



Effect of Financial Inclusion on Income Inequality in Sub-Saharan Africa

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Aims: To analyze financial inclusion as a channel to alleviate inequality in order to provide insight into the edifice of inequality reduction.

Study Design: Dynamic panel study.

Place and Duration of Study: Sub-Saharan African countries over the period 2004-2018.

Methodology: Using the generalized method of moments (GMM) on a sample of 27 Sub-Saharan African countries.

Results: The results show that the estimated financial inclusion index has a negative effect on income inequality. Therefore, the depth of commercial bank branches and the effective use of bank accounts reduce income inequality.

Conclusion: Increase financial inclusion as well as the development of financial infrastructure and the provision of specific low-cost services tailored to low-income households.

Keywords: Financial inclusion; financial inclusion index; GMM; income inequality.

Classification JEL: D31, D63, G21, O16.

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1. INTRODUCTION

Over the past two decades, Africa has experienced a rapid economic growth, leading scholars to refer to "Africa on the rise". However, we might have thought that this growth would benefit the poor more than the rich with being more inclusive and contributing to poverty reduction. But this dizzying growth has not the desired effect on the poor, reducing poverty and inequality in general and income inequality in particular. Many authors have analyzed inequality and the link between inequality and finance. Kuznets [1], which establishes a non-linear relationship between the level of economic development and income inequality. As for financial factors, authors such as Piketty [2] show that labor income and wealth are explanatory factors of income inequalities. Milanovic [3], for his part, analyses the differences in inequality between different countries and concludes that inequality follows an "elephant-shaped" curve. This is reflected in the high importance of reducing inequalities.

Level of income inequality in SSA is very high. Indeed, according to UIS¹ (2018), Africa has the most unequal countries in the world. This observed level of income inequality in SSA may be due to the paucity of studies on the issue in Africa and the unexplored avenues that have yet to be explored. Inequality is an important problem in a society. There is a consensus that a developed financial sector is a counterpart for inclusive economic growth [4] and financial inclusion is a dimension of financial development. According to the World Bank report (2012), financial inclusion is access to financial services for all segments of the population at lower cost. However, in an environment where access to financial services is limited to individuals based on income and gender, financial development can lead to a gap between the poor and the rich.

While scholars analyzed the relationship between finance and inequality, most of these studies do not allow us to make a definitive decision on the nature and meaning of this relationship. Since the pioneering work of Kuznets [5], Greenwood and Jovanovic [5] analyzing the link between finance and inequality, studies on this relationship have proliferated. These studies [6,10,4,11] mainly show that financial development has a positive

effect on reducing inequality. Inequality will increase at the beginning of development and decrease at the end of development. Two main points can be highlighted. The former highlights a controversial relationship between financial development and inequality [5] while the latter highlights the availability of financial services as a factor in reducing inequality [7]. These studies mainly analyze the effect of inequality on financial development. In both developing and developed countries. The originality of this study lies on the use of a composite index of financial inclusion, which is currently hardly ever used, particularly in Sub-Saharan Africa. In addition to the Financial Inclusion Index, we analyze different dimensions of financial inclusion to determine which one primarily influences income inequality.

Financial development is strongly correlated with household inequality. Access to financial services, financial development in terms of financial depth (as measured by the credit/GDP ratio), has an effect on inequality all else being equal. It is then essential to study this linkage, as the persistence of inequalities can undermine efforts to reduce poverty. This paper analyses theoretically and empirically the effect of financial development and inequality in general and in particular one dimension of financial development that is financial inclusion on income inequality. To do so, we will use different dimensions of financial inclusion and construct a FI index to strengthen our analyses. The objective here is not to take stock of the channels through which inequality can influence financial inclusion, but to analyze financial inclusion as a channel to alleviate inequality in order to provide insight into the edifice of inequality reduction. We use a general method of moment on a panel of 27 SSA countries from 2004 to 2018. We find that financial inclusion, globally, has a negative and significant effect on reducing income inequality. Thus, increasing financial inclusion in terms of access to and use of financial services contributes to the reduction of inequalities.

The rest of the study is structured around as follows: The second section highlights the stylized facts, the third section focuses on empirical literature, the fourth section is devoted to the presentation of statistical and econometric tools, the fifth section presents the main results of our empirical analyses, and finally the last section concludes and gives some policy implications.

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2. FINANCIAL INCLUSION AND INEQUALITY IN SSA: SOME STYLIZED FACTS

In general, income inequality as a key determinant of low financial inclusion is widely discussed in the literature [10,12,13]. And, these authors conclude that inequalities have a negative impact on financial inclusion. Is the reverse relationship true?

2.1 Low Improvement in Financial Inclusion in SSA

The graphs in appendix show that the access to different banking services for different regions of the world. These are accounts in formal financial institutions, savings and bank borrowing.

According to the IMF report (2016), access to financial services is a prerequisite for people's well-being. Access to financial services is the basis for individuals to qualify as included before indicators of banking usage. Based on these indicators, SSA is the region with the lowest rates of access to various financial services with low-income countries, most of which are those in

Sub-Saharan Africa and well below the global level. With the highest level for high-income countries. In each case there is a gender gap. These gaps appear to be higher for low-income countries and those in Sub-Saharan Africa where the gap is high. These particularly high inequalities in the region exacerbate the low rate of inclusion because, as we have said, there is a negative and significant relationship between income inequality and access to financial services.

2.2 There is a Positive Relation between Per Capita Income and Financial Inclusion

However, there is a positive relationship between per capita income and financial inclusion. Income inequality refers both to differences in country levels and per capita household income. Fig. 1 illustrates the difference between African countries. We have the high-income countries where financial inclusion is quite developed (according to the Global Findex database, we have an access rate of 99% in these countries). On the other hand, in low-income countries, inequality is high due to the low income level of a significant part of the population.

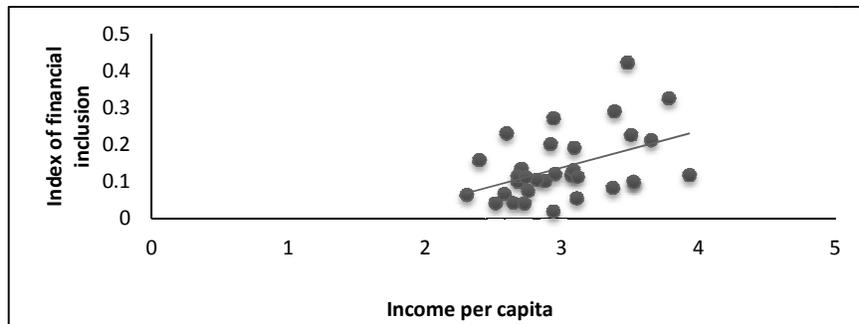


Fig. 1. Correlation between financial inclusion and income per capita
 Source: Author based on data from the global findex database (2004-2016)

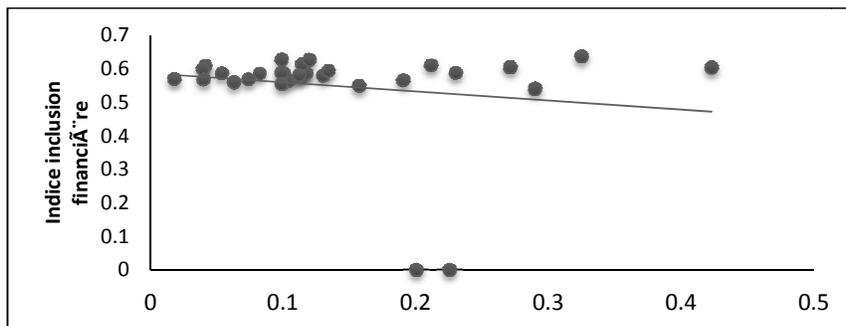


Fig. 2. Correlation between Gini index and FI Index between 2004-2016 in SSA
 Source: Author based on data from global findex (2018)

The Fig. 1 shows that financial inclusion, as captured by the Financial Inclusion Index, has a positive relationship with per capita income. However, since the correlation is different from causality, this graph is limited to showing a presumption of a causal relationship between financial inclusion and the level of household income.

When correlating financial inclusion with income (captured here by the logarithm of GDP per capita) in SSA and over the period considered, a positive relationship between income per capita and financial inclusion in SSA emerges. As income increases, the level of inclusion increases. This positive result corroborates the findings of Kempson and Whyley [14]. In 2017 the global finindex database reported that in SSA, 27% of individuals acknowledge that they do not have accounts in formal financial institutions because of the high costs of banking services. To this end, 73% of individuals cited lack of funds to use and maintain a bank account as the reason. Income inequality is not to be outdone in terms of its effect on financial inclusion.

2.3 Negative Relation between Inequality and Financial Inclusion

The Fig. 2 shows the correlation between the Gini index and the SSA Financial Inclusion Index over the period 2004-2016.

There is a negative correlation between the Gini index that captures income inequality and the financial inclusion index. It is consistent with authors who analyze a negative relationship between inequality and financial development. These are [15-19].

3. LITERATURE REVIEW

3.1 Theoretical Framework

The theoretical anchoring of income inequality dates back to the seminal work of Kuznets [1], which establishes a non-linear relationship between the level of economic development and income inequality. The author examines the effect of inequalities in income distribution on economic development. Kuznets [1], argument shows that, in the early stages of development, income inequality increases due to the rapid rate of urbanization. However, in the intermediate stage of development, the relationship is expected to stabilize and then begin to deteriorate at an advanced stage as a result of public redistribution policies. Initially, income inequality increases in the early stages of

development until it reaches a peak of inequality that begins to decline as the country develops.

Subsequently, Banerjee and Newman [7], Galor and Zeira [6] approached the relationship between finance and inequality by showing a negative relationship between financial development and income inequality. Banerjee and Newman [7] model is based on the initial assumption that finance can provide entrepreneurial opportunities for each individual. Poor people do not have access to financial services because of their low or non-existent income. This is because they often have no credit history and no collateral to offer. Moreover, market imperfections lead poor economic agents to opt for wages rather than self-employment, and the rich, those who have access to financial services and financing from financial intermediaries, become entrepreneurs who employ the poor. Galor and Zeira [6] model focuses on the distribution of wealth through investment in human and physical capital. According to these authors, imperfect credit markets prevent a better allocation of resources by reducing the capacity of households to invest in human and physical capital. The authors postulate that, while individuals are equal in terms of ability, they differ in terms of inherited wealth. Thus, inheritance determines the investment that heirs will make in their assets. The initial endowment is then a determinant of inequality reduction. Reducing financial constraints will then benefit the poor, reduce inequality and increase economic growth.

The literature identifies three factors of income inequality. Socio-economic factors, institutional factors and financial factors. Socio-economic factors such as inflation and unemployment influence income inequality [20]. Institutional factors have a negative relationship with income inequality [21,22]. On the other hand, other authors [23,24] show an inverted U-shaped relationship.

As for financial factors, authors such as [2] show that labor income and wealth are explanatory factors of income inequalities. [3], for his part, analyses the differences in inequality between different countries and concludes that inequality follows an "elephant-shaped" curve. According to him, overall inequalities are high and are mainly due to differences between countries.

These studies have shown that, income inequality is caused by different factors. This has made it possible to consider two visions of

financial inclusion. Firstly, the optimistic vision [25,12] which shows that financial inclusion enables individuals to smooth their consumption, invest in human capital and build up savings. According to the pessimistic view (Mokerjee and Kalipioni) [26], financial inclusion helps fuel income inequalities between populations.

3.2 Empirical Studies

Research has focused on both the microeconomic evidence linking finance to economic opportunities and macroeconomic analyses of income distribution. For example, while some studies analyse the effect of finance on savings, education and investment, others highlight the effect of finance on the Gini coefficient. However, it should be noted that studies on SSA, although existing, are scarce. Different authors have reached conclusions that are more or less in agreement with the above theory.

Empirically, the effects of financial inclusion on income inequality can be direct and indirect. From a direct perspective, the effects of financial inclusion on income inequality are non-consensual. Through improved financial services for agents who already have access to the formal financial system, including: well-established firms and wealthy individuals. Conversely, financial development indirectly improves access to and use of financial services by agents who, due to financial constraints, had not used financial services. In other words, financial development will reduce the intergenerational persistence of relative incomes by improving economic opportunities for less privileged groups [27]. This is consistent with liquidity constraint theory, which posits that constraints on access to liquidity hamper business opportunities for the poor and thus increase income inequality for economic operators [28,29,30].

Although increased access to financial services accelerates economic growth and stimulates demand [31], there are inequalities and consequences in terms of the distribution of growth gains. Initially, the gains are concentrated on a small group of individuals who, because of market imperfections, will benefit from the full gains [7]. But eventually, a larger class of workers will benefit from the entrepreneurial spillovers of wealthy individuals.

The model of Gine and Townsend [32] suggests that the best quantitative impact of access to

household financial services on income inequality remains the indirect effect of employment and wages on the labor market. According to these authors, reductions in inequality do not come from poor people accessing financial services for the first time or from individuals at the bottom of the ladder increasing their access to financial services, but rather, they argue, the reduction in inequality comes from the increase in the labour force.

In the same vein, Kim, et al. [33] attempts to estimate how financial inclusion has a positive impact on reducing inequality. In addition, the author estimates the effect of financial inclusion on financial growth. The author shows that income inequality has a negative impact on economic growth; this negative relationship is even stronger for low-income countries. Financial inclusion improves the relationship between income inequality and economic growth. Reducing income inequality through financial inclusion changes the negative relationship between income inequality and economic growth into a positive relationship.

Studies that have examined the link between financial inclusion and income inequality have analyzed the indirect effect through the size of the financial sector, economic development, and fiscal policies. According to these authors, the size of the financial sector does not contribute to a more equal distribution of income. In this study, we consider different dimensions of financial inclusion. Indeed, lower costs of financial services reduce income inequality to the extent that entrepreneurs obtain credit and workers obtain higher wages. Relaxing borrowing constraints, on the other hand, can have an ambiguous impact on inequality.

From the non-exhaustive review of the literature on the effect of financial inclusion on inequality, three main points can be made. First, financial inclusion is important for people, second, financial inclusion can exacerbate inequality, and third, financial inclusion can help reduce inequality.

In fact, the different dimensions of financial inclusion may have different consequences for inequality. In a partial equilibrium analysis, all economic agents can benefit from a more inclusive financial system, even at varying degrees of economic development. However, in general equilibrium of Pareto, the resulting

changes in interest rates and wages can lead to losses for some agents. For example, the most effective policy for increasing access (reducing participation costs) benefits mainly poor and talented agents, while rich agents lose out because of higher interest rates and wages. In contrast, policies that target financial depth (easing borrowing constraints) benefit rich and talented agents but may impose losses on rich but less talented agents. In this study we exploit the different dimensions of financial inclusion to define which has more impact on reducing inequality.

4. EMPIRICAL MODEL, METHODOLOGY AND DATA

4.1 Model and Variables Definitions

In order to analyze the relationship between financial inclusion and income inequality, this study draws on the work of Kuznets [1], and Mokerjee and Kalipioni [26]. The model is as follows:

$$GINI_{it} = \alpha + \beta_0 GINI_{i,t-1} + \beta_1 FI_{it} + \beta_2 GDP_{it} + \beta_3 GDP_{it}^2 + \delta X_{it} + \epsilon_{it}$$

$$\epsilon_{it} = \mu_{it} + \gamma_t + \rho_{it}$$

- **The dependent variable**

$GINI_{it}$ represents the inequality index in country i at date t . Income inequality describes the gap between the wealthy who can afford better living conditions and those living below the income poverty line. The coefficient is measured on a scale of 0 to 1, where 0 corresponds to perfect income equality and 1 corresponds to perfect inequality (where one person receives all the income). Although the Gini coefficient reflects the distribution of income, it is limited because it does not demonstrate the well-being of the low-income group [34].

This study also uses the Atkinson Index to test the sensitivity of the results. The Atkinson Index is a popular measure of 'income inequality,' which measures the percentage of total income that a given society would have to give up in order to have more equal shares of income among its citizens. The same justification has been provided for the use of these inequality indicators in recent literature [35].

- **The variable of interest**

Financial inclusion (FI) was calculated using the methodology of Sarma [36], Sarma and Pais

[37]. Studies on the link between access to financial services and income inequality have used the number of bank branches per 100,000 inhabitants as a proxy for financial inclusion [26] According to Mundaca [38], this measure captures the real effect of finance through household access in a country. The index we construct has the advantage that it includes the accessibility, availability and use of financial services. So it aggregates that the variables used by the different [36] and [37]. Indeed, they use either an index of access, depth or use of formal financial services.

The formula for the Financial Inclusion Index is as follows:

$$FII = 1 - \frac{\sqrt{(1-d1)^2 + (0.5-d2)^2 + (0.5-dn)^2}}{1.5}$$

In this equation, d_i represents the different dimensions taken into account in the calculation of our index. These are the penetration of the banking system with the number of bank accounts per 1000 inhabitants as a proxy for $d1$, the availability of banking branches and ATMs per 1000 inhabitants for $d2$, and finally, the use of these financial services, which is captured by the ratio of credits plus deposits to GDP for $d3$.

In our analyses, we also use the disaggregated values of the index to capture the weight of each value on the dependent variable.

- **Control variables**

GDP per capita is used as an indicator of the level of development of a given economy. Kuznets [1] shows that the financial inequality tandem follows an inverted U-shaped curve with increasing inequality at the initial stage of financial development and declining towards the end of the development cycle. Similarly, we assume that the Financial Inclusion Index (FII) and the Gini Index follow the same process. Indeed, there will then exist an inverted U-shaped relationship between these two variables. As a result, GDP per capita will be negative and GDP^2 will be positive. The countries in our sample are at the beginning of their financial development, which is conducive to an increase in inequality.

Inflation reflects the monetary macroeconomic stability of the economy. According to Easterly and Fischer [39] and Sylviane and Kpodar [40],

high inflation is more likely to harm the poor than the rich, since the latter are less exposed to macroeconomic shocks because of their greater access to financial instruments. A positive sign is then expected.

Political stability has a negative sign because it reduces inequality and a positive sign if it is explained from the point of view of political instability.

Unemployment and the informal sector A review of the literature shows a positive correlation between unemployment and income inequality. In different economies. According to Burdett and Mortensen [41], there are positive correlations between the Gini index and the unemployment rate.

4.2 Estimation Technique and Data Source

Examining the effects of financial inclusion on income inequality is not without obstacles. The main identification problem that can arise is the correlation of some of our exogenous variables with the error term. Estimating the above equations using OLS can lead to inconsistent and biased estimates, since the Gini lag is endogenous to fixed effects (μ_i). Because of the high probability of a correlation between the lagged value and the error term, double least squares estimates, even after accounting for fixed and random effects, can lead to biased estimates. The Generalized Method of Moments (GMM) developed by Hansen [42] could correct this problem of endogeneity bias. Indeed, this method eliminates any unobserved country-specific effects that are invariable over time, thus eliminating any potential source of bias.

As suggested by Arellano [43] and Blundell and Bond [44], two tests are needed to ensure the consistency of estimates from GMMs: Sargan and Hansen's over-identification tests, the latter being robust to the former, but more sensitive to the number of instruments. Both tests accept the null hypothesis that the instruments are exogenous.

Blundell and Bond [44] find that the GMM estimator in a system is more efficient than the difference estimator, which only uses the conditions of the moments of the equation in first difference with level lagged variables as instruments. The validity of the instruments is made by the Sargan and Hansen test [45].

Concerning the data source, the variables GDP per capita, inflation, unemployment, and weight of the informal sector are from the WDI database (2018); the political stability variable is from the WGI database (2018); the Gini index variable which is our dependent variable is from the WDI database (2018) and the Atkinson variable is from the World Inequality database (2018). It is a base that has provided open and convenient access to the largest database currently available on the global distribution of wealth both within and between countries.

5. PRESENTATION AND DISCUSSION OF RESULTS

5.1 Descriptive Results

In this sub-section, we present the results of descriptive statistics: the correlation matrix and descriptive statistics.

There is a positive correlation between our different variables and our inequality indices. However, there is a negative correlation with the informal sector variable. The informal sector exacerbates inequalities and reduces access to formal financial services.

5.2 Results and Interpretation

The impact of financial inclusion on income inequality is estimated using the OLS method. For maximum data availability, our sample covers a panel of 27 SSA countries. Table 3 presents the results of the estimation of the above model showing the effect of financial inclusion on income inequality. There are four regressions in the results table. Financial inclusion consists of indicators of accessibility, penetration and use of banking services and income inequality, captured by the GINI index.

The results in Table 3 show that only the overall index and the usage indicator are negative and significant at 10%. Indeed, the Financial Inclusion Index (FII) in column 1 suggests that a one-point increase in financial inclusion reduces income inequality by 0.0670 points in the sample and over the period considered. Thus, better access to financial services for a large majority of individuals at affordable costs and effective use of these services reduces income inequalities. Having access to financial services increases the ability of low-income individuals (the poor) to cope with macroeconomic shocks and reduces inequality.

Table 1. Correlation matrix

	Atkinson	Gini	IIF	Stability	GDP	Access	Enter	Usage	Unempl	Informal	Inflation
Atkinson	1,0000										
Gini	0,9149	1,0000									
IIF	0,0861	0,1088	1,0000								
Instability	0,0281	0,0304	0,2546	1,0000							
GDP	0,2279	0,1486	0,5149	0,1617	1,0000						
Access	0,1287	0,1862	0,5924	0,4727	0,3986	1,0000					
Penetration	0,0608	0,1057	0,3687	0,3309	0,1289	0,7569	1,0000				
Usage	0,0411	0,0975	0,8537	0,1905	0,5184	0,5435	0,3013	1,0000			
Unempl	0,3789	0,3014	0,4002	0,0103	0,6789	0,3768	0,1553	0,3388	1,0000		
Informal	-0,2514	-0,265	-0,263	0,1810	-0,0637	-0,1043	-0,1082	-0,158	-0,1853	1,0000	
Inflation	-0,0975	-0,124	0,1274	0,1677	-0,1109	0,1127	0,0722	0,0665	-0,0585	0,1921	1,0000

Note: IIF is financial inclusion index and Unempl is unemployment; Source: Author

Table 2. Descriptive statistics

Variables	Observations	Average	S.D	Minimum	Maximum
Atkinson	405	0,702754	0,0578993	0,509804	0,834688
Gini	405	0,586366	0,028822	0,488273	0,672078
IIF	401	0,139009	0,1064844	0,006146	0,536415
Instability	291	-0,498187	0,8400534	-2,52378	1,200234
GDP	401	3,014332	0,4192265	2,105271	4,030041
Accessibility	401	1,059171	0,9470243	-2,10202	3,537419
Penetration	401	2,627574	0,7185687	-0,134763	4,856971
Usage	401	4,541829	1,250642	-0,997140	7,483492
Unemploym	401	1,904962	0,8420405	-0,295714	3,627004
Informal	379	3,651233	0,2076523	3,095578	4,235265
Inflation	399	8,47427	24,24134	-8,97474	302,117

Source: Author

Table 3. OLS results (GINI)

	Dependent variable : GINI Index			
	(1)	(2)	(3)	(4)
IIF	-0,0670* (0,103)			
Accessibility		-0,000536 (0,00204)		
Depth			-0,00260 (0,00182)	
Usage				-0,00079* (0,00136)
GDP	-0,0183 (0,0203)	-0,0153 (0,0181)	-0,0145 (0,0175)	-0,0159 (0,0199)
GDP2	0,00102 (0,00137)	0,000871 (0,00125)	0,000801 (0,00121)	0,000869 (0,00137)
Political instability	0,00747*** (0,00222)	0,00648*** (0,00228)	0,00708*** (0,00212)	0,00601*** (0,00199)
Inflation	-0,000641*** (0,000241)	-0,000503** (0,000206)	-0,000488** (0,000206)	-0,000498** (0,000218)
Informal	-0,0386*** (0,0101)	-0,0342*** (0,0101)	-0,0357*** (0,00970)	-0,0327*** (0,00792)
Unemployment	0,00706*** (0,00271)	0,00722*** (0,00258)	0,00726*** (0,00258)	0,00718*** (0,00251)
Constant	0,796*** (0,0961)	0,766*** (0,0902)	0,775*** (0,0870)	0,760*** (0,0775)
Observations	260	260	260	260
R-squared	0,185	0,157	0,162	0,158

Note: *, **, *** indicates significance at 10%, 5% and 1% respectively; Source: Author

However, due to the lagged variables in the model, this estimation technique is not appropriate. It encountered problems of endogeneity. Table 4 presents the results of estimating the effect of financial inclusion on income inequality using the GMM in-system technique.

Two statistical tests validate the empirical model. First, the AR(2) testing the autocorrelation of errors should not be rejected. Second, the null hypothesis of the identification of the Sargan and

Hansen tests should not be significant because their alternative hypotheses propose that, the instruments are invalid or correlated to the error term. In line with recent literature [46], it is preferable to consider Hansen's test and limit the proliferation of instruments by ensuring that the number of instruments is less than the number of countries in each specification [45].

The GMM estimation results in the Table 3 reinforce the OLS estimates in Table 3. The coefficients associated with the overall Financial

Inclusion Index (IIF) and the penetration and usage indicators are all negative and significant at 5% and 10% respectively. These results show that reducing inequality in the countries in our sample is strongly conditioned by the financial inclusion of poor households and more particularly by the penetration of bank branches and the use of financial services. When the overall financial inclusion index is increased by 1 point, inequality is reduced by 0.0135. And, when the indicators of penetration and use of banking services are increased by 1 point, inequality decreases by 0.00277 and 0.00354 respectively. These results also suggest that access to bank accounts does not have a significant impact on reducing income inequality. Kuznets [1] hypothesis is confirmed because the relationship between GDP growth and inequality is an inverted U-shaped relationship. Being in their launch phase, the countries in our sample are on

the rising part of the curve, i.e. an increase in GDP leads to an increase in inequality. This result is in line with those of the theoretical study by Greenwood and Jovanovic [5], which has been questioned by Banerjee and Newman [7] who show the negative impact of financial inclusion on income inequality. Beck and Torre [47] show that, first, financial inclusion has a considerable impact on household income; second, they show that low-income households benefit more from financial inclusion than high-income households; and third, they argue that financial inclusion helps reduce income inequality in China. Also, according to Kim [48], for financial inclusion to reduce inequalities in social protection and ensure income convergence, rural financial markets need to be redesigned to allow greater access to credit, especially for low-income and vulnerable households.

Table 4. GMM results (GINI)

	Dependent variable : GINI Index			
	(1)	(2)	(3)	(4)
Gini(-1)	0,919*** (0,0327)	0,873*** (0,00405)	0,874*** (0,0445)	0,857*** (0,0469)
IIF	-0,0135** (0,00649)			
Accessibility		-0,000821 (0,000924)		
Penetration			-0,00277*** (0,000782)	
Usage				-0,00354*** (0,00104)
GDP	0,0120*** (0,0160)	-0,00772** (0,00575)	-0,0199** (0,0192)	0,00172 (0,0118)
GDP2	-0,00111** (0,00119)	0,000251** (0,000379)	0,00115* (0,00150)	-0,000655 (0,000803)
Political instability	0,00297*** (0,000970)	0,00263*** (0,000880)	0,00404*** (0,000743)	0,00386** (0,00146)
Inflation	-0,000190** (7,56e-05)	-0,00026*** (6,15e-05)	-0,00114*** (0,000142)	-0,000353*** (8,93e-05)
Informal	-0,0176*** (0,00635)	-0,0116* (0,00638)	0,00286 (0,0106)	-0,0351*** (0,00852)
Unemployment	0,00406 (0,00419)	0,00256 (0,00247)	-0,00304 (0,00503)	0,0106 (0,00312)
Constant	0,0787 (0,0491)	0,155*** (0,0400)	0,166*** (0,0405)	0,232*** (0,0600)
Observations	234	234	234	234
Number of countries	28	28	28	28
AR(1)	0,00176	0,00187	0,0799	0,0179
AR(2)	0,236	0,219	0,116	0,152
Instruments	26	26	26	26
Hansen OIR	0,748	0,497	0,787	0,606
Fischer	1686	23338	1710	989,1

Note: *, **, *** indicates significance at 10%, 5% and 1% respectively; Source: Author

Table 5. GMM result (Atkinson)

	Dependent variable : Atkinson Index			
	(1)	(2)	(3)	(4)
Atkinson (-1)	0,958*** (0,0107)	0,997*** (0,00966)	0,981*** (0,0405)	0,998*** (0,0413)
IIF	-0,0138*** (0,00475)			
Accessibility		-0,00406*** (0,00115)		
Penetration			-0,00101 (0,00468)	
Usage				-0,00113* (0,000795)
GDP	-0,0296*** (0,00868)	-0,107*** (0,0233)	-0,111 (0,0754)	-0,152** (0,0659)
GDP2	0,00194*** (0,000640)	0,00764*** (0,00169)	0,00774 (0,00531)	0,0108** (0,00466)
Stability pol	0,00135** (0,000551)	-0,00145 (0,00122)	0,000568 (0,00359)	0,00287 (0,00427)
Inflation	-0,00026*** (3,97e-05)	-0,00056*** (9,84e-05)	-0,00069** (0,000351)	-0,00070** (0,000355)
Informal	0,00164 (0,00336)	-0,0324*** (0,00831)	-0,00838 (0,0188)	-0,0284 (0,0248)
Unemployment	0,00114 (0,00245)	-0,00745*** (0,00183)	-0,00589 (0,00698)	-0,00773 (0,00715)
Constant	0,134*** (0,0264)	0,522*** (0,0832)	0,452 (0,301)	0,656** (0,297)
Observations	207	207	207	207
Number of countries	28	28	28	28
AR(1)	0,00130	0,00206	0,00326	0,00612
AR(2)	0,732	0,195	0,785	0,755
Instruments	26	26	26	26
Hansen OIR	0,463	0,947	0,976	0,991
Fischer	36922	7390	193,5	187,5

Note: *, **, *** indicates significance at 10%, 5% and 1% respectively; Source: Author

The control variables have all the expected signs. Political stability is a positive and significant sign for the overall financial inclusion index and for the indicators of accessibility, penetration and use of financial services. Political stability can reduce the inequalities created by political instability if it provides the conditions for ruling elites to put in place practices that maintain, foster and promote the equal distribution of the fruits of growth. However, in the case of our sample, which is all SSA countries, this positive sign is justified by the political instability in these countries. The informal sector and unemployment variables are insignificant for the financial services penetration indicator for the informal sector and for the accessibility, penetration and even the overall indicator for unemployment.

These results corroborate those of Mokerjee and Kalipioni [26] Using a sample of developed and

developing countries, the authors find that broad access to formal financial services robustly reduces income inequality in these countries. They also find that barriers to access to banking services increase income inequality. Like Beck and Torre [47], the authors use bank branches per 100,000 inhabitants to capture financial inclusion.

5.3 Robustness Analysis

In this subsection, we estimate using the Atkinson index as the dependent variable. The question for us is whether financial inclusion has an impact on income inequality as captured by the Atkinson index. The Atkinson index is a popular measure of income inequality; it measures the percentage of total income a society needs to have an equal distribution among its citizens.

Table 5 presents the results of these estimates using the Atkinson index as the dependent variable. Overall, the results are stable compared to previous estimates.

Financial inclusion in terms of access to financial services has a negative impact on income inequality here captured by the Atkinson index. Indeed, if we look at the variables of interest, when we increase the accessibility and use of banking services by one point, inequalities are reduced by 0.00406 and 0.00113 respectively.

These results are consistent with those of Kim [48] who shows that financial inclusion in terms of affordability in low-income and fragile countries has a negative impact on income inequality.

6. CONCLUSION

This study aims to analyze the effect of financial inclusion on income inequality in SSA. We use the empirical model introduced by Galor and Zeira [6] and test the Kuznets [1] hypothesis in this context. Data is collected on 27 SSA countries for the period 2004-2018. Based on our estimates, we find that financial inclusion, globally, has a negative and significant effect on reducing income inequality. Thus, increasing financial inclusion in terms of access to and use of financial services contributes to the reduction of inequalities. This findings lead us to propose the following economic policy recommendations to reduce income inequality in SSA. First, to ease bank conditions so that they can give to all social classes the opportunity to have access to bank accounts. Then, to set up specific conditions for individuals with lower incomes so that they benefit from a better allocation of resources and redistribution. Finally, we recommend the implementation of training workshops on banking language by experts from the banks and the creation of partnerships between microfinance institutions and banks in rural areas in order to multiply the provision of financial services to as many people as possible.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX

World Indicators of Financial Inclusion

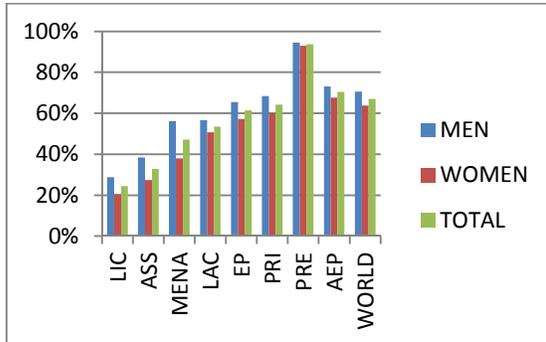


Fig. 1. Hold an account in a formal financial institution

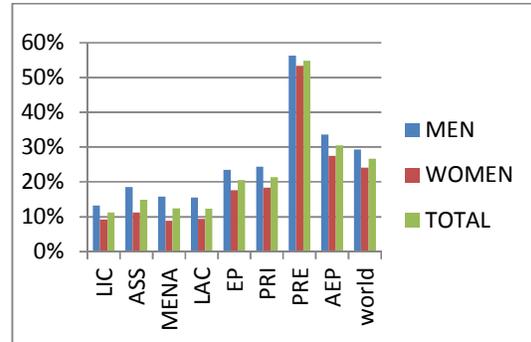


Fig. 2. Data saved in a formal financial institution

Source: Authors based on data from the findex global database (2018)

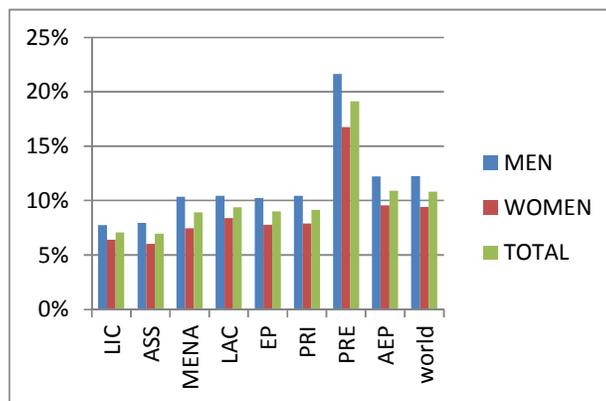


Fig. 3. Borrowed from a financial institution

Source: Authors based on Global findex data (2018)

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