There might also be a lack of interest in searching financial services if the person is sick, because of poor confidence in the future, and even because of a shorter life span.

This could ultimately decrease one's foreseeable return of investment, which is described by the organisations mentioned above. According to them, the physical and mental impacts of HIV might result in HIV positive people dropping out of the MF programs, which conversely could imply that PLWH do not seek MFs in the same extent as other people.

4.3. Theory 3: Social stigmatization

Our third and last theory about MF exclusion for PLWH is another demand side oriented theory. This theory suggests that PLWH are excluded from the MF market because of indirect reasons linked to social stigmatization and discrimination. As mentioned in the literature review, MF programs involved in borrowing typically form saving groups to spread the risk of defaulting a loan payment. If PLWH are stigmatized and discriminated in a society, it might be very difficult to participate in MF programs because the mistrust from other participants and the foreclosure of PLWH. Even if MFIs provide MFs to PLWH and there is a demand for it, the stigmatization around the diseases might prevent PLWH to access the services. Social stigmatization could be different in different regions. In more traditional societies, like people living on the countryside, it might be more difficult to live with HIV, and even get the right treatment needed. In more modern societies, like cities, living positively with HIV might be more accepted and the knowledge and access to medicine better. Regional differences will be analysed in "Results" and discussed in "Discussion".

5. Method

In this section, we present and describe our econometric model, what our data contain and how it was collected and finally the variables used in our regressions.

5.1. Econometric model

Our first baseline model is an ordinary least square (OLS); a simple model that describes the relationship on the extensive margin between our dependent variable, existence of MFIs, and the explanatory variable, HIV prevalence, together with control variables.

This estimate uses a dummy as the dependent variable, which makes the regression outcome binary with only 1 or 0 as eligible values. Existence of MFI takes the value 1 for the existence of a MFI in a district and 0 otherwise. However, this violates the OLS normality assumption. A disturbance of the normality assumption does not affect the efficiency nor the unbiasedness in the regression. It does affect the standard errors (SE), which in turn can contribute to an incorrect level of significance. This is only a problem when the sample size is less than 200 (Wooldridge, 2014). In our sample, we have only 110 observations, which therefore could lead to fallacious significance levels, consequently aggravating the interpretation of our output.

Further on, when the dependent variable is binary, the outcome variable reported by the OLS might be incorrect because of the technical construction of the OLS-model, where the outcome takes illogical values outside the range of 0 to 1. (Wooldridge, 2014). The OLS model demands a linear regression, which the binary never will be. It is, however, common to use a OLS model when analysing binary numbers since the output is easier to interpret. A drawback when using this method is that it can result in incorrect SE.

The SE bias could be overcome by including a probit/logit estimate in our analysis and compare the outcome with the OLS estimate. The probit/logit estimates are found in Appendix. We also use robust SE when conducting our regressions, because of the fact that

Our second baseline model is much like the first one, except that the dependent variable is not a dummy. The dependent variable, number of MFIs, varies between 0 and 107 MFIs for the 110 districts we analyse in our regression on the intensive margin. As before, we add our control variables and explanatory variable, HIV prevalence.

Our two baseline regressions can be expressed using a simple model found below.

$$Y_i = \beta_0 + \beta_1 * hivprev_i + \beta_2 * X_{1i} + \beta_3 * X_{2i} + \varepsilon_i \qquad (1)$$

Model (1) is composed of the dependent variable, one for each model, existence of MFI and number of MFIs in a certain region, which is Y_i. The model describes the relationship between these dependent variables and the explanatory variable *hivprev* (HIV prevalence). The expected sign of the coefficient *hivprev* will take a negative value if the correlation between the presence/distribution of a MFI and the HIV prevalence in a certain district is negative, according to our hypothesis. This could imply that PLWH are in some extent excluded from the MF market, based on the geographical distribution of the MFIs.

β_0 is a constant and X_{1i} include our control variables in forms of the certain characteristics we think MFIs value when they establish a new MFI or a branch of an existing MFI. These controls are population, rural population, literacy and subsistence farming. We will explain and motivate these variables further under "Data". In our regressions, we will continuously add variables to see how the outcome changes, starting with population. The characteristics are important to include in order to distinguish different effects from different variables. The magnitudes, signs and significance levels will be analysed and discussed under "Results" and "Discussion", in an attempt to explain the distribution of MFIs in Uganda. By adding the control variables one by one we are able to see how the explanatory variable changes as different control variables explain different amount of the outcome variable.

X_{2i} include the region-specific variables as well as the regional interaction terms. They consist of the three regional dummies *Western*, *Eastern* and *Northern*, and the interaction terms between HIV prevalence and the regions: *hivXwestern*, *hivXeastern* and *hivXnorthern*. These

interaction terms and region-specific variables are important for the analysis on the regional differences between HIV prevalence and MFI distribution.

Finally, we add an error term, ε_i, with the function of capturing any unobserved variation that we are unable to fit in the model. The error term is essential to add since it is impossible to include all other features that might explain the outcome or influence the dependent or explanatory variables (Wooldridge, 2014). It is important that the error term fulfils the OLS assumption about exogeneity. If violated, the error term correlates with at least one of the regressors and by that the outcome. It could therefore cause omitted variable bias. We further discuss the omitted variable bias in our estimates in section "Discussion".

5.2. Data description

Our data is collected from three different sources: Ugandan Bureau of Statistics (UBOS), the Association of Microfinance Institutions of Uganda (AMFIU), and the U.S Agency for International Development (USAID). Using these three sources, we created a dataset on district level that we used for our regressions.

The data from UBOS was ordered from the National Population and Housing Census 2014, and contain district level data from 112 districts in Uganda. The census was conducted in 2014 together with the United Nations Population Fund (UNFPA) and the Department for International Development (DFID) from the United Kingdom, and contains information about population levels (total and rural), literacy rates, and percentage depending on subsistence farming.

From AMFIU, we collected data from the Uganda Microfinance Directory 2013/2014 about the distribution of MFIs and their branches on district level in Uganda. Our sample does not include all the MFIs in Uganda, since it is derived from a membership directory. However, all the major MF providers are included, such as BRAC Uganda, Centenary Rural Development Bank and the Post Bank Ltd. The number of MFIs in a district is calculated as the existence of

a branch, mobile unit or head office[4]. Of 112 districts, 25 districts did not have any MFI. For simplicity, we used the district division from USAID from which we collected the data on HIV prevalence (see below). Therefore, six districts have been modified. Merged into existing districts are: the town Buyikwe included in the Buikwe district, the town Fort Portal included in the Kabarole district, the town Ishaka included in the Bushenyi district, the town Kagadi included in the Kibaale district, Kyotera included in the Rakai district and the county Terego included in the Maracha district.

We believe that this directory contains a credible distribution of the MFIs in Uganda. Nevertheless, it is important to know that the MFIs included pay membership fees to AMFIU. Therefore, it could be a small number of MFIs not associated with AMFIU. This could affect the outcome, if districts have more MFIs than our dataset tells us. We do not consider this in our analysis, since we find AMFIUs directory credible and the fall out numbers so few.

The districts Ntoroko and Bukwo are not included because of the lack of data from USAID on HIV prevalence. The MFIs included in the dataset are institutions that has MF as a major business. These institutions are representative for the Ugandan financial market which consists of four general tiers: commercial banks, credit institutions, micro deposit institutions (MDIs), and other MFIs and Saving and Credit Cooperative Organizations (SACCOs). Included in the dataset are also NGOs and non-regulated companies that are members of AMFIU and provide microfinance services. Chart 1 show the regional distribution of MFIs in Uganda. Central region has the highest distribution with 41% while Northern and Eastern has the smallest with 14 respectively 13% of the total MFIs in Uganda, according to AMFIU.

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[4] For example, in Moyo district, BRAC Uganda has one branch and Moyo SACCO has one branch and a head office, resulting in three MFIs in Moyo district.

Chart 1

Distribution of MFIs by region, Uganda
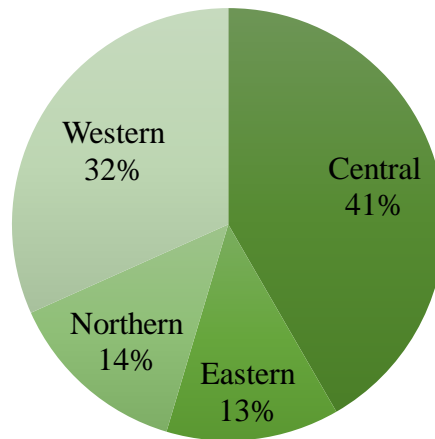
From USAID we collected data on HIV prevalence on district level using the Demographic and Health Survey Program (DHS), and the AIDS Indicator Survey (AIS). Using the dataset's GPS location and Geographic Information System (GIS) in the program QGIS, we created a variable of HIV prevalence at district-level. The HIV prevalence were clustered into different GPS locations, and by merging this dataset with a dataset containing GPS locations for the districts of Uganda, we got the HIV prevalence for each district. The HIV prevalence at district level were later merged with the dataset containing numbers of MFI on district level, as well as the control variables at district level. By preforming these merges, we created the dataset we needed for our data analysis.

Below, in Table 1, the description of the variables is presented.

Table 1

List of variables

Variable	Description
extMFI	Dummy variable that is 1 for districts with at least one MFI and 0 for the rest
MFI	Number of MFIs
hivprev	HIV prevalence in percentage
population	Logged number of total population
rural	Logged number of rural habitants
literacy	Literacy rates in percentage
subfarm	Percentage of households depending on subsistence farming
western	Dummy variable that is 1 for all districts in Western region and 0 for the rest
eastern	Dummy variable that is 1 for all districts in Eastern region and 0 for the rest
northern	Dummy variable that is 1 for all districts in Northern region and 0 for the rest
hivXwestern	Interaction term between *hivprev* and *western*
hivXeastern	Interaction term between *hivprev* and *eastern*
hivXnorthern	Interaction term between *hivprev* and *northern*

5.3. Variable description

5.3.1. Dependent variables

In this paper, we run two main regressions with two different dependent variables, existence of MFI (*extMFI)* and number of MFIs (*MFI*). This distinction was made to better understand the distribution of MFIs in Uganda. There could be different determinants for existence and number of MFIs: if a district has non, or very few MFIs, we presume that microfinancial inclusion is low in that area. If a district has high HIV prevalence and very few MFIs it can indicate that the needs of PLWH are not being met and that they might be excluded from the market. Thus, existence of MFI might be a stronger determinant since a lack of MFI always is a shortage. However, a district that has very few MFIs might on the other hand have a large outreach, and despite the few numbers accomplish to meet the needs in that specific district.

We have chosen to use the MFI distribution in Uganda to estimate how many people in every district that are reached by MFI. There is no district level data available on microfinancial inclusion, which would have been preferred.

The first dependent variable, *extMFI*, is a binary dependent variable, taking the value 1 for districts with at least one MFI and 0 for districts with no MFI. As mentioned before, 25 districts in our dataset do not have any MFI. However, since our dataset of MFIs is based on the membership directory from AMFIU, the exact distribution of MFIs in Uganda is somewhat different. We chose to use the AMFIU directory because it included exact district level data of MFIs in Uganda. The regional distribution is also matched by the estimates from "The state of Microfinance in Uganda" conducted by the Ministry of Finance Planning and Economic Development together with AMFIU.

Our second dependent variable is *MFI*. This variable ranges from 0 to 107 MFIs in the districts (see table 2). On district level, Kampala is the district with the most MFIs. By region, Central has the most and Eastern has the least number of MFIs. A summary of the statistics is presented after the variable description.

5.3.2. Explanatory variable

Our explanatory variable is HIV prevalence (*hivprev*) and consists of individual data in percentage form for all 110 districts in our dataset. HIV prevalence is highest in the Central and Northern regions of Uganda, which make the understanding of the disease and its prevalence interesting yet complex. HIV prevalence varies between 0 and 15.9% in the districts with a mean of 5.2% according to the data in table 2. Central and Northern regions are very different in terms of wealth, literacy and development (UBOS, 2014). MFIs are most frequent in the first and least frequent in the latter. This makes HIV prevalence in addition with control variables an interesting analysis of the distribution of MFIs in Uganda, but also opens the door for further research about the phenomenon.

5.3.3. Control variables

By including control variables, we reduce the risk of omitted variable bias when estimating the effect of HIV prevalence. Since we want to investigate the distribution of MFIs in Uganda and in the Ugandan districts, it is important to add other variables that can play a role in explaining the current distribution. These control variables are correlated with both our dependent and explanatory variable: MFIs and HIV prevalence.

We also control for regional fixed effects by using the fixed region model (specification 6 in our following models). We try to isolate the region level unobservable characteristics that are constant over time and districts.

Below follows a short description and motivation for our control variables. It is important to note that this simple study lack data on other variables that might play a role in the determination of a MFI in a district, such as road accessibility, conflicts and MFI outreach. This will be further discussed in "Discussion" where the results from the regional analysis is presented.

Population is added as a control variable in order to investigate any relationship between MFIs and population levels in districts. It is informative for MFIs since it works as a planning tool; e.g. in very populated areas, the demand for more MFIs or branches might be one factor that motivate MFIs to settle there. Therefore, we expect a positive correlation between

population and the dependent variable in our regressions. A higher level of population does also imply a more urbanized area, in which people tend to live in less traditional relationships. We do therefore expect to find a positive correlation between HIV prevalence and population.

The highest population distribution is found in the Eastern region with 28.9% of the total population, and respectively in the Wakiso district (Central region) with 2 million inhabitants or 5% of the total population. The least populated region is the Northern with 20.9% of the total population and the least populated district is Kalanga (Central region) with around 55 000 inhabitants which is 0.1% of the total population. Rural population (*rural*) is, like population, an interesting variable since 77% of Uganda's population lives in rural areas. A rural area is the opposite to an urban area. The latter is described by UBOS as the following: a city, municipality, town council or town board. The remaining areas are counted as rural. Rural living is often related to subsistence farming, which is one of the poorest groups in Uganda. This would therefore be an important factor for settlement among MFIs. If MFIs are established to meet the needs for the most vulnerable groups, we expect a positive relationship between rural population and HIV prevalence in our regressions.

"Literacy is the ability for one to read with understanding and to write a simple sentence meaningfully in any language" (UBOS, 2014). In Uganda, 72% of the population are literate and the levels are slightly lower for females than for males (68% and 77% respectively). The variable *literacy* in this dataset describes the percentage rate of all adults that are able to read and write according to the standards stated above. We have chosen to use literacy as a proxy for education in our dataset, which gives a hint on the livelihoods of the inhabitants in every specific district. If literacy is low, it is not unlikely that the development in a district follow the same pattern. For example, in the Kotido district in Northern Uganda, literacy is 12%, and only 13% of the children aged 6-12 attend school. The Northern region has also the highest number of people living under the income poverty line (UBOS, 2014).

Higher literacy means more awareness, which helps in increasing financial inclusion. Literacy is likewise the key to financial literacy[5], which could be crucial when applying for MF services. Therefore, it is logical to think that literacy is positively correlated with the distribution of MFIs in Uganda, although if the literacy is low because of low development, one could argue that more MFIs would establish to meet the demand for financial services among poor people. As mentioned before, education is negatively correlated with HIV prevalence. Higher educated people are therefore less likely to be HIV-positive.

Subsistence farming is defined as a farmer who consumes most of the produce he or she grows, leaving little or nothing to be marketed. In Uganda, 42% of all households are dependent on subsistence farming. This is also the most common source of income for women, occupying half of all working females. Subsistence farming is one of the major obstacles for ending poverty according to the Government of Uganda. The majority of subsistence farmers are located in the Eastern region, a region which also has the lowest calorie consumption per day (UBOS, 2014). Subsistence farming (*subfarm*) is therefore accounted as a proxy for income in our dataset, ultimately important for the establishment of a MFI in a district.

We expect a positive correlation between subsistence farming and MFIs, because of the very idea behind the MF-program: to serve the poor. Poorer districts with high levels of subsistence farmers would therefore have more MFIs to meet the demand. When it comes to HIV-prevalence, the expected correlation is somewhat weaker. On one hand, we have stressed that HIV-positive people could be stigmatized and vulnerable, both economically and socially. On the other hand, data reveal that there is a negative relationship between HIV-prevalence and income, where the wealthier households statistically are more likely to be affected by HIV (Durevall and Lindskog, 2012; United Nations Population Division, 2005). This could be explained by different standards of living; a person that is somewhat better off are more likely to live in urban areas, where it is more common to have less traditional

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[5] Financial literacy is the education and understanding of various financial areas. This topic focuses on the ability to manage personal finance matters in an efficient manner, and it includes the knowledge of making appropriate decisions about personal finance such as investing, insurance, real estate, paying for college and budgeting.

relationships. That could in turn expose the wealthier person to a greater risk of getting infected by HIV.

AMFIU address the importance of MF services to subsistence farmers in order to modernize their agriculture into commercial farming and raising their income. Eswaran and Kotwal (2006) state that making agriculture more productive can increase wages for farmers, leading to more consumption and higher demand, spurring import, export and development in a country. Thus, MF could be one way of financing better technology for a more productive agriculture.

By including this variable into our regressions, it enables us to analyse the relationship between MFIs and the subsistence farming ratio in Uganda. If subsistence farming is considered a low-income generating activity, mainly occupied by poor rural women, this would be a potential target group for MFIs, which in turn would suggest a positive correlation between MFIs and percentage of households depending on subsistence farming. The poorest region in Uganda is the Northern, followed by the Eastern. Region specific poverty estimates are presented in figure 2. In table 2 we present summary statistics for all our variables.

Figure 2

Poverty estimates by region, Uganda
2005-2013
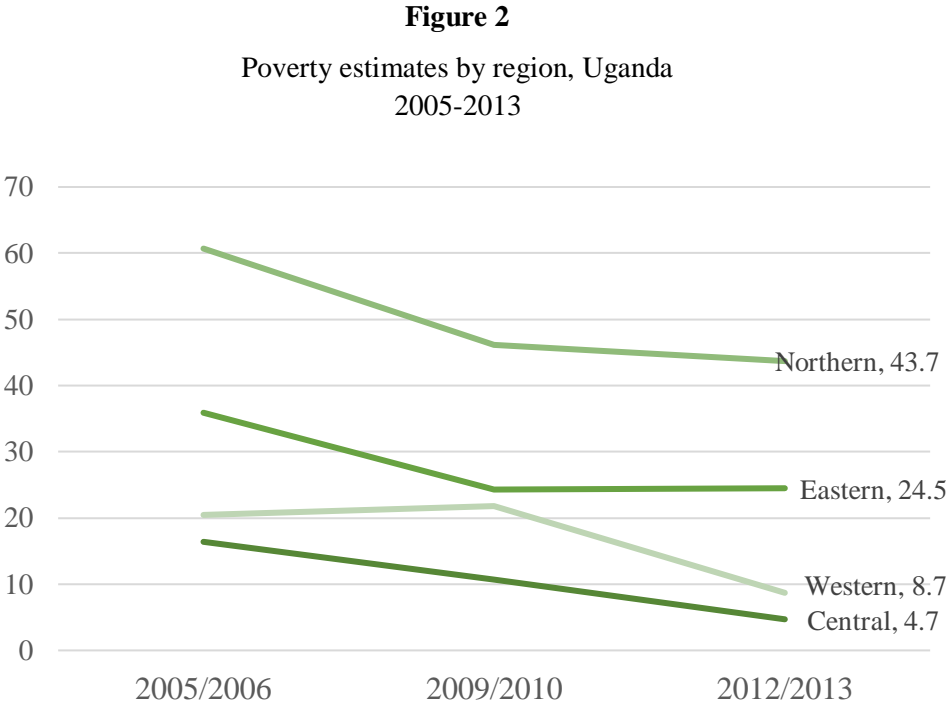
Source: Uganda National Household survey, 2012/2013

Table 2

Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	Observations
extMFI	0.627	0.485	0	1	110
MFI	6.109	11.689	0	107	110
hivprev	0.052	0.032	0	0.159	110
population	12.480	0.598	10.885	14.512	110
rural	12.192	1.296	0	14.129	110
literacy	0.6836	0.138	0.12	0.941	110
subfarm	0.752	0.160	0.011	0.973	110
western	0.227	0.420	0	1	110
eastern	0.281	0.451	0	1	110
northern	0.272	0.447	0	1	110

6. Results

6.1. Existence of MFIs

Table 3

OLS estimates on *existence of MFI*.

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI
hivprev	2.276	3.052	3.160	2.660	1.792	1.002	-4.634
	(1.692)	(1.286)**	(1.293)**	(1.448)*	(1.572)	(1.641)	(2.678)*
population		0.417	0.410	0.383	0.330	0.306	0.239
		(0.062)***	(0.058)***	(0.068)***	(0.077)***	(0.083)***	(0.085)***
rural			0.025	0.027	0.051	0.046	0.054
			(0.010)**	(0.011)**	(0.021)**	(0.021)**	(0.023)**
literacy				0.302	0.259	0.145	0.127
				(0.408)	(0.392)	(0.436)	(0.456)
subfarm					-0.518	-0.401	-0.642
					(0.384)	(0.407)	(0.433)
western						0.127	-0.241
						(0.112)	(0.218)
eastern						-0.256	-0.776
						(0.129)**	(0.218)***
northern						-0.120	-0.574
						(0.152)	(0.245)**
hivXwestern							5.431
							(3.500)
hivXeastern							9.081
							(4.498)**
hivXnorthern							6.929
							(3.823)*
constant	0.507	-4.737	-4.961	-4.840	-3.995	-3.519	-2.190
	(0.099)***	(0.791)***	(0.836)***	(0.853)***	(1.052)***	(1.139)***	(1.240)*
R^2	0.02	0.28	0.29	0.29	0.31	0.39	0.42
N	110	110	110	110	110	110	110

Robust standard errors in parentheses

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 3 describe the relationship between the existence of a MFI and HIV prevalence in a district, together with control variables[6]. By adding more control variables and regional fixed effects, we analyse how HIV prevalence (*hivprev*) interact with the existence of MFI (*extMFI*).

Primarily, specification (1) include our explanatory variable, HIV-prevalence, and the dependent variable, existence of MFI. In the following four specifications, (2), (3), (4) and (5), we add our control variables one by one. Finally, in Specification (6) and (7), the regional fixed effects of Western, Eastern and Northern regions are included as dummies and interaction terms to further explain the regional differences of HIV prevalence in the regions.

In the first specification, there is a positive correlation between the existence of MFI and HIV prevalence. By adding more control variables in specifications (2) to (5), HIV prevalence is still positively correlated with the existence of a MFI, with a stronger magnitude in the two first specifications. But this magnitude is weaker and continues to weaken after adding literacy as a control variable in specification (4). HIV prevalence is significant in specification (2) and (3) at 5% and in specification (4) at 10%. After adding subsistence farming (*subfarm*) and the regional fixed effects as control variables in specification (5) and (6), HIV prevalence is insignificant. In specification (7), our explanatory variable is significant at 10%.

Since the magnitude and significance of HIV prevalence falls as more variables are added, we suspect that this effect might be masked by regional differences between the four regions. For comparison between these, we add regional fixed effects in terms of the three dummies and the interaction terms in specification (6) and (7). Any unobserved characteristics that might differ across regions are now observed (Wooldridge, 2014).

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[6] A probit/logit estimate is used because of the limitations of the OLS model when we include a dummy as a dependent variable. The probit/logit estimates are presented in table 5 and 6 in Appendix. They show no major differences in comparison with our OLS estimate. The significance levels differ somewhat in the probit/logit, where the regional dummies and the regional interaction terms have higher levels of significance. Because of the similarities in the outputs, we choose to present our results from the OLS estimates, and further on refer to these.

By adding these regional fixed effect, we allow for different slopes in specification (7). When the interaction terms of the three regions are added, the Central regions is the region being analysed. We now state that one percentage point change of HIV prevalence will create a

-4.63% change of the probability that Y_i equals one. It is, consequently, slightly less probable to find a MFI in the Central region if the HIV prevalence increases. We find that HIV prevalence in Central region is negatively correlated and weakly significant, confirming our theory about PLWH are being excluded from the MF market.

As Central region is being analysed in the last specification, we conduct a joint hypothesis test (F-test) to check the significance level of HIV prevalence in the other three regions. This is important since the we want to know if the variables have any effect on the dependent variable when analysing the interaction terms and the multiple regression coefficients (Wooldridge, 2014). The result show that the F-statistics are less than ten. The conclusion of this is that HIV prevalence is not significant in Western, Eastern or Northern regions.

Moving on to our control variables, the important determinants, population is positively correlated and significant in all specifications. Thus, the population factor seems to explain a substantial part of the variation in our regression, after HIV prevalence and the regional effects, which the R-square suggest. MFIs tend to be centred in highly populated areas, for example urban areas like the capital city Kampala (107 MFIs). The same argument holds for literacy, although, in our sample, it is not as strong as population, and not significant. Rural population (*rural*) is also weakly positively correlated and significant. Subsistence farming is negatively correlated with the existence of a MFI when all the control variables are added in specification (5), and the regional fixed effects are added in specification (6) and (7). This might be because some MFIs fails to target the poorest group in a society, which in Uganda is rural subsistence farmers. The results from the regression will be further discussed under "Discussion".

6.2 Number of MFIs

Table 4

OLS estimates on *number of MFIs*

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	MFI	MFI	MFI	MFI	MFI	MFI	MFI
hivprev	48.223	70.727	43.324	33.144	4.948	-3.159	-27.031
	(23.244)**	(22.143)***	(12.201)***	(12.508)***	(12.997)	(13.213)	(29.846)
population		12.095	13.860	13.323	11.579	11.086	10.842
		(3.864)***	(1.371)***	(1.340)***	(0.752)***	(0.758)***	(0.765)***
rural			-6.333	-6.286	-5.513	-5.441	-5.398
			(0.233)***	(0.234)***	(0.385)***	(0.417)***	(0.433)***
literacy				6.156	4.746	7.870	7.176
				(2.971)**	(2.069)**	(2.328)***	(2.307)***
subfarm					-16.840	-19.095	-20.406
					(5.526)***	(5.780)***	(6.228)***
western						2.229	0.724
						(1.028)**	(2.569)
eastern						-0.309	-1.868
						(0.940)	(2.110)
northern						2.227	-0.298
						(1.213)*	(2.374)
hivXwestern							21.862
							(34.109)
hivXeastern							21.761
							(29.465)
hivXnorthern							40.622
							(34.883)
constant	3.568	-148.571	-91.941	-89.476	-62.017	-57.793	-52.117
	(1.034)***	(48.354)***	(19.785)***	(19.470)***	(10.256)***	(10.680)***	(11.086)***
R^2	0.02	0.40	0.87	0.88	0.91	0.92	0.92
N	110	110	110	110	110	110	110

Robust standard errors in parentheses

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 4 present the results from our second regression which describe the relationship between the number of MFIs and HIV prevalence in a district, together with control variables.

These results are similar to the existence of MFIs, in table 3. HIV prevalence is still positively correlated with the number of MFIs in the five first regressions. In specification (1) this is significant at a 5% level and for specification (2), (3) and (4) at a 1% level. Much like table 3, the prediction HIV prevalence is a weaker determinant as more control variables are added. In specification (6), regional fixed effects are added, which, like table 3, consists of three regional dummies of Western, Eastern and Northern regions. Specification (7) consists of the interaction terms between HIV prevalence and region as well as three regional dummies. As mentioned before, the Central regions is analysed in specification (7). After running the F-test, we can conclude that HIV prevalence in Central region is still negatively correlated with the number of MFIs whereas the three other regions are not. None of the regional results are significant.

As previously confirmed in our baseline regressions, HIV prevalence not being a strong determinant, in combination with insignificancy suggest that HIV prevalence is not a major determinant among MFIs in Uganda and its regions. The baseline regression results suggest that population and literacy are stronger and significant determinants.

Both population, rural population, literacy and subsistence farming are significant in all specifications. There is little variation in the control variables in specification (2) to (4). The positive and significant relationship between population and number of MFIs suggest that, like stated before, population seem to be an important determinant for establish a MFI in a district. After the regional effects, population is the strongest predictor for our explanatory variable. Like population, literacy seem to be an important determinant. Rural population and subsistence farming are both negatively and significantly correlated with the number of MFIs, which again might explain MFIs not targeting the poorest.

7. Discussion

7.1. Interpreting obtained results

The hypothesis in this paper is based on the idea that PLWH are excluded from the MF market in Uganda. Overall, we examined this by analysing the distribution of MFIs in different districts in Uganda, and its relationship with HIV prevalence. We controlled using state fixed effects together with a set of variables that we think are important determinants for the establishment of a MFI. We used two OLS models at the extensive and intensive margins with two dependent variables: existence and number of MFIs.

The results obtained from the two main regressions imply that HIV prevalence is not a strong determinant for establishment among Ugandan MFIs. This is based on the variation of HIV prevalence as a variable, with mixed magnitudes, signs and significance levels over the regressions. The more variables added, the magnitude and significant levels of HIV prevalence falls, and the determinant gets weaker. We use state fixed effects in the two last specifications in order to understand the regional differences of the MF distribution in Uganda. This suggest that HIV prevalence in Central region is negatively and significantly correlated with the existence of MFIs, which support our hypothesis. The probability that a MFI will exist in the Central region will therefore be smaller as HIV prevalence rises. Even though Central region has the largest number of MFIs, PLWH might still be left out of the programmes. This is suggested by the individual approach in theory 1 in "Theoretical framework".

Clearly MFIs choose to establish in Central region even though the HIV prevalence is high, which means that they might actively exclude PLWH. Another factor behind this scenario is that since a large part of the total MFIs are situated in the Central region, it is logical to presume that a substantial share of the for-profit organisations is operating here. A for-profit organisation might have other stakeholders than a NGO or non-profit organisation; for example, they might be more selective when choosing who to participate in a MF program. It might also be easier for for-profit organisations to distinguish between customers and therefore exclude people they find non-suitable for their products. A NGO or non-profit organisation might on the contrary grant MFs or cash grants for another selective groups that

need to fulfil certain criteria that for-profit organisation lack. For example: a NGO might grant MFs to 2 000 unemployed female farmers and do follow ups every second year with money from the Swedish International Development Cooperation Agency (SIDA), whilst a for-profit organisation or enterprise might offer their products to customers who apply by themselves. To further analyse this difference, it would be preferable to divide our dataset into for-profit and non-profit organisations. But lack of information and suitable data, the analysis was restricted to a mixture between different types of organisations.

Western, Eastern and Northern regions are positively and insignificantly correlated with our dependent variables in our regressions. One possible causative factor can be that HIV is not a poverty disease. On the contrary: the disease is more likely to occur in less deprived areas. Hence, an increase in HIV prevalence in the poorer regions, like Northern and Eastern, could imply that people are somewhat better off than before. If the livelihoods improve, there might be room for more amusement, and thereby enabling more opportunities to sexual encounters; which increases the risk of getting infected by HIV.

Since HIV prevalence does not seem to be an important determinant for MFIs we look at our control variables - they play an essential role in explaining the output from our regressions. Population seem to have major explanatory value in the two main regressions. It is logical to explain this positive correlation between MFIs and population with the fact that more populated areas, like cities, are more accessible when it comes to banks, post offices, shops etcetera. It might be more lucrative for MFIs to establish in highly populated districts to reach out to as many people as possible.

Subsistence farming is negatively correlated with MFIs in our two regressions. Research by for example Morduch (1999) and Rabbani et al. (2006) note that MFIs repeatedly fail to meet the demand of the absolutely poorest in a society, the group of people who maybe need financial services the most. This is problematic in one sense, but also understandable since the market of MFs today do not solemnly exists by NGOs and governmental subsidies, but also of companies and banks, as well as saving clubs and various kinds of corporations, who demand a certain standard of their clientele. This is also linked to the positive relationship between literacy and MFIs. It is much easier to train literate and already educated people about loans, repayments, saving accounts and other financial services, than illiterate and uneducated people.

7.2. Validity of the model

7.2.1. Omitted variables

There are some possible omitted variables that are important to notice when interpreting the regression results. As described in the "Theoretical framework", social stigmatization and self-exclusion are two theories that explain our hypothesis about PLWH being excluded from the MF market. These two theories are not statically tested in our paper, but are linked to the regional differences of the regression output. Since Northern has a substantial part subsistence farmers, low economic activity and low literacy rates, people might be affected and treated differently if they have HIV. This might hinder people in the Northern region to seek MF if they have HIV. The discrimination and stigmatization might be greater in rural areas and socioeconomic vulnerable areas compared to cities and more developed districts, such as Kampala. This might hinder that PLWH seeks MFs in the Northern region, which might be different from the Central. Thus, the demand for MF and the actual MF participants are two omitted variables that could help explain the distribution of MFIs in Uganda. District level data on these variables could help us explain the regional differences in a better way.

The regional differences are very important when interpreting the results. The Northern region of Uganda has for a long time been haunted by violent conflicts in combination with a large inflow of refugees, mainly from South-Sudan. The lack of roads, schools, hospitals, food and other necessities make the Northern region very unstable. A variable describing the degree of conflict would surely explain some of the output differences across regions. Contrary, the Central region includes some of the major cities of Uganda, where people tend to be better educated and less dependent on subsistence farming. The Central region has also a substantial part HIV positive people, compared to the other regions. The regions have different omitted variables, that we lack in order to make more accurate estimates of the determination of MFIs and its relationship with HIV prevalence.

One possible determinant frequently used in the literature is "road accessibility" or "physical infrastructure". In Uganda, many roads are in very bad condition, which makes it impossible to travel by car during some periods of the year. Thus, several districts are almost unreachable from time to time. One could therefore argue that road accessibility plays a major role when MFIs decide where to establish. In our dataset, it was not possible to include road accessibility

as a control variable. As seen in our results, there is a strong correlation with increase in population and number of MFIs in a district. According to Cyrus Chu (1997) "Population size plays an important role because it helps generate more aggregate demand for a professional infrastructure sector, which in turn improves transaction efficiency and facilitates the division of labour". A higher population density enables more labour which leads to more industries and therefore a development of infrastructure. Glover and Simon (1975) do also find a strong correlation between infrastructure and population density. Further on does Ashok Sharma (2001), find evidence that it is more cost effective to place a MFI in an urban, easy accessible area, which proves the hypothesis that road accessibility plays a major role when it comes to the distribution of MFIs.

7.2.2. Data validity

There is a risk that the selection of MFI distribution does not match the true MFI distribution in Uganda. We have used data from AMFIU since they cover most of the market. It is, however, important to know that they only include the MFIs that pay membership fees. Hence, there are additional MFIs that are not included in this dataset operating in Uganda.

We use a dataset collected in 2014. However, the MF programs targeting PLWH were launched in 2012, which could imply a change in the distribution of MFs before our dataset were collected. If there are large imbalances it would endanger our results, and we would have stronger evidence for our hypothesis. However, we believe that the MF distribution, and the stigmatization of PLWH, is very structural. It is not likely that remarkable changes take place that quickly, but it is of course not impossible.

Our dataset does not say anything about the magnitude of the MFIs outreach, nor how many clients that are served, and if they serve PLWH. This is a drawback since it makes it difficult for us to conclude how many people that are financially included. It could be the case that the MFIs in areas with few MFIs cover all the need for financial services, and that there is no room for additional ones. It could also be the other way around, but it is impossible to say using our dataset. It would have been more useful with a variable that stated the degree of financial inclusion by MFIs in every district.

Another drawback in our dataset is the lack of a good poverty estimate. We are using subsistence farming as a proxy for poverty, but that is somewhat problematic since it does not cover all the different parameters of poverty. When using this variable in our regressions, the poverty within the urban areas become omitted, since the urban residents do not engage in subsistence farming. Poverty is a very complex measurement and there are far more variables than subsistence farming that could play a major role. Ideal would have been to use a poverty estimate that accounted for multidimensional poverty. This poverty measurement includes three main dimensions, health, education and standard of living, which gives a more nuanced view on various sources of poverty that can batter a household at the same time. Nutrition, years of schooling, assets and electricity are some of the indicators that multidimensional poverty takes account for.

7.2.3. Standard errors and sample size

The general formula for variance for OLS estimators in multiple regressions is complicated. If there are two regressors and the SE are homoscedastic, the formula is simpler and provide some insight about the distribution of the OLS estimators (Wooldridge, 2014).

Because we run the regression using robustness checks, we can presume that the errors are homoscedastic, and the conditional variance of u_i can be written as $var(u_1\ X_{1i}, X_{2i}) = \sigma_u^2$. In large samples, the sampling distribution of $\hat{\beta}_1$ is $N(\beta_1, \sigma_{\hat{\beta}_1}^2)$, where the variance of the distribution, is $\sigma_{\hat{\beta}_1}^2 = \frac{1}{n}\left(\frac{1}{1-\rho_{X_1,X_2}^2}\right)\frac{\sigma_u^2}{\sigma_{X_1}^2}$.

ρ_{X_1, X_2} is the population correlation between the two regressors X_1 and X_2, and $\sigma_{X_1}^2$ is the population variance of X_1. Therefore, if X_1 and X_2 are strongly correlated, then ρ_{X_1,X_2}^2 will be close to 1 and $1 - \rho_{X_1,X_2}^2$ will be small which contributes to a larger variance of $\hat{\beta}_1$. If the variance of $\sigma_{X_1}^2$ is small, the variance of $\hat{\beta}_1$ will be large. By that said, our SE are larger since we have a small spread on the X_1, in this case the HIV prevalence in the different districts. Our sample does also have small number of observations, denoted n. The small n will also affect the outcome of $\sigma_{\hat{\beta}_1}^2$ and provide a larger variance of $\hat{\beta}_1$.

There are thus two major things that may affect our SE and thereby affect the significance of the test. This is important to notice in order to not draw conclusions based only on these significance levels, since they could be untrue. In this paper, we are trying to account for other possible factors, other than the regression output and its significance levels, that can strengthen our arguments.

8. Conclusion

The focus of this paper was to investigate if PLWH are being excluded from the MF market in Uganda. We presented three possible theories in order to analyse our hypothesis. One of these theories was formally tested using data collected from AMFIU, UBOS and USAID. Using this data, we analysed the relationship between two dependent variables: existence of MFI and number of MFIs with the main explanatory variable HIV prevalence.

What we can conclude is that we find evidence showing the negative relationship between HIV prevalence and the number of MFIs in the Central region of Uganda. This might indicate that districts with high HIV prevalence has fewer MFIs, which could be caused by discrimination of PLWH, if we assume that the needs of this group are not being met in the best way. This is therefore in line with our hypothesis. The other three regions are not negatively correlated and not statistically significant. HIV prevalence does therefore not seem to be a good determinant for MFIs to establish. Other variables such as literacy and population show stronger and more significant results.

However, it is important to note that we lack certain valuable data that might play a crucial role in our regressions, that the number of observations if unsatisfyingly low and that the significance levels are very various. We therefore present two other theories that might help explain the claimed discrimination against PLWH. One of them state that self-exclusion due to sickness and/or mental illness is one reason why PLWH not seeking MFs, the other suggest that social stigmatization and discrimination from other people explain this. These theories were not statistically tested in our paper.

We want to emphasize usefulness of the district level dataset we have constructed, which could be applicable in various ways in further studies. We believe that this dataset is one of the main contributions we have accomplished by this paper, and we would be delighted to share it with other interested parties.

We believe that our paper will inspire to further research on the topic, as it might help organizations and stakeholders to better understand the needs of PLWH and the distribution of MFIs in Uganda. We hope that the paper will interest other students, organisations or researchers in the field, as it interested us.

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Appendix

Table 5

Probit estimates on *existence of MFI*

Specification	(1)	(2	(3)	(4)	(5)	(6)	(7)
Variable	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI
hivprev	5.841	11.385	8.137	6.743	3.270	3.842	-33.969
	(4.521)	(4.692)**	(4.784)*	(5.174)	(5.544)	(5.664)	(13.834)**
population		1.681	4.640	4.600	4.181	3.521	1.869
		(0.308)***	(1.513)***	(1.552)***	(1.587)***	(1.551)**	(1.529)
rural			-3.069	-3.091	-2.530	-1.716	-0.193
			(1.432)**	(1.463)**	(1.475)*	(1.517)	(1.481)
literacy				0.928	0.997	0.481	0.636
				(1.335)	(1.245)	(1.488)	(1.573)
subfarm					-3.625	-2.931	-5.925
					(1.587)**	(1.786)	(2.538)**
western						0.664	-2.697
						(0.661)	(1.511)*
eastern						-0.921	-4.228
						(0.589)	(1.239)***
northern						-0.373	-3.447
						(0.664)	(1.268)***
hivXwestern							49.290
							(23.541)**
hivXeastern							47.095
							(17.357)***
hivXnorthern							43.581
							(15.919)***
constant	0.021	-21.052	-19.946	-19.729	-18.375	-20.078	-13.072
	(0.254)	(3.900)***	(4.158)***	(4.143)***	(4.599)***	(5.086)***	(5.648)**
N	110	110	110	110	110	110	110

Robust standard errors in parentheses

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 6

Logit estimates on *existence of MFI*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI	extMFI
hivprev	10.470	19.483	14.848	12.857	6.530	6.196	-58.504
	(8.515)	(8.564)**	(8.569)*	(9.368)	(9.875)	(9.919)	(25.672)**
population		2.831	8.629	8.504	7.531	5.920	3.111
		(0.579)***	(2.929)***	(3.051)***	(3.054)**	(2.625)**	(2.661)
rural			-5.905	-5.889	-4.664	-2.789	-0.252
			(2.659)**	(2.754)**	(2.750)*	(2.558)	(2.516)
literacy				1.307	1.345	0.565	1.032
				(2.535)	(2.245)	(2.651)	(2.879)
subfarm					-6.042	-4.807	-10.541
					(2.859)**	(3.125)	(5.017)**
western						1.144	-4.687
						(1.259)	(2.941)
eastern						-1.638	-7.078
						(1.092)	(2.219)***
northern						-0.673	-5.780
						(1.218)	(2.259)**
hivXwestern							88.218
							(47.145)*
hivXeastern							78.986
							(32.061)**
hivXnorthern							74.450
							(28.482)***
constant	-0.015	-35.494	-34.696	-34.129	-31.950	-34.797	-21.927
	(0.444)	(7.336)***	(8.136)***	(8.198)***	(8.996)***	(9.607)***	(10.654)**
N	110	110	110	110	110	110	110

Robust standard errors in parentheses

* *p*<0.1; ** *p*<0.05; *** *p*<0.01