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**The effect of microfinance on income inequality:
Perspective of developing countries**

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Abstract

Aim/purpose – Studying the impact of microfinance on income inequality from a macro-economic perspective.

Design/methodology/approach – Cross-sectional regression analysis is used to measure the effect of microfinance on the Gini index in a sample of 30 developing countries from across Africa, Asia, Latin America, and Europe. A set of control variables are added to the model including: inflation, educational attainment, democracy, population growth, percentage of arable land to strengthen the model's reliability.

Findings – Results indicate that neither a positive nor a negative impact of microfinance on Gini index could be significantly proved for the sample countries.

Research implications/limitations – Due to lack of data availability, research is conducted on a small sample of 30 countries. Therefore, to obtain more generalisable results, it is recommended for future research to use a larger sample.

Originality/value/contribution – Microfinance is becoming a focal issue in alleviating poverty and inequality, and this paper's main contribution is that it explores this matter from a macro-economic perspective by looking at the holistic impact of microcredit on a sample of developing countries. Hence, the paper provides further investigation and suggestions for a better implementation of microfinance policies.

Keywords: developing countries, income inequality, microcredit, microfinance.

JEL Classification: D14, O16.

1. Introduction

“We believe that poverty does not belong in a civilised human society. It belongs in museums. This [Microcredit] Summit is about creating a process which will send poverty to the museum... sixty-five years after this Summit, we will create a poverty-free world” (Microcredit Summit, 1997, p. 11). With that enthusiasm, Muhammad Yunus, leader of microfinance and Nobel Prize laureate, started the microcredit movement and remarkably participated in the universal collective effort to eradicate poverty and inequality. Throughout the last decades, poverty has been a major concern of the world (Hermes, 2014). Particularly, the universal effort to combat poverty has been clearly demonstrated with the launch of the Millennium Project in 2000 that aimed at achieving the eight Millennium Development Goals (MDGs) by the year 2015; when the ‘Eradication of Extreme Poverty’ was the first of the 8 goals. By the end of the year 2015, the Sustainable Development Goals (SDGs) replaced the Millennium Project with 17 new aims including the ‘Reduced Inequality’ goal as well as the ‘No Poverty’ goal coming, again, on the top of the list (United Nations, 2015).

In an attempt to actively contribute to the universal collective effort to eradicate poverty and inequality, the modern model of microfinance has emerged and rapidly disseminated throughout the world representing an extremely powerful tool in the face of destitution and hence, gaining a lot of supporters among the public and academics (Buera, Kaboski, & Shin, 2012; Littlefield, Morduch, & Hashemi, 2003).

Although there are various success stories of microfinance, it has been subject to several critiques raising an important debate among academics and practitioners about its impact and sustainability (Ghosh, 2013; Hermes, 2014; Sample, 2011; Săvescu, 2010). The lack of consensus about the impact of microfinance has made it essential to explore that topic further. Therefore, the purpose of this paper is to investigate the effect of microfinance activity on income inequality.

In an attempt to answer this research question, this paper will be organised as follows: The first section will review the literature on microfinance, its definitions, importance, emergence, development, critiques and challenges, as well as the impact of microfinance on income inequality. The following section will focus on the research methodology including the model and variables’ specifications to test for a main hypothesis: Microfinance has a negative impact on (reduces) income inequality. And finally, the main findings, interpretations, and policy recommendations will be presented.

2. Literature review

This part will review the definition and concept of microfinance, its importance and main objectives, the emergence and development of microfinance institutions (MFIs), some critique of microfinance, and finally some challenges facing microfinance.

2.1. Defining and understanding the concept of microfinance

It has been argued in several studies that the lack of access to credit by a country's poor population is one of the most considerable obstacles that hinder that country from reducing its level of poverty and income inequality. Consequently, it can be argued that microfinance plays an utterly crucial role in a country's economic development (Hulme & Mosley, 1996; McKenzie & Woodruff, 2008). Accordingly, microfinance is defined as the provision of small, free of collateral loans as well as other financial assets and insurance services to the poor segment of the society to enhance their standard of living. That poor population could not otherwise get access to such small-scale loans and financial services because of the lack of collateral (Chowdhury, Ghosh, & Wright, 2005; Taiwo, Yewande, Edwin, & Benson, 2016).

Săvescu (2010) provides another definition that links microfinance to small enterprises and entrepreneurship. It defines microfinance as a means of financial security for small entrepreneurs, that allows them to access small loans and basic financial services that help them develop small businesses and thus escape poverty through generating income for themselves and their families. The link between microfinance and small entrepreneurs has been also incorporated in a more comprehensive definition of microfinance by Electrin et al. (2013) who defined microfinance as an empowerment tool for low-income populations that grants them small loans without collateral and with relatively low interest rates. This should enable them to engage in small entrepreneurial activities and will ultimately increase their welfare through better access to the funds necessary for their children's education and for better houses. They can also benefit from other financial services such as micro-insurance and micro-mortgage offered by the MFIs that are tailored to perfectly suit the needs of the underprivileged.

The aforementioned definitions of microfinance can be complemented by what is stated by Rahman & Nie (2011); they have indicated that microfinance means granting remittance, savings, as well as opportunities for better education,

healthcare, skill training and insurance services that help the underprivileged reach a better social standard, and to escape their cruel social situations due to the lack of access to credit.

It is utterly important while reviewing the literature to distinguish between two terms: microfinance and microcredit since they are often used interchangeably (Fishman, 2012). As stated earlier, microfinance is the provision of versatile financial services including small loans, thrift, micro-insurance, micro-savings deposits and others in order to boost the poor population's well-being. This will essentially help curtail poverty and lead to economic development. On the other hand, microcredit can be defined as the provision of micro-loans to the poor or micro-entrepreneurs. Accordingly, it can be concluded that the microfinance term is a broader and a more inclusive term than microcredit (Electrin et al., 2013; Sengupta & Aubuchon, 2008; Taiwo et al., 2016).

2.2. Importance and objective of microfinance

The importance of microfinance can be observed from two perspectives; the first one is the social perspective. Women empowerment, for instance, is highly correlated to microfinance. The access to credit increases women's self-employment opportunities and access to education (Fishman, 2012; Kabeer, 2005). Furthermore, Kumar (2016) has provided a more thorough investigation of the effect of microfinance on women empowerment through the 'Triple I Model' that he built based on the analysis of the effect of JEEViKA¹ (a microfinance project in India supported by the World Bank). In that model, he described women empowerment (measured by the level of women *Insecurity*) as a function of *Income* and *Identity*. Before the introduction of JEEViKA project, women's identity and income were at extremely low levels resulting in a high level of insecurities whereas after the introduction of JEEViKA, the opposite occurred.

From the economic perspective, microfinance is considered as an influential player in the eradication of poverty that was one of the (MDGs) until the year 2015. Numerous models in the literature consider microfinance as a development tool that has positive micro-economic and macro-economic effects that include: increased GDP per capita, higher level of per capita expenditures, improved access to education on the micro level leading to lower illiteracy on the macro level, lower unemployment and increased total factor productivity (Buera

¹ JEEViKA means livelihoods (Kumar, 2016).

et al., 2012; Littlefield et al., 2003). The microfinance's ability to promote the social inclusion of the marginalised members of the society such as immigrants, the poor, women, etc. ... is the main determinant of its economic importance. It can simply fill the gap of the demand on micro-loans that is generally in excess of the supply of micro-loans. Accordingly, the poor's living standards will definitely be enhanced in terms of employment and income, education, and social empowerment which ultimately promote economic development (Hermes, 2014; Săvescu, 2010).

2.3. Emergence and development of microfinance and MFIs

The idea of microcredit started when Muhammad Yunus wanted to experiment the effect that a small collateral-free loan may have on some people residing in a Bangladeshi village. Thus, he founded Grameen Bank under a special contract from the Bangladeshi government as a formal independent micro-financial institution (Chowdhury et al., 2005)

The Grameen Bank has quickly grown up and succeeded in what was a failure for the traditional banking sector because of the group-lending and joint liability model. The model works as follows: Borrowers first have to construct groups of five 'solidarity groups' and present themselves to the bank requesting loans. The first two members of the group receive their small loans. If the first 2 members repay their loans, the second 2 members receive their loans, then the last member. If any member during the process defaults, the whole group will be deprived from future credit. Each 8 solidarity groups should then form a 'center' that holds a 'center meeting' in which repayments are collected transparently in public (Rahman & Nie, 2011; Sengupta & Aubuchon, 2008).

The joint liability model ensures the avoidance of two concerns of lenders. The first problem is the 'moral hazard'². This problem is non-existent in the group-lending model of Grameen Bank, since members of a solidarity group will strive to avoid it especially that the whole group's eligibility to future credit depends on each member's commitment in his/her loan's repayment. *The second problem* is that of 'adverse selection'³ which is similarly minimised in the

² Moral hazard is a problem caused by asymmetric information that involves the risk of having the borrower use the borrowed money in un-preferred or 'immoral' activities from the lender's perspective. Since these activities increase the probability that the borrower may default and therefore lenders may stop giving out loans to avoid that risk (Mankiw & Rashwan, 2012).

³ **Adverse selection** is another problem caused by asymmetric information that makes lenders refrain from giving out loans as they lack information about the borrowers and whether they are

Grameen Bank's model because safe members who intend to repay their loans will not enter in a solidarity group whose members are not safe. Besides, members of a group will not accept un-safe peers who are likely to default. Once the two aforementioned concerns are avoided, the risk is significantly transferred from the lender to the borrowers. Hence, the need to charge high interest rates to compensate the risk of defaulting members disappears, and the Grameen Bank can, opposite to other banks, charge low interest rates on all members (Sengupta & Aubuchon, 2008).

Table 1. Main characteristics of Grameen Bank

Particular	5 members
Group function	Weekly conference, allocation of information and conversations
Loans	Group and individual
Liability	Group and individual
Collateral	Free, no group members are accountable to pay on behalf of others
Repayment	Usually, weekly in the central meeting. Field staff sometimes visit borrower's house in case of failure to pay
Interest rate	Varies (0-15%) flat rate

Source: Rahman & Nie (2011, p. 216).

Table 1 includes a summary of the key features of Grameen Bank in terms of the mechanism and functionalities, interest rates, and types of loans.

2.4. Critique of microfinance

Several academics argue that microfinance, may lead to the reproduction of poverty and social inequalities instead of poverty reduction. This mainly originates from the intrinsic feature of the group lending model that requires peer-monitoring. That is, to minimise the risk of being deprived from future credit, each group member must ensure that all his peer-members are able to repay their loans. Therefore, better-off borrowers who are likely to repay their loans mainly select similar low-risk peers in their groups. This eventually increases the probability that the extremely poor and marginalised members of the society will be disproportionately excluded (Copestake, 2013; Ghosh, 2013; Shakya & Rankin, 2008).

likely to repay their loans or to default; especially that borrowers who are likely to default – generate bad credit risks – are the ones that most actively demand credit and are likely to be selected. Therefore, although there may be good borrowers, lenders do not want to give out loans (Mankiw & Rashwan, 2012).

Another critique of microfinance is the high interest rates. A large percentage of micro-borrowers used loans for consumption purposes such as school fees, medicaments, and food; not in asset-creation such as the development of micro-enterprises or other income-generating activities. This has generally decreased the repayment rates, therefore, MFIs started to introduce individual loans where there is no peer-monitoring. In exchange of bearing the costs of screening borrowers, MFIs had to charge higher interest. It is obvious that the borrowers are the losers of that scheme as they eventually have to pay off their loans at excessively higher interest rates which sometimes leaves them worse-off (Copestake, 2013; Hulme, 2000; Ladman & Afcha, 1990; Shakya & Rankin, 2008).

Bateman & Chang (2012) examined the macro-level impact of microfinance. They suggested that microfinance may be an enormous barrier to the sustainable social and economic development. This is based on two arguments: first, that microfinance disregards the importance of scale economies, i.e. the cost reduction as the scale of production and investments increase. Second, that microfinance overlooks the ‘fallacy of composition’ assuming that the creation of thousands of micro-enterprises having similar or quasi-similar activities will improve the macro-economic development in the same way as each micro-enterprise improves the well-being of individual micro-entrepreneurs. Consequently, as the economy gets saturated by micro-enterprises with modest activities and no synergy between them, the local economy may be deindustrialised and productivity improvements may not occur.

2.5. Challenges hindering growth of MFIs

Due to the success of microfinance, MFIs have become widespread in several countries which generated a fierce competition between them, such that in some villages, in India for instance, it is not unusual to find up to eight microfinance institutions competing to serve the same clients. Thus, some mature microfinance markets are said to experience saturation with regards to the supply of microfinance which introduced patterns of ‘loan swapping’. That is, one borrower can borrow micro-loans from more than one microfinance institution to enable him or herself to repay the original loan from the new loan, and so forth (Ghosh, 2013; Sample, 2011). Loan-swapping often leads to the over-indebtedness of borrowers and hence, a reduction in repayment rates. Consequently, MFIs find themselves with less savings deposits and get obliged to increase their interest rates to obtain higher returns and be able to get loans from other banks. This is

considered as a significant barrier to MFIs' sustainability and efforts to reduce income inequality (Fishman, 2012; Shakya & Rankin, 2008).

Furthermore, some MFIs exhibit a lack of accountability and transparency as they tend to not fully disclose their interest rates or their repayment rates to the public. This problem is magnified due to the poor accounting capabilities of such MFIs and their inadequate financial auditing and control. Moreover, the shortage in government regulations may allow some unethical institutions to enter the microfinance market seeking profits at the expense of the poor. Those market intruders generally take savings, disburse a few loans at unreasonably high interest rates, they allow loans for non-income generating purposes, they provide no support for loan repayments, and then they disappear which leads to worsening the status of the severely destitute clients. Such unethical practices jeopardize the microfinance sustainability and curtail microfinance's aspirations of saving the severely underprivileged society members. Therefore, it is utterly essential to have MFI-friendly governmental policies or even self-regulatory policies among MFIs (Sample, 2011).

Finally, the lack of financial backing of MFIs represents an obstacle to enabling them to impact a wide base of clients by giving out more loans to a larger number of poor people. But MFIs often encounter a trade-off; either to expand by disbursing more loans at higher interest rates or not to expand and leave their interest rates and customer base unchanged (Fishman, 2012; Rahman & Nie, 2011).

2.6. Effect of microfinance on income inequality

Income inequality has an adverse effect on human capital and labour productivity as it hinders the poor's ability to attain the adequate education. Income inequality also obstructs the economic growth from benefitting the poorest quintiles of the population (Dabla-Norris, Kochhar, Suphaphiphat, Ricka, & Tsounta, 2015). Microfinance impacts income inequality indirectly by tapping on such education, employment, and poverty problems and thus lifts up the poor in comparison with the richer segments so that the gap between them shrinks.

Baldi & Šipilova (2014), in a study conducted in Latvia, prove that there is a positive impact of microfinance on participants' employment level. It was concluded that individuals who had access to loans supported micro-entrepreneurs to develop their micro-enterprises and thus aided them to break their unemployment and poverty cycle which ultimately contributed to Latvia's economic development.

Another social aspect that reflects the microfinance's positive impact on income inequality is its influence on education. Amin & Sheikh (2011) contended – based on a study of ASA, BRAC, and Grameen – that access to micro-loans remarkably contributed to the households' affordability of educating their children.

Moreover, Bruhn, & Love (2014) in a study of the economic consequences of opening a new microfinance bank in Mexico, pointed out that the introduction of microcredit services has considerably impacted low-income individuals in terms of incomes, savings, and poverty reduction by helping them develop their informal micro businesses. It also helped existing micro-enterprises improve their businesses and incomes. McKenzie & Woodruff (2008) provide an explanation to that increase in income by pointing out that micro-entrepreneurs highly benefit from microcredit because even small capital investments remarkably improve their businesses and increase incomes as they have a relatively higher rate of return on capital. Consistently, findings from Rahman, Luo, & Minjuan's (2015) study in China show that, as a result of the availability of microfinance services in a Chinese poor county, asset ownership of microcredit households was significantly enhanced. Considering all the aforementioned findings, it can be argued that microfinance can contribute to the alleviation of income inequality through its positive upward push for incomes of the population's poorest quintiles.

3. Research methods and procedure

After exploring the literature about microfinance and its effect on income inequality, it has been noticed that there is a gap in exploring the effect of microfinance on income inequality in direct manners through the examination of the Gini-coefficient or any other quantitative index of income inequality. The majority of the existing research is focused on other factors such as poverty reduction, income per capita growth, increase in savings, increase in education and employment that in turn may affect income inequality. The gap particularly exists in examining the impact of microfinance on income inequality in the developing countries. This topic is rarely undertaken and requires further research. Therefore, the exact hypothesis that will be tackled in this paper is: microfinance has a negative effect on (reduces) income inequality in developing countries.

Table 2 contains a list of countries included in the sample ordered alphabetically. The sample consists of 30 developing countries from across Africa, Asia, Latin America, and Europe.

Table 2. List of countries included in the sample

Armenia	Congo, Democratic Republic	Pakistan
Bangladesh	Ecuador	Panama
Benin	El Salvador	Philippines
Bolivia	Ethiopia	Russia
Brazil	India	South Africa
Cameroon	Indonesia	Sri Lanka
Chile	Kenya	Sudan
China	Mexico	Turkey
Columbia	Morocco	Vietnam
Costa Rica	Nigeria	Tunisia

This paper pursues a methodology that follows the past literature investigating the relationship between microfinance and macro-economic variables such as financial development, poverty, and income inequality. For example, Beck, Demirgüç-Kunt, & Levine (2007) have examined the cross-sectional relationship between income inequality (Gini) and financial development (private credit). They also specified some control variables affecting income inequality including inflation, education, and trade openness. Similarly, Clarke, Xu, & Zou (2006) assessed the cross-sectional relationship between Gini and financial sector development (credit by both private sector firms and non-financial domestic sector). The control variables included the inflation rate, non-agricultural sector share of GDP, and several others. Furthermore, Bangoura, Mbow, Lessoua, & Diaw (2016) examined the relationship between poverty and microfinance measured by either the share of active borrowers in total population or the value of microfinance loans as a percentage of the GDP. Moreover, Kai & Hamori (2009) studied the effect of microfinance on income inequality. They used the number of MFIs and the number of borrowers to capture microfinance intensity and included inflation rate, democracy, and trade openness as control variables. Whereas Hermes (2014) used the number of active borrowers and the value of microfinance loans to capture microfinance intensity and included inflation rate, percentage of arable land and rural population, democracy, schooling, and others as control variables.

Accordingly, this paper follows the most relevant comprehensive model in the context of the research question, which is the model used by Hermes (2014). However, unlike the model used by Hermes (2014), this paper's model will use a more equally divided sample among Africa, Asia, and Latin America with an average of 9 countries from each; while taking only 2 countries from Europe since it is the least continent of interest due to its relative better economic situa-

tion. The model represents income inequality as a function of microfinance and some other control variables as follows:

$$Gini_i = \alpha_i + \beta_1 MF_i + \beta_2 CV_i + \varepsilon_i$$

where:

Gini is the Gini-coefficient of country i ,

α is the intercept term,

MF_i is the microfinance intensity measure,

CV_i is a vector of control variables that affect income inequality other than microfinance, ε_i is the error term.

The model's dependent variable, which is the Gini-coefficient, is a measure of the extent to which a country's distribution of income among households and individuals differs from the situation of a perfectly equal distribution. Gini is expressed as the area between the Lorenz curve and the line of perfect equality as a percentage of total area under the line taking a value between 0 and 100; the closer to 100 the higher income inequality. Gini values for the sample countries are obtained from UNDP Human development report for the year 2016.

The main explanatory variable is the microfinance intensity variable and it is the variable of interest. It is measured either by:

MF_1: The total value of issued microfinance loans in a country *divided by* the country's GDP; or

MF_2: The number of active microloans borrowers in a country *divided by* the country's total population.

Data about the number of active borrowers and microfinance loans is obtained from Microfinance Information Exchange MIX website. And data for GDP and population is obtained from the 2016 UNDP human development report.

The control variables include: ***inflation rate*** measured as the growth in a country's GDP deflator; ***rural population*** measured as the percentage of the population living in rural areas from the total population; ***arable land*** measured as the percentage of arable land from a country's total land area; ***democracy level*** which is an eleven-point scale from 0 to 11 with the higher values indicating more democracy; ***population growth rate*** which is the percentage change in a country's total population from a year to another; ***openness*** capturing the economy's openness and measured by a country's trade level, that is the sum of its exports and imports, expressed as a percentage of GDP; and finally ***enrollment*** measuring the level of human capital and captured by the gross secondary enrollment ratio, that is, the total enrollment in secondary education expressed as a percentage of population of secondary education age.

Data for all control variables is obtained from the World Bank Development Indicators (WBDI) website, except the democracy variable, it is obtained from the Center for Systematic Peace website, the Integrated Network for Societal Conflict Research (INSCR) data page. All data is collected for a sample of 30 developing countries from Africa, Latin America, Europe, and Asia. Gini data is one-year observation assumed to be for the year 2015. Microfinance data include the most recent data available expressed as cumulative numbers from 2013-2015. All control variables are average numbers for the data of the most recent available five years.

It is hypothesised that microfinance affects the Gini index negatively, which means that; as microfinance intensity increases, there should be more financial inclusion of the lowest-income groups, hence, less income inequality. Inflation rate is expected to have a positive relation with Gini, since it decreases the purchasing power of the population's income. Moreover, it is expected that human capital reflected in the secondary enrollment ratio has a negative coefficient since educational attainment helps create more employment and financial inclusion opportunities. There is some uncertainty about the impact of trade openness. The literature studying the effect of trade openness on Gini provides mixed results; indicating that the relationship varies according to the sample countries as well as the type of exports and imports in each country (Calderon & Chong, 2001; Mahesh, 2016). Similarly, the expected effect of the ruralisation ratio, percentage of arable land, cannot be decided as it depends greatly on the nature of the sample countries; for example if a country has a high percentage of arable land, then ruralisation ratio will be negatively related to Gini. Similarly, population growth may be positively or negatively related to Gini depending on whether this growth is in rural or urban population, and whether the country's income depends on agricultural or urban activities. As for the democracy variable, it is expected to have a negative impact on Gini as higher democracy means better policies that ensure more equal distribution of income.

4. Research findings and results

First, an analysis of the descriptive statistics for the dependent and all independent variables is shown in Table 3. The analysis mainly helps evaluate the skewness of the data in order to choose the correct functional form and to decide whether it is more appropriate to log the variables or to use them directly in the regression analysis.

Table 3. Descriptive statistics

Statistic	Gini	MF_1	MF_2	Inflation	Openness	Population Growth	Rural Population	Arable Land	Democracy	Enrollment
Mean	2.77667	0.006766	0.029410	6.003167	62.94603	1.926667	45.69181	17.36155	3.973333	77.40182
Median	2.15000	0.001928	0.014941	4.707740	57.86793	1.400000	43.77920	13.04954	6.80000	84.33204
Maximum	63.40000	0.045529	0.126357	28.51602	166.5729	13.80000	81.68360	59.13190	10.0000	114.1126
Minimum	30.70000	1.17E-05	0.000211	0.609153	24.02416	0.000000	10.83260	1.493321	-50.0000	36.87581
Std. Dev.	7.405109	0.011228	0.034760	5.218633	30.21516	2.372680	19.71714	14.47090	10.65959	21.54919
Skewness	0.491747	2.186447	1.451109	2.908805	1.797516	4.344035	0.183639	1.382559	-4.51970	-0.446649
Kurtosis	3.324017	7.000675	4.275540	12.82797	6.742357	22.41239	2.023757	4.365494	23.46828	2.028659
Jarque-Bera	1.340312	43.90949	12.56235	163.0420	33.66187	565.4044	1.359930	11.88807	625.8267	2.104295
Probability	0.511629	0.000000	0.001871	0.000000	0.000000	0.000000	0.506635	0.002621	0.000000	0.349187
Sum	1283.300	0.202991	0.882304	180.0950	1888.381	57.80000	1370.754	520.8464	119.2000	2244.653
Sum Sq. Dev.	1590.234	0.003656	0.035039	789.7899	26475.71	163.2587	11274.20	6072.801	3295.179	13002.30
Observations	30	30	30	30	30	30	30	30	30	29

Results of the descriptive statistics shown in Table 3 indicate that the variables do not have remarkably high skewness values which indicate that data are nearly normally distributed and hence, the unlogged data can be used in the regression analysis.

Secondly, a correlation matrix, shown in Table 4, has been examined to check for possible multicollinearity problems.

Table 4. Correlation matrix

Correlation Probability	MF_1	MF_2	Inflation	Openness	Population Growth	Rural Population	Arable Land	Democracy	Enrollment
MF_1	1.000 -								
MF_2	0.64169 0.0002	1.000 -							
Inflation	-0.16018 -0.4065	-0.2663 0.1625	1.000 -						
Openness	0.18411 0.3390	0.1073 0.5793	0.45311 0.0139	1.000 -					
Population Growth	0.49925 0.0058	0.51266 0.0045	-0.02354 0.9035	0.10264 0.5962	1.000 -				
Rural Population	-0.07156 0.7122	-0.0692 0.7210	0.36274 0.0531	-0.28124 0.1394	0.07292 0.7070	1.000 -			
Arable land	-0.178579 0.3540	0.25004 0.1908	-0.01760 0.9278	-0.20074 0.2964	-0.01514 0.9378	0.439303 0.0171	1.000 -		
Democracy	0.109213 0.5728	0.03619 0.8521	-0.03730 0.8477	-0.26055 0.1722	0.03408 0.8607	0.001074 0.9956	-0.020533 0.9158	1.000 -	
Enrollment	0.115609 0.5504	0.08066 0.6774	-0.43880 0.0173	0.21589 0.2607	-0.14071 0.4666	-0.655679 0.0001	-0.412879 0.0260	0.020115 0.9175	1.000 -

The correlation matrix in Table 4 indicates that only the two variables 'enrollment' and 'rural population' are significantly correlated with each other with a P-value of 0.0001 and therefore, should not be included in the same regression. As for the two microfinance measures, they are significantly correlated as they both measure microfinance intensity, however, they are not essentially intended to be used simultaneously. Thus, the regression will be run four times, two times

including MF1 with either of enrollment and rural population; then, similarly for MF2.

In order to decide on the best model that includes the most relevant variables with significant impact on income inequality, two simple regressions have been run to test the direct and separate effect of microfinance on Gini. Then, a series of seven multiple regressions have been run; each included Gini as dependent variable with only two explanatory variables: microfinance and one of the control variables. This process has been repeated twice for each of the microfinance measures 'MF_1' and 'MF_2' with a total of 14 regressions. After that, the coefficients' P-values and t-statistics for the involved variables in all the previously mentioned regressions have been analysed. Variables that have been proved insignificant, i.e. having a P-value less than 0.10, were decided to be eliminated from the analysis. Using MF_1, all control variables were significant except trade openness; however, using MF_2, all control variables were significant except trade openness and population growth. Accordingly, a decision has been made to run 4 final regressions considering the above significance results and the multicollinearity between enrollment and rural population. The regressions that yielded the most adequate results are as follows:

- 1) Regress Gini on MF_1, enrollment, inflation, democracy, arable land, and population growth. Results are in Table 5.
- 2) Regress Gini on MF_1, rural population, inflation, democracy, arable land, and population growth. Results are in Table 6.
- 3) Regress Gini on MF_2, enrollment, inflation, democracy, and arable land. Results are in Table 7.
- 4) Regress Gini on MF_2, rural population, inflation, democracy, and arable land. Results are in Table 8.

Table 5. Regression results: Gini on MF_1, enrollment, inflation, democracy, arable land, and population growth

Dependent Variable: Gini Method: Least Squares Date: 05/02/17 Time: 19:17 Sample (adjusted): 1 29 Included observations: 29 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
1	2	3	4	5
C	48.91345	6.360375	7.690341	0.0000
MF 1	22.68681	105.1527	0.215751	0.8312
Enrollment	0.026940	0.059123	0.455653	0.6531
Inflation	-0.376418	0.217397	-1.731484	0.0974
Democracy	0.196494	0.091980	2.136269	0.0440

Table 5 cont.

1	2	3	4	5
Arable Land	-0.269561	0.077368	-3.484163	0.0021
Population Growth	-1.082912	0.487352	-2.222035	0.0369
R-squared	0.614452	Mean dependent var	42.95517	
Adjusted R-squared	0.509303	S.D. dependent var	7.470207	
S.E. of regression	5.232865	Akaike info criterion	6.354300	
Sum squared resid	602.4233	Schwarz criterion	6.684337	
Log likelihood	-85.13735	Hannan-Quinn criter.	6.457664	
F-statistic	5.843605	Durbin-Watson stat	2.834992	
Prob(F-statistic)	0.000914			

In the regression results shown in Table 5, all estimated coefficients are significant except the coefficients of both microfinance variable “MF_1” and secondary enrollment variable “enrollment” with P-values equal 0.8218 and 0.1327 respectively.

Table 6. Regression results: Gini on MF_1, rural population, inflation, democracy, arable land, and population growth

Dependent Variable: Gini				
Method: Least Squares				
Date: 05/02/17 Time: 19:19				
Sample: 1 30				
Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	53.83666	2.507039	21.47421	0.0000
MF_1	22.11094	97.08081	0.227758	0.8218
Rural Population	-0.089516	0.057426	-1.558798	0.1327
Inflation	-0.307374	0.197238	-1.558392	0.1328
Democracy	0.202302	0.086577	2.336676	0.0285
Arable Land	-0.234034	0.073872	-3.168093	0.0043
Population Growth	-1.045786	0.445061	-2.349760	0.0277
R-squared	0.646636	Mean dependent var	42.77667	
Adjusted R-squared	0.554455	S.D. dependent var	7.405109	
S.E. of regression	4.942850	Akaike info criterion	6.234725	
Sum squared resid	561.9306	Schwarz criterion	6.561671	
Log likelihood	-86.52087	Hannan-Quinn criter.	6.339318	
F-statistic	7.014795	Durbin-Watson stat	2.768106	
Prob(F-statistic)	0.000245			

In regression results shown in Table 6, the coefficients of MF_1, rural population, and inflation are all insignificant. However, the coefficients of democracy, arable land, and population growth are all significant.

Table 7. Regression results: Gini on MF_2, enrollment, inflation, democracy, and arable land

Dependent Variable: Gini Method: Least Squares Date: 05/02/17 Time: 19:28 Sample (adjusted): 1 29 Included observations: 29 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.50189	6.433096	6.917647	0.0000
MF_2	-44.44769	33.41880	-1.330021	0.1966
Enrollment	0.064060	0.061790	1.036741	0.3106
Inflation	-0.379971	0.232757	-1.632481	0.1162
Democracy	0.195699	0.097446	2.008281	0.0565
Arable Land	-0.221932	0.084066	-2.639970	0.0146
R-squared	0.543105	Mean dependent var	42.95517	
Adjusted R-squared	0.443779	S.D. dependent var	7.470207	
S.E. of regression	5.571295	Akaike info criterion	6.455124	
Sum squared resid	713.9045	Schwarz criterion	6.738012	
Log likelihood	-87.59929	Hannan-Quinn criter.	6.543721	
F-statistic	5.467949	Durbin-Watson stat	2.611832	
Prob(F-statistic)	0.001852			

As for regression results shown in Table 7, all coefficients are insignificant except democracy and arable land.

Table 8. Regression results: Gini on MF_2, rural population, inflation, democracy, and arable land

Dependent Variable: Gini Method: Least Squares Date: 05/02/17 Time: 19:21 Sample: 1 30 Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	53.62366	2.683392	19.98354	0.0000
MF_2	-43.99643	29.91539	-1.470696	0.1544
Rural Population	-0.105596	0.060708	-1.739430	0.0948
Inflation	-0.346040	0.210536	-1.643618	0.1133
Democracy	0.197725	0.091738	2.155321	0.0414
Arable Land	-0.197934	0.079230	-2.498221	0.0197
R-squared	0.582627	Mean dependent var	42.77667	
Adjusted R-squared	0.495674	S.D. dependent var	7.405109	
S.E. of regression	5.258805	Akaike info criterion	6.334541	
Sum squared resid	663.7208	Schwarz criterion	6.614781	
Log likelihood	-89.01812	Hannan-Quinn criter.	6.424192	
F-statistic	6.700502	Durbin-Watson stat	2.538961	
Prob(F-statistic)	0.000489			

And finally, the regression results in Table 8 show that all coefficients are significant except MF_2 and inflation.

5. Discussion

When running the regression, with enrollment (without rural population) included, both MF_1 and MF_2 yielded near results (Table 5 and 7). Both models R-squared were adequately high ranging from 0.54 with MF_2 and 0.61 with MF_1, which means that those independent variables explained about 54% to 61% of the Gini variations. Also, the adjusted R-squared that adjust for the number of parameters have high values ranging from 0.44 with MF_2 and 0.51 with MF_1. Moreover, the P-value for the F-statistic is nearly zero for both MF_1 and MF_2. Accordingly, the used models can be argued to be reliable.

With both MF_1 and MF_2, the inflation coefficients are significantly negative (-0.38) and (-0.31), respectively, with 10% significance level. This means that as inflation increases, income inequality decreases. This could be explained by the fact that across the sample countries, inflation mainly harms the high-income groups rather than low-income groups. In other words, the high-income segments that likely own savings and accumulate wealth are more negatively affected by the increased inflation since it decreases the value of their wealth and shrinks their savings. Thus, the gap between the high-income and low-income segments seems to shrink with increased inflation for this sample of countries.

As for the democracy coefficient, both MF_1 and MF_2 yield a significant positive coefficient (≈ 0.196). This means that, for the sample countries, as democracy increases income inequality increases. A potential reason behind this relationship is that the sample countries may have high corruption levels and consequently, any gains from democracy are likely reaped by the higher income segments. Thus, the democracy index is no more a sufficiently reflective index for this sample of developing countries.

Regarding the arable land coefficients with both MF_1 and MF_2, they were both significantly negative (≈ -0.22). This indicates that as the percentage of a country's arable land increases, income inequality decreases. A possible explanation is that the majority of a country's population may be poor and dependent on the arable land as one of the main sources of income. Therefore, for this sample of countries, as the percentage of arable land increases, their income per capita improves which leads to a better distribution of income.

The population growth variable is only included in the MF_1 regression and has a significant negative coefficient (≈ -1.08). This shows that, for this sample, countries with higher population growth are the countries witnessing lower in-

come inequality. A potential reason for this relationship may be that the growth in population mainly occurs among the high income segments, therefore, the income accruing to this segment is divided on a larger number of people; i.e. their income per capita decreases which helps reduce the gap between high and low-income segments. Also, countries with higher population growth may be more alert to the income inequality problem and thus direct more attention and adopt more equality-oriented policies which help decrease their Gini index. Alternatively, this relationship could simply mean that higher population growth means an increasing population size and labour supply which raises the country's production, income, and income per capita leading to lower income inequality.

The enrollment coefficients are negative yet insignificant with both MF_1 and MF_2. This could be caused by the fact that the regression is for a cross-sectional sample, where the effect of secondary education attainment could not be reflected in the Gini.

When running the regression, with rural population (without enrollment), both MF_1 and MF_2 yielded very near results to those of the regressions that included the enrollment variables regarding the R-squared, adjusted R-squared, Coefficients, P-values, and the F-statistics P-values (Table 6 and 8).

Throughout the 4 regressions, microfinance has not been proved significant. When observing the P-value for the estimated microfinance coefficients, we can find that MF_1 has a positive coefficient indicating a direct relation with income inequality, i.e. as microfinance intensity (measured as a country's total value of MF loans divided by the GDP) increases, income inequality increases. Nevertheless, this positive relationship is insignificant and holds whether the accompanying control variables include enrollment or rural population. As for the alternative measure of microfinance, that is, MF_2 (Total number of a country's microfinance borrowers divided by the total population) has negative coefficient indicating an inverse relation with income inequality, i.e. as microfinance intensity increases, income inequality decreases which conforms to the theory's expectations. Yet, this relationship holds insignificant whether the accompanying control variables include enrollment or rural population.

The insignificance of the microfinance variable's effect on income inequality was unexpected. Instead, microfinance was expected to act as a major development tool that contributes in curtailing the reasons for income inequality between the high and low-income segment of the society. This may be the result of the relatively small customers' base of microfinance or that the microfinance

loans do not reach the truly underprivileged deserving segments in the sample countries. Moreover, the regression did not consider the effect of loan-swapping and over-indebtedness that the micro-borrowers may have suffered from in the sample countries; which may have worsened the borrowers' situation leading to a positive yet insignificant effect of microfinance on income inequality (Ghosh, 2013; Sample, 2011).

Therefore, it is recommended that the sample countries' governments enhance their supervisory role by enforcing a set of clear regulations to organize the microfinance activities, preserve its transparency and goal achievement, ensure an ethical competition which prevents unethical practices that lead to worsen the status of the low-income segments instead of improving it, and to make sure that micro-loans and other microfinance services reach the truly low-income deserving segments.

Furthermore, it is recommended that countries adopting the group-lending model restructure their lending process to accommodate a larger customer base. One of the crucial shortcomings of the group lending model is that borrowers who have high probability to repay their loans tend to choose group members with similar high repayment probability to avoid being deprived from future credit; while potentially excluding some other needy people. Thus, this model could have a reverse effect and lead to more financial exclusion of the poor which widens the gap between the rich and the poor. A proposed restructuring solution is to adopt a lending model similar to the Islamic banks' *musharakah motanaqisa* or 'diminished partnership' concept: MFIs can provide a type of contracts that allows low-income candidates to take an interest-free loan on a condition to use it in a micro-business. The MFI should have a set of loan approval restrictions and should review the candidates' profiles to assess whether they deserve the loan. Once the contract is concluded, the MFI (capital owner and partner) should monitor, supervise, and guide the borrower (partner contributing with management efforts) to ensure the sustainability of his micro-business and thus, ensuring loan repayments. Profits are shared between the MFI and the borrower; however, the borrower should make periodical payments along with periodical profits in order to gradually purchase the MFI's share in equity until it reaches zero (Hassan & Lewis, 2007; Iqbal & Mirakhor, 2011; Manan & Kama-luddin, 2010). This way, the borrower is allowed to improve his income while contributing to the whole economy's development, and the MFI benefits from the partnership by investing its savings deposits in income-generating activities. Diminished partnerships may represent an efficient solution to avoid any poten-

tial financial exclusion that may reverse the effect of microfinance on income inequality from negative to positive; and it is also suitable for both Islamic and non-Islamic countries.

6. Conclusions

In conclusion, microfinance, as argued, is a critical instrument in the economic development process that has disseminated throughout the world and gained a lot of advocates. It allowed the marginalised members of the society to access collateral-free small loans that enabled them to start small businesses and weed out their abject poverty. Despite critiques of microfinance, it remains an appealing issue to examine whether its micro-level influence is further translated into macro-level benefits, e.g. reduced income inequality across the developing countries.

To study the direct effect of microfinance, a cross-sectional regression of the Gini index on 2 alternative measures of microfinance intensity and a set of control variables has been done. Regression results show that for both measures of microfinance, neither a positive nor a negative impact of microfinance on Gini could be significantly proved. Most of the other control variables proved significant. A strengthened governmental supervisory role, as well as, a restructuring of the traditional group lending model is recommended to ensure financial inclusion of the poor segments of the society and hence reducing inequality. Some limitations have been faced during this research: First, there was a remarkable difficulty in finding recent data for the Gini index especially when it comes to the developing countries. The problem has been overcome by obtaining the data from the 2016 human development report while assuming that the Gini stated in the report are for the year 2015. It is also recommended for future similar research to re-check for heteroskedasticity to obtain more accurate reflective results.

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