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## **Remittances, Financial Inclusion and Income Inequality in Africa**

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# Remittances, Financial Inclusion and Income Inequality in Africa

Yannick BKWAYEP<sup>1</sup>

## Abstract:

This paper extends the existing literature on financial inclusion by analyzing the role of financial inclusion (FI) within remittances on income inequality (Gini, Atkinson and Palma-Ratio). It examines whether FI amplifies the reduction in income inequality in a panel of 47 countries over the period 2004-2014. The empirical evidence is based on Generalised Method Moments. We used Five financial inclusion indicators (ATMs for 100,000 adults; banking branches for 100,000 adults; credits: deposits and insurance), remittances and three income inequality variables (Gini index; Atkinson and Palma ratio) as part of this study. The results show that migrant remittances and FI reduce income inequality. The results further indicate that FI amplifies the impact of the migrant remittances on income inequality, revealing a complementarity between remittances and FI to reduce income inequality. The complementary action of financial inclusion on migrants' remittances offers wider access to financial services which also leads to an increase in remittances and therefore reduces inequalities.

**Keywords:** Inequality, Remittances, Financial Inclusion, Africa

## 1. Introduction

There are great inequalities between people, countries and regions. North America is 3.5 times richer than the world average (Banque Mondiale, 2018). The financial and banking sector are the main causes of inequality among many others. Access to financial services remains the appropriation of the rich and a luxury for the poor. Excluded from formal and informal financial circuits represent, according to official statistics, nearly 90% of the world population (Avom et Bobbo 2018). According to Demirgüç-Kunt et Klapper (2012a), 94% of adults hold accounts in high income economies compared to 23% in Africa. Aware that 2.5 billion adults worldwide are deprived of banking services and that almost 200 million very small, small and medium-sized enterprises in developing countries lack access to financial services and credit at an affordable cost, on October 11, 2013 in Washington, the World Bank formulated the global objective of universal access to financial services. Achieving this goal will be a major step towards widespread financial inclusion, in a world where everyone will have access to the financial services they need to seize opportunities, reduce vulnerability and inequality (Banque Mondiale, 2013).

Inequalities, the unrestrained conquest of well-being and the quest for new wealth push men to move from underdeveloped countries to developed countries and sometimes, it is the opposite. Leaving behind all kindreds of relatives whose main motivation is to improve their living conditions through the transfer of money commonly known as sending remittances. This is justified because in 2012, remittances from emigrants reached the amount of USD 401 billion. For the same year, more than three times the amount of official development assistance and more than half of the private capital flows received by developing countries (Anzoategui,

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Demirgüç-Kunt, et Martínez Pería 2014). And five years later, 2017, the World Bank estimates that officially recorded remittances to low and middle-income countries are USD 466 billion.

Although economic literature has focused more on the effects of remittances on financial inclusion (Gautam, 2019 ;Anzoategui et al. 2013; Toxopeus et Lensink, (2008); Singh, 2009), inequality and poverty (Taylor et al., 2005) and financial development (Sobiech, 2019; Beine et al. 2012; O Morekwa et al., 2012; pperman et al. 2018) to our knowledge, the potential impact on inequality through financial inclusion has been relatively overlooked. Using different approaches to measuring inequality such as the GINI, Palmaratio and Atkinson index, this paper examines the question of whether the funds of migrants sent from abroad reduce inequalities through financial inclusion or does financial inclusion linked to migrant remittances reduce inequality in Africa?

Since an increased level of financial inclusion can support both economic efficiency and reduce equality, remittances can have a significant impact on economic development by contributing to financial deepening and distribution more fair (Gautam 2019). The rest of document is organized as follows. Section II will consist of the literature review. Section III describes the ant the empirical methodology that will used for the analysis of our data. Section V presents the results of our estimates and section V the conclusion.

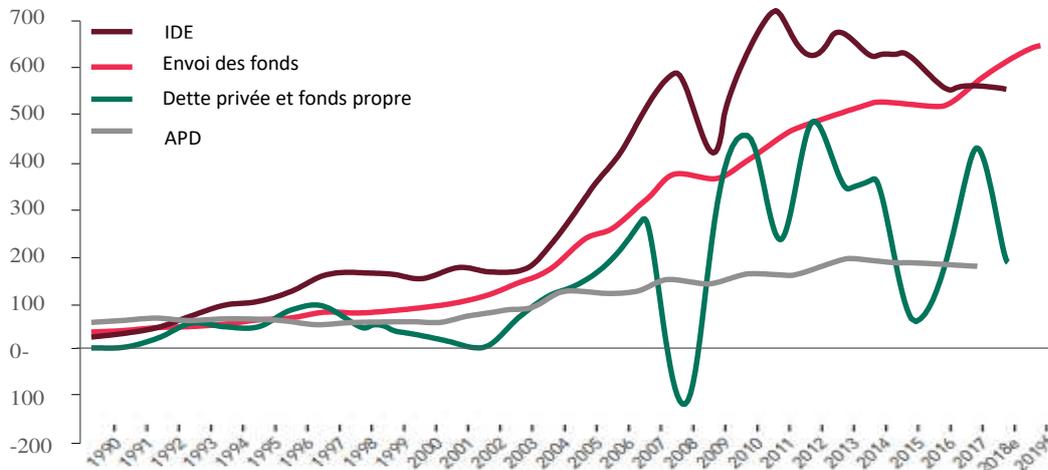
## **2. Literature Review**

Remittances are particular important for developing countries. We can distinguish two types of remittances: the remittances which are linked to the rural exodus. They concern the people who leave villages for the city. And the international remittances that concern the people moving from developing countries to developed countries. It is this category of person that concerns us. Because in 2018, their remittances to low-income or intermediate countries reached USD 528 billion, therefore USD 45 billion for countries of sub-Saharan Africa. And over the period 2010-2018, they had a growth evolution of 47%.

Rapoport et Docquier, (2006) explain that a combination of individualistic (for example altruism, exchange) and family (example, investment, insurance) raison explains this rapid growth in tranferts. Excluding China, remittance flows are also significantly higher than foreign direct investment (FDI) in low-income or middle-income countries (BanqueMondiale, 2018b). In many countries, remittances in remittances now exceed those of official development assistance and other private capital inflows (Chitambara 2019).

Figure 1 below shows that remittances to low-income or middle-income countries are higher than official development assistance, more stable and increasing than private capital flows over the period 1990-2018. This steady increase in remittances to developing countries and their potential economic effects have attracted keen interest from specialists worldwide. The two main theoretical approaches to remittances are the “family approach”, indicating that altruistic reasons determine the immigrant to send money to support left relatives, and the “portfolio approach” which considers remittances as investments made by the immigrant from the country of origin. In both cases, remittances should have economic effects, either by increasing consumption (on the demand side) or production (on the supply side), and therefore by stimulating the economic development of host countries (OCDE, 2006 ; Goschin, 2014).

**Figure 1: Different types of financing (billions of US dollars)**



Sources : estimations du personnel de la Banque mondiale; Indicateurs de développement dans le monde.  
 Notes : IDE = Investissement Direct Etranger; APD = Aide Publique au Développement.

The literary review of some empirical work document various effects on the inflow. In low-income and middle-income countries, the rural area abounds with a large part of population, which constitutes an important base of global inequality. Rural income are much lower than other incomes with an unequal consequence on social well-being and economic development (Stark, Taylor, et Yitzhaki 1986). And further the costs of immigration are different whether one is in a rich or poor household. Rapoport et Docquier, (2006) explain the increase or decrease in inequality due to the process of cost immigration. When the costs are low, the two types of household are not subject to constraints. Because migration and remittances reduce the income range originally, regardless of the initial income gap. The opposite result is not necessarily true. For high migration costs, poor households are significantly more constrained, so that inequality increases. However, it may also be optimal for some wealthy households to reduce migration among their ranks, so that the overall effect of the costs of migration on economic inequality is ambiguous.

High levels of remittances are associated with lower poverty indicators and high growth rates (Adams et Page, 2005 ; Acosta et al., 2008). Because these funds, which go largely to poor families, should reduce inequalities in income distribution ( Quibria, 1997; Taylor, 1999; Adams et Page, 2003; Docquier et Rapoport, 2003). They are used to repay informal loans used to finance studies in the country of origin. Because a natural interpretation is that it is the prospect of migration (rural-urban or international) that makes education a profitable investment for the family. Remittances are a source of capital, further support for employment and economic growth in host economies (Ratha, 2005 ; Lowell et de la Graza, 2000 ; León-Ledesma et Piracha, 2001). López-córdova (2006) uses the 2000 Mexican census to examine the relationship between remittances and various factors at the municipal level. He revealed that the municipalities in Mexico that receive more funds have higher levels of literacy and more than 14 years of school attendance. Likewise, Yang (2004) finds that children in families with higher education and more educated migrants whose positive exchange rate shocks are greater in

the Philippines. And on the macroeconomic level, the help to close the current account deficit (Daianu, 2001; Terry et al., 2004).

Djajić (1986) shows that the remittances improve the well-being not only of populations of direct recipients, but also of those who are not related to foreigners. World Bank (2006) found that remittances were associated with welfare gains in recipient countries. Mesnard (2001) provides theoretical evidence that inter-generational remittances have a positive impact of temporary emigration and capital accumulation on the prosperity of the countries of origin. Goschin, 2014 analyse the remittances growth over the 1999-2001 period. He finds a significant positive influence of remittances on growth in selected central and eastern European countries (Chitambara 2019).

Other researchers, however, have questioned the positive role of remittances. Milanovic (1987). Milanovic (1987) tested the possibility of the ‘runoff’ effect using panel Data from Yugoslav household surveys of 1973, 1978 and 1983. He found no empirical support for this hypothesis. On the contrary, his results showed that remittances tended to increase inequalities, although their effects differed over the periods and social categories considered (It is mainly for agricultural households than an effect of increasing inequality was found).

Adams (1991) found a sharp increase in land price due to remittances to countries of origin. The flow of remittances could lead to an appreciation of the real exchange rate and the allocation of resources from the tradable goods to the non-tradable good sector, which could hamper the economic growth of recipient countries. This is commonly called the phenomenon of Dutch disease (Chitambara 2019). Remittances can lead to negative behavioural change at the household level, which can also reduce their economic impact. Indeed, a significant part of remittances is devoted to non-productive “non-status related” consumption and other economically unproductive investments (Chami et al., 2003). Remittances can also have a negative impact on growth by reducing the supply of labor or labor force participation. . Chami et al., (2005) show that where such effects are dominant, remittances have a high negative impact on beneficiary economies.

To achieve any result from the use of remittances, the household in the country of origin must have a minimum of financial literacy. The inclusive financial systems offer a wide range of services, including savings, money transfer, credit, payment and insurance. It is expected to provide several benefits to poor households and rural communities in almost all economies (Demirgüç-Kunt et Klapper 2013). It is widely accepted that most of the money is spent on household consumption, health care and housing (OCDE 2003), although the propensity to save seems to be higher for remittances compared to the national currency (Richard H. Adams 1998).

The household’s decision to invest is determined by the money that remains available after basic needs are met, but it also depends on the general economic environment, including the financial market, interest rates, politics tax, etc. (Puri et Ritzema 1999). Anzoategui et al., 2013 examine the impact of remittances on financial inclusion over the period 1995-2001, their estimates invariably show that households that receive remittances are more likely to have deposit account in a financial institution but do not necessary request credit.

Our document contributes to the study of impact of remittances on economic and social development. First, to our knowledge, this is the first document to directly analyse the impact of remittances on income inequality through financial inclusion. Second, unlike previous publications which focus only on remittances and inequality or on the financial systems, this document has the particularity that it deals with three variables of income inequality (GINI,

Atkinson and the Ratio of palma) and five financial inclusion variables (ATMs, Banking, Credit, insurance and deposit) in Africa. Third, it complements a literature dealing with the impact of remittances on inequality and their interaction on financial development. Finally, our study provides evidence on the impact of remittances on the various measures of inequality through the channel of financial inclusion in Africa for which remittances represent a very large share of GDP. In summary, as indicated in the literature, large inflows of remittances into a country seem to have significant socio-economic effects, mainly positive, compensating for some negative aspects due to emigration.

### 3. Data and methodology

This document uses panel data for 47 countries in Sub-Saharan African over the period 2004-2014 to study the effect of remittances on inequality. The unavailability of data imposes on us the temporal and geographic dimension at the time of this study. This gives us a number of observations equal to  $N * T = 470$ , where N is the number of countries (47) and T the number of years (10). The full description of the data is as follows:

#### 3.1 Data

**Table 1: Summary statistics and list of countries**

Panel A: Summary statistics						
Variables		Obs	Mean	S.D	Min	Max
	Remittances	476	4.143728	6.02928	.0001967	41.49946
Income inequality	Gini index	516	.5810357	.0379824	.4408218	.8516453
	Atkinson2	516	.6947042	.0656996	.444092	.8346884
	Palmaratio	516	6.245201	1.550645	2.483522	14.43498
	Crédit	506	28.53963	64.75536	.6734411	906.3829
Financial Inclusion	Depot	506	32.67753	55.38967	1.916668	763.7811
	Linsur	425	.7919183	1.952701	.0006644	12.22088
	ATMs	420	9.587688	13.97723	0	65.80647
	BranchBank	501	6.124462	8.637954	.1320796	53.20523
	GoVConsum	466	15.1833	6.130246	4.157404	39.45063
Control Variables	School	442	.9287666	.087254	.62173	1.12088
	MobilFon	513	47.63528	37.32142	.2084224	162.2837
	UseNet	510	8.811391	11.31272	.0310112	56.8

#### Panel B: list of countries

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros Congo, Dem, Rep, Congo, Rep, Côte d'Ivoire, Djibouti, Egypt, Arab Rep, Ethiopia, Gabon, Gambia, The, Ghana,Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania,Mauritius,Morocco Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, South Africa Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia.

S.D: Standard Deviation. Min : Minimum. Max : Maximum. Obs. : Observations

The dependent variable is the remittances of migrants. Our main independent variable is inequality. These variables come from the World Bank: Indicators of development in Africa. In addition to the financial inclusion variable (Credit; Deposit; Insurance ATMs and banking branches), we include four control variables, generally considered in the literature as determining in empirical work on remittances: (i) consumption governmental; ii) level of education; iii) and mobile phone; and iv) internet use. A detailed description of all the variables is presented in Table 3.

The main contemporary literary trends on inequality are based on three indicators which will be adopted in our study (Tchamyou et al., 2018; Asongu et Odhiambo 2020). The indicators include: (i) the Gini coefficient which assesses the level of wealth inequality in the population. However, the main drawback of this indicator is that it fails to capture the extreme values of the distribution of inequalities (Zhang et Ben Naceur 2019). Therefore, in order to control the tails of the distribution of inequalities, the Gini coefficient is supplemented by two other inequality indicators which are designed to capture extreme values of the distribution of inequalities, namely: the Palma report and the Atkinson index. (ii) The Atkinson index is an indicator of income inequality which measures the percentage of total income that a specific society would forgo in an attempt to have more income equality between citizens. (iii) The Palma ratio indicates the shares of national income from the 10% of the wealthiest households to the poorest 40% (Asongu and Odhiambo, 2020).

The choice of our remittances variable is justified in the literature. Remittances can potentially help promote economic development by providing a mechanism for sharing risks, reducing poverty and improving equality (Pfau et Long 2011). Morekwa et al., (2012) believe that remittances appear to be an important source for improving growth in African countries. Similarly, women from disadvantaged groups who have participated in financial inclusion programs have improved their living conditions (Swamy 2014). Beck et al., (2007) also find that banking industries are associated with a statistically significant reduction in income inequality. Morgan et Pontines (2014) find that policy measures aimed at increasing financial inclusion have the parallel advantage of also contributing to financial stability and Kim (2016) shows that financial inclusion helps reduce income inequality in low income countries.

The remittance variable and the financial inclusion variable each have an impact aimed at reducing income inequality. In our work we will cross the variable sends money and financial inclusion to see its effect on income inequality. We believe that financial inclusion amplifies the action of remittances. The development of bank forms allows the underprivileged to have a proximity of financial services which remain a luxury for the rich. Regular remittances to poor families allow a formal financial institution to grant them credit that can help them start an economic activity. The benefits generated by this activity will allow this family to improve their living conditions and avoid economic shocks. Acquiring life or non-life insurance brings some mental stability to the family. It can offer an opportunity for an opportunist to take more risk in an activity. Increased insurance penetration can potentially reduce inequality as, as recently shown by the OECD (2017), insurance policies supplemented by simplified claims and extended coverage can improve access to financial protection for previously underserved segments of society.

**Table 2: Correlation matrix**

	Income inequality			Remittances	Financial inclusion					Control variable			
	Gini	Atkinson2	Palma ratio		Crédit	Depot	Linsur	ATMs	Branch Bank	GoVConsum	School	Mobil Fon	UseNet
Gini	1.0000												
Atkinson2	0.8854	1.0000											
Palmaratio	0.9576	0.9234	1.0000										
Remittances	-0.0809	0.0888	-0.0205	1.0000									
Crédit	0.4381	0.2407	0.4028	0.0164	1.0000								
Depot	-0.0038	-0.0791	-0.0000	0.1096	0.7390	1.0000							
Linsur	0.5944	0.3973	0.6159	-0.1312	0.8084	0.3905	1.0000						
ATMs	0.1808	0.0445	0.2183	-0.0453	0.7511	0.7338	0.6194	1.0000					
BranchBank	-0.1488	-0.1847	-0.1068	0.0939	0.4427	0.6999	0.1397	0.7881	1.0000				
GoVConsum	0.0504	0.0431	0.1377	0.1243	0.2397	0.2998	0.2632	0.3939	0.4165	1.0000			
School	0.0900	0.0487	0.1212	0.1212	0.2002	0.2387	0.1606	0.2361	0.2231	0.1161	1.0000		
MobilFon	-0.0738	-0.1184	-0.0206	0.0225	0.4783	0.5325	0.3095	0.6480	0.5585	0.2148	0.2723	1.0000	
UseNet	-0.1337	-0.1716	-0.1114	0.1290	0.5682	0.7183	0.2093	0.7029	0.7505	0.2233	0.2732	0.7769	1.0000

**Table 3: Definitions and sources of data**

Variables	Definitions	Sources
Gini index	"The Gini index is a measure of income distribution of a country's residents".	GCIP
Atkinson	The Atkinson index measures inequality by determining which end of the distribution contributed most to the observed inequality	GCIP
Palma ratio	"The Palma ratio is defined as the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40%'s share"	GCIP
Branch Bank	Number of commercial bank branches per 100,000 adults.	World Bank (GFDD)
ATMs	Number of ATMs per 100,000 adults.	World Bank (GFDD)
Linsur	Life insurance premium volume to GDP (%)	World Bank (GFDD)
Depot	Bank account per 1,000 adults	World Bank (GFDD)
Credit	Bank credit to bank deposit (%)	World Bank (WDI)
Mobile phone	Mobile phone subscriptions (per 100 people)	World Bank (WDI)
Internet	Internet subscriptions (per 100 people)	World Bank (WDI)
Government expenditure	General government final consumption expenditure	World Bank (WDI)
Education	School enrolment, secondary (gross)	World Bank (WDI)
Remittances	Remittances inflows to GDP (%)	World Bank (WDI)

WDI: World Bank Development Indicators. GFDD:Global Financial Development Database. GCIP: Global Consumption and Income Project.

### 3.2 Methodology

To study the relationship between remittances, financial inclusion and income inequality, we start with the direct impact of remittances and financial inclusion on income inequality. To carry out our analysis, the empirical model is based on Lartey (2013); Adams and Klobodu (2016) and Zghidi et al. (2018). Following these studies, we estimate the following equation:

$$IneRev_{it} = \beta_0 + \beta_1 IneRev_{it-1} + \beta_2 Remit_{it} + \beta_3 FinI_{it} + \beta_4 X_{it} + \mu_i + v_t + \varepsilon_{it} \quad (1)$$

*Remit* is equal to migrant remittances, *FinI<sub>it</sub>* is the financial inclusion variable, *IneRev<sub>it</sub>* is equal to income inequality indicators, *X<sub>it</sub>* represents a vector of conditioning information that controls other factors associated with inequality,  $\mu_i$  is an unobserved observer country-specific effect,  $v_t$  is a time-specific effect and  $\varepsilon_{it}$  is the error term.

Besides the direct impact of remittances and financial inclusion on income inequality described in equation (1), several factors can amplify or undermine the effect of remittances on inequality revenues. As mentioned above, this paper examines the role of financial inclusion in the relationship between remittance and income inequality. To this end, we analyze the sending of

funds with the financial inclusion variable and test the importance of the coefficient in interaction. The specification of the equation is as follows:

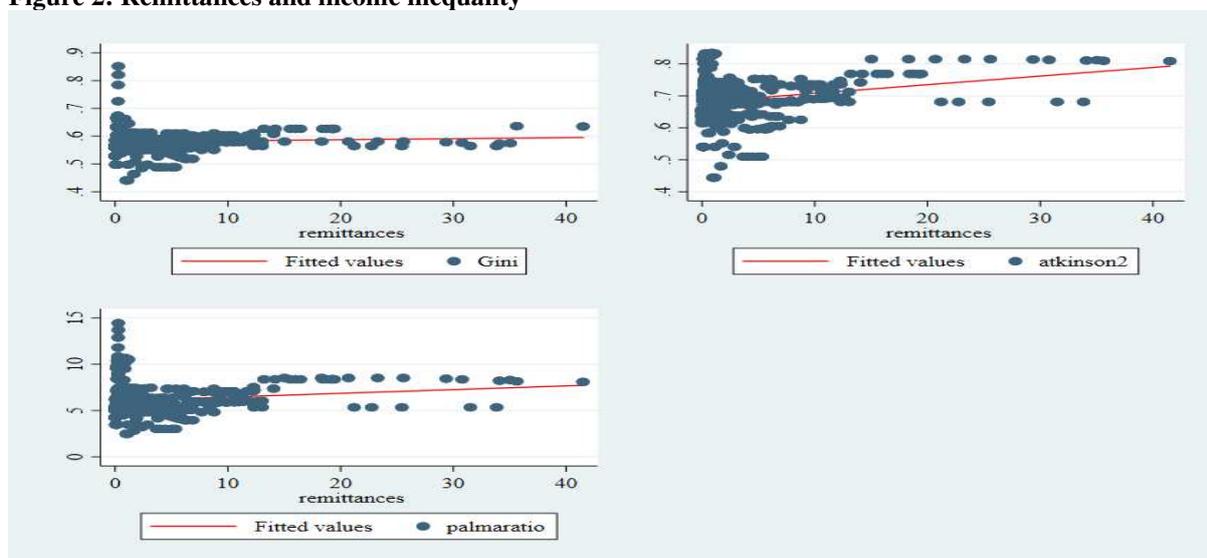
$$IneRev_{it} = \beta_0 + \beta_1 IneRev_{it-1} + \beta_2 Remit_{it} + \beta_3 FinI_{it} + \beta_4 (Remit_{it} * FinI_{it}) + \beta_5 X_{it} + \mu_i + v_t + \varepsilon_{it} \quad (2)$$

Where  $(Remit_{it} * FinI_{it})$  is the interaction term between remittances and financial inclusion. To test the hypothesis explained above, we are interested and provide information on the marginal effect of remittances on income inequality depending on the level of financial inclusion. A positive interaction coefficient term would imply that the marginal impact of remittances on income inequality as amplified with the level of development of financial inclusion. On the other hand, a negative interaction would indicate that financial inclusion mitigates the beneficial effect of remittances on income inequality.

We apply the generalized moments method (GMM) by system proposed by (Arellano et Bond, 1991, Arellano and Bover, 1995; Blundell and Bond, 1998). GMMs are used for several benefits. First, the GMM estimator has been widely used to solve the endogeneity problem that appears in the estimation of panel data (Arellano and Bover, 1995 and Blundell and Bond, 1998). Second, the GMM estimator also takes into account the biases that arise due to the country-specific effects. Third, GMM also avoids problems of simultaneity or reverse causation. The GMM method has two variants, namely the one-step estimators and the two-step estimators. However, the two-stage estimator has been found to be more efficient than the one-stage estimator because it uses optimal weighting matrices (Law et al., 2018). Therefore, this paper applies the GMM system in two stages to study the effect of migrant remittances on inequality through financial inclusion. The consistency of the GMM estimator depends on two factors: the validity of the assumption that the error term has no serial correlation (AR (2)) and the validity of the instruments (Hansen test).

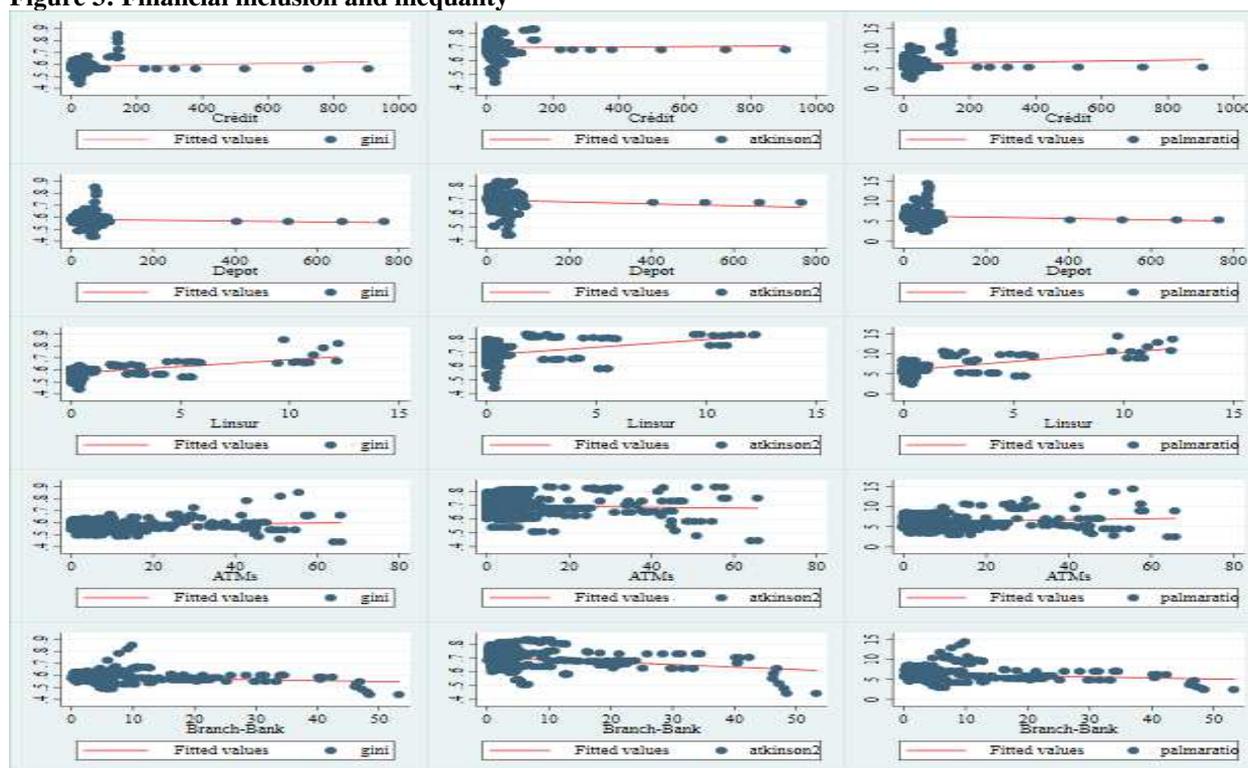
Figure 2 shows a negative relationship between migrants' remittances and the index, unlike Atkinson and the Ratio de Palma. Figure 3 shows that apart from premium insurance, all financial inclusion variables attempt to reduce income inequality (Gini, Atkinson and Palma). However, we will undertake econometric analyzes to study the relationship between remittances and inequality.

**Figure 2: Remittances and income inequality**



Author: Authors' calculation using Stata 15.1

**Figure 3: Financial inclusion and inequality**



Author: Authors' calculation using Stata 15.1

## 4. Empirical results and discussions

### 4.1. Basic model of remittances and inequality

The results obtained with the previous regression models are presented in Tables 4,5 and 6 which successively consist of the basic model, the basic model and its control variables and finally the model of the variable crossed between sending funds and financial inclusion. Each table includes three panels A, B and C. These panels respectively represent the results of regressions of the three income inequality variables, namely: the GINI index, the Atkinson index, and the Palma Ratio.

**Table 4: Basic model**

<b>Panel A : Variables dépendantes : Indice de GINI</b>					
VARIABLES	(A)	(B)	(C)	(D)	(E)
remittances	-0.000749*** (2.38e-05)	-9.17e-05*** (1.91e-05)	-2.79e-05*** (2.46e-06)	-0.000185*** (5.60e-05)	-0.000184*** (1.62e-05)
ATMs	-0.000174*** (2.52e-06)				
Crédit		-1.07e-05*** (8.86e-07)			
Depot			-0.000164*** (1.51e-05)		
Linsur				-0.000524*** (6.63e-05)	
BranchBank					-0.000882*** (1.00e-05)
L.gini	0.894***	1.172***	0.855***	1.039***	0.875***

	(0.000886)	(0.00379)	(0.00233)	(0.00374)	(0.000787)
Constant	0.0649***	-0.101***	0.0887***	-0.0226***	0.0782***
	(0.000545)	(0.00213)	(0.00148)	(0.00187)	(0.000572)
Nombre de pays	43	44	44	39	44
AR(1)	0.105	0.106	0.0975	0.104	0.104
AR(2)	0.285	0.310	0.830	0.320	0.308
Nombre d'instruments	28	32	36	20	41
Hansen OIR	0.118	0.544	0.236	0.152	0.320
Fisher	606869***	35032***	47088***	457230***	1.114***

**Panel B : Variables dépendantes : Indice de Atkinson**

VARIABLES	(E)	(F)	(G)	(H)	(I)
remittances	-0.000649***	-0.000318***	-4.93e-05**	-0.00156***	-0.000128*
	(0.000139)	(3.58e-05)	(2.35e-05)	(0.000220)	(7.24e-05)
ATMs	-0.000282***				
	(1.38e-05)				
Crédit		-0.000109***			
		(3.92e-06)			
Depot			-4.80e-06***		
			(1.39e-06)		
Linsur				-0.000379***	
				(0.000120)	
BranchBank					-0.000192***
					(8.02e-06)
L.atkinson2	0.956***	0.951***	0.948***	0.962***	1.102***
	(0.00235)	(0.00127)	(0.00291)	(0.00352)	(0.00132)
Constant	0.0334***	0.0364***	0.0352***	0.0290***	-0.0719***
	(0.00159)	(0.000862)	(0.00193)	(0.00197)	(0.000870)
Observations	362	425	425	356	425
Nombre de pays	43	44	44	39	44
AR(1)	0.116	0.0885	0.0925	0.0950	0.0928
AR(2)	0.724	0.183	0.107	0.580	0.223
Nombre d'instruments	28	36	31	28	37
Hansen OIR	0.388	0.402	0.542	0.382	0.460
Fisher	115775	375875	52518	41616	342350

**Panel C : Variables dépendantes : Ratio de Palma ratio**

VARIABLES	(K)	(L)	(M)	(N)	(O)
remittances	-0.0299***	-0.00523***	-0.000898**	-0.0139***	-0.00446**
	(0.00277)	(0.000333)	(0.000396)	(0.00330)	(0.00175)
ATMs	-0.00692***				
	(0.000294)				
Crédit		-0.000196***			
		(2.47e-05)			

Depot			-0.000129*** (4.18e-05)		
Linsur				-0.0746*** (0.00199)	
BranchBank					-0.00593*** (0.00194)
L.palmaratio	0.956*** (0.00193)	1.073*** (0.00208)	0.939*** (0.00428)	1.122*** (0.00404)	0.911*** (0.0259)
Constant	0.423*** (0.0130)	-0.458*** (0.0141)	0.349*** (0.0282)	-0.673*** (0.0189)	0.590*** (0.165)
Observations	362	425	425	356	425
Nombre de pays	43	44	44	39	44
AR(1)	0.104	0.0959	0.0945	0.101	0.0956
AR(2)	0.327	0.312	0.302	0.314	0.311
Nombre d'instruments	33	49	45	29	23
Hansen OIR	0.115	0.536	0.655	0.207	0.779
Fisher	1.780e+06	143684	20061	114231	642.7

Note: \*\*\*, \*\*, \*: Significance levels at 1%, 5% and 10% respectively. Standard errors reported in parenthesis. The significance of bold values is twofold. 1) The significance of estimated coefficients and Wald statistics. 2) The failure to reject the null hypothesis of: a) no autocorrelation in the AR (1) & AR (2) tests and; b) the validity of the instruments in the Hansen OIR tests.

Four statistical tests are used to assess the validity of the model (Asongu et Moor, 2017)<sup>2</sup>. From these criteria, two aspects should be clarified. From these criteria, two aspects should be clarified. On the one hand, the second-order Arellano and Bond autocorrelation test differs from the first order because studies in the literature rely exclusively on the second-order test (Narayan et al., 2011). On the other hand, the Hansen test is preferred to the Sargan test and such a preference is justified by the rule of thumb that the number of instruments is less than the corresponding number of cross sections in each specification. It is important to note that the Sargan test is not robust, but not weakened by the instruments, while the Hansen test is robust and weakened by the instruments. Consequently, the robust test can be adopted and the empirical rule making it possible to avoid the proliferation of instruments is respected (Tchamyou et al., 2018).

<sup>2</sup> First, the null hypothesis of the second-order Arellano and Bond autocorrelation test (AR (2)) as a difference for the absence of autocorrelation in the residues should not be rejected. Second, Sargan and Hansen's tests on identification restrictions (OIR) should not be significant since their null hypotheses are the positions according to which the instruments are valid or not correlated to the terms of error. In essence, although the Sargan OIR test is not robust, but not stressed by the instruments, the Hansen OIR is robust but weakened by the instruments. In order to limit the identification or to limit the proliferation of instruments, we have taken care that the instruments are less than the number of effective sections in most specifications. Third, the Hansen Difference Test (DHT) for exogeneity of the instruments is also used to assess the validity of the Hansen OIR test results. Fourth, a Fischer test for the joint validity of the estimated coefficients is also provided. (Asongu and De Moor, 2017, p. 200).

## 4.2 Presentation of the results

Table 4 presents the results of the basic model consisting of dispute panels on income inequality. Whatever the inequality observed in table 4, remittances are all significant at 1%. This allows us to deduce that shipments reduce income inequality in Africa. With an international poverty line set at \$ 1.90 per person per day, and more than half of the world's poor living in sub-Saharan Africa (Banque Mondiale 2015), remittances remain a major source of reduction of inequalities. Because they make it possible to smooth household consumption, improve human capital, avoid economic shocks and facilitate access to the creation of small and medium-sized enterprises in the countries of origin. This result joins the work of World economic outlook (2005) et Akobeng (2015).

Regarding the inclusion variables, the results in Table 4 show that: ATMs and bank branches allow inequality to be reduced to the significance level of 1% in panels A, B and C. This can be explained by the fact that financial transactions between migrants and households in the countries of origin officially pass through a financial structure (banks and microfinance). The presence of a financial structure in an environment makes it possible to seize financial opportunities and catalyse financial literacy.

The credit variable is significant at 1% and it reduces income inequality in the three panels. This is explained by the fact that when sending remittances, the households receiving the funds have some follow-up with the financial institutions with which they deal. There can be a relationship of trust between the bank and household in the country of origin. At this moment, if the household has a shock or a need for financing for the expansion of an activity, then the bank will be able to offer it a credit which could have a direct or indirect impact on the environment where it is located. Bank deposits are significant at 1% and they reduce inequalities as shown by the three panels in Table A, B and C. When the poor come together in community, and make deposits in MFIs, this money is put back into the financial circuit through the borrowing channel.

The insurance variable is significant at 1% in the different panels and makes it possible to reduce inequalities in the study area. This can be explained by the fact that migrant remittances can allow receiving households to take out an insurance policy and to take more risk in their activities as was the case in Ghana where Karlan et al., (2014) used agricultural insurance to take more risk in growing rice. Similarly, Cai et al., (2015) have shown that sow insurance has increased investment in hog farming. Overall, the results of the impact of financial inclusion on growth corroborate with that of Anzoateguie et al., 2013 in the savador who find that using deposits and credits as an inclusion variable, shipments of fund act favorably on financial inclusion by promoting bank accounts.

We will continue our analysis with the control variables in Table 5 on the next page.

**Table 5: Income inequality and its control variables**

<b>Panel A : Variable dépendante : Indice de Gini</b>					
<b>Modèles</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>
ATMs	-0.000300*** (3.20e-05)				
Crédit		-0.000123*** (2.24e-05)			
Depot			-0.000761*** (0.000281)		
Linsur				-0.00310*** (0.000715)	

BranchBank					-0.000473*** (4.59e-05)
remittances	-0.000284** (0.000106)	-0.00122*** (9.80e-05)	-0.000762** (0.000369)	-0.00165*** (0.000383)	-0.00177*** (5.28e-05)
GoVConsum	-0.000639*** (0.000111)	0.000757*** (4.69e-05)	0.000456 (0.000367)	0.00256*** (0.000464)	0.00131*** (5.05e-05)
School	-0.0706*** (0.0124)	0.217*** (0.00895)	0.319** (0.130)	0.0435** (0.0181)	0.131*** (0.00278)
MobilFon	0.000106*** (2.56e-05)	-0.000133*** (2.61e-05)	-0.000611*** (0.000222)	-4.21e-06 (5.32e-05)	0.000148*** (1.65e-05)
useNet	-1.72e-06 (5.22e-05)	0.000221*** (4.95e-05)	0.00199*** (0.000547)	-0.000178 (0.000152)	-0.00125*** (3.16e-05)
L.gini	0.912*** (0.00491)	1.218*** (0.0144)	0.828*** (0.0428)	1.035*** (0.0205)	0.866*** (0.00296)
Constant	0.125*** (0.0124)	-0.331*** (0.0112)	-0.166 (0.0993)	-0.0903*** (0.0183)	-0.0519*** (0.00251)
Observations	271	320	320	285	322
Number of countries	41	41	41	37	42
AR(1)	0.195	0.213	0.193	0.198	0.219
AR(2)	0.320	0.440	0.297	0.346	0.254
Number of instruments	29	37	30	23	41
Hansen OIR	0.799	0.681	0.998	0.443	0.523
Fisher	9672	16803	129.3	1094	315743

**Panel B : Variables dépendantes : Atkinson**

Modèles	(6)	(7)	(8)	(9)	(10)
ATMs	-0.000396*** (2.54e-05)				
Crédit		-7.69e-05** (3.75e-05)			
Depot			-0.000178*** (5.49e-05)		
Linsur				-0.00431*** (0.00128)	
BranchBank					-0.00139*** (0.000256)
remittances	-0.000196*** (5.33e-05)	-0.00109*** (0.000225)	-0.000659*** (6.43e-05)	-0.00149* (0.000857)	-0.00586*** (0.00148)
GoVConsum	-0.000534*** (5.22e-05)	0.000482*** (0.000108)	5.71e-05* (2.95e-05)	-0.00123*** (0.000218)	-0.000461 (0.000279)
School	0.0125*** (0.00362)	0.275*** (0.0284)	-0.00233 (0.0112)	-0.0595** (0.0221)	0.0726 (0.0637)
MobilFon	3.07e-05* (1.62e-05)	-0.000215*** (2.80e-05)	0.000235*** (3.50e-05)	3.83e-05 (4.84e-05)	-0.000322*** (0.000116)
useNet	0.000141*** (5.12e-05)	0.000237*** (3.59e-05)	-0.000902*** (0.000103)	0.000266*** (9.68e-05)	0.00138*** (0.000381)
L.atkinson2	0.964*** (0.00519)	1.096*** (0.0149)	1.114*** (0.00655)	1.041*** (0.0240)	1.035*** (0.0379)
Constant	0.0199*** (0.00507)	-0.319*** (0.0272)	-0.0767*** (0.00841)	0.0473 (0.0286)	-0.0535 (0.0724)
Observations	271	320	320	285	322
Number of countries	41	41	41	37	42
AR(1)	0.222	0.196	0.178	0.161	0.195
AR(2)	0.168	0.894	0.599	0.292	0.384
Number of instruments	30	37	39	22	28

Hansen OIR	0.717	0.590	0.680	0.862	0.856
Fisher	74583	17843	183302	2295	927.9
<b>Panel C : Variable dépendante : Palmaratio</b>					
Modèles	(11)	(12)	(13)	(14)	(15)
ATMs	-0.00790*** (0.000448)				
Crédit		-0.00379*** (0.00126)			
Depot			-0.00718*** (0.00259)		
Linsur				-0.0797*** (0.0260)	
BranchBank					-0.0503*** (0.00377)
remittances	-0.00224* (0.00127)	-0.0233* (0.0131)	-0.0152*** (0.00398)	-0.0453** (0.0177)	-0.193*** (0.0264)
GoVConsum	-0.00403*** (0.00140)	0.00484 (0.00368)	0.0307** (0.0124)	0.0567*** (0.0159)	0.0328*** (0.00355)
School	-0.333 (0.349)	3.345*** (0.871)	4.870*** (0.692)	0.503 (0.536)	1.591 (0.947)
MobilFon	0.00163*** (0.000504)	-0.000767 (0.00150)	-0.00241 (0.00167)	0.00351*** (0.00126)	-0.00781*** (0.00203)
useNet	0.000818 (0.00143)	0.00250 (0.00321)	-0.00118 (0.00562)	-0.00976** (0.00383)	0.0294*** (0.00624)
L.palmaratio	0.956*** (0.00555)	1.072*** (0.0220)	1.003*** (0.0157)	1.056*** (0.0217)	0.720*** (0.0123)
Constant	0.574* (0.322)	-3.485*** (0.805)	-4.709*** (0.659)	-1.622*** (0.580)	0.992 (0.732)
Observations	271	320	320	285	322
Number of countries	41	41	41	37	42
AR(1)	0.120	0.120	0.111	0.120	0.185
AR(2)	0.296	0.319	0.266	0.357	0.573
Number of instruments	29	29	30	23	28
Hansen OIR	0.744	0.999	0.809	0.216	0.376
Fisher	38939	5611	1361	904.0	2668

Note: \*\*\*, \*\*, \*: Significance levels at 1%, 5% and 10% respectively. Standard errors reported in parenthesis. The significance of bold values is twofold. 1) The significance of estimated coefficients and Wald statistics. 2) The failure to reject the null hypothesis of: a) no autocorrelation in the AR (1) & AR (2) tests and; b) the validity of the instruments in the Hansen OIR tests.

Table 5 above presents the results of the regression of the basic model taking into account the control variables. We find that the results of this regression are similar to that of the basic model with some ready differences. Overall, remittances and FI have a negative impact on different income inequalities and are all significant. The education variable is significant regardless of the panel we are in. Its sign is negative, that is to say that education has a negative effect on growth apart from the models 1,8,9 and 11. This can be explained by the fact that parents who migrate and leave their children in the countries of origin have not followed in education. The mobile phone helps to reduce inequalities and it is significant. It makes it possible to communicate with the household of the country of origin, to make financial transactions, and to get closer to mobile financial services. In addition, the commercial enthusiasm that reigns today is centered on the lower costs of mobile money transactions to allow the poorest populations to have access to them. The growth of mobile phones in developing countries, their availability and convenience are more convenient to access and use compared to bank branches

and ATMs. It should be emphasized, however, that digital banking, favored by the spectacular development of the simultaneous use of mobile telephony and the Internet by Africans in recent years, has contributed to significantly reducing the phenomenon of financial exclusion and therefore inequalities. In fact, according to the GSMA, there were 285.9 million mobile accounts registered in sub-Saharan Africa in December 2017. In some countries, including Kenya, Tanzania, Zimbabwe, Gabon, Ghana, Uganda and Namibia, more than 40% of the adult population actively use mobile banking (GSMA 2018). This result is similar to that found by (Singh 2009). Whatever the panel, table 5 above shows that internet use is significant and helps reduce inequalities. We will now analyze the cross-action of financial inclusion and migrants' remittances on income inequalities in Table 6.

**Tableau 6: Cross variable between remittances \* financial inclusion**

<b>Panel A : Variables dépendante : Indice de Gini</b>					
	(1)	(2)	(3)	(4)	(5)
ATMs	-0.000300*** (2.11e-05)				
Remit.ATMs	3.00e-05*** (4.57e-06)				
Crédit		-0.000133*** (2.19e-05)			
Remit.Crédit		1.66e-05*** (2.26e-06)			
Depot			-0.000356*** (0.000118)		
Remit.Depot			5.37e-05*** (1.57e-05)		
Linsur				-0.00465*** (0.000617)	
Remit.Linsur				0.000552** (0.000250)	
BranchBank					-0.00129*** (7.39e-05)
Remit.BranchBank					0.000247*** (1.80e-05)
remittances	-0.000314** (0.000154)	-0.000665*** (0.000144)	-0.00185*** (0.000472)	-0.00264*** (0.000658)	-0.00179*** (0.000207)
GoVConsum	-0.000610*** (7.48e-05)	0.000764*** (0.000157)	0.000422* (0.000236)	0.00214*** (0.000463)	0.00130*** (0.000170)
School	-0.122*** (0.00922)	0.163*** (0.0166)	0.140*** (0.0377)	0.0449** (0.0216)	0.0680*** (0.0106)
MobilFon	0.000148*** (1.85e-05)	-0.000163*** (2.08e-05)	-0.000191** (9.43e-05)	1.23e-05 (6.01e-05)	- (2.13e-05)
useNet	-7.79e-05** (3.05e-05)	6.64e-05 (4.55e-05)	0.000210 (0.000199)	-5.59e-05 (0.000143)	-2.30e-05 (4.86e-05)
L.gini	0.921*** (0.00509)	1.123*** (0.0108)	0.838*** (0.0160)	1.110*** (0.0203)	0.858*** (0.00511)

Constant	0.165*** (0.0110)	-0.224*** (0.0160)	-0.0250 (0.0347)	-0.128*** (0.0218)	0.0198 (0.0127)
	271	320	320	285	322
Number of countries	41	41	41	37	42
AR(1)	0.196	0.215	0.193	0.192	0.210
AR(2)	0.291	0.460	0.515	0.388	0.434
Number of instruments	34	36	32	23	33
Hansen OIR	0.727	0.785	0.982	0.287	0.148
Fisher	14495	47541	1154	1007	50788

**Panel B : Variable dépendante : Atkinson**

	(6)	(7)	(8)	(9)	(10)
ATMs	-0.000750*** (2.37e-05)				
Remit.ATMs	6.57e-05*** (4.32e-06)				
Crédit		-5.45e-05 (4.12e-05)			
Remit.Crédit		4.08e-05* (2.24e-05)			
Depot			-0.000402*** (5.85e-05)		
Remit.Depot			4.38e-05*** (4.68e-06)		
Linsur				-0.00346*** (0.000213)	
Remit.Linsur				0.000470*** (5.11e-05)	
BranchBank					-0.00156*** (0.000198)
Remit.BranchBank					0.000205*** (2.16e-05)
L.atkinson2	0.959*** (0.00562)	1.090*** (0.0156)	1.104*** (0.00468)	0.978*** (0.00464)	0.846*** (0.0285)
Constant	0.0625*** (0.00933)	-0.298*** (0.0288)	-0.0778*** (0.0103)	0.00102 (0.00449)	0.0306 (0.0387)
remittances	-0.000210** (8.91e-05)	-0.00154*** (0.000331)	-0.00180*** (0.000154)	- (0.000125)	-0.000861* (0.000511)
GoVConsum	-0.000519*** (7.45e-05)	0.000543*** (0.000107)	5.94e-05 (4.21e-05)	- (0.000103)	0.00161*** (0.000316)
School	-0.0274*** (0.00910)	0.252*** (0.0299)	0.0122 (0.0124)	0.0225*** (0.00590)	0.0657 (0.0509)
MobilFon	3.06e-05* (1.58e-05)	-0.000202*** (2.80e-05)	0.000282*** (3.21e-05)	2.76e-05*** (7.33e-06)	-0.000106 (6.72e-05)
useNet	0.000242***	0.000168***	-0.00110***	-4.45e-05**	5.36e-05

	(4.98e-05)	(5.40e-05)	(8.84e-05)	(1.77e-05)	(0.000162)
Observations	271	320	320	285	322
Number of countries	41	41	41	37	42
AR(1)	0.217	0.189	0.179	0.174	0.163
AR(2)	0.186	0.904	0.498	0.757	0.294
Number of instruments	36	37	39	34	25
Hansen OIR	0.530	0.726	0.764	0.427	0.932
Fisher	255902	22760	19101	573046	1412

**Panel C : Variable dépendante : Atkinson**

	(11)	(12)	(13)	(14)	(15)
ATMs	-0.0227*** (0.00205)				
Remit.ATMs	0.00179*** (0.000269)				
Crédit		-0.00614*** (0.000608)			
Remit.Crédit		0.000835*** (7.70e-05)			
Depot			-0.0120*** (0.00319)		
Remit.Depot			0.000895** (0.000363)		
Linsur				-0.174*** (0.0448)	
Remit.Linsur				0.0271* (0.0138)	
BranchBank					-0.0468*** (0.000777)
Remit.BranchBank					0.00438*** (8.15e-05)
remittances	-0.00910*** (0.00226)	-0.0178*** (0.00311)	-0.0420*** (0.00906)	-0.0940** (0.0382)	-0.0148*** (0.00131)
GoVConsum	0.0332*** (0.00876)	0.000267 (0.00305)	0.0291** (0.0123)	0.0251 (0.0249)	0.0423*** (0.00113)
School	0.678 (0.564)	3.601*** (0.270)	5.440*** (0.753)	1.506 (0.902)	3.288*** (0.166)
MobilFon	0.00165* (0.000911)	-0.00491*** (0.000394)	-0.00368** (0.00180)	0.00309 (0.00254)	-0.00175*** (0.000163)
useNet	-0.00471 (0.00355)	0.00896*** (0.000762)	0.00240 (0.00588)	0.00170 (0.00360)	0.00286*** (0.000583)
L.palmaratio	0.888*** (0.00738)	1.094*** (0.0121)	1.001*** (0.0192)	1.200*** (0.0378)	0.769*** (0.00692)
Constant	-0.350 (0.605)	-3.687*** (0.311)	-5.027*** (0.667)	-2.880*** (0.878)	-2.025*** (0.144)
Observations	271	320	320	285	322

Number of countries	41	41	41	37	42
AR(1)	0.104	0.119	0.114	0.188	0.119
AR(2)	0.191	0.265	0.272	0.366	0.243
Number of instruments	30	37	30	23	38
Hansen OIR	0.157	0.719	0.781	0.423	0.736
Fisher	5796	12574	747.4	354.0	32103

Note: \*\*\*, \*\*, \*: Significance levels at 1%, 5% and 10% respectively. Standard errors reported in parenthesis. The significance of bold values is twofold. 1) The significance of estimated coefficients and Wald statistics. 2) The failure to reject the null hypothesis of: a) no autocorrelation in the AR (1) & AR (2) tests and; b) the validity of the instruments in the Hansen OIR tests.

The results of the analysis of the interaction variables between remittances and financial inclusion on the inequalities are presented in the table above.

Interactions terms help establish contingency. if the coefficient of the interaction term is positive and significant, this implies that the marginal effect on inequality depends on the level of integration of financial inclusion. This implies that the impact of remittances on inequality increases with a high rate of financial inclusion. Conversely, if the coefficient on the interaction terms negative and significant, this implies that the effect of remittances on inequality decreases with the action of financial inclusion.

The interaction between remittances and financial inclusion in models A, B and C show that all the coefficients are positive. Regardless of income inequality (GINI, ATKINSON and PALMA Ratio), financial amplifies the action of remittances. This can be explained by the fact in a region, if the number of banking branches is widespread enough, host families can easily receive money. They can allow them to minimize the costs of transportation to get to metropolitan areas and get their money. Its remittances allow the promotion and use of deposit accounts Its remittances allow the promotion and use of deposit accounts (Anzoategui et al., 2014). His deposits with financial institutions may have delays in withdrawals, hence an opportunity for financial institutions to borrow and improve growth as think Chitambara (2019). A family that continually receives money from a financial institution may have the credibility to benefit from a loan. This loan can improve the emergence of an activity and generate profits that can protect this family from certain economic shocks. By having insurance, a family can benefit from a loan and can take more risk in investing in an activity (Cai et al. 2015; Asongu et Odhiambo 2020)

## Conclusion

This study investigated the impact of migrant remittances on different income inequalities through different financial inclusion measures in 47 African countries over the 2004-2014 period. The empirical study was based on the generalized method of moments. The three main dependent variables were, the GINI index, the Palma ratio and the Atkinson index and six indicators used as androgenic variables were the different FI measures (ATM machine for 100,000 adults; banking branches for 100 000 adults; credits: deposits and insurance) and remittances. The results of our analysis show that remittances significantly reduce inequality in Africa accompanied by financial inclusion. This study positions itself in conformity with the sustainable development objectives of the United Nations, in particular objectives 10 which is: "Reducing inequalities in countries and from one country to another" in the same direction The study has contributed to the times to the macroeconomic literature on the measurement of inequality and responded to the major current issue of meeting the challenges of inequality in the post-2015 sustainable development goals by means of remittances and financial inclusion.

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