

FINANCIAL INCLUSION AND RISK OF POVERTY ALLEVIATION IN AFRICA: PANEL STUDY ON SELECTED EAST AFRICAN COUNTRIES

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ABSTRACT

Eliminating severe poverty continues to be among the most challenging and important Sustainable Development Goals (SDGs) in Africa. The key aim of this study is to identify if there is a long-term co-integration presence among the proxies of financial inclusion and poverty abating in selected East Africa countries (i.e. Rwanda, Zambia, and Zimbabwe) from 2010 to 2018. The study utilized Panel of Fully Modified Ordinary Least Squares (FMOLS) method to determine the long-term equilibrium nexus amongst the proxies examined. The study discovered that financial inclusion has a long-run association with the level of poverty. The findings will help East African countries' policymakers develop financial inclusion instruments and strategies to promote financial development and resolve the situation of extreme poverty in region. The novelty of this paper lies in establishing the impact of financial inclusion on poverty alleviation in context of East Africa, a region with many people living below the poverty line.

Keywords: Financial Inclusion, Poverty Alleviation, Panel Fully Modified Ordinary Least Squares (FMOLS), Co-integration, Granger Causality, East Africa.

INTRODUCTION

Poverty is commonly acknowledged as an overwhelming and personally disastrous event, and it is situation that is subject to numerous definitions and conceptualizations (Chang & Bruton, 2017; Sutter, Bruton & Chen, 2019). Poverty can be described as individuals' inability to obtain an adequate and sustained livelihood that can meet their needs like food, housing, clothes, education and transportation (World Bank, 2001; Parolin & Wimer, 2020). Many Sub-Saharan African nations have the highest numbers of people living in extraordinary poverty, and is the main area on the planet which has encountered an upsurge in poverty in recent decades, with the underprivileged people here much worse off than the rest of the world (Simmons, 2015; Umar et al., 2021). Recently, the African Development Bank (2019) stated that the poverty rate is 33.3% of the population in East African countries; in fact, people are living on less than \$1.90 a day. The stark reality is that a high number of East Africans are struggling to earn a sufficient income to survive and get their basic food requirements. If this is to continue unchecked into the future, it will inevitably increase the percentage of societies living below the poverty line throughout East Africa.

Meanwhile, numerous studies have documented a positive and direct connection between financial inclusion in terms of admittance to poverty alleviation programs and financial services (Honohan, 2004; Jalilian & Kirkpatrick, 2005; Beck, Demirgüç-Kunt & Levine, 2007; Odhiambo, 2009; Odhiambo, 2010; Molla et al., 2008; Jeanneney & Kpador, 2011). According to Sarma (2008), financial inclusion is the desired outcome for all members

of society to access it easily and then use recognized financial systems as effectively as possible. Financial inclusion has been empirically recognized and developed theoretically but more importantly, practicably, to minimize poverty and realise the Millennium Development Goals that have been designed to help the poor (IFPRI, 2007; Chibba, 2008a, 2008b, 2008c, 2008d; Imai et al., 2010; Allen et al., 2014; Choudhury, 2014; Swamy, 2014; Beck et al., 2015; Mohammed et al., 2017; Park & Mercado, 2018). Financial inclusion creates numerous advantages for countries' economic development. Research has demonstrated that society's financial institutions offer the required deposit tools so that people can enlarge their savings, monitor their expenditure, improve women's empowerment and make targeted investments (Ashraf, Karlan, and Yin, 2010). Undoubtedly, having an easy path to accessing financial services also alleviates poverty, reduces inequality and improves private investment and economic growth (Allen et al., 2016; Beck et al., 2007; Beck et al., 2004; Bruhn and Love, 2014). Therefore, financial inclusion strengthens the system of payments and facilitates the transmission of money from one country and to another thus helping individuals and firms (Beck et al., 2015; Demirgüç-Kunt et al., 2011).

Most published works on this topic have concentrated on the level of access to finance, for example: Abdulmumin, Etudaiye-Muthar, Jimoh & Sakariyahu (2019), Kalunda and Ogada (2019) & Dinku (2019). Conversely, only very limited studies have surveyed the factors that drive admittance to financial inclusion, for instance (Wokabi & Fatoki, 2019). Apart from the level and factors that drive financial inclusion, several other researches have inspected the linkage among financial inclusion and poverty alleviation in Africa. These include: Onaolapo (2015); Mohammed, Mensah & Gyeke-Dako (2017); Ajide (2015); Emara and Moheildin (2020); Ajisafe, Anyakudo, Akinkuotu, and Okunade (2018); Neaime and Gaysset (2018); Ageme, Anisiuba, Alio, Ezeaku & Onwumere (2018). Apart from these studies, scholars have concentrated on how financial access affects economic growth, monetary policy, income inequality and financial remittances: Anarfo, Abor, Osei & Gveke-Dako (2019); Esther (2019); Abbas, Hassan, Asif & Zainab (2018); Inoue and Hamori (2016); and Ajefu & Ogebe (2019). Moreover, Odhiambo (2010), Fowowe & Abidoye (2012); Boukhatem (2016) have empirically analysed the relationship among economic growth and poverty lessening.

Despite financial inclusion now becoming a 'hot' issue as part of the world-wide economic strategy to retain growth, finance-related research on financial inclusion is recognized and especially for throughout Africa. This paper empirically analyses the long-term association between financial access and poverty alleviation in selected East Africa countries. This study chooses to investigate poverty problems in these nations because they are considered to have too many people living below the poverty line (African Development Bank, 2019). This study will benefit policymakers in East African countries, in encouraging them to establish policies and/or reforms for their finances systems to alleviate poverty and contribute to creating financially inclusive societies in the region.

METHODOLOGY

Data and Variables

This study used balanced panel information which is obtained from the Financial Access Survey database operated by the International Monetary Fund (IMF) and World Development Indicators, which is part of the World Bank's database. The study examines 3 East African countries ((Rwanda, Zambia, and Zimbabwe) from 2010 to 2018. Most of the prior research has used financial inclusion as a proxy for the sum of ATMs per 100,000 individuals, such as (Neaime & Gaysset, 2018; Emara & Moheildin, 2020) but only a few studies have employed financial inclusion as proxy for the sum of mobile money transactions

per 1,000 adults. Research done by Abbas et al. (2018) and Wu, D. (2018) used poverty as a proxy for the poverty headcount ratio of living below \$1.90 a day as a percentage of population, and poverty headcount ratio of living below \$3.20 a day as a percentage of the population. Other analyses have used only the poverty headcount ratio at \$1.90 a day as a percentage of the population to measure the poverty level, for example, Emara and Moheildin (2020). Their study employed ATMs for every 100,000 individuals and the sum of mobile money transactions per 1,000 adults as proxies of financial inclusion, which functioned as an independent variable.

Model and Equation Development

The explanatory variable of the study is poverty reduction which serves as the proxy of poverty headcount ratio at \$1.90 a day as a percentage of the population, and the poverty headcount ratio at \$3.20 a day as a percentage of the population. The model is shown in the following equations written below:

$$\text{LogPoverty1.9it} = \beta_0 + \beta_1 \text{LogATMit} + \beta_2 \text{LogMNTit} + \text{uit} \quad (1)$$

$$\text{LogPoverty3.2} = \beta_0 + \beta_1 \text{LogATMit} + \beta_2 \text{LogMNTit} + \text{uit} \quad (2)$$

Where: LogATM = Natural Logarithm of the Number of ATMs per 100,000 people; LogPoverty1.9 = Natural Logarithm of Poverty at \$1.90 rate a day headcount ratio as a percentage of total population; LogMNT = Natural Logarithm of the Number of mobile money transactions users per 1,000 adults; and LogPoverty3.2 = Natural Logarithm of Poverty at \$3.20 rate a day headcount ratio as the percentage of total population.

Analytical Approach and Model Efficiency Test

In this study, Panel Unit Root Test is used to: firstly, investigate the extent to which the study variables are integrated; and secondly, evaluate the stationary properties of all variables employed. The study used different versions of the Panel Unit Root Test which included Fisher-type assessments using ADF and PP trials introduced by Maddala and Wu (1999). The null hypothesis of the Fisher-type assessment via ADF and PP valuations asserts there is a unit root across the cross-sections of all variables, whereas an alternative hypothesis assumes there is stationarity across the cross-sections. Also, the study utilized the Panel Co-integration test to identify the presence of a long-term connection among financial inclusion and reduction in poverty. The principle for classifying the co-integration is to check whether variables go in the same direction significantly in a certain relationship (Abadir & Taylor, 1999). The study engaged Pedroni's (1999, 2004) panel co-integration assessment to confirm if there was indeed an association between financial inclusion and poverty reduction.

Pedroni (1999, 2004) offered dual categories of assessments of co-integration, for instance group and panel experiments. The panel examination is founded on "within dimension" and comprises 4 main kinds of panels such as Panel rho-Statistics, Panel v-Statistics, Panel ADF-Statistics and Panel PP-Statistics. In contrast, the group test is founded on "between dimensions" and comprises 3 types, these being Group ADF-Statistics, Group PP-Statistics and Group rho-Statistics. All those 7 examination-statistics are asymptotically dispersed as normal standard. After discovering that the factors are co-integrated, the paper used the Panel Fully Modified Ordinary Least Squares (FMOLS) technique for the varied co-integrated panel to establish if there was a long-term equilibrium nexus (Pedroni, 2001). The FMOLS technique is intended to produce the highest estimate for co-integration regression which was initially introduced by Phillips and Hansen (1990). Co-integration relationships

among non-stationary sequences that cause to endogeneity in the regressor, could not be escaped by employing vector auto-regression. The technique amends the least squares to account for the influence of sequential association and for the endogeneity in the regressor. The outcomes emerge from the presence of a co-integration relationship.

RESULT AND FINDINGS

Panel Unit Root Test

The outcomes of the unit root assessment in Table 1 revealed that financial inclusion and poverty reduction are stationary at a level and first difference in both Phillips-Perron and Augmented Dickey-Fuller tests. Outcomes of the two tests revealed there was no higher order of integration such as I (2) in the model. For this reason, we accept the alternative hypothesis which is that all variables are stationary at the level and first difference, and we rejected the null hypothesis of non-stationary at the 5% significance level for all variables. Subsequently, these findings confirmed that all the factors are unified at the level and for order one. The next stage is to run the long-term link among the variables of concentration by employing the Pedroni co-integration technique.

Unit Root Test	Variables	Level	First Difference	Order
Augmented Dickey-Fuller (ADF)	LogPoverty1.9	25.8704*	25.7837*	1(0)
		0	0	
	LogPoverty3.2	25.8202*	16.5219**	1(0)
		0	-0.0112	
	LogATM	21.3263*	19.5959*	1(0)
		-0.0016	-0.0033	
	LogMNT	25.1149*	29.1113*	1(0)
		-0.0003	-0.0001	
Phillips-Perron (PP)	LogPoverty1.9	30.1945*	28.5824*	1(0)
		0	0	
	LogPoverty3.2	29.9610*	37.6587*	1(0)
		0	0	
	LogATM	22.9904*	16.2872**	1(0)
		-0.0008	-0.0123	
	LogMNT	37.9365*	26.2685*	1(0)
		0	-0.0002	
Note: All variables are in natural logarithm while the figures in parentheses are the p-value. * and ** represent significance at the 1% and 5% levels, respectively.				

Long-run Co-integration Test

The study engaged the Panel Fully Modified Ordinary Least Squares (FMOLS) to define the long-term equilibrium nexus among the variables of both models. Table 2 presents the outcomes of FMOLS. The coefficient of the hyperbolic logarithm for the sum of ATMs per 100,000 adults as representing financial inclusion, indicates statistical significance and is positive at the 1% level. In other words, the coefficient can be explained as a 1% expansion

in financial inclusion when used as a proxy. The sum of ATMs per 100,000 adults increases the level of poverty by 3%. However, when the employed hyperbolic logarithm of the sum of money transactions per 1,000 adults indicates financial inclusion, it showed an inverse link among financial inclusion and poverty alleviation. This outcome suggests that a 1% decline in the total of mobile phone financial transactions per 1,000 adults decreases the rate of poverty reduction by 0.5%.

Dependent variable	Model 1 LogPoverty1.9		Model 2 LogPoverty 3.2	
	Coefficient	Prob	Coefficient	Prob
LogATM	3.002162*	0.0005	3.298772*	0.0005
LogMNT	-0.523852*	0.0016	-0.570916*	0.0016

The figures in parentheses () are the probability figures while (*) represents significance at the 1% level.

Panel Granger Causality Test

The study used the Granger causality assessment to determine if there was a direct association between financial inclusion and poverty alleviation (see Table 3). Granger causality is a statistical theory that seeks to predict if one variable influences another (Granger, 1969). The study employed a maximum of 2 lags. The findings of Granger causality tests in Table 3 depicted there is no causality relationship in which financial inclusion influences poverty alleviation and vice versa. This is because the P-value is more than 5% which means that financial inclusion exerts no impact on poverty alleviation and vice versa. However, only the unidirectional relationship between number of mobile financial transactions per 1,000 adults and the sum of ATMs per 100,000 adults is found. This suggests that these transactions and the number ATMs both significantly influence each other and the P-value is less than 5%.

Variables	F-statistics	Prob.
LogPoverty1.90 causes to LogATM	0.04912	0.9522
LogATM cause to LogPoverty1.90	0.16507	0.8493
LogPoverty1.9 causes to LogMNT	0.5644	0.5796
LogMNT causes to LogPoverty1.9	0.12853	0.8803
LogPoverty3.2 causes to LogATM	0.03395	0.9667
LogATM causes to LogPoverty3.2	0.15919	0.8542
LogPoverty3.2 causes to LogMNT	0.70264	0.5099
LogMNT causes to LogPoverty3.2	0.10724	0.899

LogMNT causes to LogATM	6.17615	0.0103
LogATM causes to LogMNT	1.84233	0.1905
Note: The lag length of all variables is 2.		

Model Efficiency Test

The study used two sorts of panel co-integration technique: firstly, it employed (Pedroni's, 2004); and then secondly, Kao's (1999) to discover if co-integration did exist among the variables. Table 4 shows Pedroni's panel co-integration and it reported 5 "within dimension" and 3 "between dimensions". Furthermore, Pedroni's co-integration test led to the discovery that there is a long-run connection among variables and we reject the null statement. Specifically, this claims there is no co-integration association between the variables because the Group ADF-Statistics, P-value of Group PP-Statistics, Panel PP-Statistics and Panel ADF-Statistics are all below the 1% significance level. Kao's method helped to identify the long-term association and the outcomes of this test are presented in Table 4. It confirms that the presence of co-integration between the variables is signified by a P-value of less than 5%.

Test Statistics	Statistic	Prob.	Weighted	Prob.
Panel v-Statistic	-0.906569	0.8177	-0.961712	0.8319
Panel rho-Statistic	-0.302059	0.3813	-0.411090	0.3405
Panel PP-Statistic	-5.254898*	(0.0000)	-6.537653*	(0.0000)
Panel ADF-Statistic	-4.019277*	(0.0000)	-4.662846*	(0.0000)
Group rho-Statistic	0.407528	0.6582		
Group PP-Statistic	-11.66207*	(0.0000)		
Group ADF-Statistic	-5.054158*	(0.0000)		
Kao Statistics			T-Statistics	Prob
ADF			-2.601627*	(0.0046)
The figures in parentheses () are the probability values while (*) represents significance the at 1% level.				

Table 5 shows that the second model devised for this study investigates the level of co-integration while the Kao test identifies the existence of long-run nexus among variables. It emerged that the same outcomes with Model 1 indicate the degree of co-integration among variables because the P-value is significant but amounts to less than 5%. The Kao test does support Pedroni's co-integration assessment which showed there is a long-run link among factors of the study and the P-value is less than 5%. Therefore, the paper revealed that financial inclusion and poverty lessening are co-integrated in both models of the study. As the result of Pedroni's and Kao's tests, both models identified panel long-run equilibrium link between the variables, which in turn revealed that financial inclusion moves in unison with poverty reduction in the long-term.

Test Statistics	Statistics	Prob	Weighted	Prob
Panel v-Statistic	-0.878826	0.8103	-0.961223	0.8318
Panel rho-Statistic	-0.311931	0.3775	-0.409019	0.3413
Panel PP-Statistic	-4.936767*	(0.0000)	-6.593258*	(0.0000)
Panel ADF-Statistic	-3.918205*	(0.0000)	-4.675141*	(0.0000)
Group rho-Statistic	0.407764	0.6583		
Group PP-Statistic	-11.68740*	(0.0000)		

Group ADF-Statistic	-5.049508*	(0.0000)		
Kao Statistics			T-Statistics	Prob
ADF			-2.717791*	(0.0033)
The figures in parentheses () are the probability values while (*) represents significance at the 1% level.				

DISCUSSION

The study attempts to identify whether there is a long-run co-integration presence between the variables of financial inclusion and poverty alleviation in selected East African countries (Rwanda, Zambia, and Zimbabwe) from 2010 to 2018. The current research employs ADF and PP tests to identify the variables' stationary and co-integration assessment to inspect the long-term equilibrium nexus. The research utilizes dual indicator factors of financial inclusion: firstly, the natural logarithm for the sum of ATMs per 100,000 adults; and secondly, the natural logarithm for the number of mobile money transactions per 1000 adults. This study employs two indicators of poverty reduction. The study tries to solve a complex question of whether an improvement in financial inclusion alleviates the poverty rate in the chosen East African nations.

The experimental outcomes of this paper found a long-run co-integration nexus among financial inclusion and poverty alleviation variables. The findings are in line with the study of Ageme et al. (2018). The FMOLS outcomes depict a significant and positive link among LogATMs per 100,000 adults and poverty reduction, which is consistent with what Honohan (2004) and Jalilian and Kirkpatrick (2005) reported. In contrast, this study revealed a statistically significant and negative link between LogMNT per 1,000 adults and poverty reduction. This agrees with the discoveries of Romer & Romer (1998) and Inoue and Hamori (2012). It can be suggested that poverty in East Africa is positively impacted by the total of ATMs per 100,000 adults as an indicator of financial inclusion. Similarly, this also establishes that the influence could help raise the currently poor standard of living that most people in the region endure.

Most East Africans living under the poverty line are nomadic people and they generally stay in the countryside regions. In order to utilize the implications of this study, it is essential to develop financial services for the rural zones or urbanize them to some extent, so that more modern infrastructure can be provided in Rwanda, Zambia, and Zimbabwe. In addition, improved financial literacy in these rural areas could be the 'game-changer' in the battle for financial inclusion. Alternative strategies to help banking infrastructure can be measured, such as agency banking. Rural people currently suffer from financial handicaps, for example the seasonality of their wages and the displacement and migration brought about by climate change-induced events such as drought and floods. To prevent or minimize these serious problems, financial services need to be designed for the rural population so that their needs are met.

Our empirical results have significant policy implications. Policies should be coordinated so that they lead to a framework making the far-reaching conveyance of financial services possible. This is particularly vital for the Sub-Saharan and East African nations that are falling behind in accomplishing one of the sustainable development goals – the reduction of poverty. East African policymakers face challenges when determining whether to emphasise policy reforms that lead to meaningful innovation, financial access and financial inclusion or whether to concentrate on other kinds of developments that improve financial stability. Nevertheless, this study recommends policymakers to consider making the most of recent discoveries that have accentuated finance-related innovation (fintech). For example, mobile financing, biometric ID and electronic installments can reduce poverty by ensuring there is flexibility in financial systems that make obsolete the requirement of a physical presence.

A range of studies reveal the ways in which quicker, less expensive, and safer financial exchanges occur through advanced technology (Jack & Suri, 2014; Beck et al., 2015; Mbiti & Weil, 2015; Suri & Jack, 2016; El-Zoghbi et al., 2019). Similarly, fintech services have likewise appeared to support ventures and help many families overcome or survive calamities, and in a practical sense remove the gender gap so that women have access to finances (United Nations, 2019). Such advances will benefit East African governments by bringing down operational expenses while encouraging admittance and acceptance to financial services. The idea is that, given the East African countries have combined nearly 100 million "digital locals" younger than 30 years of age, advanced financial inclusion should be at the top of governments' poverty reduction strategies.

For these reasons, governments are recommended to enhance financial inclusion by investing more in assets to upgrade their institutional and administrative structures. Furthermore, those in charge of finance/banking administration systems are urged to devise approaches that give entrepreneurs access to private sector financing so that larger inaccessible territories are covered. Such an effort will enhance the dynamics of the supply side so that it works well with the demand side factors. If administration systems expand access to financial institutions, then it is expected that the anticipated risk of poverty will decrease. Hence, widening and improving people's access to financial amenities and making this process as productive as possible, will help all the people, not just those living in conditions of penury. Poverty in the East African nations can be solved by ensuring that the right financial services are developed for poor people.

CONCLUSIONS

Enriched access to financial inclusion has become one of the most important strategies for improving the development of the global economy. The relationship between government policy and poverty mitigation is not clear, and various hypotheses have been proposed which often produce conflicting answers. Moreover, we do not have enough experimental proof on the connection among financial inclusion and poverty alleviation in the selected East African nations. This study utilized ADF and PP tests to identify the stationary of the variables and co-integration assessment to evaluate the nature of the long-term equilibrium nexus. The experimental outcomes indicated a long-run co-integration link among financial inclusion and poverty alleviation variables.

The findings have important financial implications for humanitarian agencies and other relevant bodies who are trying to eradicate poverty in East Africa. Results of this research are consistent with the theory that financial inclusion to some extent erases poverty by reducing the costs associated with accessing financial services and increasing equal opportunity for everyone in society. Our empirical study reveals that policymakers should adopt advanced measures to develop financial inclusion since it has a long-term link with poverty reduction. Since conveyance and use of mobile banking innovations are anticipated to alleviate poverty in a straightforward way as suggested in this research, it will make achieving the SDGs easier to do.

Lastly, the lack of more available data from the East African nations is a key limitation that future studies on financial inclusion's impact on poverty alleviation should take into account. Future studies should focus using more variables of financial inclusion to comprehend the different aspects of it and how these affect poverty reductions. The governments of the three chosen East African countries must pay close attention to data accessibility given the ubiquitous nature of digital financial transactions and these could lead to solutions for poverty in the region. As more information becomes available over time,

future researchers could extend this investigation by comparing nations and/or regions of the world, in terms of evaluating the nexus among access to finance and poverty reduction.

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