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The impact of microfinance programs on monetary poverty reduction

Evidence from Sudan

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Abstract

Purpose – The purpose of this paper is to examine the impact of microfinance programs sponsored by Sudanese microfinance institutions (SMFIs) on monetary poverty reduction in Sudan where poverty is widely spread.
Design/methodology/approach – The study adopted the control group approach, where income and expenditure are taken as welfare indicators. The updated World Bank's international poverty line of 1.90 per person per day was adopted to separate the poor from non-poor. The data were collected by the means of a questionnaire distributed to a random sample of beneficiaries in the institution under study. The study adapted the Foster, Greer and Thorbecke (FGT) model to evaluate the role of microfinance programs in poverty reduction. Furthermore, to gain more insight into the impact of the program, a preliminary analysis was conducted using the independent-samples *t*-test to examine the difference in the welfare indicators for the sample of the control group and treatment group as well as that of the small loan group and micro-loan group.
Findings – The findings show that the microfinance program provided by SMFIs has reduced the monetary poverty among the participants. The results also reveal that beneficiaries who had received a larger volume of loan were noted lesser poverty than those who had received very small loan size. Moreover, the results demonstrate that poverty indices based on expenditure as a welfare indicator are far lower than those based on income for both groups.
Originality/value – This study contributes to the available literature by filling the gaps through including income and expenditure as monetary variables, which included separately in previous studies adopted the FGT model in the area of microfinance, in addition to exploring the role of loan size in the effect of microfinance on poverty reduction.

Keywords Microfinance, Sudan, Impact assessment, FGT model, Monetary poverty

Paper type Research paper

1. Introduction

No society can surely be flourishing and happy when the greater part of the society is poor and miserable" (Smith, 1776). Therefore, the main goal of development policies must be to lifting people above the poverty line in particular in less developing countries (LDCs) where poverty still a live issue (Novignon *et al.*, 2018). According to Nissanke (2002), poor and hard-core poor usually have no access to financial institutions, such as banks. Thus, the fundamental premise of the microfinance approach is that the lack of access by the poor constitutes one of the most critical obstacles to poverty alleviation and further in economic development. Therefore, the main reason for introducing microfinance institutions (MFIs) was to bridge this gap. Recently, microfinance becomes the widest tool used directly in the development of a wide range of projects, especially in LDCs, which at the stage of growth, and hence MFIs are considered as banks for the poor (Rahman *et al.*, 2017), and Sudan is no exception.

Sudan is a poverty-ridden country, as the IMF (2013) reported that the incidence of poverty in Sudan is 46.5 percent. The Central Bureau of Statistic (CBS, 2010) reported that the monthly total household income and consumption expenditure is very low. Mahran (2007) argued that poverty is one of the most severe problems affecting Sudan economy and

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become a major question for the public, as well as national and international organizations. The majority of Sudanese poor have no access to formal financial institutions due to the procedures and requirements for loan delivery in the banking system such as the requirement of collateral is biased to the formal sector rather than poor people (Ahmed and Amar, 2016; Hansen, 2009; Policy Assessment Consultancy and Training, 2013). Due to this disheartening feature of poverty in Sudan, the government intends to address this challenge. It has adopted microfinance as a tool to alleviate poverty in 2007 (Hansen, 2009). Since then, the Central Bank of Sudan (CBOS) makes many endeavors to develop this industry; however, the results so far are not clear.

Although there is extensive literature demonstrating the positive effect of microfinance on poverty reduction, there are many questions concerning microfinance remain unanswered, such as: does microfinance has an impact on the socioeconomic situation of the poor in LDCs (Hermes *et al.*, 2011). Furthermore, the mixed results obtained by previous studies also affirmed that the effect of microfinance on poverty reduction still in question (Miled and Rejeb, 2015). Nevertheless, most of the earlier studies ignored to examine the effect of loan size in the role that microfinance could play in poverty reduction. Besides, most of the studies used money-metric measures have focused only on one monetary dimension, which is income or consumption and neglected to adopt both indicators as recommended in the literature (Fisher *et al.*, 2013; World Bank, 2015).

Hence, the current study aims to answer two questions: first, does microfinance provided by Sudanese microfinance institutions (SMFIs) led to monetary poverty reduction in terms of income and consumption. Second, does the loan size have any effect on the role that microfinance could play in reducing poverty? Hence, this study is contributing to the literature by conducting an impact assessment using both income and consumption as monetary poverty dimensions as well as exploring the effect of loan volume in the role of microfinance in reducing monetary poverty.

2. Literature review

Nowadays poverty reduction becomes one of the major objectives in development policies in particularly in LDCs, where poverty still one of the chronic diseases affecting the majority of its population and development (Novignon *et al.*, 2018). The governments of these countries are striving to eradicate poverty; they adopted several anti-poverty programs to combat poverty, notably among them is the microfinance program for almost three decades (Rahman *et al.*, 2017). Microfinance Summit (MSC, 2014) defined microfinance as the extension of small loans to the very poor people in combination with other services like training, saving, health, networking and peer support.

Poverty has both monetary and non-monetary dimensions (Latifee, 2003). The money-metric measurement of poverty focuses on the situation and progress of the most deprived people in the community in terms of income deprivation. Said (2000) stated that the monetary measurement of poverty approach is widely employed in LDCs for at least two main reasons. First, there is a need to quantify the magnitude of poverty in order to be able to determine the direction of effort required combating poverty and, second, to judge the relative success or failure of programs and policies oriented to alleviate poverty. As their name suggests, monetary approaches to poverty impute a monetary value to poverty, such as income or consumption expenditure (Riddell, 2004; World Bank, 2015). In spite of the money-metric approach drawbacks, as it is conceptually and analytically easy to understand and to implement corresponding policies, it remains one of the most frequently used approaches for measuring poverty (Bourguignon, 2006).

Studies from different countries demonstrated the positive impact of microfinance on poverty reduction. Hulme and Mosley (1996) found that microfinance has a positive impact on the incomes of the beneficiaries in Bangladesh and India. Likewise, Sengsourivong and Mieno (2014)

found that microfinance has boosted household expenditure and income in Laos. Findings of Sehrawat and Giri (2016) revealed that there is a positive relationship between financial accessibility and poverty reduction. Rahman and Khan (2013) concluded that the microfinance program in Bangladesh has a significant impact on improving the socioeconomic status of the clients. Recently, Nukpezah and Blankson (2017) concluded that microfinance intervention program in Ghana has improved business performance and the standard of living for both women farmer-entrepreneurs and their households. Similar findings were also reported in the studies undertaken by Al-Mamun and Adaikalam, Badri (2013), El Habeeb *et al.* (2014), Latifee (2003), Miled and Rejeb (2015) and Rahman *et al.* (2017).

Although the above-reviewed studies show optimistic findings, quite a number of studies indicate a pessimistic kind of results in the role microfinance can play in alleviating poverty (Banerjee *et al.*, 2013). While some indicate mixed impact (Van Rooyen *et al.*, 2012), others have emphasized the non-uniform distribution of benefits (Karlan and Zinman, 2009a) that the impact of microfinance varies considerably from country to country. From Bangladesh, Nawaz (2010) found that the microfinance program has led to moderate poverty alleviation among the participants. Hence, knowledge about the achievements of these programs remains only partial and controversial.

Studies that adopted the Foster, Greer and Thorbecke (FGT) model to detect the role of microfinance in monetary poverty reduction have also reported inconsistent results. By using income as welfare indicator and the World Bank international poverty line, Imtiaz *et al.* (2014) concluded that the incidence, depth and severity of poverty was reduced compared to the period before the intervention in Pakistan. From Nigeria, Idowu and Oyeleye (2012) also adopted income as a welfare indicator; they concluded that the microfinance bank credit has improved the standard of living. Balogun *et al.* (2011) also documented similar findings.

Agbaeze and Onwuka (2015) employed the FGT methodology and consumption expenditure to assess the impact of microfinance on poverty reduction in Nigeria. The findings reveal that access to microcredit has mild effect on the beneficiaries. Most recently, Odunjo *et al.* (2018) adopted consumption expenditure and the FGT model to assess the role of microcredit on poverty reduction. The findings demonstrated that the incidence and depth of poverty were lower among the treatment users compared to non-users. Although Fisher *et al.* (2013) and World Bank (2015) recommended the use of both income and consumption as welfare indicators instead of choosing one of them, it is obvious that most of these studies did not adopt both of them.

The Sudanese experience showed the positive impact of microfinance on the welfare of the clients. Ammar and Ahmed (2016) stated that microfinance in Sudan has led to poverty reduction. However, the results obtained from the previous studies in Sudan are mixed. In this respect, there are few studies carried out to appraise the role of microfinance in poverty reduction in Sudan. Studies carried out by Badri (2013), El Habeeb *et al.* (2014) and Mohamed and Al-Shaigi (2017) demonstrated that the intervention program has led to poverty reduction. On the contrary, Ibrahim and Bauer (2013) showed very slight effect, while Ghandour (2014) found a negative effect that the majority of clients struggle a lot and they face a great financial problem to pay back the loan, owing to their unprofitable projects and the higher cost of microfinance. Therefore, this disagreement in the impact of microfinance on poverty alleviation ensures that the debate is far from settled and, hence, there is much room for increasing our knowledge in this respect.

Apart from that, Noreen (2010) and Van Rooyen *et al.* (2012) suggested that beyond assessing the effect of microfinance, detecting how and, under which circumstances do microfinance programs help the poor clients is a very interesting area to be discovered in further studies. Yet, exploring the role of other factors such as loan size is lacking in our knowledge. Adjei *et al.* (2009) concluded that the loan amount does not relate to the increase in saving deposits. However, Zaman (1999) argued that if the loan amount is very small, it is very challenging for a poor client to start or established a profitable new business or enterprises. Yet, Ibrahim and Bauer (2013) found a slight effect of microfinance on poverty reduction; he observed that the effect of the

program was greater for clients who received the bigger size of the loan. Nevertheless, most of the earlier studies ignored to examine the role of the volume of loan received by the clients in poverty reduction. Hence, the mixed results found in the previous studies might be attributed to the difference in the volume of the loan provided to the clients.

3. Poverty measurement model

There are two different levels for measuring poverty. The first, called the identification problem, relates to the classification of the population into poor and non-poor through the poverty line. The second, called the aggregation problem, relates to measuring poverty by aggregating its level into a single index (World Bank, 2005).

3.1 Identification stage

According to the World Bank (2005), this stage concerns with the choice of quantitative measurement of a welfare indicator to discriminate the poor from the non-poor, typically via the poverty line. According to Laderchi (2000), in this stage, it is essential to decide on the poverty indicators and the poverty line. The following are more details.

First: the choice of poverty indicators. There are number of conceptual approaches to measuring economic welfare based on monetary approach; however, the widely used measures are based on consumption expenditure or income (World Bank, 2015). According to Gradín *et al.* (2008), the choice between income and consumption expenditure as a welfare indicator is debatable. While most assessors prefer to adopt consumption expenditure as a lifetime indicator of welfare due to its stability and ease to recall more than income is (Haughton and Khandker, 2009), yet, advocates of using the income to measure standard of living believe that income is one of the most important factors of living standard (Idowu and Oyeleye, 2012). However, the adoption of either consumption expenditure or income as welfare indicators to measure poverty has some drawbacks. According to World Bank (2015), the use of income as welfare indicator poses a number of problems; for example, usually people forgot what they earn such as items sold, money received from relatives, etc.; in addition, People incline to give wrong data, lest tax collector or social factors or others. Regarding consumption, it probably be systematically understated for two reasons that households usually under-declare what they spend on luxuries such as illicit items, and, due to question matter, if the questions are not in more details, it is hard for the respondents to recall what he spends in more details, and, accordingly, they will report lower spending, since both indicators have shortcomings. In such case, Kessy (2013) suggested that if there are two indicators and each of them has some weaknesses, the use of both indicators would minimize the flaws of each one. Fisher *et al.* (2013) also proposed the adoption of both indicators instead of choosing between the measures in assessing welfare. Likewise, World Bank (2015) stated that in some surveys, consumption or expenditure might be harder to collect; nevertheless, if the analyst is capable to access data for both income and consumption, then the optimal solution is to compute poverty measures with both indicators and compare the results. Nevertheless, most of the previous studies (Balogun *et al.*, 2011; Idowu and Oyeleye, 2012; Imtiaz *et al.*, 2014) have not used these two indicators in tandem to assess the impact of microfinance on poverty reduction. Therefore, the present study has adopted both income and expenditure as monetary poverty indicators.

Second: the choice of poverty line. Haughton and Khandker (2009) define the poverty line, as the level of the monetary indicator (consumption or income) needed by a person to escape poverty. In literature, there are two kinds of poverty lines: "absolute poverty line" and a "relative poverty line". However, Haughton and Khandker (2009) and Ravallion (1998) stated that a poverty line should always be absolute in the space of welfare if the researcher is trying to estimate the impact of anti-poverty policies over time, such as the effect microfinance on poverty alleviation. Such a poverty line affirms that the conducted poverty

comparisons are consistent that two persons with a similar level of welfare are treated the same way (Ravallion, 1998). One of the common poverty lines is the one created by the World Bank (2017), which updated in 2015 to $1.9 per capita per day based on International Comparison Program, Purchasing Power Parity.

The World Bank poverty line remains the main measure for worldwide poverty, at least in terms of income/consumption poverty (Sumner, 2012). Cobbinah *et al.* (2015) also consider the World Bank poverty line as one of the commonest indicators of poverty. These statements confirmed by the adoption of the United Nations (UNs) in 2013 to the World Bank poverty line to estimate the number of the global population living in abject poverty, cited in Cobbinah *et al.* (2015). In addition, the progress toward achieving the poverty reduction as the first goal of the MDGs, which was adopted by the UNs, is monitored by the World Bank international poverty estimates (Dhongde and Minoiu, 2013). Furthermore, the adoption of a number of authors (Dhongde and Minoiu, 2013; Chen and Ravallion, 2010; Ivanic and Martin, 2008; Idowu and Oyeleye, 2012; Imtiaz *et al.*, 2014; Pinkovskiy and Sala-i-Martin, 2009) to the World Bank poverty line to estimate the number of people living in poverty also justifies the use of this measure for poverty assessment. Hence, this study adopted the World Bank poverty line to assess the impact of microfinance on poverty reduction.

3.2 Aggregation stage

The aggregation stage related to measuring poverty by generating a summary statistic to aggregate the information in the identification level on a welfare measure such as per capita consumption and a poverty line. There exist in the literature a number of aggregate measures of poverty with different desirable properties. Nevertheless, the Asian Development Bank (ADB) reported that the FGT model is the most common and widely used measure to investigate the monetary poverty (Sugiyarto, 2007).

The FGT model consists of three formulas for measuring poverty, namely, the head-count index (P_0) (measuring the incidence of poverty), the poverty gap index (P_1) (measuring the depth of poverty) and the squared poverty gap index (P_2) (measuring the severity of poverty) (money-centric measures). The general formula for the FGT class of poverty measures, which, denoted by P_α, is:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^\alpha \alpha \geqslant 0, \tag{1}$$

where P_α is the poverty measure, n is total population, q is the number of the poor, z is the poverty line, y_i is the income of poor household i and α is a measure of the sensitivity of the index to poverty (it is a non-negative integer).

Accordingly, when $\alpha = (0)$, the FGT measure reduces to the head-count index, often denoted by (P_0) or (H). The head-count index is the proportion of the number of individuals with income or consumption level that falls below the poverty line in the total population poverty as given by the following equation:

$$P_0 = H = \frac{q}{n}, \tag{2}$$

when $\alpha = (1)$, the FGT measure reduces the poverty gap ratio, often denoted by (P_1). The poverty gap index is the average for all individuals (or households) in the society for the gaps between the welfare indicator (income/consumption expenditure) of poor households and the poverty line, expressed as a ratio of the poverty line (Haughton and Khandker, 2009). Since the

greater the shortfall, the higher the gap, mathematically given as follows:

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\frac{z-y_i}{z}. \quad (3)$$

When $\alpha = (2)$, the FGT index reduces to the squared poverty gap index; denoted by (P_2), it is also called A severity of poverty index. It captures differences in income levels among the poor segment of the population. The lower value of (P_2) indicates that most of the poor people in the study sample are clustered around the poverty line (Imtiaz *et al.*, 2014), mathematically defined as in the following equation:

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^2. \quad (4)$$

Assessing the impact of microfinance on poverty reduction requires measuring the trend of poverty level among the beneficiaries to detect whether it reduced over time (Imtiaz *et al.*, 2014).

According to the empirical application, the FGT methodology is a very useful measure to assess the extent of poverty across space and time, and it is understandable, theoretically sound and applicable (Foster, 2010; Balogun *et al.*, 2011). Moreover, the ADB also recommended the adoption of FGT family of poverty indices to measure the level of poverty; in addition, FGT indices are the World Bank poverty measurement methodology (Imtiaz *et al.*, 2014). Thus, following Balogun *et al.* (2011), Idowu and Oyeleye (2012), Imtiaz *et al.* (2014) and Agbaeze and Onwuka (2015), this study adopted the FGT model to evaluate the role of a microfinance program on poverty reduction.

4. Hypotheses of the study

Mosley (2001) stated that various previous studies have reported the positive effect of microfinance on income and consumption of the beneficiaries. Several studies found a positive effect on income and expenditure of the clients (Idowu and Oyeleye, 2012; Imtiaz *et al.*, 2014). In literature, researchers argued that if the volume of loan increased the probability of the borrower to get rid of poverty also increase; because the borrowers have enough funds to finance the business, it makes them get more profit and increase their business profile (Ibrahim and Bauer, 2013; Nawai and Shariff, 2012). Hence, the proposed hypotheses are:

H1. There is a significant difference between the treatment group and the control group in their income.

H2. There is a significant difference between the treatment group and the control group in their consumption expenditure.

H3. There is a significant difference between the small loan group and the very small loan group in their income.

H4. There is a significant difference between the small loan group and the micro-loan group in their consumption expenditure.

5. Sampling and data collection techniques

The targeted population for this study is the beneficiary families of five SMFIs, namely, South Darfur Microfinance Institution, Agricultural Bank of Sudan Microfinance Initiative, Al Watania Microfinance Institution, Al Gezira Microfinance Institution and Port Sudan Association for Small Enterprise Development clients. Based on Ondoro and Omena (2012), the sample size of this study is 382 clients. Regarding the sampling techniques, the current study adopted three-stage sampling methods, namely, cluster sampling, the quota or proportionate sampling and convenience techniques in drawing the study sample. Accordingly, primary data on

the variables of interest were collected from the clients by mean of a questionnaire. The data were collected face to face by using well-trained data collectors from the clients who came to pay the monthly installment. The questionnaire was designed to collect the data on the two monetary variables namely income and consumption expenditure. The survey questionnaire comprises three sections. Section A includes questions on the socioeconomic and demographic information of the respondents. Section B includes several questions related to different sources of income to calculate the total income of the respondent. Section C includes questions pertaining to different channels of expenses to calculate the total consumption expenditure of the respondent. Out of 382 questionnaires distributed to the respondents, 353 questionnaires were found usable for the final analysis and the rest were excluded, as the questionnaires were not completed and, therefore, not adequate for further analysis.

Mosley (1997) and Nelson *et al.* (2001) stated that adopting the new clients as the control group will help to control for self-selection bias because both groups are opted to join the program. Moreover, this study has included some of those who dropped out of the program by either the failure or success to the treatment group to overcome the two major problems of dropout bias, namely, incomplete sample bias and attrition bias. The adoption of new clients as comparison group will easily enable the researcher to control different selection bias with less cost and time and without even following the client overtime and conduct a longitudinal survey (Karlan, 2001).

Following Agbaeze and Onwuka (2015), the total consumption expenditure for the household was aggregated in food and non-food items, while the total income was aggregated from different sources of the household income based on Noreen (2010). The assessment was based on the difference in the values of income and consumption as key variables for measuring poverty, between the outcomes on treatment group against the values of those variables that would have occurred for the control group. Hence, the difference in outcomes between the two groups is deemed to be the impact of the treatment. In the empirical literature, researchers have adopted different thresholds to separate new clients from old clients. However, most researchers did not explain explicitly the basis and the reason for adopting the threshold, except Habte (2016), who proposed to select the cut of the period based on the discussion with the MFI's authorities. Therefore, following the methodology adopted by Habte (2016), in consultation with SMFIs' field staff; they articulated that with the assumption that given circumstances in Sudan they do not expect to realize the fruits of microfinance on beneficiaries in less than two years after receiving the loan. Hence, the beneficiaries were controlled based on the length of their relationship with the MFI and divided into old respondents (with 24 months or more in the program) as the treatment group and new respondents (with less than 24 months in the program) as a control group.

Regarding the loan size, it measured in Sudanese Guineas (SDG). According to the CBOS, there are two types of microfinance namely micro-loan (less than SDG10,000) and small loan (more than SDG10,000) and not exceeding 20,000 (El sheikh, 2016). Therefore, the volume of the loan provided to the borrower was separated into two categories, namely, micro-loan size and small loan size.

6. Results and discussion

Based on Agbaeze and Onwuka (2015) and Imtiaz *et al.* (2014), the FGT methodology was adopted in the analysis of the data, SPSS version 20, as well as Excel 2007, 2010 were used. To examine the level of poverty on the beneficiary households, the current study adopted both income and consumption expenditure as welfare indicators based on Martinetti and World Bank (2015). The total expenditure for the household is aggregated in food and non-food items based on (Agbaeze and Onwuka, 2015), while the total income was aggregated from the different sources of the household income based on Noreen (2010), who proposed that income approach can be measured by taking sources and levels of income. Moreover, this study adopted the

World Bank's updated international poverty line of $1.9 per capita per day, based on (Idowu and Oyeleye, 2012; Imtiaz *et al.*, 2014).

Following the poverty line calculated by Mohamed and Al-Shaigi (2017) for Sudan, which was estimated based on the World Bank poverty line, a poor person is the one who earns or consumes less than SDG912 per month ($1.9 × SDG 16 × 30 days). Then the poverty line for the household is equivalent to SDG912 per capita per month. Furthermore, to achieve the research objective, the respondent's households were split into two groups, namely, the new clients (represent the control group) and the old clients (represent the treatment group).

Table I reports the FGT poverty indices for income and consumption expenditure, where (P_0), (P_1) and (P_2) are head-count index (measuring the incidence of poverty), poverty gap index (measuring the depth of poverty) and the squared poverty gap index (measuring the severity of poverty), respectively. When income was taken as a welfare indicator, the results demonstrate that (P_0) for the control group i (0.83), those 83 percent of the respondents are falling below the poverty line, whereas, for the treatment group (0.66), those 66 percent of the respondents are classified not poor. The results also reveal a remarkable decline in the (P_1) from (0.25) for the controlled group to (0.14) among the treatment group. Similarly, the (P_2) declined from (0.09) among the controlled group to (0.05) among the treatment group. Likewise, when expenditure was adopted as a welfare indicator, all poverty indices turned out to be significantly lower for the treatment group compared to the control group. These results supported *H1* and *H2*. These findings align with the findings of previous studies undertaken by Mohamed and Al-Shaigi (2017) in Sudan, and Agbaeze and Onwuka (2015) and Idowu Oyeleye (2012) in Nigeria. Therefore, these findings confirmed that the services extended by SMFIs have led to remarkable poverty reduction in Sudan.

The results in Table II report the FGT indices results for income and consumption for micro-loan group and small loan group. Regarding income as a welfare indicator, the results demonstrate that the three poverty measures for the small loan group are significantly lower than the measures for the micro-loan group. It reveals a decline from (0.80) to (0.71), from (0.24) to (0.15) and from (0.09) to (0.06) for (P_0), (P_1) and (P_2), respectively. For expenditure as a welfare indicator, once more, the results demonstrate that beneficiaries who had received bigger loan size were noted lesser poverty than those who had received smaller loan volume.

These results supported *H3*, which anticipated that the amount of loan received by the client would determine the role that microfinance can play in poverty reduction. Idowu and Oyeleye (2012) argued that as the amount of loan delivered to the beneficiary increased, the beneficiaries' standard of living will improve and, accordingly, their poverty will reduce. Ibrahim and Bauer (2013) concluded that borrowers who received a large volume of loan have

Table I. FGT income and consumption expenditure poverty indices for new and old clients

	Income		Consumption expenditure	
Poverty indices	Control group (new clients)	Treatment group (old clients)	Control group (new clients)	Treatment group (old clients)
P_0	0.83	0.66	0.80	0.58
P_1	0.25	0.14	0.22	0.11
P_2	0.09	0.05	0.07	0.04

Table II. FGT income and expenditure poverty indices for small and micro-loan groups

	Income		Consumption expenditure	
Poverty indices	Micro-loan group	Small loan group	Micro-loan group	Small loan group
P_0	0.80	0.71	0.76	0.63
P_1	0.24	0.15	0.21	0.12
P_2	0.09	0.06	0.07	0.05

lesser poverty than those who received a smaller amount of a loan. Kisto (2014) also documented similar results. Therefore, the findings of this study affirm that the higher the amount of loan provided by an MFI to its clients, the higher the benefits gained by the beneficiary.

What is more interesting about these findings, however, is that poverty indices based on expenditure as a welfare indicator are far lower than those based on income for both groups. This could be attributed to the significant increase in consumption expenditure for the treatment group following the intervention program. On the other hand, the decrease in poverty levels among the controlled group, when expenditure was taken as a welfare indicator, might be attributed to the social solidarity system that prevailing among the Sudanese society. In his study of poverty in Sudan, Nur (1992) observed that a characteristic feature of the Sudanese community is the prevalence of a social solidarity system, based on which the community helps the needy people. According to this system, various resources flow from the rich to support the poor and from the moderately poor to support the extremely poor; Nur (1992) called this system "Allah Kareem," which means God is generous.

Furthermore, to gain more insight into the impact of the program, the authors conducted a preliminary analysis using the independent-samples *t*-test to examine the difference in income and expenditure for the sample of the control group and that of the treatment group. In addition, the same test was also used to explore the difference between clients who received a large volume of loan and those who obtained a small amount of loan. The use of the independent-samples *t*-test is common in microfinance studies and can be found in Gloede *et al.* (2015), Morris and Barnes (2005) and Rahman *et al.* (2017).

An independent-sample *t*-test was conducted to compare income and consumption in the treatment group and control group conditions. Regarding the effect on income, the results in Table III illustrate that there was a significant difference in the scores for the treatment group ($M = 4{,}719.70$, SD = 1,093.28) and control group ($M = 4{,}083.90$, SD = 954.14) conditions, t (347.018) = 5.826, $P = (0.000)$. For the effect on expenditure, once again the results in Table III reveal that there was a significant difference in the scores for the treatment group ($M = 4{,}874.75$, SD = 988.42) and control group ($M = 4{,}291.15$, SD = 899.18) conditions, t (349.476) = 5.806, $P = (0.000)$. These results suggest that microfinance certainly affects income and consumption expenditure of the borrowers. Precisely, SMFIs' intervention program had led to significant improvement in both income and consumption of at least some of the clients, if not all of them. Previous studies carried out by Agbaeze and Onwuka (2015) and Mohamed and Al-Shaigi (2017) documented similar findings.

An independent-sample *t*-test was also carried out to compare income and consumption expenditure in small loan and micro-loan conditions. Concerning the effect on income for loan size groups, the results in Table IV demonstrated that there was a significant difference in the scores for the small loan group ($M = 4{,}654.17$, SD = 1,124.94) and micro-loan group

Table III.
Results of the independent-sample *t*-test for the control and treatment groups

	Treatment group		Control group			
Variables	*M*	SD	*M*	SD	*t*	*p*
Income	4,719.70	1,093.28	4,083.90	954.14	5.826	0.000
Expenditure	4,874.75	988.42	4,291.15	899.18	5.798	0.000

Table IV.
Results of the independent-sample *t*-test for the small and micro-loan groups

	Small loan		Micro-loan			
Variables	*M*	SD	*M*	SD	*t*	*p*
Income	4,654.17	1,124.94	4,162.61	963.75	4.406	0.000
Expenditure	4,874.75	988.415	4,291.15	899.18	4.242	0.000

($M = 4{,}162.61$, SD = 963.75) conditions, t (341.110) = 4.406, $P = (0.000)$. With respect to the effect on expenditure for loan volume groups, the results in Table IV indicate that there was a significant difference in the scores for the small loan group ($M = 4{,}874.75$, SD = 988.42) and micro-loan group ($M = 4{,}291.15$, SD = 899.18) conditions, t (345.590) = 4.242, $P = (0.000)$. These findings specifically suggest that when SMFIs provided a bigger volume of a loan to the poor clients, it significantly reduced their monetary poverty in terms of income and expenditure better than to provide a small volume of loans. The findings of this study confirm the findings of the studies undertaken by Ibrahim and Bauer (2013) and Kisto (2014).

Generally, the results demonstrated that the percentage of the new clients who could not meet the required food and non-food basic needs was estimated at 83 and 80 percent when the study income and consumption as welfare indicators, respectively; however, only 66 and 58 percent of the old borrowers could not meet the basic needs of food and non-food items, respectively. Therefore, these results specifying that due to the implementation of microfinance program in Sudan almost 17 percent of the loan recipients have got rid of poverty grip when income was used as a welfare indicator, while 22 percent of them were uplifted above the poverty line in the case of consumption expenditure. Although the rest of the participants remain poor, however, the results of the poverty gap index indicate that the treatment has mitigated the poverty level of the poor beneficiaries by 11 percent. Furthermore, the provision of microfinance services has reduced the differences in income and consumption levels among the poor clients by 4 and 3 percent, respectively.

7. Conclusion and implications

The study examined the impact of microfinance programs sponsored by SMFIs on monetary poverty reduction at the household level in Sudan. It is worth mentioning that most of the published studies that adopted FGT model in the area of microfinance impact assessment have used either income or consumption expenditure as a welfare indicator, whereas in literature, Martinetti and World Bank (2015) recommend the use of both income and expenditure as an optimal solution. Hence, the current study adopted both income and consumption as welfare indicators.

Thus, to achieve the objectives of this study, the study adopted income and expenditure as welfare indicators and the World Bank international poverty line, to calculate the most commonly used FGT poverty indices, namely, the incidence, depth and severity of poverty. These cardinal measures of poverty were then, used for assessing the impact of the intervention program with respect to poverty alleviation. Additionally, to achieve more insight into the effect of the microfinance program, a preliminary analysis was conducted using the independent-samples t-test to examine the difference between income and consumption expenditure for the sample of the control group and that of the treatment group as well as for the samples of a small loan and micro-loan groups.

Based on the above reported results, irrespective of the welfare indicator used, all poverty indices turned out to be significantly lower for the treatment group compared to the control group. Similarly, all FGT poverty indices were significantly lower for the small loan group when compared to the micro-loan group. Likewise, the results obtained from the independent-sample t-test indicated that there was a significant difference in the impact of microfinance on both welfare indicators between the treatment and control group as well as the small loan size group and micro-loan group. Accordingly, this study concludes that microfinance program provided by SMFIs has led to significant reductions in all poverty measures for the beneficiaries in Sudan.

The findings of this research have essential implications for policy makers, academics, clients, SMFIs team, as well as other microfinance practitioners. For policy makers at the state level, these results affirmed the effectiveness of the intervention program introduced by SMFIs in monetary poverty reduction. Concerning the academicians, these results affirm the importance of exploring the role of microfinance on monetary poverty dimensions rather than

focusing only on non-monetary poverty indicators. In regards to clients, the findings assure the vital role of the microfinance program in the monetary poverty reduction. For policy makers at SMFIs' level, the findings indicate the effectiveness of the adopted program in monetary poverty reduction in particular if the clients received a larger volume of a loan.

According to the reported results, SMFIs have to continue providing different microfinance products to low-income households. These results implying that the microfinance program could play a vital role when borrowers obtained a larger amount of loan, as all FGT poverty indices were significantly higher for those who received a smaller loan size. Thus, the MFI should increase the size of loans to improve the client's standard of living and, as a result, mitigate their poverty.

Considering the importance of microfinance impact assessment, this study examined only the moderating effect of loan size; therefore, the effect of other moderating variables such as entrepreneurial experience and socioeconomic traits in the role that microfinance services could play role on poverty reduction is also an exciting area to be explored in future studies. Furthermore, to depict a whole picture for the role of Sudanese MFIs programs, future studies could assess the role of microfinance services on both monetary and non-monetary poverty dimensions among the beneficiaries and compare the results.

In sum, (P_0), (P_1) and (P_2) for the treatment group is significantly lower than the control group. Furthermore, all three poverty measures are lower among the small loan group when compared to the same measures for the micro-loan group. Similarly, the results obtained from the independent-sample *t*-test indicated that there was a significant difference in the impact of microfinance on income and consumption between the groups. This indicates that the intervention program introduced by SMFIs has led to a significant reduction in all poverty measures, particularly if the MFIs increased the volume of the loan provided to the client.

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