



Migrant Remittances and Economic Growth: The Role of Financial Efficiency

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Authors' contributions

This work was carried out in collaboration among all authors. Author NP designed the study and revised the final draft. Author AYB perform the methodology and write the empirical result and discussion. Author BMCG write the literature review and revise the final draft.

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ABSTRACT

The objective of this paper is to examine the relationship between migrant remittances and economic growth by considering the role of financial efficiency in 34 African countries from 1995 to 2016. The methodology is based on a GMM system model and a Pooled Mean Group (PMG) on a sample of 34 African countries. The empirical results show us the following conclusions: (i) Migrant remittances and financial efficiency have a positive impact on economic growth. (ii) The interaction between remittances and financial efficiency has a negative impact on economic growth. (iii) Migrant remittances have a long-term impact on economic growth. (iv) The combined effect of migrant remittances and financial efficiency has a negative impact on economic growth. Moreover, this impact is more pronounced in low-and middle-income countries. To better benefit from migrant remittances, recipient countries need to focus on financial development.

Keywords: Migrant remittances; financial efficiency; growth; GMM in system.

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1. INTRODUCTION

The growing importance of migrant remittances in developing countries has raised a number of

questions about both financial development and economic growth in these countries. Indeed, migrant remittances represent a source of external financing for the economies of

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developing countries and are qualified as a source of funding to achieve the Sustainable Development Goals (SDGs) in Africa.

Migrant remittances to developing countries have achieved increased growth in recent decades. Indeed, in low- and middle-income countries it has increased from US\$529 billion in 2018 to US\$550 billion in 2019, placing it above foreign direct investment and development assistance [1]. These statistics come from formal recorded sources excluding those transiting through the informal circuit. Moreover, migrant remittances are less volatile due to their counter-cyclical effect. Indeed, it has been recognized that migrant remittances are higher in low economic conditions to compensate for the level of household income. Moreover, the 2008 economic crisis did not have a significant effect on migrant remittance flows compared to other flows.

Recent studies recognize the effects of migrant remittances on both poverty reduction, financial development and economic growth. However, the debate on the effect of migrant remittances on economic growth is still topical due to varied and inconclusive results [2,3]. The main channel through which migrant remittances impact economic growth is the financial system [2]. Unfortunately, apart from the research of [4,5] on the impact of remittances on financial efficiency, no study to our knowledge has considered the role of financial efficiency on the relationship between remittances and economic growth. This paper tries to fill this gap in the literature.

Our study has several different contributions compared to the existing literature. First, we provide a new view on the role of financial efficiency as a channel through which remittances have an impact on economic growth. Second, understanding the importance of financial efficiency in the relationship between migrant remittances and economic growth allows policy makers to adopt or boost the efficiency of financial systems in Africa in order to better channel these funds through the formal channel. Moreover, financial efficiency is designated as an attractive element of deposits and especially helps to capture more remittances from migrants transiting through the informal to the formal channel.

The rest of the paper is organized as follows: a brief review of the literature presents the studies done on the relationship between remittances

and economic growth taking into account the role of financial development and the relationship between remittances and financial efficiency, Empirical methodology and data presents the methodology adopted and the data of the study, Empirical results presents the empirical results and discussions, and the last section Conclusions and implications presents the empirical results and economic implications.

2. BRIEF REVIEW OF THE LITERATURE

The literature on the relationship between migrant remittances and economic growth has identified three main channels through which migrant remittances influence economic growth in recipient countries [6,7]. These three main channels include: human and physical capital accumulation, the financial system, and labour.

Indeed, for [8], the transfer of migrant remittances impacts growth through three main channels such as capital accumulation, labour growth and total factor productivity. Migrant remittances act as an alternative source of financing for domestic investment of recipient households in the face of financial constraint. From a microeconomic perspective, if a household faces a financial restriction that constrains its investment activity, remittances contribute to capital accumulation by alleviating the financial constraint [6]. Moreover, in recipient countries where the financial system is less developed, remittances can be used to facilitate this constraint by increasing the accumulation of physical and human capital for recipient households. However, by alleviating the financial constraint, migrant remittances reduce the demand for credit from financial institutions and therefore have a negative impact on financial development. Thus, migrant remittances act as a substitute for the financial sector in countries with low financial development. Indeed, the impact of migrant remittances on economic growth is positive for countries with low financial development and negative in countries with high financial development [3]. Moreover, the human capital channel through which remittances impact economic growth is more developed in the literature. Indeed, the largest share of remittances received by households is spent on education and health [9-12]. Examining the impact of migrant remittances on health spending in Mexico, [10] find that migrant remittances increase health spending. Approximately 6 pesos out of every 100 receipts are spent on health. [9]

show how remittances alleviate financial constraints and increase school enrolment.

The second channel refers to labour force growth. Indeed, the channel through which migrant remittances can influence the labour factor is active labour force participation. However, the transfer of migrant remittances raises the problem of "moral hazard" between the migrant and the recipient household. Recipient households consider remittances as a substitute for their income and thus increase their spending on leisure. [12] shows that migrant remittances reduce the female labour force participation rate but do not affect the male participation rate. Furthermore, [13] shows that remittances have a significant impact on both the demand and supply of labour in recipient countries. On the labour supply side, remittances reduce labour force participation and increase the informal sector of the labour market.

The third channel, which is financial development, confronts two types of literature: one advocates the direct impact of financial development on the relationship between remittances and economic growth, and the other advocates the non-linearity of this relationship. The first type refers to the fact that financial development directly influences the relationship between migrant remittances and economic growth.

[3] examines the impact of migrant remittances on growth in 61 emerging and developing countries from 1970 to 2010 by considering the role of financial development as a channel. These results show that the effect of migrant remittances on growth depends on the level of financial development. Indeed, the impact is positive for countries with a low level of financial development and negative in countries with a high level of financial development. But this study does not provide information on the level of the financial development threshold at which financial development has a positive or negative impact on the relationship between migrant remittances and growth. [2] compensate for this gap by taking into account the threshold effect of financial development in this relationship. Using a Panel Threshold Regression (PTR) model developed by [14,2] show that there is a single threshold in the relationship between remittances and economic growth by taking financial development as the threshold variable and the threshold is between 28.69 and 46.35% as a percentage of GDP of the financial development variable. Below the 28.96% threshold, the

relationship between remittances and economic growth is insignificant. However, above the 28% threshold (more than 28% for domestic credit offered by the bank and domestic credit to the private sector, 35.3% for domestic credit offered by the financial sector and 46.3% for the M2/GDP variable), the relationship between remittances and economic growth is positive.

Financial efficiency measures the ability of financial institutions to offer quality products and services at low cost. The impact of migrant remittances on financial efficiency finds its place in the pioneering work of [4]. Indeed, [4] examines the effect of migrant remittances on two dimensions of the financial sector, namely size and efficiency, in a sample of 94 non-OECD countries. The results show that migrant remittances increase size and financial efficiency in these recipient countries. Furthermore, the results suggest that remittances lead to increased financial efficiency in countries with high government ownership of banks. Focusing on the banking sector and the stock market, [5] examine the relationship between migrant remittances and its volatility on financial development (depth and efficiency) in SSA countries. The results show that the volatility of migrant remittances is detrimental to both the depth and efficiency of the financial sector and remittances act as a proxy for the banking system in SSA countries.

The change in overheads and transaction costs are reflected in the interest rate margin between the depositary and the lender [15]. According to [4], while migrant remittances increase the availability of credit, they may also contribute to the decline in overhead costs and the net interest rate margin. Thus, by increasing the reserve of banks, the transfer of migrants' remittances is a channel that promotes financial efficiency [5]. Thus, the transfer of migrants' remittances through financial efficiency can boost economic growth by attracting more of these flows to the banking channel. Indeed, if the change in overheads and operating costs are reflected in the interest rate margin, they may attract more migrant remittance deposits to banks and their use in terms of credit to the economy.

3. DESCRIPTIVE DATA, STATISTICS AND METHODOLOGY

3.1 Data and Descriptives Statistics

The list of countries and the map of Africa can be found in annexes 1 and 2, respectively. The

Table 1 provides a description of the variables considered in our model.

Our sample includes 34 African countries between 1995-2016 due to data availability. Our data are taken from several databases including World Development Indicators, Polity IV and the KOF Globalization Index.

Our variable of interest is migrant remittances which represents two components namely personal remittances and employee compensation. As [16] point out, the amount of migrant remittances is underestimated because the flow of migrant remittances transiting through the informal circuit represents 50 to 250% of the formal flow. However, all papers on migrant remittance issues suffer from the same problem. The description of the other variables used in this study are presented in Table 1.

Financial efficiency was measured by ratio of overheads to total assets. [4,15] measure financial efficiency by the ratio of overheads to

total assets and net interest margin. However, due to the availability of data, the ratio of overheads to total assets is taken into account as a measure of financial efficiency. Table 2 provides descriptive statistics on the variables used.

The correlation matrix actually allows us to observe the risk of multi-collinearity in our sample. This matrix (see Table 3) reveals a weak correlation between our variables.

In order to better capture the short and long term dynamics we use a PMG model. But, before doing so, we do unit root tests of [17] to determine their level of integration, then we do a Kao cointegration test and finally we do the Farrar-Glauber multi-collinearity test.

In the light of the Farrar-Glauber multi-collinearity test (see Table 7), we can conclude that there is no multi-collinearity in our panel because all F-tests have a P-value of less than 1%.

Table 1. Variable descriptions

Variables	Description	Source
Growth	Annual percentage growth rate of GDP based on constant 2010 U.S. dollars	WDI
Tfmpib	Remittances as % of GDP	WDI
Overhead	Total overhead cost of asset	Global Financial Development Database
Tradeopen	Sum of exports and imports of goods and services as percentage of GDP	WDI
Inflationcpi	Inflation, annual growth of consumer price index	WDI
Polity2	Measure of democracy level. It ranges from -10 to 10	Polity IV
KOFglobalisation	Represent economic globalisation	KOF globalisation index
overtfm	Represent interaction between remittances and overhead	Authors

Source: Author, 1995 to 2016

Table 2. Statistics descriptive

Variables	Mean	Std.Dev	Minimum	Maximum
Growth	4.517111	3.93022	-28.09998	35.22408
Tfmpib	4.05357	8.87547	.0045058	108.4032
Inflationcpi	7.25282	10.00397	-9.616154	132.8238
KOFglobalion	48.53986	9.481162	25.79535	71.73953
Polity2	1.791444	5.368043	-7	10
Tradeopen	68.40144	28.10792	14.77247	165.6459
Overhead	5.217128	2.688167	.174175	25.6274

Source: Author, 1995 to 2016

3.2 Empirical Methodology

To address the problem of endogeneity of migrant remittances, we use a GMM system following the work of [4,5]. Indeed, high financial development increases the amount of migrant remittances transiting through the formal circuit via the financial sector. In addition, the development of the financial sector can have an impact on lowering transaction costs and thus increase the flow of remittances [18]. Thus, by using a GMM in system, we address the possible endogeneity bias.

Indeed, a GMM in system is a dynamic panel model allowing a lagged variable among its explanatory variables. Moreover, a GMM in system gives more efficient results than a GMM in difference according to the tests made by the Monte Carlo test [19]. In this study, we use a GMM in system of [20] whose empirical specification is as follows:

$$growth_{it} = \beta_0 + \beta_1 growth_{i,t-1} + \beta_2 tfmpib_{it} + \beta_3 overhead_{it} + \beta_4 X_{it} + \beta_5 overtfm + \lambda_i + \mu_i + \varepsilon_{it}$$

Where $growth_{it}$ is the annual percentage GDP growth of country i at time t , $tfmpib_{it}$ is migrant remittances as a percentage of GDP, $overhead$ represents overhead costs taken here as a measure of financial efficiency; and X represents the control variables that can have an impact on growth., λ_i is the country-specific unobserved effect, μ_i is the time-specific effect and ε_{it} is the error term.

According to [21], static panel estimators do not take into account the advantage of the panel data dimension by distinguishing between the short and long term. Static panel models do not capture the data dynamics that are fundamental to the growth literature [22]. Thus, in this study we used a dynamic panel using a system GMM in the [19]. But the GMM method just captures the short term dynamics and ignores the long term dynamics. To take into account the long-term dynamics, it is therefore appropriate to use a Pooled Mean Group (PMG) model developed by [23]. Indeed [23] suggests 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). The model can be written as follows:

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

$Growth$ represents the annual percentage growth of GDP, δ and γ represents the short-term coefficient of the lagged independent and dependent variable, respectively., β represents the long term coefficient, p and q represents the lagged dependent variable and independent respectively, φ is the coefficient of the speed of adjustment towards long term equilibrium, ε_{it} the error term.

The PMG model is adopted in this work for two main reasons. First, we want to observe the short- and long-term dynamics of the impact of remittances on economic growth, taking into account the role of financial efficiency. Second, the PMG model is used for its adequacy with our data because it is suitable for estimates with variables with varying degrees of integration, i.e.,

level and difference stationary variables. Before any use of the PMG model, a unit root test is essential to determine the level of integration because the variables must not exceed I (1) because if some variables are I (2), the estimate is not consistent [24]. In this study, we perform the unit root test of [17] and the Fisher test following the Augmented Dickey-Fuller (ADF) approach. In addition, we use [25] cointegration test to examine the existence of a long-term relationship between our study variables.

3.3 Empirical Results

In our empirical results, we first present the estimates of the GMM in system, then we present the unit root test, the Kao cointegration test and finally we present the results of our PMG model.

Table 3. Matrix correlation

Variables	Growth	Tfmpib	Tradeopen	Inflation	Polity2	Kofglo	Overhead	Overtfm
growth	1.0000							
tfmpib	-0.0083	1.0000						
tradeopen	-0.0600	0.1673	1.0000					
inflation	0.0617	-0.0596	-0.1460	1.0000				
polity2	0.0115	0.1167	0.2186	-0.0036	1.0000			
KOFglo	-0.0757	-0.0163	0.3609	-0.1883	0.1830	1.0000		
overhead	0.0930	-0.0505	-0.2206	0.2428	0.0145	-0.4364	1.0000	
overtfm	-0.0305	0.7985	0.0901	-0.0194	0.0693	-0.0170	0.1143	1.0000

Source: Author, 1995 to 2016

Table 4. Farrar-glauber multi-colinearity test

Variables	F test	p-value
Tfmpib	821.233	0.000
Overhead	92.840	0.000
Overtfm	867.022	0.000
Tradeopen	28.151	0.000
Inflationcpi	8.313	0.006
Polity2	13.754	0.001
KOFglobalisation	42.499	0.000

Source: Author, 1995 to 2016

Table 5. Pesaran (2004) CD test

Variables	Test CD	Corr
Growth	5.06***	0.046
Tfmpib	9.46***	0.090
Inflationcpi	19.10***	0.200
Kofglobalisation	69.84***	0.689
Tradeopen	11.11***	0.104
Overhead	5.18***	0.064
Overtfm	3.67***	0.034

Source: Author, 1995 to 2016

Table 6. Pesaran's CADF test

Variables	Constant		Constant and trend		Decision
	At level	In difference	At level	In difference	
tfmpib	-2.869***	-9.007***	-1.943**	-6.855***	I(0)
InflationCPI	-6.710***	-14.725***	-5.960***	-11.357***	I(0)
KOFglobalisation	-3.121***	-9.734***	-2.266**	-6.327***	I(0)
tradeopen	-1.668**	-7.843***	-0.012	-4.041***	I(0)
overhead	-1.919**	-8.006***	0.316	-5.952***	I(0)
overtfm	-0.174	-10.420***	1.182	-7.857***	I(1)
growth	-5.596***	-15.666***	-4.595***	-12.553***	I(0)

Source: Author, 1995 to 2016

3.3.1 Cross sectional dependency test

We are doing a transversal dependency test in this work in order to be able to choose between first- or second-generation unit root tests. Indeed, in the presence of a transversal dependency, the first-generation unit root tests give biased results. In this work, we have chosen [26] transverse dependency test due to its robustness when the sample size is higher than its temporal dimension [27].

The results in Table 5 reject the null hypothesis at the 1% threshold. They show that there is a cross-sectional dependency in the study data.

3.3.2 Panel unit root test

Due to the presence of cross-sectional dependence in our data, we use the Cross-

Sectional Augmented Dickey-Fuller (CADF) from [26].

Table 6 shows us that all our variables are level stationary except for our cross-tabulated variable which is integrated of order 1.

3.3.3 Kao cointegration test

In order to examine the existence of long-term relationships between the variables, we use the [25] cointegration test.

The results in Table 5 show that there is cointegration between variables at the 1% threshold. This rejects the null hypothesis of the non-existence of cointegration between the variables. Our results show robust evidence of the existence of a long-term relationship between migrant remittances and the other variables in the model.

Table 7. Kao's cointegration test

Statistique	Coefficient	p-value
Modified Dickey-Fuller t	-19.1151	0.0000
Dickey-Fuller t	-17.7539	0.0000
Augmented Dickey-Fuller t	-11.9069	0.0000
Unadjusted modified Dickey-Fuller t	-26.8305	0.0000
Unadjusted Dickey-Fuller t	-18.9383	0.0000

Source: Author, 1995 to 2016

Table 8. Estimates of the GMM in system model

Variables	GDP growth
L.GD Pgrowth	-0.566*** (0.106)
tfmtfib	8.852*** (1.416)
InflationCPI	0.0866 (0.0678)
polity2	-0.480*** (0.108)
KOFglobalisation	-0.542*** (0.178)
tradeopen	0.520*** (0.0842)
overhead	4.579*** (1.270)
overtfm	-0.774*** (0.272)
Constant	-39.45*** (11.90)
AR1 (p-value)	0.000
AR2 (p-value)	0.867
Sargan (p-value)	0.500
Observations	621
Number of countries	34

Source: Author, 1995 to 2016

Table 9. Empirical results using a Pooled Mean Group (PMG)

Growth Variables	Pooled mean group			Mean group		
	Coef	Std.err	p-value	Coef	Std.err	p-value
LR tfmpib	.4923012	.089925	0.000	4.080819	2.922596	0.163
overtfm	-.0692351	.0145981	0.000	-.0669999	.1885319	0.722
Hausman h= 2.35 ; p-value= 0.3095						
SR ECT	-.847956	.0516482	0.000	-.9740747	.0710055	0.000
D1tradeopen	.0618432	.0356745	0.083	.00737	.0343253	0.830
D1inflationCPI	.0024258	.0544989	0.964	-.3091561	.3599132	0.390
D1polity2	-.2444504	.2090284	0.242	-.3273584	.24965	0.190
D1kofglobalisation	.1419594	.1786225	0.427	.2564081	.1889781	0.175
D1tfmpib	-.8512523	1.209356	0.482	-1.729763	1.288108	0.179
constant	3.120739	.299618	0.000	.1581234	3.563365	0.965
Number obs	668			668		

Source: Author, 1995-2016

3.4 Basic Results

The table below shows the results of the estimation of the GMM in system.

Table 8 presents the results of the GMM in-system model on the relationship between migrant remittances and economic growth taking into account the role of financial efficiency in 34

African countries. The results suggest that there is no second-order autocorrelation in the residuals but there is first-order autocorrelation in the residuals. Sargan's test focuses on instrument validity, and in this model, our instruments are valid. Thus, our model has successfully passed all the required tests (AR1, AR2 and Sargan) for a dynamic panel.

Our results show that migrant remittances have a positive impact on economic growth. These results support the view that migrant remittances increase economic growth in developing countries and corroborate the findings of [28,29]. We also find that financial efficiency has a positive and significant impact on economic growth. Indeed, financial development can have an impact on reducing transfer costs, thereby increasing the impact of transfers on economic growth [2].

Moreover, when we interact migrant remittances and financial efficiency, we observe a significant negative impact on economic growth. This result shows that the impact of migrant remittances on growth decreases with the increase in financial efficiency. Indeed, financial efficiency is measured here by the overhead costs of total assets as in the studies by [4,5]. The change in overheads and transaction costs is visible in the interest rate margin between the custodian and the lender [15]. Thus, an increase in overheads makes it more difficult for banks to solicit for loans. In fact, this result shows that financial efficiency is low and does not allow the transfer of migrants' remittances to be channeled through the formal circuit due to high transfer costs. According to the [1], the cost of sending 200 US dollars to low and middle income countries is 7% in the first quarter of the year 2019. This cost is more than double the SDO target of 3% by 2030. Sub-Saharan Africa, for example, has an average cost of 9.3% and the cost of transferring in several corridors of African countries remains above 10% [1].

Economic globalisation and the type of political regime in Africa have a negative impact on economic growth. However, trade openness has a positive impact on economic growth. Regarding the quality of institutions captured by the level of democracy in Africa has a negative impact on economic growth. This suggests that the quality of institutions reduces economic growth. Indeed, the level of democracy in Africa according to the Economist Intelligence Unit (EIU) report (2019) remains below the world average (5.48).

3.5 Pooled Mean Group Model

In order to be able to examine the short and long term effect in our study we use a PMG developed by [23]. Before using a PMG it is recommended to perform a unit root test to determine whether the variables are stationary or integrated of order 1. To determine the degree of integration we perform a unit root test of [30]. All our variables are level and difference.

In this study before choosing a Pooled Mean Group (PMG) we estimated a Mean Group (MG). To make a choice between a MG or a PMG the Hausman test is used. Indeed, the Hausman test tests the significance of the difference between the MG and PMG estimate and the null hypothesis is that the difference between the PMG and the MG is not significant. If the p-value is greater than the 5% threshold, the null hypothesis is rejected and the PMG is accepted as the main estimate. Table 6 presents the results of the PMG, the MG and the Hausman test.

Table 9 reports the results of the PMG, MG and Hausman test estimates that measure the efficiency between the two models. The Hausman test result indicates that the PMG model is more efficient and we use this model as our estimate. The PMG results show us that migrant remittances have a positive and significant long-term impact on economic growth. While the interaction between migrant remittances and financial efficiency has a negative and significant long-term impact.

3.5.1 Robustesses

In order to better observe the impact of migrant remittances and financial efficiency in the short and long term on economic growth. We divide our sample of 34 countries according to their income level. We distinguish in our sample two levels, namely low-income (LIC) and low- and middle-income (LMIC) economies.

The results show that migrant remittances have a negative short-term impact in low-income economies. In the long term we find that remittances have a significant impact in low- and middle-income countries. Indeed, migrant remittances have a long-term negative impact in the sample of low-income countries although this result is not significant.

Table 10. Estimated PMG by country income level

D. Growth		LIC	LMIC
LR	tfmtfpib	-.0323314 (.170627)	.7293696***(.0995433)
	overtfm	.0102983 (.0184621)	-.1110187***(.0169348)
SR	ECT	-.8867772 ***(.0620001)	-.8238901***(.0821822)
	D1tradeopen	.0913958 (.080926)	.0339534(.0262085)
	D1InflationCPI	.012269 (.1018807)	.0041853(.0586854)
	D1polity2	.2809444(.2944782)	-.5168098*(.2820866)
	D1tfmpib	-1.054975*(.5856388)	-.6727497(2.038364)
	D1KOFglobalisation	-.0180783(.3778778)	.2889989**(.141768)
	constant	4.003079***(.4791439)	2.381435***(.4007495)
	Number of observation	272	400
	Number of countries	14	20

Source: Author, 1995 to 2016

Regarding the impact of the interaction between migrant remittances and financial efficiency on economic growth, this variable is significant and negative for low- and middle-income countries.

4. CONCLUSION AND IMPLICATIONS

This paper revisits the relationship between migrant remittances and economic growth, taking into account the role of financial efficiency. The sample consists of 34 African countries from 1995 to 2016 using a GMM system and a Pooled Mean Group (PMG) to capture the short and long term. The results show that migrant remittances have a positive and significant impact on economic growth at the 1% threshold. Moreover, the interaction between migrant remittances and financial efficiency has a negative impact on economic growth. This refers to the fact that financial efficiency in Africa decreases the effect of migrant remittances on economic growth. The PMG results show us that remittances have a positive impact on long term growth while the interaction between financial efficiency and remittances has a negative long-term effect on economic growth. However, dividing our sample by income level, we find that this interaction is more significant in low- and middle-income countries.

The main recommendation is that countries receiving remittances from migrants in developing countries in order to better benefit from these transfers need to improve financial efficiency, which is one of the dimensions of financial development. By increasing financial efficiency in developing countries, the amount of migrant remittances transferred through the informal channel could be reduced and the amount transferred through the formal channel would be boosted.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ANNEXES

Annexe 1: List of countries

Algeria, Benin, Burkina Faso, Botswana, Republic of Congo, Ivory Coast, Cape Verde, Egypt, Morocco, Tunisia, Cameroon, Guinea, Kenya, Madagascar, Rwanda, South Africa, Sudan, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo, Lesotho, Gabon, Gambia, Ghana, Namibia, Mauritania, Mauritius, Malawi, Tanzania, Uganda, Guinea Bissau.



Annexe 2. Africa map and sample countries coloured in yellow

Source: Author

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