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Do remittances spur financial inclusion in Africa? a multi-dimensional approach

Abba Yadou Barnabé
University of Dschang

Ningaye Paul
University of Dschang

Bangake Chrysost
University of Artois

Abstract

The objective of this paper is to examine the effect of migrant remittances on financial inclusion in Africa using a multi-dimensional approach. Our sample consists of 21 countries over a period from 2004 to 2018. We adopted a Pooled Mean Group (PMG) to capture the short- and long-term dynamics of the impact of migrant remittances on financial inclusion. From this work, the following results have emerged. (i) Migrant remittances have a positive long-term effect on financial inclusion. (ii) Migrant remittances have a positive long-term effect on access to financial services. Specifically, the remittances have a negative effect in the short term and a positive effect in the long term on the number of banking branches. (iii) the remittances have a negative long-term effect on the use of financial services. More specifically, the remittances increase the number of depositaries with financial institutions in the long term but has a negative effect on the number of borrowings. These results are robust using a GMM system. Several implications flow from these results. To better benefit from remittances, it would be appropriate for financial institutions to offer ranges of products that are adapted to the recipient households in the use of financial services.

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Contact: Abba Yadou Barnabé - abbayadou@gmail.com, Ningaye Paul - paningaye@yahoo.fr, Bangake Chrysost - chrysost.bangake@univ-artois.fr.
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1- Introduction

Migrant remittances have grown rapidly and steadily in recent decades. Indeed, migrant remittances for low- and middle-income countries have increased from $343 billion in 2010 to $550 billion in 2019 with a growth of 4.7% compared to 2018. Moreover, these flows represent three times the flow of official development assistance and are set to surpass foreign direct investment as the largest source of external financing for developing countries (World Bank, 2019). These flows are underestimated because of the preponderant share via the informal channel, which represents 50% of the formal flow in Sub-Saharan African (SSA) countries according to the World Bank (2011) and 50 to 250% of the formal flow according to Freund and Spatafora (2008).

The growth in migrant remittances poses several development challenges. Thus, several studies have focused on its impact on economic growth (Sobiech, 2019; Bangake and Eggoh, 2019; Eggoh et al, 2019), poverty (Richard, 2006; Sanjeev et al., 2009; Azizi, 2019), entrepreneurship (Alan and Federico, 2016), health (Jorge, 2009; Pellet and Jusot, 2018) and education (Imtiaz et al., 2019).

Moreover, the empirical literature on the impact of migrant remittances on financial development shows us varied results (Fromentin, 2017; Selcuk, 2019). However, promoting financial development does not necessarily lead to financial inclusion (Anzoategui et al., 2014). Migrant remittances can improve financial inclusion when recipient households deposit surplus of income in a financial institution and benefit from a range of financial services offered by these formal institutions (Inoue and Hamori, 2016). Financial inclusion has played an important role since its inclusion in the development agenda in 2013 at the Seoul conference by the G20 countries. However, the percentage of adults holding a bank account remains low, with disparities between regions.

In Sub-Saharan African countries, for example, in 2017 only 43% of adults will have an account in a financial institution. Holding a bank account is 63% in developing countries, 35% in low income countries, 58% in low middle-income countries, 65% in middle income countries, 73% in upper middle-income countries and 94% in high income countries. According to Global Findex 2017, virtually all of these unbanked adults are from developing countries.

The stability of migrant remittance transfers in developing countries can be used for effective access by unbanked individuals and households (Sanjeev et al., 2009). Despite an increase in migrant remittances to developing countries, financial inclusion remains low in Africa compared to other regions in the world. Thus, can migrant remittances improve financial inclusion in Africa in long run?

In this study, we adopt the methodology of Wang and Guan (2017) for the selection of our financial inclusion variables but with the difference that we replace the variable "number of deposit accounts" with the number of depositors. We adopt the number of depositors' variable under the assumption that migrant remittances are an income surplus for recipient households and therefore increase the demand of safeguarding these funds from formal financial institutions.

To our knowledge there are no studies that address the impact of migrant remittances on financial inclusion by taking into account the number of depositors. Moreover, in this study we examine the short- and long-term effect of remittances on financial inclusion in a global way in these two dimensions (access and use of financial services) but also in each dimension. In addition, we examine the impact of migrant remittances on the different financial inclusion variables used in the construction of the index. Finally, we adopt a multi-dimensional approach to better understand financial inclusion as a whole.

2- Literature review

Financial inclusion is defined as the effective access and use by individuals and firms of the low-cost financial services offered by formal financial institutions. Financial inclusion is an essential element for the Sustainable Development Goals (SDGs) both in terms of its contribution to poverty reduction and economic development and for the prominence the G20 is giving it by placing it on the development agenda. In addition, migrant remittances are recognized as a source of external financing to achieve the SDGs. But to fully benefit from these transfers, financial inclusion is key. Migrant remittances can also be a determinant of financial inclusion if these resources are channelled into the formal system by lowering the transaction cost of these flows, thus facilitating their investment in more productive activities.

Previous studies on the relationship between migrant remittances and financial inclusion can be understood from two main perspectives, one theoretical and the other empirical.

Conceptually, remittances can impact financial inclusion through several mechanisms. Increased remittances can increase demand for bank deposit accounts as households need services to safeguard their temporary surplus income (Aggarwal et al., 2011; Anzoategui et al., 2014; Ambrosius and Cuecuecha, 2016). Moreover, unlike remittances through informal channels, remittances through bank accounts can encourage savings and investment (World Bank, 2005). Estimates show that 10% of remittance recipients save, invest and use them for entrepreneurial activity (Orozco and Fedewa, 2005). Taking into account the theory of remittances for personal interest such as investment, purchase of movable goods, the sender can impose the use of the funds and the way to manage it in order to have a traceability and therefore can boost the demand for deposit accounts.

In addition, remittances reduce information asymmetry between formal financial institutions and recipient households by providing information on household income (Anzoategui et al., 2014; Ambrosius and Cuecuecha, 2016). This increases the likelihood of obtaining a loan from a financial institution with the expectation that remittance recipient households will demand a safeguard of their surplus income from financial intermediaries. However, remittances also play the role of credit substitute by reducing the liquidity and credit constraint. Thus, remittances can reduce the demand for loans from financial institutions (Ajefu and Ogebe, 2019; Ambrosius and Cuecuecha, 2013).

Empirical studies on the link between migrant remittances are limited both in numbers and methodology. The impact of remittances on financial inclusion has been little developed, but the studies are more concerned with access to financial services, often taking into account a dimension of financial inclusion such as the possession of an account or the availability of financial institutions through the growth of branches of commercial banks (Inou and Hamori, 2016) and their impact on credit (Brown et al., 2013; Ambrosius and Cuecuecha, 2013). Empirical studies on the impact of remittances on financial inclusion can be divided into two main parts. One part focuses on a simple approach based on a financial inclusion indicator and the other part focuses on a multidimensional approach.

The simple approach that examines the relationship between migrant remittances and financial inclusion based on an indicator is furthermore microeconomic based on household survey data. This is the work of Anzoategui et al (2014), Ambrosius and Cuecuecha (2014) and Li et al (2014). The main limitation of this work lies in the apprehension of financial inclusion as not being multi-dimensional. In other words, financial inclusion is captured on one dimension. The results of Li et al (2014) show that remittances from migrants increase bank account ownership, use of bank branches for transactions but decrease Automated Teller Machine (ATM) use and insurance take-up. Moreover, there is no link between the receipt of remittances and credit and investment.

Ambrosius and Cuecuecha (2014) using survey data in Mexico shows that migrant remittances increase borrowing by recipient households. There is thus evidence that the receipt of remittances from migrants facilitates the obtaining of a loan via the demand-induced effect because the recipient has another additional source of income and thus the latter at less risk or via the supply-induced effect because the lender can accept the remittance as collateral for the loan because the borrower has an additional and relatively stable source (Ambrosius and Cuecuecha, 2014).

Anzoategui et al (2014) using survey data from El Salvador, shows that migrant remittances have a positive impact on financial inclusion by promoting the use of deposit accounts but have no significant effect on the demand for and use of credit offered by formal financial institutions.

Inoue and Hamori (2016) examine the impact of migrant remittance flows on access to formal financial services in 30 developing countries in Asia and Oceania from 2001 to 2012. These results show that the receipt of migrant remittances increases the number of commercial banking branches because in order to receive these transfers, recipients attach themselves to banks (Li et al, 2007).

Taxopeus and Lensink (2007) examine the effect of migrant remittances on financial inclusion in developing countries. The results show that migrant remittances have a positive effect on financial inclusion in developing countries. Note here that financial inclusion is captured by the expected share of households with a bank account, thus ignoring the use dimension of financial services. Thus, financial inclusion is reduced to its access dimension.

The growth of cell phone and internet access in Africa has given more optimism about its effect on financial inclusion. Studies by Olaniyi (2018) show that access to Information and Communication Technologies (ICTs) significantly increases financial inclusion and this causality is uni-directional. Some authors such as (Maloumby-Baka et al., 2016; Ludovico, 2019) have discussed the role that mobile banking and cryptocurrency can play in the relationship between migrant remittances and financial inclusion in terms of transaction costs (Maloumby-Baka et al., 2016). The role of mobile banking in financial inclusion has become significant in recent decades, especially in

countries such as Kenya with the M-PESA and in Sub-Saharan African countries. The work of Bounie et al (2013) provides sufficient evidence that mobile technology through mobile banking has an effect on financial inclusion.

3- Methodology

To understand financial inclusion in a multi-dimensional way as evidenced by Sarma (2008), we adopt a factor analysis following the work of Chuc et al (2019). In this study to examine the short- and long-term dynamics we adopt a Pooled Mean Group (PMG) developed by Pesaran et al (1999). To test the robustness of our results we take into account a GMM model in system such as Chuc et al (2019) to address the problem of potential endogeneity.

3.1 Basic model specification

Pesaran et al. (1999) suggest that for a large cross-section and a dynamic panel, panel regression and an error-correction model can be combined by applying an Auto Regressive Distributive Lag ($ARDL_{p,q}$)[1].

The model can be written as follows in the case of our study:

$$IFI_{i,t} = \varphi^i \left[IFI_{i,t-1} \left\{ \beta_0^i + \beta_1^i X_{i,t-1} \right\} \right] + \sum_{j=1}^{p-1} \gamma_j^i IFI_{i,t-j} + \sum_{j=0}^{q-1} \delta_j^i \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (1)$$

With IFI which represents the index of financial inclusion. δ and γ represents respectively the short-term coefficient of the lagged independent and dependent variable, represents the long-term coefficient, p and q represents respectively the lagged dependent and independent variable, φ is the coefficient of the speed of adjustment towards the long-term equilibrium, ε_{it} the error term.

3.2- System GMM model

The GMM method has been widely used in the field of finance in particular for its potential endogeneity in the model. The GMM model in system is specified as follows:

$$IFI_{it} = \beta_0 + \beta_1 IFI_{i,t-1} + \beta_2 tfmpib_{it} + \beta_3 X_{it} + \varepsilon_{it} \quad (2)$$

With IFI the measurement of the financial inclusion index of country i at time t, tfmpib is the migrants' remittances as a percentage of GDP, X_{it} represents the control variables and ε_{it} the error term.

3.3-Data and descriptive statistics

Description of the data

Our sample consists of 21 African countries from 2004 to 2018. The choice of study period and sample is dictated by the availability of financial inclusion data in the Financial Access Survey (FAS) database. Indeed, the FAS database is adopted by the International Monetary Fund to measure the capacity of domestic financial institutions to expand banking and financial services in order to achieve SDG target 8.10 by 2030. As such, the FAS is a key global source on financial inclusion that takes into account access to and use of financial services by firms and households.

Construction of the Financial Inclusion Index

Construction of the financial inclusion index following the approach of Wang and Guan (2017) with two dimensions of financial inclusion: access and use (Table 1). We use a factor analysis approach as in the work of Chuc et al (2019).

Table 1: Descriptions of Financial Inclusion Variables

Dimensions	Variables	Source
Access	Number of commercial bank branches per 100,000 adults	Financial Access Survey
	Number of ATMs per 100,000 adults	Financial Access Survey

[1] p and q represent respectively lag of dependent variable and the lag of independent variable.

Use of financial services	Number of depositors with commercial banks per 1,000 adults	Financial Access Survey
	Number of borrowers from commercial banks per 1,000 adults	Financial Access Survey

Source: Authors

Other explanatory variables are drawn from the literature on the relationship between migrant remittances and inclusion such as (Taxopeus and Lensink, 2007; Naceur et al., 2019; Chuc et al., 2019) and the determinants of financial inclusion (Beck, Demirgüç-Kunt and Martinez Peria, 2005).

The quality of institutions plays an undeniable role in the availability of financial services. Moreover, Beck et al (2005) find that good governance, better communication and transport infrastructure is correlated with greater availability of financial services. Thus, in this study we take into account the institutional quality measured by the average of the six governance variables namely: corruption control, government effectiveness, political stability/absence of violence, regulatory quality, rule of law and voice and accountability from the World Governance Indicator (WGI) as used by Chuc et al (2019). In addition, we use the variables regulatory quality and political stability as individual control variables. We capture the impact of human capital through secondary school enrollment Table 2 presents descriptive statistics for the variables used in this work. Our variables are taken from World Development Indicators (WDI) and World Governance Indicators (WGI); the description of each variable is in the appendix (see Appendix 2) and the list of countries in Appendix 1.

Table 2: Descriptive statistics

Variables	**Obs**	**Mean**	**Std.Dev**	**Min**	**Max**
IFI	315	0.000000026	0.9393	-1.941	3.193
AFI	315	0.000000033	0.853	-1.849	2.305
UFI	315	0.00000005	0.745	-1.932	3.017
popdensity	315	104.931	110.071	2.317	498.659
tfmpib	315	3.915	6.081	0.0009	41.499
Inflation	315	7.884	6.560	-2.814	36.964
school	315	50.306	22.369	11.968	102.145
popgrowth	315	2.246	0.924	-2.628	3.788
institutionquality	315	-0.476	0.621	-1.718	0.795
Politicalstability	315	-0.394	0.941	-2.523	1.200
Regulatoryquality	315	-0.546	0.545	-2.236	0.667
internet	315	15.412	16.000	0.196	64.190
mobile	315	62.575	43.811	1.410	184.298
logbranch	315	1.415	1.092	-0.936	3.976
logatms	315	1.606	1.546	-3.239	4.421
logdepositor	315	5.154	1.425	-0.748	7.674
logborrower	315	3.301	1.516	-4.003	5.762

Source: Authors

Descriptive statistics show us that on average migrant remittances contribute 3.915573% of GDP in our sample and have low volatility. All the variables are low volatile except for internet use and subscription to mobile services. The country-level average of all Financial Inclusion measures (IFI, AFI and UFI) is presented in appendix 3.

4- Empirical results

Before estimating the PMG we determine the integration of our different variables because to use a PMG no variable of the model must be integrated of order 2 or I(2). But before we test the cross-sectional dependence using the Pesaran (2007) test as shown in Table 3.

Table 3: Pesaran CD test

Variables	Test CD	Corr
IFI	36.41***	0.649
AFI	35.02***	0.624

UFI	19.95***	0.355
popdensity	55.46***	0.988
tfmpib	0.98	0.017
school	25.57***	0.456
Inflation	6.92***	0.123
popgrowth	6.58***	0.117
Politicalstability	2.32**	0.041
Regulatoryquality	-0.84	-0.015
institutionquality	1.36	0.024
internet	50.90***	0.907
mobile	53.04***	0.945
logbranch	39.13***	0.697
logatms	31.40***	0.559
logdepositor	25.96***	0.463
logborrower	21.65***	0.386
Notes: ***, ** and *represent 1%, 5% et 10% of level of significant respectively.		

Source: Authors

The null hypothesis of cross-sectional independence is rejected for all variables except tfmpib, institutionquality and regulatoryquality. In the presence of cross-sectional dependence, first-generation unit root tests produce biased results, so we use Pesaran's (2003) CADF test in this work. The Table 4 presents the Pesaran's CADF test.

Table 4: Pesaran's CADF panel unit root test

	Constant		Constant and trend		Decision
Variable	Level	First difference	Level	First difference	
IFI	-0.010	-3.996***	-0.231	-4.110***	I(1)
AFI	-1.064	-2.165**	0.748	-1.295*	I(1)
UFI	0.724	-2.596***	1.253	-1.913**	I(1)
inflation	-2.728***	-3.234***			I(0)
institutionquality	0.057	-4.888***			I(1)
popgrowth	-9.504***				I(0)
politicalstability	-1.997**	-3.023***			I(0)
internet	1.115	-2.819***			I(1)
mobile	-3.747***				I(0)
school	0.897	-0.519	1.292	0.798	I(2)[2]
logbranch	-1.641**				I(0)
logatms	-4.079***				I(0)
logdepositor	-1.192	-3.743***			I(1)
logborrower	-2.198**				I(0)
popdensity	-6.415***				I (0)
Notes: ***, ** and *represent 1%, 5% et 10% of level of significant respectively.					

Source: authors

Table 4 shows us that our variables are stationary at level and in first difference except for the school variable which is integrated of order 2. As said above for a PMG the variables must be integrated of order 1 or I (1) or stationary at level or I (0). Therefore, in our PMG model we exclude the variable school which integrated of order 2.

[2] See results in appendix 4.

RESULT OF THE BASIC MODEL

Table 5 presents PMG's estimates of the relationship between migrant remittances and financial inclusion. The first column presents the transfer effect of financial inclusion by taking into account the quality of institutions in a global way (average of the six WGI governance indicators) and the other to takes into account political stability and the quality of regulation. Indeed, the quality of regulation captures perceptions on the government's ability to formulate and implement policies and regulations conducive to private sector development.

Table 5: Pooled Mean Group (PMG) estimation results for financial inclusion

	Variables	**Model 1**	**Model 2**	**Model 3**
LR	tfmpib	0.030* (0.017)	0.046** (0.019)	0.056*** (0.018)
	Inflation	-0.106*** (0.0123682)	-0.100*** (.013)	-0.138*** (0.014)
	popgrowth	1.738*** (0.268)	2.0004*** (0.283)	2.364*** (.289)
	institutionquality	0.568** (0.261)		
	politicalstability		0.367*** (0.117)	
	regulatoryquality			0.451 (0.372)
SR	ECT	-0.220*** (0.064)	-0.211*** (0.056)	-0.217*** (.057)
	tfmpib	-.315 (.321)	-0.380 (.393)	-0.366 (0.334)
	popgrowth	0.784 (2.123)	0.695 (2.210)	1.926 (2.193)
	institutionquality	0.312 (0.580)		
	mobile	0.006 (0.005)	0.003 (0.006)	.001 (.006)
	internet	0.002 (0.022)	0.004 (0.022)	-0.006 (0.025)
	regulatoryquality			-0.163 (0.248)
	Inflation	0.0132* (0.007)	0.008 (0.006)	0.0182** (0.008)
	politicalstability		.469 (.295)	
	_cons	-0.542** (0.240)	-0.639*** (0.235)	-0.794*** (0.294)

Note: * p-value < 10%, ** p-value< 5% and *** p-value < 1%. Standard errors are in brackets. LR is long term and SR is short term.

Source: Authors

Migrant remittances have a positive effect on financial inclusion in all three long-term models. Moreover, our results show that in the short term, migrant remittances have a negative impact on financial inclusion. The short-term result can be explained by the share of the informal channel. Indeed, our sample is made up of developing countries, more precisely mostly Sub-Saharan African countries where the informal flow of migrants' remittances is higher. Indeed, according to Freud and Spatafora (2008), the share of these flows is around 50 to 250% in SSA countries. Thus, as the size of the informal circuit is more developed, recipient households have the same tendency to safeguard the funds received informally or simply help them with consumption to the detriment of safeguarding them with formal

financial institutions. Moreover, according to the World Bank's April report on migrant remittances shows that banks are the most expensive channels for migrant remittances, accounting for an average of 10.9%.

To better understand the effect of the TFM on financial inclusion, we divided the financial inclusion index into two dimensions as specified in Table 1. One dimension measures access to financial services and the other measures use of financial services. In Table 6 we present the results of the estimation of the PMG using the access index and the variables of this index as the dependent variable. The results show that remittances from migrants have a positive long-term effect on access to financial services. This result corroborates the findings of (Chuc et al., 2019, Inoue and Hamori, 2016). Indeed, this result can be explained by the need of households receiving funds from a financial institution to receive deposits where remittances are more secure than informal remittances (friends, relatives...). Indeed, according to Li et al (2014), the remittances increases the number of banking branches because recipient households attach themselves to a banking branch in order to receive the funds. This is justified by the fact that migrant remittances have a positive long-term effect on the number of banking branches. On the other hand, the short-term effect of remittances has a negative effect on the number of bank branches. The use of the informal flow (friends, relatives...) cannot be maintained in the long term and the migrant would be obliged to bring the recipient household to make contact with a formal financial institution. Thus, the demand for services for financial intermediation increases and to better take advantage of this, banks will tend to multiply their branches in cities where the reception of this flow is higher. But on the other hand, the transfer of migrant remittances has a positive impact on the number of ATMs in the long term and a negative impact in the short and long term, even though it is not significant. Our results are contradictory to those of Li et al (2014) based on survey data in Mexico. Indeed, Li et al (2014) shows that migrant remittances have a negative impact on the number of ATMs in Mexico but increase the number of bank branches. However, in the work of Anzoategui et al (2014), remittances increase the number of bank accounts and consequently the recipient households can acquire bank cards and thus increase the number of ATM applications and consequently the number of ATMs.

Table 6: Estimate for access to financial services

	Variables	AFI	logbranch	logatms
LR	tfmpib	0.073*** (0.017)	0.076*** (0.013)	0.008** (0.003)
	popdensity	-0.030*** (0.004)	-0.009*** (0.003)	0.026*** (0.003)
	institutionquality	2.996*** (0.291)	2.078*** (0.230)	
	popgrowth	-4.676*** (0.575)	0.820*** (0.274)	-0.766*** (0.209)
SR	ECT	-.198*** (.066)	-0.324*** (0.099)	-0.490*** (0.1009)
	tfmpib	-0.0312 (0.142)	-0.015 (0.038)	.063 (.058)
	Institutionalquality	0.470 (0.500)	-.218 (.354)	0.266 (0.358)
	popdensity	7.834 (5.016)	-0.492* (0.264)	2.287* (1.340)
	popgrowth	-2.108 (3.037)	-2.197 (1.907)	-1.666 (2.129)
	mobile	.007 (.005)	-.004 (.004)	0.000032 (0.002)
	Inflation	-0.013 (0.015)	0.00029 (0.0025)	
	_cons	2.382*** (0.600)	.613* (0.323)	1.204*** (0.305)

Note: * p-value < 10%, ** p-value< 5% and *** p-value < 1%. Standard errors are in brackets. LR is long term and SR is short term.

Source: Authors

Table 7 shows us the effect of migrant remittances on the use of financial services overall as well as on the number of deposits and the number of loans. Like the work of Chuc et al (2019), migrant remittances have a long-term negative effect on the use of financial services. Indeed, the transfer of migrant remittances has a positive effect on the number of deposits because of the demand by households receiving financial services to deposit their surplus income. However, in economies where the credit constraint is high, migrant remittances are used as a substitute for formal borrowing (Chuc et al., 2019; Giuliano and Ruiz-Arranz, 2009). Moreover, the effect of migrant remittances on borrowing is more oriented towards informal finance than formal finance (Ambrosius and Cuecuecha, 2016).

Table 7: Estimated remittances and use of formal financial services

	Variables	UFI	logdepositor	logborrower
LR	tfmpib	-0.0713*** (0.016)	0.139*** (0.016)	-0.111*** (0.023)
	Inflation	-0.003 (0.007)	-0.008*** (0.002)	-0.0007 (0.006)
	institutionquality	2.132*** (0.191)		
	popgrowth		0.097*** (0.034)	
	regulatoryquality		0.2548*** (0.067)	
SR	ECT	-0.328*** (0.096)	-0.435*** (0.092)	-0.348*** (0.071)
	tfmpib	-0.257 (0.273)	-0.049 (0.048)	-0.336* (0.197)
	Institution quality	-0.742 (0.764)		
	regulatoryquality		-0.274** (0.135)	-0.838** (0.353)
	mobile	0.007 (0.007)	-.006* (0.003)	.0048 (0.006)
	Inflation	-0.004 (0.006)	.012 (.0119)	-.002 (.011)
	popgrowth	-1.051 (1.802)	-1.336 (1.066)	0.628 (1.230)
	_cons	0.616*** (0.225)	2.126*** (0.433)	1.366 *** (0.318)

Note: * p-value < 10%, ** p-value< 5% and *** p-value < 1%. Standard errors are in brackets. LR is long term and SR is short term.

Source: Authors

ROBUSTNESS: A SYSTEM GMM APPROACH

For robustness we use a GMM in system (see Table 8) in order to take into account a potential endogeneity of the variables and moreover this model is more used in the field of research concerning finance. The results corroborate those found using a PMG.

Table 8: Migrant remittances and financial inclusion: SGMM approach

VARIABLES	IFI	AFI	UFI
L.IFI	0.682*** (0.101)		
L.AFI		0.632*** (0.151)	

L.UFI			0.465** (0.199)
tfmpib	0.145*** (0.041)	0.097** (0.042)	-0.124** (0.061)
Inflation	0.00352 (0.00515)	0.0068 (0.00428)	-0.005 (0.005)
popgrowth	0.689*** (0.251)	-0.212 (0.169)	0.071 (0.131)
popdensity	0.0000193 (0.000318)	0.000803** (0.000338)	0.00176*** (0.000553)
institutionquality	0.325 (0.202)	-1.036** (0.448)	0.0552 (0.155)
internet	-0.00737** (0.00374)	-0.00791*** (0.00293)	-0.0301*** (0.00704)
mobile	0.00749*** (0.00261)	0.0124*** (0.00449)	-0.00255 (0.00258)
schoolbon	0.00136 (0.00270)	-0.00497* (0.00264)	0.0517*** (0.0138)
Constant	-2.314*** (0.811)	-0.839 (0.623)	-1.747*** (0.538)
AR1 (p-value)	0.000	0.00321	0.0104
AR2 (p-value)	0.143	0.657	0.464
Sargan (p-value)	0.315	0.656	0.427
Number of countries	21	21	21
Observations	290	290	270
Standard errors are in brackets *** p<0.01, **p<0.05 and * p<0.1			

Source: Authors

5- Conclusion

This paper examines the effect of migrant remittances on financial inclusion in 21 Africa countries for 2004 to 2018 through a multi-dimensional approach. As specified by Sanjeev et al (2009), migrant remittances can be a channel through which unbanked households can access formal financial services. However, in the specific case of our study, remittances have a negative impact on financial inclusion as a whole. More specifically, the receipt of remittances increases access to financial services in the long run but has a negative effect on the use of financial services. As a result, remittances from migrants create an alternative source of financing for recipient households at the expense of the financial market represented mainly by banking institutions. Thus, in order to better channel these funds, it would be beneficial to promote a range of services adapted to households receiving these funds to make better use of formal financial services. Furthermore, in order to channel remittances through the formal channel, it is preferable to limit transaction costs that undermine the use of the formal channel. Considering the importance of migrant remittances as a source of stable capital and its effect on the development of recipient countries. It will be important in future studies to use estimation techniques to establish whether there is an inverse effect in the relationship between migrant remittances and financial inclusion. This would involve finding a threshold.

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APPENDIX

Appendix 1: List of countries

Boswana, Burundi, Cameroon, Cape Verde, Democratic Republic of Congo, Egypt, Gabon, Ghana, Guinea, Lesotho, Madagascar, Malawi, Namibia, Nigeria, Rwanda, Seychelles, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe.

Appendix 2: Description of the variables

Variables	Description	Source
IFI	Financial Inclusion Index	Authors
AFI	Financial Services Access Index	Authors
UFI	Financial Services Utilization Index	Authors
tfmpib	Migrant remittances received (% GDP)	WDI
Inflation	Inflation, price index (annual %)	WDI
popgrowth	Population growth (annual %)	WDI
popdensity	Population density measured by the number of people per square kilometre of area.	WDI
school	Human capital as measured by the gross secondary school enrolment ratio	WDI
Regulatory quality	Captures the perception of the government's capacity to formulate and implement policies and regulations that enable and promote private sector development.	WGI
Political stability	Captures the likelihood that the government will be destabilized or overthrown by unconstitutional means for political and terrorist motivation.	WGI

institutionquality	Captures overall institutional quality as measured by the average of the six governance indicators from WGI	Authors
internet	Individual internet use (% of population)	WDI
mobile	Subscription to mobile services (per 100 people)	WDI
logbranch	Logarithm of the number of commercial bank branches per 100,000 adults	Authors
logatms	Logarithm of the number of ATMs per 100,000 adults	Authors
logdepositor	Logarithm of the number of depositors per 1000	Authors
logborrower	Logarithm of the number of borrowers per 1000	Authors

Source: Authors

Appendix 3: country-level average of all Financial Inclusion measures

country	IFI	AFI	UFI
Boswana	0.0000000046	-0.0000000067	-0.0000000067
Burundi	0.000000048	-0.000000006	-0.0000000521
Cameroon	-0.00000006667	-0.000000033	0.000000029
Cape Verde	-0.00000006	0.0000000666	-0.00000002
Democratic Republic of Congo	0.000000029	0.0000000253	-0.00000000127
Egypt	0.000000053	0.00000004	-0.0000000098
Gabon	0.00000002	0.000000033	-0.0000000048
Ghana	-0.000000013	0.00000003	0.00000012
Guinea	0.00000016	-0.00000006	-0.000000148
Lesotho	0.00000004	0.00000029	-0.0000000066
Madagascar	0.000000033	0.0000000333	-0.00000002
Malawi	0.000000047	0.0000000217	-0.0000000117
Namibia	0.000000083	-0.000000041	-0.0000000166
Nigeria	0.00000000667	0.0000000762	0.0000000363
Rwanda	0.00000000667	0.000000013	0.0000000067
Seychelles	0.0000000667	-0.000000073	0.00000006
Tanzania	-0.0000000878	0.0000000167	-0.000000015
Tunisia	0.000000026	0.000000296059	0.000000074014
Uganda	0.000000073	0.000000013	0.00000002
Zambia	-0.000000058	0.00000003	0.000000015966
Zimbabwe	0.000000026	0.00000002	0.00000000667

Appendix 4: Pesaran CADF test for variables school

Variables	2nd difference	3rd difference
school	-2.030**	-4.580***

Source: Authors