**Sustainability and Depth of Outreach: Evidence from Microfinance Institutions in Sub-Saharan Africa**

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**ABSTRACT**

The feasibility of microfinance institutions (MFIs) to expand outreach to the poorest while remaining financially sustainable has long been debated. Using data from 206 MFIs in 33 African countries, we adopt the three-stage least square technique to examine if a trade-off exists between sustainability and outreach depth. Our results confirm the existence of a trade-off. The evidence also supports ongoing subsidies for MFIs with the aim of encouraging outreach. In addition, we examine whether there is an inflection point beyond which higher interest rates reduce profitability for MFIs. We find no evidence of a threshold beyond which profitability is reduced.

**Keywords:** Microfinance, Sustainability, Outreach, Financial Performance, 3SLS

**JEL Codes:** G21, L25, I39

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# INTRODUCTION

Microfinance has become an important tool in the developing world. With the widespread confidence that it helps alleviate poverty, the microfinance industry has attracted several donors and stakeholders ([Armendáriz & Morduch, 2007](#_ENREF_3)). As a result, microfinance is practiced widely across the world and has a strong presence in Africa. The industry in Africa is quite diverse and is often considered by policy makers as a tool in achieving various development goals. In addition, the focus of microfinance in Africa as well as other parts of the world has gone beyond the issuance of microcredit. Most microfinance institutions (MFIs) in Africa now include micro-insurance (insurance services for the poor), micro-savings (savings services for the poor) and training as part of their services to the poor ([Hulme & Arun, 2009](#_ENREF_16)).

Today, the success of microfinance and the industry’s ability to have a sustainable impact is hinged on the sustainability and efficiency of MFIs. However, a significant challenge faced by the industry is how to reach out to the poorest in society without undermining sustainability. An equally faced challenge is the ability to attain sustainability without undermining outreach to the poorest. Some MFIs have prioritized sustainability and thus charge high interest rates to cover transaction costs. A number of MFIs also resort to the issuance of large loans under the premise that large loans are associated with low administrative costs. With the former scenario, recent evidence suggests that MFIs that charge high interest rates may end up excluding the poorest in society (Karlan and Zinaman, 2008; Dehejia et al. 2012). In the case of the latter, it is known that the poorest usually have demand for small loans. Thus, when MFIs resort to the issuance of larger loans, they again exclude the poorest. In essence, both strategies – raising interest rates and re-orientation in the size of loans – affect outreach to the poorest.

Anecdotal evidence largely suggests that there is a trade-off between sustainability and outreach. It is often argued that it is not possible to achieve both goals (that is sustainability and increase in outreach) at the same time. The debate on which goal to focus on has led to different perspectives– the sustainability/institutionalist perspective and the poverty/welfarist perspective. The advocates of the former argue that microfinance can only make a long term impact if they are efficient and sustainable. Thus, MFIs ought to focus heavily on sustainability. In addition, with the threat of donor funds fading out, the institutionalists believe that the only way to ensure the continual existence of the industry is to adopt relevant measures that would promote sustainability. [Helms (2006](#_ENREF_14)) argue in favour of the institutionalists. They argue that financial sustainability is not an end in itself but should be conceived as a way of securing the future of the microfinance industry beyond subsidies and donor funds.

On the other hand, the welfarists argue that the primary focus of microfinance is to eradicate poverty. Accordingly, they propose that MFIs need to focus on these social goals and achieve them even if it means government subsidies and donor supports have to remain indefinitely. Amidst these arguments, one strand of the existing literature ([Mersland & Strøm, 2010](#_ENREF_21); [Quayes, 2012](#_ENREF_23); [Rhyne, 1998](#_ENREF_24); [Woller, 2007](#_ENREF_28)) suggests that sustainability and outreach should be seen as complements. It is argued that transaction costs associated with loans are impediments to microfinance sustainability. However, increase in outreach can help MFIs reduce transaction costs given that MFIs would have more clients to serve. In addition, with more clients, and the implementation of group lending methods, outreach is expanded while the costs associated would be reduced. Other studies such as [Fernando (2004](#_ENREF_11)) and [Hishigsuren (2007](#_ENREF_15)) also provide evidence of the complementarity of financial performance and outreach of MFIs. One of the most comprehensive studies on the subject by [Cull, Demirguc-Kunt, and Morduch (2007](#_ENREF_10)) with a large dataset from 124 MFIs across 49 countries also confirms that sustainability and service to the poor can be achieved concurrently. They however point out that in reaching out to the poorest, a trade-off occurs. As a result, MFIs rather focus largely on less poor clients. Several other studies ([Conning, 1999](#_ENREF_9); [Hulme & Mosley, 1996](#_ENREF_17); [Zeller, Wollni, & Abu Shaban, 2003](#_ENREF_31)) all argue that there is a trade-off between sustainability and outreach.

 While most of the existing studies draw conclusions on the existence and non-existence of a trade-off, majority of the empirical studies, some of which have been discussed here, only examine the concept of mission drift but not trade-off. The term mission-drift in microfinance and the trade-off between sustainability and outreach have been used interchangeably. However, these are related terms but not the same. Mission drift is a situation where MFIs move away from serving the poorest in an attempt to attain sustainability or other profitability related pursuits. The occurrence of a mission drift is usually characterized by a change in focus from the poorest to relatively wealthier clients (i.e., the poor). The primary focus of MFIs is the social goal of reaching out to the poorest, thus, moving away from this focus as a result of sustainability is termed mission drift. The idea of mission drift is therefore a one directional effect of the trade-off concept. Almost all of the existing literature focuses on the effects of sustainability on outreach. We attempt to bridge this gap in the existing literature. It is however worth mentioning that [Quayes (2012](#_ENREF_23)) presented an empirical perspective on the issue which considered the causality between sustainability and depth of outreach. They address simultaneity between sustainability and outreach. However, the study did not account for endogeneity and the sample was not restricted to Africa. In addition, like several other studies, Quayes (2012) made use of average loan size as a proxy for depth of outreach. With the believe that the poorest would prefer small loans, most studies resort to the use of average loan size as an indicator of outreach depth. Therefore, a higher average loan size would suggest a mission drift and decreases in the average loan size would indicate an increase in outreach depth. The use of this variable has some fundamental flaws. Overtime, the poorest that have access to microcredit and improve their businesses may no longer have the need for smaller loans. When this happens, the average loan size would increase and this does not necessarily imply a mission drift or a decline in outreach depth.

From a different perspective, the trade-off concept has not been explored adequately with evidence from Africa. [Makame (2008](#_ENREF_20)) however provides evidence from Africa which suggests that both goals (that is social and financial performance) can be achieved simultaneously. Although [Makame (2008](#_ENREF_20)) consider a sample from Africa, their study is limited in scope as they only use data from the East Africa and Southern African Development Communities. In addition, they did not address the issue of simultaneity between the two variables.

In this current study, using a sample from Sub-Saharan Africa, we take a closer look at the issue of trade-off between sustainability and depth of outreach. The contributions of this study are numerous. First, we address the issue concerning the measure of outreach depth by introducing a measurement index. Second, we adopt simultaneous equation models (SEMs) to appropriately examine the trade-off concept. The use of a SEM helps examine the causality between sustainability and outreach. Thus, unlike in the existing literature where only the concept of mission drift is examined, we address the issue of simultaneity. Lastly, we examine whether high interest rates promote sustainability and to what extent.

With regards to the last contribution, there is a wide spread belief that implementing high interest rate regimes help attain microfinance sustainability. This has been widely embraced by most practitioners. While the underlying concepts behind the relationship between high interest rates and sustainability may be true, we examine if there exists a threshold beyond which further increment in interest rates would rather lead to a decline in profitability.

The rest of the paper is organized as follows. Section 2 presents a description of the data and variables. Section 3 presents an overview of the main empirical strategy adopted by this study. Section 4 presents the empirical results and discussions of the results. Finally, section 5 provides a summary of the findings and a few concluding comments.

# DATA AND VARIABLES

The data used for this study was collected from the Microfinance Information Exchange[[1]](#footnote-1) (or the MIX Market) database. The MIX market (the MIX) is a web-based platform which contains extensive information about MFIs. Data from this database is mainly information self-reported by MFIs. This information is then audited by the MIX prior to its release online for public access. Based on the audit process, data from the MIX is widely used and highly regarded as reliable. Several studies including those conducted by [Cull et al. (2007](#_ENREF_10)), [Hartarska and Nadolnyak (2007](#_ENREF_13)), [Kai (2009](#_ENREF_18)) and [Quayes (2012](#_ENREF_23)) all used data from the MIX Market database.

The dataset includes data on 206 MFIs in 33 Sub-Saharan African countries from 2007 to 2011. Given that data from the MIX is self-reported and MFIs sometimes fail to provide information to the MIX, the dataset is unbalanced. In addition, some MFIs are relatively new and thus data is not available for all MFIs for each year. Table 1 presents a summary statistics of the data.

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|   | [INSERT TABLE 1 HERE] |  |

## Sustainability and Outreach Variables

### Sustainability

The term sustainability is widely used in the literature to infer the financial performance of MFIs, which potentially determine the institutions permanency. Thus, profitability measures are widely used as proxies for sustainability. A number of studies have also considered institutional financial performance and efficiency measures as viable proxies for sustainability. Some schools of thought, however, remain sceptical about the use of efficiency measures as proxies for sustainability. For instance, [Balkenhol (2007](#_ENREF_4)) amongst others have argued that a more precise measure for sustainability is operational and financial self-sufficiency. Nonetheless, the widely used proxies for sustainability include operational self-sufficiency (OSS), return on assets (ROA) and profit margin. In this study, we also adopt these measures. We use them individually as proxies for sustainability and also in the development of the measurement index for sustainability. OSS is the ratio of financial revenue of the MFI to the sum of operating/financial expense and impairment loss. Profit margin is the ratio of the net operating income of the MFI to its financial revenue, whereas, ROA is the ratio of the net operating income of the MFI to the average total assets. ROA is argued to be a viable measure of sustainability since it reflects the average returns from the total assets of the MFIs. It is also used as a measure of profitability by most studies (see for example, ([Cull et al., 2007](#_ENREF_10); [Olivares-Polanco, 2005](#_ENREF_22))). Using these three indicators of sustainability – OSS, profit margin and ROA, we develop a measurement index for sustainability. For each of these three indicators, an increase in ratio suggests good performance. Thus, in developing the measurement index, we first scale the observations in each variable, allowing all observations to fall between 0 and 1. The lowest observation is assigned 0 and the highest 1, and all other observations are scaled to fall between 0 and 1[[2]](#footnote-2). After scaling the variables, we take the average of the scaled values to get our measurement index.

### Depth of Outreach

[Schreiner (2002](#_ENREF_25)) describes microfinance outreach as two-dimensional – the depth of outreach and the breath of outreach. In this study, we focus on the former. Measuring depth of outreach has been quite challenging for most researchers as it requires that particular attention be paid to the quality of outreach. Quality of outreach includes the percentage of the poorest in society that are reached among other things. Measuring this happens to be a bit controversial as data on poverty levels of client is not readily available. Thus, as mentioned earlier, most studies make use of average loan size as a measure of depth of outreach. This study adopts this variable as well. In addition, we argue that percentage of female borrowers can be used as a proxy for depth of outreach as the most vulnerable in society are believed to be women ([Bhatt & Shui-Yan, 2001](#_ENREF_6)). Thus, reaching out to the vulnerable in society, who in most cases require small loans, infers quality of outreach. Accordingly, we use percentage of female borrowers and average loan size as measures for depth of outreach. We use these variables independently in our regressions and also in a measurement index developed by combining them. For the variable percentage of female borrowers, it is expected that increasing values recorded by MFIs would reflect high depth of outreach. Thus, we adopt the same strategy used for sustainability in our scaling. On the other hand, for average loan size, it is expected that, the smaller the reported value, the higher the depth of outreach and vice versa, since smaller loans reflect better outreach. Thus, for this variable, we adopt a scale[[3]](#footnote-3) which assigns a value of 1 to the lowest observed value and 0 to the highest observed value. The average of these two variables is then taken to get our measurement index.

### Validity of Measurement Indices

Although from a theoretical perspective the indicators used in the development of the measurement indices are acceptable, we also test empirically whether these variables are appropriate using a factor analysis. From the factor analysis results, first, we observe that for all the variables involved in the creation of both our sustainability and depth of outreach indices, the highest variance recorded is 0.2943, for percentage of female clients in the depth of outreach variables analysis. This indicates that for all indicators included in each index, there is a low variance not accounted for by other variables. Thus, with the highest uniqueness value being 0.2943, we can conclude that all variables included in each index are relevant. In addition, observing the factor loadings of the variables, results indicate that the lowest factor loading is 84%. This suggests that the dimensionalities of our factors are well defined. We proceed to rotate the factor loads with the aim of getting a clearer pattern of the relevance of the indicators in the index. We conclude that each indicator used in the index is relevant and thus, from an empirical perspective, our indices are valid.

# REGRESSION APPROACH

One of the fundamental aims of this study is to address the issue of simultaneity between sustainability and depth of outreach. To deal with this issue, we adopt the three-stage least square (3SLS) technique. The two-staged least square (2SLS) is also a viable approach in dealing with simultaneity and endogeneity. However, our preferred strategy is the 3SLS. This preference is due to the fact that the 3SLS is a combination of the 2SLS and seemingly unrelated regressions (SUR). While, the 2SLS component deals with the correlation between the unobserved error term and the regressors ([Basmann, 1957](#_ENREF_5)), the error terms in each system of equation involved in the analysis may be correlated and hence the need to account for this. This leads to the third stage of 3SLS, which involves the SUR component. The SUR component accounts for the correlation between the error terms of the equations ([Zellner, 1963](#_ENREF_32)).

Specifically, we specify the following system of equations;

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|  | $$SUS\_{it}=α\_{it}+γOUT\_{it}+β\_{1}LLR\_{it}+β\_{2}CPB\_{it}+β\_{3}YLD\_{it}+β\_{4}DEP\_{it}+β\_{5}AGE\_{it}+β\_{6}PRO\_{it}$$ | (1) |

|  |  |  |
| --- | --- | --- |
|  | $$OUT\_{it}=α\_{it}+γSUS\_{it}+β\_{1}CPB\_{it}+β\_{2}YLD\_{it}+β\_{3}DEP\_{it}+β\_{4}LP\_{it}+β\_{5}AGE\_{it}+β\_{6}PRO\_{it}$$ | (2) |

Where $SUS$ is microfinance sustainability and as mentioned earlier, we use a sustainability measurement index as well as the individual indicators used in the index. $OUT$ is depth of outreach. $CPB$ is cost per borrower. This variable is considered an efficiency indicator and is given by the ratio of the operating expense to the number of active borrowers. $YLD$ is the real gross portfolio yield and is widely considered in the literature as a measure of interest rates faced by customers. $DEP$ is number of deposit accounts. This variable amongst other things also captures the number of savings accounts held by clients of MFIs. $AGE$ is MFI age dummy. Based on the information provided by the MIX, we introduce dummies for new MFIs and mature MFIs in our model, leaving out young MFIs as the omitted category to avoid multicollinearity. We hypothesize a better performance for older MFIs. This hypothesis is informed by the assumption that older MFIs usually have the advantage of experience and also a stronger presence supported by a large number of employees and offices. $PRO$ is MFI profit status dummy and we include a dummy for not-for-profit MFIs. Our aim is to examine the veracity of anecdotal evidence in the mainstream which suggests that not-for-profit MFIs are usually more focused on the social goals and thus, would perform better in terms of outreach. Lastly, $LP$ is gross loan portfolio and it is expected that an increase in gross loan portfolio would lead to an increase in outreach. Since the sustainability of MFIs does not depend on the gross loan portfolio, we take advantage of an exclusion restriction that makes the variable gross loan portfolio available to identify equation (1). Additionally, $LLR$ is loan loss rate and following conventional logic, we expect that as the loan loss rate of an MFI increases, the level of sustainability is would reduce. We also take advantage of this variable to identify equation (2) since loan loss rate is not expected to have any direct impact on outreach.

## Instruments

The correlation between a regressor and the error term can lead to some inconsistencies in coefficients. To address this inconsistency, the estimators adopted for use in this study rely on instruments or instrumental variables (IVs). Valid IVs are expected to be uncorrelated with the error term and are used in a first stage regression analysis to obtain predicted values of the endogenous variable. These predicted values are then used in the second stage regression analysis to predict the dependent variable ([Kennedy, 2003](#_ENREF_19); [Wooldridge, 2002](#_ENREF_29)).

Most researchers find it difficult to find valid and strong IVs. As a result, instruments used in empirical studies are usually chosen based on availability and ad hoc arguments. Consequently, in most areas of economics, the validity of instruments used in various studies is highly debatable[[4]](#footnote-4). An appropriate instrument should, however, have no direct association with the dependent variable but should have a correlation with the endogenous variables, and uncorrelated with the error term.

In this study, we introduce two sets of IVs given that we have two endogenous variables, sustainability and outreach, to deal with. For sustainability, we use operating expense ratio and administrative expense ratio as instruments, depending on the measure of sustainability in use (that is whether the measure in question is profit margin, ROA, OSS or the measurement index). Both IVs are considered efficiency measures in microfinance. As a result, they are highly correlated with sustainability but not with depth of outreach. For depth of outreach, we use average outstanding loan balance and assets as instruments. The assets of MFIs include the number of offices they have and this is correlated to outreach as an increase in the number of MFI offices reflects positively on outreach.

The validity of using assets as an instrument for outreach can potentially be questioned. For instance, it can be argued that using assets as an instrument for outreach may not be valid as it is likely that assets are correlated with sustainability, given that return of assets (ROA) is a sustainability measure. While the correlation between ROA and sustainability may be valid, assets do not have direct correlation with sustainability. Assets reflect the level of resources that MFIs have to reach out to the poor. On the other hand, ROA is a ratio, which is a complete transformation of both assets and net income. Thus, while it may be correlated with sustainability, the asset component of the ratio does not have a correlation with sustainability.

We proceed with empirical tests to further support the validity of our instruments. A common approach used in determining the validity of instrument is the test for overidentifying restriction. This test has long been used but recently, various studies propose the use of the $F$-statistics and partial $r$-squared of the first stage regression. [Bound et al. (1995](#_ENREF_7)) and [Staiger and Stock (1997](#_ENREF_26)) amongst others have argued that when a large sample is used, the validity of instruments may be compromised even when the correlation between the instruments and endogenous variable are significant at conventional levels. In situations like this, they indicate that the test for overidentifying restriction may not be reliable and sufficient to determine the validity of instruments. [Stock et al. (2002](#_ENREF_27)) argue that as a rule of thumb, for inferences made from 2SLS estimates to be reliable, the $F$-statistics from the first stage regression must be larger than 10 as the $F$ test presents statistics for the joint significance of the instruments used in the first stage. Prior to this, [Bound et al. (1995](#_ENREF_7)) also recommended the use of the $r$-squared from the first stage regression which includes the instruments. This approach is valid only in the case of a single endogenous regressor. Similarly, [Hahn and Hausman (2003](#_ENREF_12)) argue that existing tests used to determine the validity of instruments are quick to reject the validity of instruments especially when weak instruments are present. Using the approach proposed by [Bound et al. (1995](#_ENREF_7)) and [Stock et al. (2002](#_ENREF_27)), we conclude that the IVs presented in this study are acceptable for both endogenous variables. We provide the diagnostic test results in the next section, below each regression output table.

# EMPIRICAL RESULTS AND DISCUSSIONS

Panel 1 of table 2 presents 3SLS results for the relationship between the sustainability measurement index and depth of outreach index. Panel 2 presents results for operational self-sufficiency (OSS) and average loan balance (ALB). Panel 3 shows results for OSS and percentage of female clients. Panel 4 presents the results for profit margin and ALB. In panel 5, results are shown for the association between profit margin and percentage of female clients. Lastly, panel 6 and 7 presents results for return on assets’ (ROA) relationships with ALB and percentage of female borrowers respectively.

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| --- | --- | --- |
|  | [INSERT TABLE 2 HERE] |  |

Empirical results across all panels show that there is a trade-off between sustainability and depth of outreach in Africa. First, for panel 1, which explains the association between the sustainability and depth of outreach indices, we observe that the negative coefficient explaining the effects of sustainability on depth of outreach is much stronger than what is observed in the opposite direction. The size of the coefficient suggests that the negative effect of sustainability on outreach is about 3 times what is observed in the case of the effects of depth of outreach on sustainability. From this, we infer that focusing on sustainability in Africa is extremely detrimental to the social goals of microfinance. This indicates a severe mission drift when MFIs attempt to attain sustainability. Thus, firms that attempt to become operationally self-sufficient perform badly in terms of depth of outreach. Turning to the results in panel 2, we observe that at the 1% significance level, there is a positive association between OSS and ALB. Empirical results indicate that an increase in OSS is associated with an increase in average loan size (decrease in depth of outreach). Thus, using average loan size as a proxy for depth of outreach, sustainability (measured by OSS) has a negative effect on depth of outreach. In essence, firms which are operationally self-sufficient, have higher average loan sizes than firm which are not. The results therefore contradict the existing literature which indicates complementarity between financial performance and outreach. A 1% increase in the average loan size results in an estimated 0.31% increase in OSS. On the other hand, a more severe effect is observed in the other direction, where a 1% increase in OSS leads to a 2.14% increase in the average loan size (or a 2.14% decrease in depth of outreach). Thus, our results indicate that MFIs that give larger loans become sustainable. This is evident from the positive and significant coefficient explaining the effects of average loan size on sustainability. We also observe, as shown in panel 3, that there is a negative association between OSS and the number of female borrowers of MFIs. Here, we observe that a 100% change in OSS generates a 27.39 decline in the percentage of female borrowers. On the other hand, we observe that a unit change in the percentage of women borrowers generates a 3.54% increase in OSS. This indicates that self-sufficient MFIs tend to avoid a large number of female clients, while on the other hand, the negative effects on sustainability faced by MFIs that try to reach out to female clients is marginal. Women are usually considered vulnerable in society. Thus, women empowerment is considered one of the primary social goals of MFIs. In this regard, higher numbers of female clients are expected to be an indicator of good performance in terms of outreach depth. Similarly, it is expected that women would go for smaller loans in order to enhance proper management. Based on this understanding, MFIs that serve few female clients can be seen as drifting away from the mission of women empowerment. Using the profit margin as an indicator of sustainability, panel 4 also shows that there is a trade-off between sustainability and depth of outreach. Here, we observe that MFIs with higher profit margin or more profitable MFIs have larger average loan sizes. Similarly, depth of outreach has a negative effect on profit margin as well. Larger loans (decrease in outreach depth) are associated with higher profit margins. The results indicate that a 100% increase in profit margin leads to an approximated 48.79% increase in average loan size. Likewise, a 100% increase in average loan size (that is a 100% decline in depth of outreach) leads to a 62.39% improvement in financial performance. A similar relationship is observed for ROA’s relationship with average loan as shown in panel 6. This suggests that profitable MFIs or those that attempt to attain profitability perform very poorly in terms of depth of outreach. On the other hand, MFIs that are more focussed on their social goals, though perform poorly in sustainability, they are not intolerably affected in terms of profitability considering the outreach effects of sustainability. The inference drawn from results shown in panels 5 and 7 are not different. We see that as the number of female borrowers increase, there is a decline in the profit margin and returns on asset of MFIs. On the other hand, MFIs with higher profit margins and returns on assets serve few female clients.

The results from this study do not support the arguments put across by the proponents of the sustainability approach. In fact, as observed from the empirical results, the dual goal of sustainability and depth of outreach are not complementary. Sustainability does not promote the social mission of MFIs. Arguments presented by the advocates of the sustainability approach, which leads to the conclusion that increasing depth of outreach can considerably happen when MFIs are sustainable, does not hold in the case of Africa. In fact, if MFIs would act in the interest of optimization, focussing on depth of outreach seems more prudent than focussing on sustainability given that the negative effects experienced while focussing on outreach is weaker. While unquestionably there is a trade-off between these two goals, there is a stronger adverse effect on outreach when MFIs become sustainable. Our results suggest that sustainability does not guarantee a successful end of depth of outreach increase as argued by the proponents of the sustainability approach. Even with the focus on attaining sustainability, MFIs still find it hard to achieve this goal and in the process drift away from the social goal. In essence, we come to the controversial conclusion that reducing outreach is not the best way to attain sustainability. In fact considering the weaker effects of an increase in depth of outreach on sustainability, we argue that the continual existence of subsidies to aid the performance of MFIs might lead to a more efficient performance in which depth of outreach is expanded and MFIs remain in operation. While this may not seem like an appropriate long term plan to sustain the industry, it appears to be a more viable solution than the sustainability approach of focusing on profitability to the detriment of outreach. The fact remains that donor funds may dry out and the existence of subsidies can be curtailed. Thus, a potential area of future research with significant policy implications for developing economies is to examine how the microfinance industry can pursue sustainability without adversely affecting outreach.

Turning to the relationships between the other regressors and our endogenous variables, we observe that at the 1% significance level, there is a negative and significant relationship between loan loss rate and sustainability in panels 1 and 2, and at the 10% level for panels 6 and 7. In panel 4, we observe a significant negative relationship at the 5% while, on the contrary, there is no significant relationship in the case of panel 3 at the 1%, 5% or 10% significance levels. Considering these results, we can draw a conclusion that there is a negative association between loan loss rate and sustainability. Loan loss rate is considered as a measure of default and as anticipated, an increase in this ratio has an adverse effect on sustainability and other financial performance measures. An increase in the default rates suggests that significant portion of the loan portfolios are at risk and this would affect the profitability indicators of MFIs. In addition, with high cost of giving out microloans, an increase in the loan loss rate suggests the possibility of MFIs having difficulties in covering administrative costs.

With regards to the effects of cost per borrower, we observe statistically significant relationships in all panels at the 1% significance level. For panels which do not include average loan size as the measure of depth of outreach (panels 1, 3, 4 and 7), we find that cost per borrower has a negative effect on both sustainability and outreach. This is also the case for results presented in panels 2, 4 and 6. In these panels, we observe a positive effect of cost per borrower on average loan size. This indicates that as cost per borrower increases, average loan size increases (or depth of outreach decreases). Thus, across all panels, cost per borrower has a negative effect on both endogenous variables. However, there appears to be a weaker negative effect on our sustainability and profitability measures. Cost per borrower is an efficiency measure and with a stronger negative effect of cost per borrower on outreach, it can be argued that when the cost per borrower is high, MFIs find ways of distributing these costs to clients. This can be done through high interest rates and in the event of such rates, the poorest in society may be excluded as they are not willing to pay high interests. Similarly, with high costs per borrower, even if MFIs attempt to give out small loans, which are possibly captured in our average loan size variable, the total amount MFIs expect borrowers to pay back would be higher. In addition, if the costs per borrower for smaller loans are high, MFIs resort to giving out larger loans as large loans are associated with lower costs. When this happens, there is an increase in the average loan, thus, suggesting a decline in depth of outreach.

As expected, empirical results indicate a positive association between yield and sustainability. We observe that at least at the 5% significance level, there is a positive association between yield and all measures of sustainability and profitability across each panel. High interest rates have long been associated with profitability and it is not surprising that this is the case for microfinance institutions as well. Nonetheless, the extents to which the introduction of high interest rates affects profitability are discussed in the next section in more details. Results also indicate that there is a positive association between yield and all measures of depth of outreach.

Unexpectedly, we observe that there is no significant association between the variable deposit accounts and all measures of sustainability and depth of outreach. Conventionally, it is expected that for a bank, an increase in savings provides enough leverage for expansion and also profitability. However, for microfinance in Africa, our results reveal otherwise. This could possibly be as a result of the variable used. Deposit accounts capture a number of things including savings accounts that MFIs manage. In addition, most MFIs have mandatory loan repayment schemes and loan repayments deposited by clients to the MFIs are also captured by this variable. Due to data limitations, we cannot come to a strong conclusion that an increase in savings has no effect on the sustainability or outreach of MFIs nonetheless, our results point to the possibility of such a phenomenon in Africa.

We now consider the effects of the dummies for MFI age and profit status on sustainability and outreach. Turning to the effects of MFI age on sustainability and outreach, we find that that in most cases, the age of a MFI has no significant effect on sustainability and depth of outreach. However, where a significant relationship exists, younger MFIs perform poorly in terms of sustainability and profitability. This is not surprising given that new MFIs are generally faced with challenges of breaking even and meeting up with administrative costs. In addition, results from panel 2 show that new MFIs are also faced with difficulty in giving out small loans. On the other hand, we find that when the dummy for not-for-profit MFIs shift from 0 to 1, there is a decline in both sustainability and outreach. The poor performance of not-for-profit MFIs in term of sustainability and other profitability measures is expected as generally not-for-profit MFIs are not profit oriented and rely heavily on subsidies. The poor performance in term of depth of outreach is somewhat a puzzle considering that not-for-profit MFIs are expected to be more outreach oriented.

Lastly, considering the effects of gross loan portfolio, we observe a statistically significant relationship in all cases except for panels 3 and 5. Generally, we observe that as the gross loan portfolio of MFIs increase, there is a decline in depth of outreach. This could be as a result of the shift from poorer clients to wealthier clients and also the issuance of larger loans.

## Interest Rates and Profitability

Next, we extend our results to examine if the widely embraced assumption that higher interest rates lead to profitability is valid for Africa. To examine this relationship, we introduce a non-linear term, the square of yield, into our model and adopt the two-stage least square (2SLS) estimation strategy. Table 3 presents the results for these estimations.

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| --- | --- | --- |
|  | [INSERT TABLE 3 HERE] |  |

Contrary to what we hypothesized and expected, our results tell a different story. First, we expected that beyond a given threshold, further increments in interest rates would lead to an increase in the portfolio at risk. To examine this relationship, we estimate a model where portfolio at risk is used as the dependent variable. The empirical results as presented in panel 1 of table 3 suggest that an increase in yield decreases the level of portfolio at risk. This is expected. However, we find that the quadratic term is positive but statistically insignificant. This is surprising and is not consistent with our initial hypothesis. In fact, one would expect that extremely high interest rates would be associated with high loan delinquencies. Furthermore, while the coefficient of the quadratic term is not significant, it also seems quite negligible. This suggests that high interest rates in Africa, actually, do not negatively affect loan delinquencies.

What's more, we do not find the existence of a threshold beyond which further increments to interest rates might be detrimental to profitability. We find that even after introducing the non-linear term into our model, interest rates still have a positive association with return on assets, profit margin and sustainability. On the contrary, we find that the coefficients for the yield squared term are all statistically insignificant with very weak coefficients. Reconciling this with the results explaining the effects of interest rates on loan delinquencies, these results are not surprising. However, the non-existence of a threshold seems puzzling. One possible reason why a threshold does not exist may be as a result of the ‘high’ growth rates in Africa. Data from the International Monetary Fund (IMF) suggests that since the early 2000s, the growth rate in most developing economies exceeds the rate for advanced economies. Particularly, Sub-Saharan Africa and developing Asia have been identified to have the highest growth rates in the developing world. For instance, growth rate is expected to grow further with an expectation of 5.7% growth for Sub-Saharan Africa in 2014 while in regions like Latin America and the Middle East, growth has been forecasted to be around 3.8%. This has mainly been the case historically as well. With a relatively high growth rate in Africa, one would expect that this would be evident in businesses and microenterprises as well. The study by [Ahlin, Lin, and Maio (2011](#_ENREF_1)) established a link between the performance of microfinance institutions and the macroeconomic performance. Their results suggest that the success and performance of MFIs are dependent on the macroeconomic and macro-institutional features of the country of operation. Thus, if the country growth rates are strong, MFIs are able to perform better and cover costs. Based on this relationship, the conclusion can be drawn that while microfinance clients may be desperate for loans and interest rates are extremely high, they do have growing businesses. As a result, regardless of how high interest rates are most clients are able to pay their loans back since they have viable businesses they invest into and the economic environment seems to support business growth. We speculate that several other factors could be the cause of the non-existence of a threshold. Thus, there is a need to investigate further. We however circumvent these investigations for a later study. It may be worthwhile to conduct a more holistic analysis, which covers all geographical regions to determine if variations exist by region. In addition, the lending methodologies adopted by MFIs may also shed some light on why a threshold does not exist. Our data does not present information on the lending approaches used by MFIs. In fact, it is likely that default rates in the case of individual loans may be higher than in the case of group loans. With this understanding, if the group lending approach is largely practiced in Africa, it is likely that this could increase the threshold or even make it non-existent. Furthermore, if the group lending methodology is used, administrative costs involved in giving out loans would be reduced. This increases the chances of profitability. In essence, a possible extension of this study is to introduce a richer dataset which captures all geographical regions and also the lending methods adopted by MFIs.

# SUMMARY AND CONCLUSIONS

This study sought to address two major questions. First, is there a trade-off between microfinance sustainability and depth of outreach in Sub-Saharan Africa? Second, is there a threshold beyond which further increments to interest rates lead to a decline in profitability?

Using a sample of 338 microfinance institutions from 36 African countries, we find that there is a trade-off between sustainability and depth of outreach. Empirical results also confirm that there is a positive association between interest rates and profitability. However, contrary to our expectation, we find no evidence of a threshold beyond which further increments in interest rates become detrimental to profitability.

On our first question, based on our three-staged least square (3SLS) analysis, we find that while there is a trade-off between sustainability and depth of outreach, the negative effects of sustainability on outreach are much stronger. The pattern of our results suggests that there is a disincentive to focus on either of the goals. However, it might be more judicious for MFIs to focus on outreach rather than sustainability, given that the loss associated with this strategy is minimal. Thus, policy-wise, a more practical approach for MFIs and policymakers in Africa is to focus on the social goal of outreach, while developing strategies to support and strengthen ongoing subsidies and donations. Policymakers should encourage the pursuit of the social goal of outreach rather than sustainability. We also find that the age of a microfinance institution does not have any significant effect on its performance in terms of sustainability and depth of outreach. On the other hand, not-for-profit MFIs tend to perform poorly in achieving both goals.

On our second question, our results do not confirm the existence of a threshold beyond which interest rates cause profitability to decline. Contrary to what was expected, there is no threshold beyond which higher interest rates can be associated with loan delinquencies or a fall in the demand for credit. Thus, we conclude that in the case of Africa, the demand for credit is independent of the level of interest charged. We acknowledge the possibility of the existence of various reasons, which could explain this unexpected result and present two of such arguments. We argue that this could be related to the high macroeconomic growth rate of Sub-Saharan Africa and also the lending methodology used. These arguments can be corroborated by extending this study to include the effects of the lending methods adopted by MFIs on profitability. It would be interesting to explore this in an empirical context. Nonetheless, given the high administrative costs incurred in the issuance of individual loans, a crucial policy consideration would be the implementation of group lending methods for small loans, whereas, the individual lending method is adopted for larger loans.

 On the whole, our results point to the existence of a trade-off. Furthermore, they go to support the arguments presented by the proponents of the poverty/welfarist approach of focussing on outreach. In addition, the lending methods adopted go a long way to affect the profitability of MFIs and this can be investigated further. Similarly, the non-existence of an interest rate threshold can further be investigated with a larger dataset which covers a wider geographical location, especially to include regions that have growth rates lower than Africa.

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**Table 1 – Summary and Descriptive Statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Description | Mean | Std Dev | Min | Max |
| Sustainability Index | Measurement index for sustainability derived from profit margin, OSS and ROA | 0.622 | 0.088 | 0.298 | 0.813 |
| Outreach Index | Measurement index for outreach derived from percentage of female clients and average loan size | 0.541 | 0.197 | 0.017 | 0.861 |
| Return on Assets | Net operating Income after taxes/Total assets | 1.003 | 1.090 | -4.605 | 3.634 |
| Profit Margin | Net operating Income/Financial Revenue | 2.498 | 1.049 | -2.996 | 3.912 |
| Operational Self-sufficiency | Financial Revenue / (Financial Expense + Impairment Loss + Operating Expense) | 4.567 | 0.347 | 3.447 | 5.298 |
| Female Clients | Percentage of borrowers who are women | 59.549 | 25.492 | 0.430 | 100 |
| Average Loan Size | Gross Loan Portfolio/Number of active borrowers | 5.684 | 1.025 | 3.912 | 8.481 |
| Loan Loss Rate | (Write-offs - Value of Loans Recovered)/ Loan Portfolio | 0.396 | 1.587 | -4.605 | 8.301 |
| Cost per borrower | Operating Expense/ Number of Active Borrowers | 158.829 | 226.872 | 4 | 3246 |
| Gross Loan Portfolio | Outstanding principals due for all outstanding client loans. | 14.495 | 1.885 | 7.354 | 21.108 |
| Yield on Gross Portfolio | (Yield on Gross Portfolio (nominal) - Inflation Rate)/ (1 + Inflation Rate) | 27.093 | 20.406 | -23.08 | 178.89 |
| Yield Squared | Squared of yield on gross portfolio | 1149.944 | 2020.597 | 0.0004 | 32001.63 |
| Portfolio at Risk | Entire unpaid principal loan balances | 5.560 | 7.631 | 0 | 64.36 |
| Deposit Accounts | Number of Deposit Accounts | 10.566 | 44.494 | 0 | 702.526 |
| Mature MFI | Dummy variable, Mature MFIs=1, New and Young MFIs=0 | 0.548 | 0.498 | 0 | 1 |
| New MFI | Dummy Variable, New MFIs=1, Mature and Young MFIs=0 | 0.188 | 0.391 | 0 | 1 |
| Not-for-Profit MFI | Dummy Variable, not-for-profit MFIs=1, for-profit MFIs=0 | 0.607 | 0.489 | 0 | 1 |

**Table 2 – 3SLS Estimations**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| VARIABLES | SUSTAIN | OUTREACH | OSS | ALB | OSS | FEMALE | PROFIT | ALB |
| Sustinability | \_ | -1.3067\*\*\* | \_ | 2.1372\*\*\* | \_ | -27.3931\*\*\* | \_ | 0.4879\*\*\* |
|  |  | (0.1367) |  | (0.1895) |  | (3.4445) |  | (0.0857) |
| Outreach | -0.4671\*\*\* | \_ | 0.3061\*\*\* |  | -0.0354\*\*\* | \_ | 0.6239\*\*\* |  |
|  | (0.0358) |  | (0.0198) |  | (0.0062) |  | (0.1059) |  |
| Loan Loss Rate | -0.0106\*\*\* | \_ | -0.0321\*\*\* |  | -0.0199 | \_ | -0.1033\*\* |  |
|  | (0.0023) |  | (0.0078) |  | (0.0170) |  | (0.0475) |  |
| Cost per Borrower | -0.0003\*\*\* | -0.0005\*\*\* | -0.0009\*\*\* | 0.0030\*\*\* | -0.0012\*\*\* | -0.0354\*\*\* | -0.0015\*\*\* | 0.0024\*\*\* |
|  | (0.0000) | (0.0000) | (0.0001) | (0.0002) | (0.0003) | (0.0050) | (0.0004) | (0.0002) |
| Yield | 0.0014\*\*\* | 0.0030\*\*\* | 0.0030\*\*\* | -0.0093\*\*\* | 0.0130\*\*\* | 0.3635\*\*\* | 0.0018 | -0.0059\*\* |
|  | (0.0002) | (0.0004) | (0.0007) | (0.0018) | (0.0031) | (0.0537) | (0.0037) | (0.0027) |
| Deposit Accounts | 0.0000 | 0.0000 | 0.0002 | -0.0007 | -0.0002 | -0.0060 | 0.0007 | -0.0008 |
|  | (0.0001) | (0.0002) | (0.0003) | (0.0008) | (0.0008) | (0.0247) | (0.0011) | (0.0009) |
| Mature MFI | -0.0087 | -0.0096 | -0.0505 | 0.1217 | 0.0868 | 2.5915 | -0.0837 | 0.0808 |
|  | (0.0095) | (0.0185) | (0.0326) | (0.0883) | (0.0829) | (2.6709) | (0.1643) | (0.1248) |
| New MFI | -0.0333\*\* | -0.0501\* | -0.1583\*\*\* | 0.4006\*\*\* | 0.0590 | 1.9406 | 0.3531 | -0.1051 |
|  | (0.0145) | (0.0290) | (0.0493) | (0.1391) | (0.1307) | (4.0398) | (0.3289) | (0.2544) |
| Not-for-Profit | -0.0168\*\* | -0.0267\* | -0.0926\*\*\* | 0.2485\*\*\* | -0.0016 | -0.0356 | -0.3729\*\*\* | 0.3887\*\*\* |
|  | (0.0081) | (0.0161) | (0.0272) | (0.0777) | (0.0746) | (2.3314) | (0.1341) | (0.1061) |
| Loan Portfolio | \_ | -0.0174\*\*\* |  | 0.0964\*\*\* | \_ | 0.0285 |  | 0.1820\*\*\* |
|  |  | (0.0046) |  | (0.0221) |  | (0.4651) |  | (0.0340) |
| Constant | 0.8954\*\*\* | 1.6400\*\*\* | 2.9918\*\*\* | -5.9423\*\*\* | 6.5057\*\*\* | 179.1594\*\*\* | -0.9032 | 1.5029\*\* |
|  | (0.0219) | (0.0999) | (0.1171) | (0.8581) | (0.3319) | (19.6356) | (0.6241) | (0.6110) |
| Time Dummies | Yes | Yes | Yes | Yes |
| Observations | 442 | 442 | 442 | 442 | 442 | 442 | 263 | 263 |
| *Diagnostic Tests for IV Estimations* |
| First Stage F-Stat | 41.15\*\*\* | 67.59\*\*\* | 33.52\*\*\* | 141.25\*\*\* | 33.52\*\*\* | 10.66\*\*\* | 10.59\*\*\* | 79.92\*\*\* |
| Partial R-squared | 0.5322 | 0.6514 | 0.4810 | 0.7961 | 0.4810 | 0.2277 | 0.3370 | 0.7932 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

|  |  |  |  |
| --- | --- | --- | --- |
|  | (5) | (6) | (7) |
| VARIABLES | PROFIT | FEMALE | ROA | ALB | ROA | FEMALE |
| Sustinability |  | -9.1364\*\*\* |  | 0.4022\*\*\* |  | -6.9797\*\*\* |
|  |  | (2.6758) |  | (0.0775) |  | (2.4856) |
| Outreach | -0.0228\* |  | 0.5861\*\*\* | \_ | -0.0210\* | \_ |
|  | (0.0123) |  | (0.1083) |  | (0.0120) |  |
| Loan Loss Rate | -0.0984\* |  | -0.0819\* | \_ | -0.0850\* | \_ |
|  | (0.0550) |  | (0.0468) |  | (0.0516) |  |
| Cost per Borrower | -0.0006 | -0.0282\*\*\* | -0.0017\*\*\* | 0.0025\*\*\* | -0.0008\* | -0.0281\*\*\* |
|  | (0.0005) | (0.0068) | (0.0004) | (0.0002) | (0.0004) | (0.0064) |
| Yield | 0.0044 | 0.3031\*\*\* | 0.0173\*\*\* | -0.0127\*\*\* | 0.0177\*\*\* | 0.3343\*\*\* |
|  | (0.0060) | (0.0836) | (0.0035) | (0.0026) | (0.0048) | (0.0811) |
| Deposit Accounts | 0.0016 | 0.0234 | 0.0006 | -0.0004 | 0.0013 | 0.0088 |
|  | (0.0012) | (0.0293) | (0.0011) | (0.0009) | (0.0012) | (0.0288) |
| Mature MFI | 0.1193 | 4.5408 | -0.0596 | 0.0297 | 0.0816 | 3.6845 |
|  | (0.1709) | (3.9182) | (0.1605) | (0.1153) | (0.1626) | (3.6541) |
| New MFI | 0.3432 | 2.7586 | 0.3454 | -0.0989 | 0.3500 | 3.4381 |
|  | (0.3535) | (7.9771) | (0.2971) | (0.2157) | (0.3086) | (6.8308) |
| Not-for-Profit | -0.2850\*\* | -4.6461 | -0.3658\*\*\* | 0.3333\*\*\* | -0.2822\*\* | -3.2622 |
|  | (0.1434) | (3.3286) | (0.1340) | (0.0993) | (0.1381) | (3.1471) |
| Loan Portfolio |  | -2.8792\*\*\* | \_ | 0.1689\*\*\* | \_ | -2.3156\*\* |
|  |  | (1.1078) |  | (0.0325) |  | (1.0546) |
| Constant | 3.7996\*\*\* | 121.9123\*\*\* | -2.6242\*\*\* | 2.8114\*\*\* | 1.8632\*\*\* | 95.5647\*\*\* |
|  | (0.6964) | (19.7448) | (0.6424) | (0.5249) | (0.6934) | (16.9780) |
| Times Dummies | Yes | Yes | Yes |
| Observations | 263 | 263 | 264 | 264 | 264 | 264 |
| *Diagnostic Tests for IV Estimations* |
| First Stage F-Stat | 29.19\*\*\* | 77.97\*\*\* | 11.76\*\*\* | 80.37\*\*\* | 11.76\*\*\* | 43.28\*\*\* |
| Partial R-squared | 0.3370 | 0.1690 | 0.3599 | 0.7935 | 0.3599 | 0.1651 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3 – 2SLS Estimations (with quadratic term)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) |  | (2) | (3) | (4) | (5) |
| VARIABLES | PAR |  | ROA | PROFIT | OSS | SUSTAIN |
| Outreach Index | 2.0956 |  | -1.4917\* | -1.9958\*\*\* | -1.4305\*\*\* | -0.3581\*\*\* |
|  | (4.2689) |  | (0.7829) | (0.7543) | (0.1957) | (0.0524) |
| Yield | -0.1510\*\* |  | 0.0316\*\* | -0.0013 | 0.0086\*\*\* | 0.0020\*\* |
|  | (0.0686) |  | (0.0136) | (0.0130) | (0.0032) | (0.0009) |
| Yield Squared | 0.0007 |  | -0.0001 | 0.0001 | -0.0000 | -0.0000 |
|  | (0.0006) |  | (0.0001) | (0.0001) | (0.0000) | (0.0000) |
| Loan Loss Rate | 1.0779\*\*\* |  | -0.0923\* | -0.1188\*\* | -0.0656\*\*\* | -0.0179\*\*\* |
|  | (0.2364) |  | (0.0556) | (0.0532) | (0.0109) | (0.0029) |
| Cost per borrower | 0.0044\*\* |  | -0.0007\* | -0.0007\* | -0.0006\*\*\* | -0.0002\*\*\* |
|  | (0.0022) |  | (0.0004) | (0.0004) | (0.0001) | (0.0000) |
| Deposit Accounts | -0.0281 |  | 0.0021 | 0.0026 | -0.0000 | 0.0000 |
|  | (0.0237) |  | (0.0045) | (0.0043) | (0.0011) | (0.0003) |
| Mature MFI | 1.0138 |  | 0.0496 | 0.1023 | -0.0033 | -0.0011 |
|  | (0.7835) |  | (0.1640) | (0.1573) | (0.0359) | (0.0096) |
| New MFI | -0.2418 |  | 0.1309 | 0.2171 | -0.1273\*\* | -0.0342\*\* |
|  | (1.0999) |  | (0.3040) | (0.3007) | (0.0506) | (0.0136) |
| Not-for-Profit | -0.0531 |  | 0.0267 | -0.0472 | -0.0031 | -0.0046 |
|  | (0.7636) |  | (0.1530) | (0.1462) | (0.0347) | (0.0093) |
| Constant | 5.9481\*\*\* |  | 0.8659\* | 3.3549\*\*\* | 5.2584\*\*\* | 0.8003\*\*\* |
|  | (2.1711) |  | (0.4522) | (0.4327) | (0.0979) | (0.0263) |
| Time Dummies | Yes |  | Yes | Yes | Yes | Yes |
| Observations | 337 |  | 197 | 197 | 347 | 346 |
| *Diagnostic Tests for IV Estimations* |
| First Stage F-Stat | 61.70\*\*\* |  | 32.37\*\*\* | 32.54\*\*\* | 63.48\*\*\* | 63.44\*\*\* |
| Partial R-squared | 0.6543 |  | 0.6351 | 0.6363 | 0.6539 | 0.6544 |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

1. MIX Market is a not-for-profit organization that promotes information exchange within the microfinance industry. [↑](#footnote-ref-1)
2. The formula below is used in the scaling.

Where is the derived re-scaled value, and represent the maximum and minimum values of the new scale respectively. and represent the maximum and minimum original values of the variables respectively. [↑](#footnote-ref-2)
3. The following formula is used in this case;

Where all terms remain as explained earlier and is a power term which varies from indicator to indicator, and affects the distribution of the new scale. [↑](#footnote-ref-3)
4. For instance, [Angrist and Krueger (1991](#_ENREF_2)), examine the relationship between schooling and income. In their study, they used quarter of birth as an instrument. The validity of this instrument was later questioned by [Bound, Jaeger, and Baker (1995](#_ENREF_7)). They argue that quarter of birth is not exogenous as it has a weak correlation with the dependent variables income. Similarly, studies such as [Card (2001](#_ENREF_8)), [Yang, Chen, and Allenby (2003](#_ENREF_30)), and [Stock, Wright, and Yogo (2002](#_ENREF_27)) amongst others put across extensive arguments against the validity of instruments used in existing studies. [↑](#footnote-ref-4)