
Remittances and Labour Productivity in Sub-Saharan Africa

Koffi Yves Yao¹ and Auguste Konan Kouakou²

Abstract

This paper analyzes the effects of remittances on productivity in Sub-Saharan Africa between 2000-2017. We estimate our models by the Quasi-Maximum Likelihood Fixed-Effect and the Panel Corrected Standard Errors method. We find that remittances affect positively both aggregate and sectoral productivity, but more prevalent on agricultural sector, where there is an urge proportion of poor people. They therefore contribute to generalized and inclusive growth. These results are consistent with previous studies except for the consideration of sectoral development. Moreover, these funds not only optimize the capital-labour mix but also intersectoral mobility of labour, underlining its positive impact simultaneously on all sectors of activity. Our results suggest that attracting remittances generates significant economic benefits. However, it would be more beneficial and responsible for governments to leverage on the positive impact profiles of these funds through the implementation of local policies and financing strategies to avoid dependence on emigration and foreign assistance.

Keywords: Remittances, Productivity, Sectoral Development, Inclusive Growth, Sub-Saharan Africa

JEL Classification : F22, F24, J24, O11

1. Introduction

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The scarcity of productive employment opportunities and the inability to borrow on future earnings in developing economies leads to massive emigration of workforce to other countries where job opportunities and remuneration are more attractive (Harris & Todaro, 1970; Lewis, 1954). Remittances are part of the benefits from migration and constitute also a powerful channel for spreading wealth around the world. They account for a large part of household income and national budgets. They are a source of foreign currency inflow and help to finance household consumption, investment and other expenditures, especially where access to credit market is very limited (Bahadir et al., 2018).

Previous works show that remittances can be used as investments or compensation for the services that migrants' parents render to them in their absence (Lucas & Stark, 1985). Others suggest that remittances are motivated by an implicit contract to repay loans. In other words, remittances are used to repay the expenses that have been used to finance the migration and the investment in human capital that the migrant received from his parents (Ilahi & Jafarey, 1999; Poirine, 1997; Rempel & Lobdell, 1978). Contrarily, other scholars argue that , the inherent credits constraints in developing countries and particularly in Sub-Saharan Africa weaken or slow down entrepreneurship and then productivity (Evans & Jovanovic, 1989; Nguimkeu, 2014, 2016). Migration and remittances represent a mean of income streams diversification and serve also to mitigate liquidity constraints where the financial system is not developed. They therefore provide security for family members by protecting them from negative shocks such as drought, disease, fire, etc. (Kaufmann & Lindauer, 1984; Lucas & Stark, 1985; Rapoport & Docquier, 2006; Rosenzweig, 1988; Stark & Bloom, 1985; Stark & Levhari, 1982).

Worldwide remittances amount to US\$613 billion (World Bank & KNOMAD, 2019). The share going to Low- and Middle-Income Countries (LMICs) reached US\$550 billion, while in 2018 they were US\$529 billion. This makes remittances inflows more important than Foreign Direct

Investment (FDI) and Official Development Assistance (ODA) for these countries. They represent three times the amount of ODA and reached a similar value to FDI in 2018 without China (World Bank & KNOMAD, 2019). According to World Bank statistics for 2017, remittances to the Sub-Saharan Africa region increased by 9.6%. They increased from US\$42 billion in 2017 to US\$46 billion in 2018. They even amount to 19% of GDP for some countries in the Sub-Saharan African region. This upward trend observed since 2016 can also be explained by the good economic conditions of the high-income countries where migrants from Sub-Saharan Africa earn their living (World Bank & KNOMAD, 2019). In addition, a survey orchestrated by the World Bank's Development Outlook Group in 2009 shows that between 18 to 50% of remittances go to commercial investments. These funds are received by nearly 800 million people; in addition, the recipient countries as a whole contain more than 80% of the world's population. In addition, remittances account for about 60% of the total income of poor recipient households (De Vasconcelos et al., 2017).

Given the magnitude of remittances inflows in developing countries, their economic effects have become an exciting field of research. However, views are divergent among economists on the use of remittances. The effects of remittances on growth and employment have been the subject of many studies. However, very few studies have addressed its links with aggregate productivity and the productivities of the main sectors of activity and then in comparison with each other. While for some researchers, remittances are detrimental to the economy because they lead to problems similar to what is called "Dutch disease" or "migrant syndrome" (Reichert, 1981). For these authors, migrant remittances only serve to finance and stabilize mainly household consumption (Combes & Ebeke, 2011). Demand may be oriented towards imported goods or lead to inflation and exchange rate appreciation in recipient countries. This happens when the local production system is unable to absorb the additional demand generated by the transfers. They can also be used to finance new emigration, thus increasing the

dependence of economies toward foreign countries. In addition, remittances considered as non-wage revenue, supplement or replace income and can lead to a loss of interest in work (Acosta et al., 2009; Reichert, 1981).

Other researchers, however, consider that transfers have a positive impact on recipient economies. For example, migration and remittances have reduced unemployment in island states such as Tonga and contributed to improved living standards (Brown & Ahlburg, 1999). Moreover, due to the imperfect credit market in developing economies, remittances finance investment, education and business creation. They provide risk insurance for recipient families (Alcaraz et al., 2012; Bansak & Chezum, 2009; Woodruff & Zenteno, 2007; Yang, 2008). In this vein, Bahadir and al. (2018) show that remittances are countercyclical if they are received by employees and expansionists if they are received by entrepreneurs facing credit constraints. Anyanwu and Erhijakpor (2008) and Sobiech (2019) note that remittances can promote growth, however the effect is only significant when the level of financial development system is low. Similarly Olubiyi (2014) also confirms that the effects of remittances are important for economic growth in the case of Nigeria even if the effects are on the demand side. Moreover, Shapiro and Mandelman (2016) point out that counter-cyclical remittances reduce consumption and investment contractions after a recession. In addition, Rozelle and al. (1999) show that in the short term, migration generates labour loss effect, leading to lower returns. However, this reduction in family labour is partly offset by remittances. Similarly, Kapri and Ghimire (2020) point out that remittances are a driver of agricultural productivity in Nepal. At the disaggregated level, Ivanic and Martin (2018) examine the poverty implications of productivity improvements in the agricultural, industrial and service sectors. They find that in poor countries; increases in agricultural productivity have a greater effect on poverty reduction than increases in industry and services (Ivanic & Martin, 2018).

Empirical analysis suggests that there are gaps in the literature on the effects of remittances on both aggregate and sectoral labour productivity in recipient countries. Indeed, remittances can affect the productivity of key sectors differently and interdependently. Previous studies conclude that remittances either weaken (Acosta et al., 2009; Amuedo-Dorantes & Pozo, 2004; Reichert, 1981) or strengthen or have no effect on aggregate factor productivity (Al Mamun et al., 2015). While in reality they can reduce workforce in one sector of activity while maintaining or improving its productivity through the capital that is remittances and transfer labour force to other sectors to improve their productivity (disincentive to one job or sector compared to another). Indeed, remittances can allow many people to get more decent work if their current activity is inappropriate or too risky for their health. In doing so, remittances reduce the proportion of poor workers (Combes et al., 2014). They can also finance the improvement of production techniques or tools to encourage workers to remain in the sector (Stark & Bloom, 1985).

In contrast to Al Mamun et al. (2015) who argue for a suboptimal balance of labour/capital ratio, i.e. emigration reduces labour and at the same time increases capital (remittances); which increases aggregate productivity. This article, while supporting this result, extends it to sectoral level. This paper analyses the effects of remittances on labour productivity in Sub-Saharan Africa. We also compare the effects of remittances on labour productivity of the three main sectors of activity (agriculture, manufacturing and services). Emigration not only reduces the pressure for job creation in developing countries where the labour force is high and therefore labour is very abundant. Emigration increases capital through remittances and leads to intersectoral reallocations of labour while optimizing productivity. Remittances can lead to broad-based growth, diversification of activities and thus inclusive growth.

Furthermore, our contribution to the economic literature is, on the one hand; the exclusive consideration of sectoral development which makes this analysis very different to many other

studies that exist in general (Al Mamun et al., 2015). Our study belongs to the concept of inclusive growth which is defined as strong and widespread growth (Hussein et al., 2018; Ianchovichina & Lundstrom, 2009; Van Gent, 2017). On the other hand, on the methodological level we successively implement different econometric methods. At the level of aggregate labour productivity, in addition to a system-GMM estimation (Arellano & Bover, 1995; Blundell & Bond, 1998) ; we estimate our model by the quasi-maximum likelihood method (Hsiao et al., 2002; Kripfganz, 2016). We use both techniques to deal with problems of endogeneity and dynamic bias (Nickell, 1981). Both methods are adapted in short panel estimates (Kripfganz, 2016; Roodman, 2009a). Whereas, we use the method of Parks (1967) and Beck and Katz (1995) for sectoral development. We interpret the aggregate labour productivity with Quasi-Maximum Likelihood estimators because they are an interesting alternative to other approaches in terms of efficiency and performance. Moreover, this estimator is asymptotically more efficient than GMMs (Hsiao, 2014; Hsiao et al., 2002; Kripfganz, 2016). At the level of sectoral productivity, we interpret the results obtained with the Panel Corrected Standard Errors (PCSE) following the recommendations of some previous studies (Moundigbaye et al., 2018; Reed & Ye, 2011).

The rest of the document is organised as follows. Section 2 describes the methodology used to estimate the effects of remittances on labour productivity. The third Section presents the results and discussion and finally we conclude in the fourth Section while suggesting economic policies.

2. Methodology

2.1. Theoretical framework of the Model

Using the growth model of Solow (1957), we explain the effect of remittances on domestic labour productivity using the Cobb-Douglas production function :

$$Y = f(K, AL) \quad (1)$$

Where **Y** = Output, **K**: Capital stock (gross fixed capital formation plus remittances) and **L**: Labour. Based on the growth model of Romer (2012), we assumed that the labour force in our sample of countries is an effective labour force since most of these economies are open economies so modern technologies are readily available to improve the knowledge of domestic workers. Thus, the output per unit of effective labour is given as:

$$\frac{Y}{AL} = F\left(\frac{K}{AL}, \frac{AL}{AL}\right) = F\left(\frac{K}{AL}, 1\right) \quad (2).$$

Where $\frac{Y}{AL}$, output per unit of effective labour and $\frac{K}{AL}$ capital per unit of effective labour.

Let us assume that: $y = \frac{Y}{AL}$ and $k = \frac{K}{AL}$, then our production function can be rewritten as follows: $y = F(k)$.

Moreover, as the output per unit of labour depends on the amount of capital consumed by labour. Let us now see how remittances fit into this function:

$$\dot{K}(t) = sY(t) + R(t) \quad (3).$$

Where **R_t** represents remittances in period **t**. The labour supply function in the presence of migration is defined as follows:

$$\dot{L}(t) = n(L(t) - L_{mt}) \quad (4).$$

L(t) is the labour supply, **n** is the labour force growth rate, and **L_{mt}** is the number of emigrant workers at time **t**.

In addition, following Al Mamun et al. (2015) ; the function of remittance use can be defined as follows:

$$R_{Ut} = R_{Pt} + R_{Ht} \quad (5).$$

$$R_{Ht} = E_t + S_t + C_t \quad (6).$$

Where \mathbf{R}_{ut} : Uses of remittances; \mathbf{R}_{pt} : productive use of remittances i.e. as investment in the productive sector; \mathbf{R}_{ht} : use of remittances to finance education, health, consumption (food, housing or rent, etc.) or more simply investment in human capital; \mathbf{E}_t : Share of remittances allocated to education; \mathbf{S}_t : share of remittances allocated to health care; \mathbf{C}_t = consumption of transfers in food goods and services.

By incorporating remittances into capital and assuming no capital depreciation, the capital dynamics equation is:

$$\dot{k} = \frac{\partial k}{\partial K} \dot{K} = \frac{\dot{K}}{AL} = \frac{sY(t) + R_{pt} + R_{ht}}{n(L(t) - L_{mt})} \quad (7).$$

Unlike Al Mamun et al. (2015), we introduce the portion of remittances allocated to consumption and human capital development because healthy, well-educated and well-fed individuals are productive and therefore constitute capital. To make it simple, we do not take immigrants into account. Our final equation shows that labour emigration has two effects. First, the flow of remittances (\mathbf{R}_{ut}) is in the numerator. With a positive sign, they indicate an increase in the country's capital stock. Second, labour migration (\mathbf{L}_{mt}) reduces labour force in the national economy. Since \mathbf{L}_{mt} is in the denominator with a negative sign, this will lead to an increase in capital per effective labour, i.e. from a decrease in local labour to a compensation in capital according to the Heckscher-Ohlin-Samuelson (HOS) theory (De Haas, 2010; Ohlin, 1933; Samuelson, 1948). Therefore, an optimal capital-labour mix could improve aggregate productivity and thus domestic labour productivity. Indeed, according to standard model of endogenous growth, \mathbf{Y}/\mathbf{AL} depends on the \mathbf{K}/\mathbf{AL} ratio. Higher the \mathbf{K}/\mathbf{AL} ratio, higher the average labour productivity will be up to the stationary point. Since the \mathbf{K}/\mathbf{AL} ratio is expected to be low and below the equilibrium level for most of the countries in our sample where labour

is relatively abundant, then any increase in k will lead to an increase in marginal labour productivity.

Here, an increase of proportion of remittances allocated to productive investments will increase k . In addition, the share of remittances allocated to human capital, i.e., investments in education, training and health, will increase the efficiency of the local labour force. Finally, an increase in the share devoted to consumption has a positive effect on aggregate demand. On the other hand; in the short term, such an increase in aggregate demand can have a negative impact on the economy in general, because it can create inflationary pressures. Finally, although remittances increase local consumption, and according to some researchers they may possibly lead to the appreciation of the local currency as well. Such an appreciation of the local currency would lead to a decrease in local productivity in the tradable goods sector. Therefore, the inclusion of the exchange rate in our analysis is important to understand the possible impact of remittances on domestic labour productivity.

2.2. Data and empirical specifications

Most previous empirical studies capture productivity as the ratio of output to the number of workers. Others use labour productivity as the ratio of GDP expressed in purchasing power parity (PPP) 2000 to the employed population or labour force (Al Mamun et al., 2015; Jeanneney & Hua, 2011; Weiss, 1993). For our study we will use labour productivity as the ratio of real GDP (constant PPP 2011) to the employed population. The study considers aggregate labour productivity and the productivity of each industry as the dependent variable in each equation. And we select a set of variables according to the literature mobilized here: exports of goods and services, credit to private sector, domestic investment, foreign direct investment, primary school enrolment, population, exchange rate and consumption. We use World Development Indicator database of World Bank and the International Labour Organization database.

2.2.1. Dynamic Panel Specification: GMM and QML

The equation to be estimated is:

Equation 1: dynamic panel model

$$y_{it} = \delta y_{i,t-1} + X'_{it}\beta + c_i + \varepsilon_{it} \quad (8)$$

Equation 2: Remittances and productivity

$$Productivity_{it} = \beta_0 Productivity_{i,t-1} + \beta_1 \text{Rem}_{it} + \sum_{j=1}^N \psi_j X_{j,it} + c_i + \varepsilon_{it} \quad (9)$$

Where, y is the productivity, **Rem** represent personal remittances, **X**: control variables, **C** is the constant and ε is error term.

We use longitudinal data from 2010 to 2017 for aggregate productivity. Our data cover thirty-seven (37) of all forty-eight (48) Sub-Saharan African countries due to the unavailability of statistics for some countries. First, we apply appropriate econometric techniques or methods to estimate our models. We are in the case here of a short panel: few periods and many individuals or countries; N is large and T is small ($N > T$). We carry out various econometric tests.

The Hausman test leads us to the choice of the fixed-effect model. We also note the presence of heteroskedasticity and serial autocorrelation AR(1) type. Independent variables which are not strictly exogenous, i.e. which are linked to past and possibly present realizations. Remittances have been found to be endogenous and confirmed by Hausman and Nakamura's tests (Cameron & Trivedi, 2005; Hausman, 1978; Nakamura & Nakamura, 1998; Wooldridge, 2016). For this purpose, we use two estimation methods, which are consistent and well known for these types of panels and problems mentioned above. First, we estimate one-step system-GMM (Arellano & Bover, 1995; Blundell & Bond, 1998).

We also control instruments' proliferation as described by Roodman (2009b). Furthermore, in order to eliminate possible cross-sectional dependence problems, temporal fixed effects are

included in all regressions. The popularity and advantage of GMM estimators is that they address important modelling issues: fixed effects, endogeneity of explanatory variables, dynamic bias, balanced or unbalanced panels (Nickell, 1981; Roodman, 2009a). However, this method is criticized for its low robustness related to the choice of instruments, especially when the dimension T is high even if N is always larger, which can generate biased estimators. In addition, it can easily generate invalid estimates due to its flexibility and the multitude options, particularly with the "xtabond2" command (Roodman, 2009a).

Furthermore; for these reasons, we use an alternative to GMM known as quasi-maximum likelihood in dynamic fixed effects panel data (QML FE or DFE: Dynamic Fixed Effects) (Hsiao et al., 2002). This method does not use instrumental variables, but also takes into account initial conditions to correct for dynamic bias (Nickell, 1981). Quasi-maximum likelihood (QML) estimation can circumvent this dynamic bias (endogeneity) by modelling the unconditional likelihood function instead of conditioning it on initial observations. Moreover, this estimator is asymptotically more efficient than GMMs (Hsiao, 2014; Hsiao et al., 2002). The new Stata command *xtdpdqml* provides an easy implementation of QML estimators by Bhargava and Sargan (1983) for the dynamic random effects model and by Hsiao et al. (2002) for the dynamic fixed effects model. Their estimators are also extended to account for unbalanced panel data; standard deviations robust to heteroskedasticity and autocorrelation are also available (Hayakawa & Pesaran, 2015; Kripfganz, 2016).

2.2.2. Static panel specification: PCSE and FGLS

As mentioned above, the GMM and QML FE estimators take into account the analysis of short panel data and whether they are balanced or not. Here to study remittances in relation to sectoral development using other estimators and given that data at sectoral level are generally available from 2000 onwards. To balance our panel, we have adjusted it to thirty-five countries and extended the study period (2000-2017). To do this, with a time dimension of eighteen years;

we carry out several tests, including the cross-sectional dependence test, which lead to the choice of estimators adapted for this purpose.

We define productivity for each sector as the value added or its output divided by the number of jobs or workers in that sector (agricultural, industrial and tertiary sectors). The equations to be estimated are as follows:

Equation 3: Remittances and agricultural productivity

$$Productivity - A_{it} = \beta_0 + \beta_1 Rem_{it} + \sum_{j=1}^N \psi_j X_{jt} + \varepsilon_{it} \quad (10)$$

Equation 4: Remittances and industrial productivity

$$Productivity - I_{it} = \beta_0 + \beta_1 Rem_{it} + \sum_{j=1}^N \psi_j X_{jt} + \varepsilon_{it} \quad (11)$$

Equation 5: Remittances and productivity of services sector

$$Productivity - S_{it} = \beta_0 + \beta_1 Rem_{it} + \sum_{j=1}^N \psi_j X_{jt} + \varepsilon_{it} \quad (12)$$

At this level, to estimate the effects of remittances on sector development, we focus on the estimators number 6 (Feasible General Least Square (FGLS)) and 8 (Panel-Corrected Standard Errors (PCSE)) that have been identified as the best estimator in terms of efficiency and in hypothesis testing, respectively (Moundigbaye et al., 2018; Reed & Ye, 2011). Indeed, firstly, the FGLS method allows a series of hypotheses on heteroskedasticity, autocorrelation and contemporaneous correlation and cannot be used in the case of unbalanced panel data. Also, despite the existence of more recent alternatives, Parks' (1967) model is still relevant. However, a major limitation of this basic model (estimator 7) is the large number of parameters that need to be estimated. Moreover, it can only be used in cases where $T/N > 1.50$. Apart from this, no estimates are valid, which makes it unnecessary to test the assumptions. However, other FGLS estimators that are equally effective may apply (Moundigbaye et al., 2018).

To solve these problems, Beck and Katz (1995) proposed a modification of the original GLS Parks estimator to give what is called Panel-Corrected Standard Errors (PCSE). The PCSE preserves the weighting (Prais-Winsten) of the observations for autocorrelation, but uses a sandwich estimator to incorporate cross-sectional dependence in the calculation of standard deviations. Furthermore, Beck and Katz (1995) show that this regression method is less efficient in terms of parameter estimation than the FGLS method. However, the FGLS estimators are still consistent. FGLS estimators become inconsistent as the cross-sectional dimension increases and the time dimension decreases. Faced with these problems, the study presents both FGLS and PCSE estimates following recommendations 1, 2 and 3 of Moundigbaye et al. (2018). We therefore use estimators 6 and 8 to implement our models (Moundigbaye et al., 2018; Reed & Ye, 2011). Although it is embarrassing to combine two methods for different reasons, our approach is consistent with several authors who have applied them in this way (Marques, 2005).

3. Results and discussions

3.1. Descriptive statistics

3.1.1. Statistics of variables at the level of overall productivity

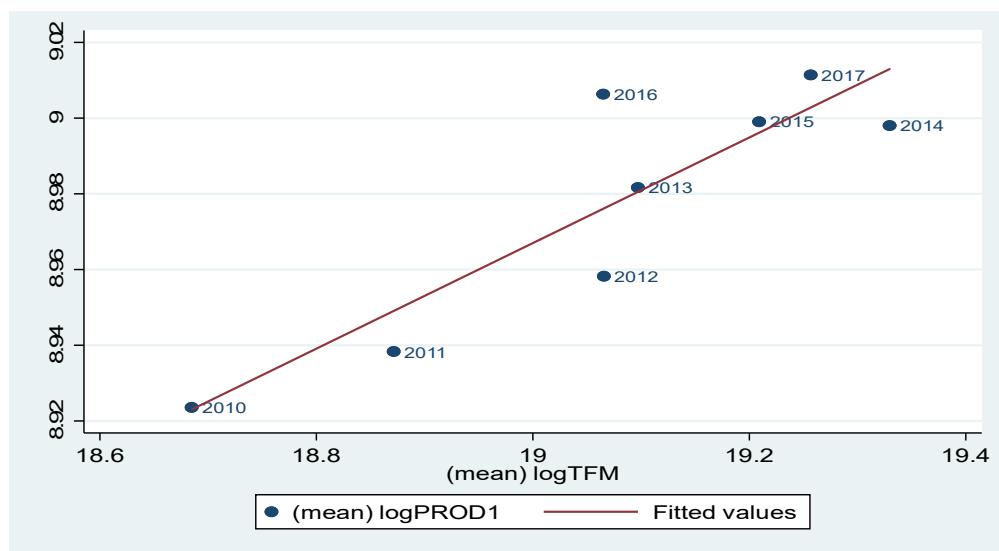
Table 1: Description of global productivity

Variable	Definition	Averages	Standard-deviations
Productivity	Labour productivity (in log)	8.977085	.9515578
Remittances	Remittances (in log)	19.07237	1.697419
Exports	Exports of goods and services (in log)	21.52479	1.798527
Credit	Domestic credit to private sector (% GDP)	24.98868	26.84843
Investment	Gross fixed capital formation (% of GDP)	21.65399	1.519938
Foreign_investment	Foreign direct investment (% of GDP)	5.831944	11.41066

Education	Gross enrolment ratio in primary education (%)	104.8599	18.72909
Population	Total population (in log)	16.10089	1.387937
Exchange rate	Official exchange rate	812.6441	1498.014
Consumption	Final consumption expenditure (in log)	22.93774	1.339926

Source: Authors based on data from the study

Figure 1: Evolution of labour productivity as a function of remittances



Source: Authors based on data from the study

The summary statistics (Tables 1) show that our variables are in the same order of unit and therefore comparable. Thus, we can expect reasonable estimated relationships to emerge. Figure 1 shows a linear evolution between productivity and migrant remittances. The adjustment line of the scatterplot is practically comparable to the 45° line. Therefore, remittances are intrinsically and positively related to productivity in the countries of origin.

3.1.2. Statistics of variables at the sectoral productivity level

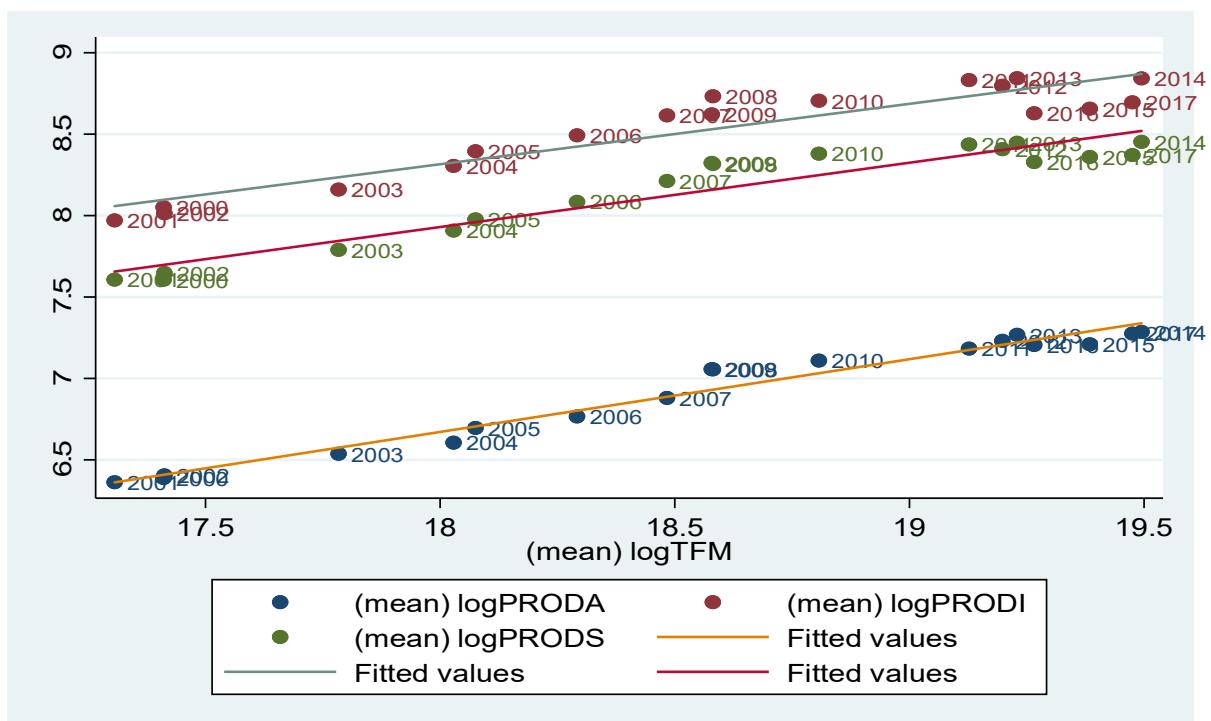
Table 2: Description of sectoral productivity

Variable	Definition	Averages	Standard-deviations

Productivity_A	Productivity of agricultural sector (in log)	6.918008	1.091903
Productivity_I	Productivity of industrial sector (in log)	8.520109	1.18447
Productivity_S	Productivity of service sector (in log)	8.147747	.9061827
Remittances	Remittances (in log)	18.55951	1.824262
Exports	Exports of goods and services (in log)	21.13352	1.755656
Credit	Domestic credit to private sector (% of GDP)	20.13654	25.86633
Investment	Gross fixed capital formation (% of GDP)	2.983869	.3776707
Population	Total population (in log)	16.09409	1.368137

Source: Authors based on data from the study

Figure 2: Evolution of each sector as a function of remittances



Source: Authors based on data from the study

At the sectoral level, descriptive statistics also reveal a linear upward relationship between remittances and the productivity of each sector. First in terms of volume, industrial productivity outperforms the other two sectors, then the tertiary sector and finally the agricultural sector. These facts are consistent with the level of developing countries precisely in Sub-Saharan

Africa. However, in terms of significance, the intensity of remittances predominates in the agricultural sector over the other two. Yet we know that the agricultural sector is the sector that employs the majority of poor people in developing countries (Dorinet et al., 2020). Therefore, remittances improve productivity in this sector and thus favour inclusive growth since they benefit the poor more.

3.2. Econometric results and discussions

3.2.1. Interpretations and discussions of the effects of migrant remittances on aggregate productivity

Table 3: Remittances and labour productivity

Dependent variable:	One step System GMM		QML FE	
	Productivity	Equation		
	1	2	3	4
1. Productivity	0.906*** (0.0286)	.9124906*** (.0342462)	0.764*** (0.128)	0.644*** (0.105)
<i>Short-term relationship</i>				
Remittances	0.00915** (0.00337)	.0048643** (.0021533)	0.00470** (0.00218)	0.00554*** (0.00135)
Exports	0.0257** (0.0117)	.0149619* (.0076011)	0.0456** (0.0229)	0.0477** (0.0241)
Credit	0.0000742 (0.000192)	-.0000939 (.0001001)	0.000863 (0.00114)	0.00104* (0.000542)
Investment	0.0455*** (0.0123)	.0244341*** (.0086493)	0.0456*** (0.0106)	0.0405*** (0.0117)
Population	-0.0782***	-.0852296**	0.0569	0.0921

	(0.0228)	(.0334414)	(0.149)	(0.108)
Exchange rate		2.09e-06*		-0.0000143**
	(1.12e-06)		(0.00000574)	
Foreign Investment		.0002285		0.000900***
	(.0002844)		(0.000157)	
Education		-.0001805		0.00175**
	(.0002187)		(0.000752)	
Consumption		.0462396*		0.0394
	(.0263645)		(0.0244)	
Dummy variable YEAR	YES**	YES	YES**	YES***
	0	.189092	27.53**	29.83***
Constant	(.)	(.1373093)	(11.56)	(10.85)

(The table continues on the next page)

Long-term relationship	One-step System-GMM		QML FE	
Equation	1	2	3	4
Remittances	.09723*** (.0298715)	.055586** (.0275738)	.0199251* (.0102523)	.0155422*** (.0043051)
Exports	.2728904*** (.0742421)	.1709754*** (.0627921)	.1930643*** (.0597344)	.1336826*** (.0383783)
Credit	.0007881 (.0019112)	-.0010727 (.0012437)	.0036556 (.0035972)	.0029228** (.0013841)
Investment	.4833217*** (.096039)	.2792174** (.1181147)	.1930537 (.1192125)	.1136267** (.0514568)
Population	-.8309517*** (.0585152)	-.9739487*** (.0549124)	.2409277 (.5484004)	.2582895 (.278979)

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	259	236	259	235
Observations	259	236	259	235
Fisher Statistic	350455.65	19024.57		
Fisher Statistic p-value	0.000	0.000		
No. of instruments	19	23		
No. of groups	37	36	37	35
AR1 (p-value)	0.0585	0.118		
AR2 (p-value)	0.296	0.236		
Sargan (p-value)	0.100	0.106		
Hansen-J (p-value)	0.107	0.135		

Standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Table 3 presents the results of the short- and long-term dynamics of the models estimated using generalized method of moments and quasi-maximum likelihood. We interpret the results based on the maximum likelihood estimation of the dynamic fixed-effects panel for the reasons described above. A percentage change in the volume of remittances is associated with a 0.55 per cent increase in domestic labour productivity in Sub-Saharan African countries in short-

term, at the significance level of 1 per cent, on average, *ceteris paribus*. Moreover, in long-term a 1% increase in remittances leads to a 1.55% increase in productivity at 1% significance level. In addition; exports, domestic credit provided to the private sector, domestic investment, foreign direct investment and the gross primary school enrolment rate have a positive impact on productivity. In contrast, consumption has a nil effect in short term, but a positive effect in long term. Similarly, population has no effect on productivity in either the short or long term. The exchange rate, on the other hand, has a negative impact on productivity in the countries in our sample. The fear of pessimistic theories on the fact that remittances reduce the overall supply of local labour is again rejected in the context of Sub-Saharan African countries. The basic elements of this result lie firstly in the fact that either remittances do not increase spending on idle consumption that is not productive or the production system of the recipient economies is able to absorb the additional demand caused by remittances. Second, remittances rather affect the Sub-optimal capital-labour mix of these countries to boost their productivity.

Indeed, populations of these countries are not passive victims of problems inherent in almost all the countries in our sample, but try to overcome them through migration and remittances, which are real networks of solidarity. Moreover, what would emigrants not do for their families in the home localities even if these countries are in unfavourable situations, as these problems are the cause of their migration. And as the new economy of labour migration theory argues, remittances are a mean of diversifying risk, removing income constraints, smoothing consumption and investing in new activities (De Haas, 2010; Rapoport & Docquier, 2006; Stark & Bloom, 1985; Stark & Levhari, 1982; Taylor, 1999).

3.2.2. Interpretation and analysis of the effects of migrant remittances on sectoral development

Table 4: Remittances and sectoral productivity

Panel-Corrected Standard Errors (PCSE)	Feasible General Least Square (FGLS)
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Remittances and Labour Productivity in Sub-Saharan Africa

Equation	1	2	3	1	2	3
	Productvty_A	Productvty_I	Productvty_S	Productvty_A	Productvty_I	Productvty_S
Remittances	0.0806*** (5.93)	0.0323*** (3.22)	0.0300*** (3.86)	0.0507*** (4.79)	0.0244*** (2.64)	0.0310*** (4.50)
Exports	0.246*** (11.93)	0.520*** (14.11)	0.320*** (11.75)	0.281*** (13.24)	0.535*** (25.77)	0.270*** (15.97)
Credit	0.0150*** (11.44)	0.00157 (1.55)	0.00893*** (12.42)	0.0128*** (8.99)	-0.000435 (-0.36)	0.00975*** (14.14)
Investment	-0.0268 (-0.85)	-0.0659 (-1.61)	0.174*** (3.69)	-0.0189 (-0.55)	-0.0322 (-0.86)	0.109*** (3.66)
Population	-0.482*** (-21.70)	-0.529*** (-16.09)	-0.406*** (-16.63)	-0.472*** (-14.39)	-0.549*** (-17.38)	-0.359*** (-16.47)
_cons	7.698*** (20.72)	5.556*** (11.18)	6.610*** (18.55)	7.387*** (14.47)	5.761*** (10.29)	7.065*** (21.43)
N	585	585	585	585	585	585
No. of groups	34	34	34	34	34	34
R-squared	0.9567	0.9747	0.9854			
Wald_chi2(5)	620.18	348.95	915.09	485.20	894.62	1140.00
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

At the level of sector development, the aim is to assess the scope of impact of remittances on the main sectors of activity. Indeed, inclusive growth is strong and widespread growth, i.e. growth that affects all sectors and therefore all social strata working in these different sectors

of activity (Hussein et al., 2018; Ianchovichina & Lundstrom, 2009; Van Gent, 2017). To this end, we focus on the PCSE estimators of Beck and Katz (1995) to interpret our results. Remittances are statistically significant in all specifications at the 1% threshold. They positively affect the productivity of each sector. At the stage of the primary sector, a percentage change in remittances leads to an 8.06% increase in the productivity of agricultural sector, while that of the industrial sector increases by 3.23% and finally that of the tertiary sector increases by 3.00% all other things being equal.

Comparatively, remittances have a more pronounced impact on agricultural productivity, i.e. the primary sector, followed by industrial productivity and finally the tertiary or service sector. They contribute to the agricultural sector more than twice as much as the other two sectors. Remittances therefore contribute to sectoral development, diversification of activities and the promotion of widespread growth in Sub-Saharan Africa. We find that remittances simultaneously affect all sectors of activity positively. Therefore, they stimulate inclusive growth in Sub-Saharan Africa. This result implies that remittances, by optimising the capital-labour ratio to increase the productivity of each sector, lead to an optimal inter-sectoral reallocation of labour. Indeed, instead of the remittances will negatively affect certain sectors through a disinterest in work as suggested by the Dutch disease theories, they lead each beneficiary to orient himself in the sector of activity he wants. Moreover, migration and remittances are a powerful means of removing supply-side constraints, unemployment and underemployment to improve productivity (Rapoport & Docquier, 2006; Stark, 1980; Stark & Bloom, 1985; Stark & Levhari, 1982).

4. Conclusion

Recent developments, prospects in the global economy and the aspirations of SDGs have shown how important it is to integrate and promote safe, orderly and regular migration and remittances

into development policies (UN General Assembly, 2018; De Vasconcelos et al., 2017). The sharp increase in remittances to developing countries is leading countries to pay close attention to the economic implications of this financial windfall. Particularly in recent years, in view of the proliferation of international and national organizations and institutions dealing with migration and remittances. These actions are more likely to have significant effects on productivity, growth and overall development in economies with significant remittance flows. This paper analysed the effects of remittances on productivity in Sub-Saharan Africa. We also compared the effects of remittances on productivity in the primary, secondary and tertiary sectors. The descriptive analysis of key variables further highlighted the importance of rethinking migration and remittances as a strategy that can complement other existing development strategies. Some descriptive results showed the close relationship between remittances and aggregate productivity in Sub-Saharan African countries. A predominance of remittance effects is revealed in the agricultural sector compared to the other two. At the econometric level, we presented a dynamic panel model of fixed effects for aggregate productivity and a static model for sectoral development. We estimated and interpreted the results obtained by the quasi-maximum likelihood fixed-effects method (Hsiao et al., 2002; Kripfganz, 2016) and the Panel-Corrected Standard Errors (PCSE) (Beck & Katz, 1995; Moundigbaye et al., 2018; Reed & Ye, 2011).

Emigration here; not only reduces the pressure for job creation in developing countries where the labour force is large and therefore labour is very abundant, it also increases capital (remittances) and leads to sectoral shifts of labour while optimizing their productivities. We have found that remittances have a positive impact on total labour productivity and the productivities of different sectors. This finding for aggregate productivity is consistent with previous work. The exclusive focus on sectoral development makes this analysis very different

from many other existing studies in general (Al Mamun et al., 2015). Our results also indicated that a percentage change in the volume of migrant remittances is associated with a 0.55 per cent increase in aggregate domestic labour productivity in Sub-Saharan African countries in the short run, at the significance level of 1 per cent, *ceteris paribus*. Moreover, in the long run a 1% increase in remittances leads to a 1.55% increase in productivity at the 1% significance level. Remittances rather affect the sub-optimal capital-labour mix of these countries to boost their productivity.

At the sectoral level, remittances are also statistically significant in all specifications at the 1% threshold. At the stage of the primary sector captured by the agricultural sector, a percentage change in remittances leads to 8.06% increase in agricultural sector productivity, while that of the secondary sector increases by 3.23% and finally that of the tertiary sector increases by 3.00% *ceteris paribus*. In comparison, remittances have a more pronounced impact on agricultural productivity, i.e., the primary sector, followed by industrial productivity and finally the tertiary or service sector. Remittances simultaneously affect all sectors of activity positively. Consequently, they promote widespread and inclusive growth. This result implies that remittances, by optimizing the capital-labour ratio to increase the productivity of each sector, cause an optimal inter-sectoral reallocation of labour. Indeed, instead of remittances negatively affecting certain sectors through a disinterest in work (or in a certain type of activities) as suggested by the Dutch disease theories, they lead each recipient to orient himself in the sector of activity he wants.

In sum, given the increased public recognition and the current political determination for more responsible migration, it is essential to conduct research in order to thoroughly understand its economic implications. Although remittances make a positive contribution to productivity in Sub-Saharan Africa; however, there still are enormous challenges to overcome in order to reap greater benefits from these funds. In particular, Maimbo and Ratha (2005) suggests that one

way to motivate migrants and remittance recipients to invest in their home countries is to improve the business climate by introducing clear regulations and limiting corruption. Moreover, instead of leaving the poorest to their fate; public policies should draw on the impact profiles of remittances in order to develop appropriate local financing systems, the creation of decent jobs and break the dependency on emigration and foreign countries. In other words, we recommend the creation of a subtle and flexible anti-emigration funding line to break the vicious circle of perilous migration without resorting to drastic repression, restrictions and campaigns that no longer have dissuasive values. Unfortunately; in this paper, due to the lack of macroeconomic data on average wages by sector of activity, the mechanism by which remittances can relocate labour to the sectors that workers want has not been explicitly demonstrated. This latter dynamic may provide the basis for interesting future macro or microeconomic investigations that would be one of the starting points for a consensus between optimistic and pessimistic views of the effects of migrant remittances on development.

References

- Acosta, P. A., Lartey, E. K. K., & Mandelman, F. S. (2009). Remittances and the Dutch disease. *Journal of International Economics*, 79(1), 102–116.
- Al Mamun, M., Sohag, K., Uddin, G. S., & Shahbaz, M. (2015). Remittance and domestic labor productivity: Evidence from remittance recipient countries. *Economic Modelling*, 47, 207–218.
- Alcaraz, C., Chiquiar, D., & Salcedo, A. (2012). Remittances, schooling, and child labor in Mexico. *Journal of Development Economics*, 97(1), 156–165.
- Amuedo-Dorantes, C., & Pozo, S. (2004). Workers' remittances and the real exchange rate: a paradox of gifts. *World Development*, 32(8), 1407–1417.

- Anyanwu, J. C., & Erhijakpor, A. E. O. (2008). International Remittances and Economic Growth in Africa. *Global Development Studies (Special Issue on Global Labor Migration and Emerging Trends in Development Finance: An Assessment of the Economic and Social Impact of Migrant (Worker) Remittances in Sub Saharan Africa)*, Volume Five, Winter, 3–4.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51.
- Assemblée générale ONU. (2018). *Conférence intergouvernementale chargée d'adopter le Pacte mondial pour des migrations sûres, ordonnées et régulières*. Nations Unies A/CONF.231/3.
- Bahadir, B., Chatterjee, S., & Lebesmuehlbacher, T. (2018). The macroeconomic consequences of remittances. *Journal of International Economics*, 111, 214–232.
- Bansak, C., & Chezum, B. (2009). How do remittances affect human capital formation of school-age boys and girls? *American Economic Review*, 99(2), 145–148.
- Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review*, 89(3), 634–647.
- Bhargava, A., & Sargan, J. D. (1983). Estimating dynamic random effects models from panel data covering short time periods. *Econometrica: Journal of the Econometric Society*, 1635–1659.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
- Brown, R. P. C., & Ahlburg, D. A. (1999). Remittances in the south pacific. *International Journal of Social Economics*, 26(1/2/3), 325–344.
- Cameron, A. C., & Trivedi, P. K. (2005). *Microeometrics: methods and applications*. Cambridge university press.

- Combès, J.-L., & Ebeke, C. H. (2011). Remittances and household consumption instability in developing countries. *World Development*, 39(7), 1076–1089.
- Combès, J.-L., Ebeke, C. H., Maurel, M., & Yogo, T. U. (2014). Remittances and working poverty. *The Journal of Development Studies*, 50(10), 1348–1361.
- De Haas, H. (2010). Migration and Development: A Theoretical Perspective. *International Migration Review*, 44(1), 227–264.
- De Vasconcelos, P., Ponsot, F., Terry, D. F., & Vásquez, B. (2017). *Travailleurs migrants et envois de fonds: vers la réalisation des objectifs de développement durable, une famille à la fois*. Fonds international de développement agricole (FIDA) : Investir dans les populations rurales.
- Dorinet, E., Jouvet, P.-A., & Wolfersberger, J. (2020). Is the agricultural sector cursed too? Evidence from Sub-Saharan Africa. *World Development*, 105250.
<https://doi.org/https://doi.org/10.1016/j.worlddev.2020.105250>
- Evans, D. S., & Jovanovic, B. (1989). An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy*, 97(4), 808–827.
- Harris, J. R., & Todaro, M. P. (1970). Migration, unemployment and development: a two-sector analysis. *The American Economic Review*, 126–142.
- Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the Econometric Society*, 1251–1271.
- Hayakawa, K., & Pesaran, M. H. (2015). Robust standard errors in transformed likelihood estimation of dynamic panel data models with cross-sectional heteroskedasticity. *Journal of Econometrics*, 188(1), 111–134.
- Hsiao, C. (2014). *Analysis of panel data*. No. 54. Cambridge university press.
- Hsiao, C., Pesaran, M. H., & Tahmisioglu, A. K. (2002). Maximum likelihood estimation of

- fixed effects dynamic panel data models covering short time periods. *Journal of Econometrics*, 109(1), 107–150.
- Hussein, K. A., Mukungu, A., & Awel, Y. M. (2018). Les moteurs de la croissance inclusive en Afrique. *Commission Economique Pour l'Afrique (CEA)*.
- Ianchovichina, E., & Lundstrom, S. (2009). Inclusive growth analytics: Framework and application. *The World Bank*.
- Ilahi, N., & Jafarey, S. (1999). Guestworker migration, remittances and the extended family: evidence from Pakistan. *Journal of Development Economics*, 58(2), 485–512.
- Ivanic, M., & Martin, W. (2018). Sectoral productivity growth and poverty reduction: National and global impacts. *World Development*, 109, 429–439.
- Jeanneney, S. G., & Hua, P. (2011). How does real exchange rate influence labour productivity in China? *China Economic Review*, 22(4), 628–645.
- Kapri, K., & Ghimire, S. (2020). Migration, remittance, and agricultural productivity: Evidence from the Nepal Living Standard Survey. *World Development Perspectives*, 100198.
- Kaufmann, D., & Lindauer, D. L. (1984). Income transfers within extended families to meet basic needs: the evidence from El Salvador. *World Bank Publications*, 644.
- Kripfganz, S. (2016). Quasi-maximum likelihood estimation of linear dynamic short-T panel-data models. *The Stata Journal*, 16(4), 1013–1038.
- Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School*, 22(2), 139–191.
- Lucas, R. E. B., & Stark, O. (1985). Motivations to remit: Evidence from Botswana. *Journal of Political Economy*, 93(5), 901–918.
- Maimbo, S. M., & Ratha, D. (2005). Remittances: Development impact and future prospects. *The World Bank*.

- Marques, H. (2005). The skilled U-shaped Europe: is it really and on which side does it stand? *Applied Economics*, 37(19), 2205–2220.
- Moundigbaye, M., Rea, W. S., & Reed, W. R. (2018). Which panel data estimator should I use? : A corrigendum and extension. *Economics: The Open-Access, Open-Assessment E-Journal*, 12(4), 1–31.
- Nakamura, A., & Nakamura, M. (1998). Model specification and endogeneity. *Journal of Econometrics*, 83(1–2), 213–237.
- Nguimkeu, P. (2014). A structural econometric analysis of the informal sector heterogeneity. *Journal of Development Economics*, 107, 175–191.
- Nguimkeu, P. (2016). Credit Constraints and Delayed Micro-Entrepreneurship. *Working Papers*.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society*, 1417–1426.
- Ohlin, B. (1933). Interregional and international trade. *Harvard University Press, Cambridge*.
- Olubiyi, E. A. (2014). Trade, remittances and economic growth in Nigeria: any causal relationship? *African Development Review*, 26(2), 274–285.
- Parks, R. W. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association*, 62(318), 500–509.
- Poirine, B. (1997). A theory of remittances as an implicit family loan arrangement. *World Development*, 25(4), 589–611.
- Rapoport, H., & Docquier, F. (2006). The economics of migrants' remittances. *Handbook of the Economics of Giving, Altruism and Reciprocity*, 2, 1135–1198.
- Reed, W. R., & Ye, H. (2011). Which panel data estimator should I use? *Applied Economics*,

43(8), 985–1000.

Reichert, J. S. (1981). The migrant syndrome: Seasonal US wage labor and rural development in central Mexico. *Human Organization*, 56–66.

Rempel, H., & Lobdell, R. A. (1978). The role of urban-to-rural remittances in rural development. *The Journal of Development Studies*, 14(3), 324–341.

Romer, D. (2012). *Advanced macroeconomics Fourth Edition*. McGraw-Hill.

Roodman, D. (2009a). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1), 86–136.

Roodman, D. (2009b). PRACTITIONERS' CORNER : A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics*, 71(1), 135–158.

Rosenzweig, M. R. (1988). Risk, implicit contracts and the family in rural areas of low-income countries. *The Economic Journal*, 98(393), 1148–1170.

Rozelle, S., Taylor, J. E., & DeBrauw, A. (1999). Migration, envois de fonds et productivité agricole en Chine. *American Economic Review*, 89(2), 287–291.

Samuelson, P. A. (1948). International trade and the equalisation of factor prices. *The Economic Journal*, 58(230), 163–184.

Shapiro, A. F., & Mandelman, F. S. (2016). Remittances, Entrepreneurship, and Employment Dynamics over the Business Cycle. *Journal of International Economics*, 103, 184–199.

Sobiech, I. (2019). Remittances, finance and growth: does financial development foster the impact of remittances on economic growth? *World Development*, 44-59,113.

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, 312–320.

Stark, O. (1980). On the role of urban-to-rural remittances in rural development. *The Journal of Development Studies*, 369–374.

Stark, O., & Bloom, D. E. (1985). The New Economics of Labor Migration. *The American*

Economic Review.

Stark, O., & Levhari, D. (1982). On migration and risk in LDCs. *Economic Development and Cultural Change*, 31(1), 191–196.

Taylor, J. E. (1999). The new economics of labour migration and the role of remittances in the migration process. *International Migration*, 37(1), 63–88.

Van Gent, S. (2017). Beyond buzzwords: What is «inclusive development». *Synthesis Report, INCLUDE Secretariat. Hague, Netherlands.*

Weiss, T. (1993). Long-term changes in US agricultural output per worker, 1800-1900. *Economic History Review*, 324–341.

Woodruff, C., & Zenteno, R. (2007). Migration networks and microenterprises in Mexico. *Journal of Development Economics*, 82(2), 509–528.

Wooldridge, J. M. (2016). *Introductory Econometrics a modern approach sixth edition*. Cengage Learning.

World Bank, & KNOMAD. (2019). *Migration and remittances : recent developments and outlook*. Migration and development brief 31.

Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. *The Economic Journal*, 118(528), 591–630.

5. Annexes

- **All the countries studied on aggregate and sectoral productivity**

The total number of countries is thirty and eight. Thirty-seven for aggregate productivity and thirty-five at the sectoral level.

1	South Africa	14	Ghana	27	Nigeria
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2	Angola	15	Guinea	28	Uganda
3	Benin	16	Guinea-Bissau	29	Democratic Republic of Congo
4	Botswana	17	Kenya	30	Republic of Congo
5	Burkina Faso	18	Lesotho	31	Rwanda
6	Burundi	19	Liberia	32	Senegal
7	Cameroon	20	Madagascar	33	Sierra Leone
8	Cape Verde	21	Malawi	34	Sudan
9	Comoros	22	Mali	35	Swaziland
10	Ivory Coast	23	Mauritius	36	Tanzania
11	Ethiopia	24	Mozambique	37	Togo
12	Gabon	25	Namibia	38	Zambia
13	The Gambia	26	Niger		

▪ **The sources of the study's data**

Variables	Definitions	Sources
Productivity	Labour productivity (in log)	World Bank WDI / International Labour Organization
Productivity_A	Productivity of agricultural sector (in log)	World Bank WDI / International Labour Organization
Productivity_I	Productivity of the industrial sector (in log)	World Bank WDI / International Labour Organization
Productivity_S	Productivity of services sector (in log)	World Bank WDI / International Labour Organization
Remittances	Remittances (in log)	World Bank WDI
Exports	Exports of goods (in log)	World Bank WDI

Remittances and Labour Productivity in Sub-Saharan Africa

Credit	Domestic credit to private sector (%GDP)	World Bank WDI
Investment	Gross fixed capital formation (%GDP)	World Bank WDI
Foreign Investment	Foreign direct investment (%GDP)	World Bank WDI
Education	Gross enrolment ratio in primary education (%)	World Bank WDI
Population	Total population (in log)	World Bank WDI
Exchange rate	Official exchange rate	World Bank WDI
Consumption	Private household consumption (in log)	World Bank WDI
