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REMITTANCES AND VALUE ADDED ACROSS ECONOMIC SUB-SECTORS IN SUB-SAHARAN AFRICA[1]

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REMITTANCES AND VALUE ADDED ACROSS ECONOMIC SUB-SECTORS IN SUB-SAHARAN AFRICA

Simplice A. Asongu[1] and Nicholas M. Odhiambo[2]

Abstract

This research assesses the relevance of enhancing remittances on value added across economic sectors in sub-Saharan Africa for the period 1980 to 2014 using the Generalised Method of Moments. First, no significant net effects on added value to the agricultural sector are apparent. Second, enhancing remittances engenders a positive net effect on added value to the manufacturing sector. Third, there are negative net effects on added value to the service sector. Given that the unfavourable net incidence of remittances to the service sector is associated with a positive marginal or conditional effect, the analysis is extended by computing thresholds at which remittances induce net positive effects on added value to the service sector. The extended analysis shows that a remittance threshold of 48.5% of GDP is the critical mass needed for further enhancement of remittances to engender positive net effects on value added to the service sector.

Keywords: Economic Output; Remitances; Sub-Saharan Africa
JEL Classification: E23; F24; F30; O16; O55

1. Introduction

The premise of this scientific paper on the relevance of enhancing remittances for value added across economic sectors in Sub-Saharan Africa (SSA) builds on two fundamental elements in the scholarly and policy-making circles, notably: (i) growing levels of remittances and (ii) gaps in the attendant literature.

First, on the front of remittances, in accordance with contemporary African development literature, remittances have been associated with positive economic development externalities, because they, *inter alia* improve: output per worker, total factor productivity and

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industrialization (Efobi Asongu, Okafor, Tchamyou & Tanankem, 2019). The narrative also maintains that remittances have been growing more in SSA over the last decades compared to other regions of the world. The comparative importance of remittances in the sub-region is clarified in Figure 1 of Section 2. According to the narrative, other established rewards associated with remittances inflow entail: cyclical characteristics, low volatility in capital and higher reliability on this external flow category. In summary, as recently summarized by Asongu, Biekpe and Tchamyou (2019), there is a growing interest from scholars and multilateral developments institutions on the importance of remittances in the doing of business and industrial development in Africa. In the light of this growing interest, the focus of this article on the importance of increasing remittances for value added across various sectors in the economy is motivated by an attendant gap in the scholarly literature.

Second, consistent with recent literature (Asongu, Rahman, Nnanna & Haffar, 2020), the attendant literature on value added across various economic sectors in Africa can be stratified into three main sectors, notably, the: agricultural sector, the manufacturing sector and service sector. (i) Within the agricultural framework, studies have been oriented towards: small-scale agricultural improvements (Lutz & Olthaar, 2017); the effect of coffee certification on the welfare of agriculturalists in Kenya (Van Rijsbergen, Elbers, Ruben & Njuguna, 2016); inclusiveness compared to competiveness of global value chains in relation to the market organization of African farmers (Lutz & Tadesse, 2017); comparative insights from farmers' cooperatives in the light of non-members in the sub-region of SSA (Olthaar & Noseleit, 2017); intentions of strategic nature and farmers' projects in Ghana within the context of the cocoa industry (Metzlar, 2017); nexuses between the economic development of landowners within poor segments of society and global value chains (Vermeire, Bruton & Cai, 2017) and the engagement of women in projects designed to boost agricultural productivity in rural areas (Uduji & Okolo-Obasi, 2018a, 2018b).

(ii) As concerns scholarship in the manufacturing sector, Ruben, Bekele and Lenjiso (2017) investigate the Ethiopian diary sector in respect of linkages between quality upgrading and value chains; Banga, Kumar and Cobbina (2015) focus on leather sector trade-related value chains in the region of SSA while Van Lakerveld and Van Tulder (2017) engage leading Dutch businesses in the same region that are concerned with supply chain operations. (iii) In the service sector, Beerepoot and Keijser (2015) have focused on the importance of this sector in outsourcing as a determinant of economic prosperity in the information and communication (ICT) sector of Ghana.

Studies that are closest to the positioning of this research are Asongu, Biekpe and Tchamyou (2019) and Efobi, Asongu, Okafor, Tchamyou and Tanankem (2019). The former has investigated nexuses between remittances, ICT and the doing of business in SSA to establish ICT thresholds at which remittances promote the doing of business while the latter has focused on nexuses between remittances, financial development and Africa's industrialization. The present research departs from the underlying studies by assessing how enhancing remittances can affect the development of value added across various economic sectors in SSA. Thefore, the corresponding research question is the following: how does enhancing remittances affect value added to the agricultural, manufacturing and service sectors in SSA?

The focus of the present study also departs from Dridi, Gursoy, Perez-Saiz and Bari (2019) by assessing how enhancing remittances has affected value added across economic sectors for the period 1980 to 2014 because the underlying study has focused on the effect of remittances on economic sectors for the period 2011-2015. Accordingly, there are apparent differences in methodologies, periodicities, samples and specifications between the present study and Dridi et al. (2019). Moreover, while the underlying study concludes that the impact of remittances on recipient countries grows with the degree of nexus across economic sectors, contingent on financial intermediation, the present study provides critical minimum levels of remittances that are needed for value added across economic sectors. In summary, the objectives and findings of Dridi et al. (2019) and the present study are different.

The rest of the research is organized in the following manner. In section 2, stylized facts, the intuition for the study and the attendant literature are covered while section 3 is concerned with the data and methodology. The empirical findings are disclosed in section 4 while section 5 concludes with future research directions.

## 2. Stylized facts, intuition and related literature

This section is engaged in three main strands pertaining to the stylized facts, theoretical underpinnings and the relevant literature on the role of remittances in economic development in developing countries.

2.1 Stylized facts

In accordance with the attendant literature (Asongu *et al*., 2019; Efobi *et al*., 2019), as shown in Figure 1 from World Development Indicators, over the past decade, relative to other regions of the world, remittances have been growing in SSA. Regions with which the sub-

region is compared are Latin America and the Caribbean; Europe and Central Asia and East Asia and the Pacific. From the graph, it is apparent that for the past 30 years, remittance inflow into SSA has been comparatively higher, a tendency that increase to a threshold of above 1.5 % of GDP at the beginning of the third millennium[3].

Figure 1: Remittance Inflow as a Percentage of GDP (1975-2014)
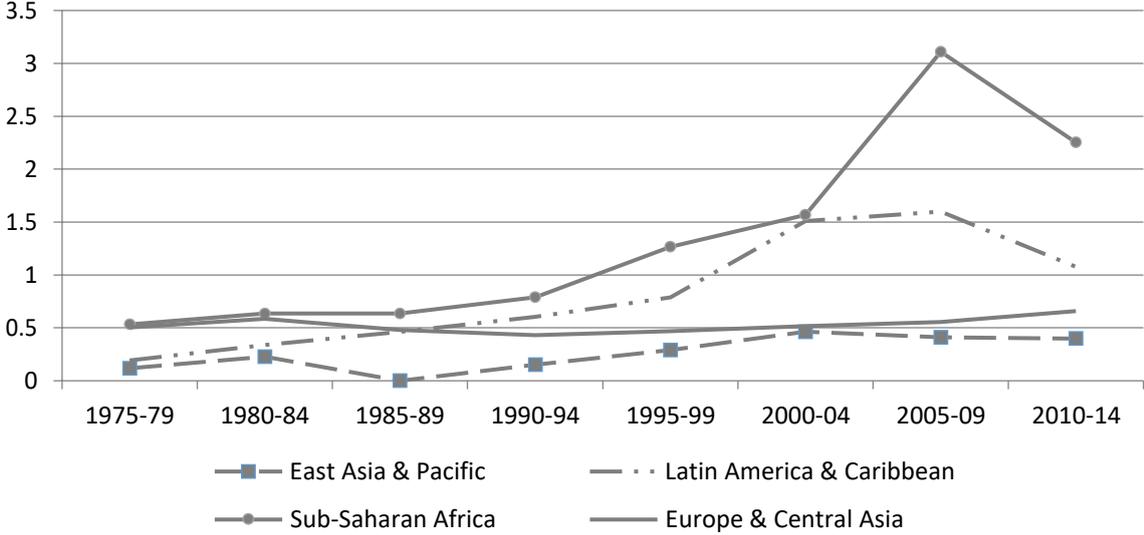
Source: Authors

2.2 Theoretical underpinnings

We now turn to the second strand of this section. From intuition, in the absence of access to formal financial services, remittances can provide financial access for value added in various sectors of the economy (Efobi *et al*., 2019; Beck, Demirgüç-Kunt & Levine, 2007; Tchamyou, 2020). This is essentially because countries in SSA owing to information asymmetry and other constraints to financial access, corporations in the agricultural, manufacturing and service sectors may have limited access to finance in the banking industry (Kusi, Agbloyor, Ansah-Adu & Gyeke-Dako, 2017; Kusi & Opoku‐ Mensah, 2018; Asongu, Batuo, Nwachukwu & Tchamyou, 2018). This narrative is consistent with the substantially documented surplus liquidity in African financial institutions (Saxegaard, 2006; Fouda, 2009; Asongu, 2014). In what follows, the extant literature is used to support these intuitive

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[3] It is important to note that remittances as a percentage of GDP is used to present remittances in relative terms. This is a form of normalization used in most studies and widely accepted in the presentation of datasets in scholarly and policy circles (Akobeng, 2016). The World Bank from which the data is sourced also presents the variable in this manner. However, remittance as a percentage of GDP can also be misleading if an economy is small or GDP is stalling (or not growing) because the same levels of remittance could be misinterpreted as increasing, whereas, it is the denominator that is constant or decreasing.

positions, especially with respect to the relevance of remittances in doing business, entrepreneurship and economic development.

2.3 Remittances and economic development

In the third strand, this research complements the extant scholarship on value added discussed in the introduction with studies on remittances which consolidate the intuition on the relevance of remittances in driving businesses and economic development, discussed in the previous paragraph. While remittances have substantially be considered as a version of altruism that is designed to engender externalities related to social insurance (Agarwal & Horowitz, 2002; Kapur, 2004), it is also worthwhile to articulate that the rewards of remittances are not exclusively restricted to household benefits. As documented in Efobi *et al*. (2019), a promising body of the literature maintains that remittances are employed beyond consumption needs. Moreover, in less developed countries where surplus liquidity issues are more apparent in the financial intermediary sector on the one hand, and capital markets are not fully developed on the other, remittances could be used in financing both consumption and production activities. This perspective accords with the position of Woodruff and Zentano (2001) within the framework that about 30% of corporations in Mexico substantially rely on remittances from the Diaspora for liquidity purposes. In addition, the authors also establish that approximately 20% of the capital of enterprises in the country is traceable to remittance inflows.

The narratives above are sympathetic to the position that remittances grease conditions for doing business, entrepreneurship and by extension, the creation of value in various sectors of the economy in developing nations. Such a narrative conforms with a body of knowledge supporting the view that, remittances are vital for, *inter alia*: the prosperity and expansion of corporations in Mexico (Woodruff & Zenteno, 2001; Massey & Parrado, 1998); entrepreneurial investment in the Philippines (Yang, 2008); favourable long-term investment ramifications in Bangladesh (Hossain & Hasanuzzaman, 2015); growing market-oriented agricultural investment (Syed & Miyazako, 2013); consolidation of non-farm and farm activities in Ghana (Tsegai, 2004); increasing the development of manufacturing (Dzansi, 2013) and improving upon total factor productivity (Barajas, Chami, Fullenkamp, Gapen & Montiel, 2013).

While the above positions in scholarship largely focus on direct nexuses between remittances and improvements in macroeconomic outcomes, it is worthwhile to articulate that indirect effects are also apparent in the corresponding literature. Examples of this

complementary stream of the literature entail, *inter alia*, the following indirect mechanisms: information technology (Asongu *et al*., 2019); financial development (Aggarwal, Demirguc-Kunt & Peria, 2011; Bettin, Lucchetti & Zazzaro, 2012; Osabuohien & Efobi, 2013; Efobi, Osabuohien & Oluwatobi, 2015; Kaberuka & Namubiru, 2014; Karikari, Mensah, Harvey, 2016; Efobi et al., 2019) and exchange rate (Rajan & Subramanian, 2005; Lartey, Mandelman & Acosta, 2008; Acosta, Lartey & Mandelman, 2009; Barajas, Chami, Fullenkamp, Gapen & Montiel, 2009; Selaya & Thiele, 2010; Dzansi, 2013; Amuedo-Dorantes, 2014).

3. Data and Methodology

3.1 Data

The positioning of the research is on twenty five countries in SSA based on annual data running from 1980 to 2014[4]. The choice of number of countries and the corresponding periodicity are contingent on data availability constraints at the time of the study. Moreover, the dataset is further restructured in order to take on board a requirement for the empirical strategy to be adopted. Accordingly, the choice of the Generalised Method of Moments (GMM) methodology requires that the number of engaged countries should be in excess of the corresponding number of years in each country (Tchamyou, Asongu & Nwachukwu, 2018). In order to improve the data structure to be consistent with the estimation strategy, five seven-year and seven five-year data averages in terms of non-overlapping intervals are computed. Upon a preliminary investigation, even when the option of collapsing instruments by Roodman (2009) is taken on board, it is apparent that the only five seven-year non- overlapping intervals produce coefficients that enable the estimated model to pass the post- estimation diagnostic test pertaining to the need to avoid instrument proliferation. The adopted non-overlapping intervals are therefore the following: 1980-1986; 1987-1993; 1994- 2000; 2001-2007 and 2008-2014.

As documented in the introduction, all three sectors of the economy are acknowledged in the conception and selection of outcome variables from the World Development Indicators (WDI) of the World Bank and the United Nations Conference on Trade and Development (UNCTAD), notably: value added in the agricultural sector, value added in the manufacturing sector and value added in the service sector. The choice of the three sets of indicators is also in accordance with contemporary value chains literature in SSA (Meniago & Asongu, 2019).

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[4]The countries selected on data availability constraints are: Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Cote d'Ivoire; Gabon; Kenya; Lesotho; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; South Africa; Sudan; Eswatini; Tanzania; Togo and Zimbabwe.

The indicator of remittances is sourced from the Financial Development and Structure Database (FDSD) of the World Bank while the three control variables adopted to control for variable omission bias come from WDI of the World Bank and the UNCTAD. Accordingly, foreign direct investment (FDI) is from the former source whereas population and education quality are from the latter source. The choice of these variables is informed by the attendant literature on economic output and productivity, notably: Becker, Laeser and Murphy (1999), Barro (2003), Sahoo, Dash and Nataraj (2010), Heady and Hodge (2009), Ssozi and Asongu (2016a, 2016b), Elu and Price (2010, 2017), Tchamyou (2017), Dunne and Masiyandima (2017), Efobi, Tanankem and Asongu (2018) and Bokpin, Ackah and Kunawotor (2018)[5].

The expected signs of the control variables cannot be established with certainty because of dynamics in economic sectors as well as the quality of the control variables. For instance, if FDI is significantly oriented towards the extraction of natural resources; it can boost the primary sector and have the opposite effect on other sectors. Education can also affect various sectors differently because it is contingent on how education programs are tailored to influence added value to various sectors of the economy. The clarification on education extends to population because the effect of population depends on the involvement of the population in various economic sectors.

It is important to clarify that the use of limited control variables is to avoid concerns of instrument proliferation even when the option option of collapsing instruments is taken into account. Accordingly, the inclusion of more control variables will engender instrument proliferation in the post-estimation diagnostic tests. It is relevant to also note that in GMM regressions, there is a choice between controlling for variable omission bias and estimated models that are robust to instrument proliferation (Asongu & Odhiambo, 2020, p. 678)[6]. The definitions and sources of variables are provided in Appendix 1 while Appendix 2 discloses the summary statistics. In Appendix 3, the correlation matrix is provided.

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[5] Other studies on output and economic development supporting the relevance of adopted control variables are: Nyasha and Odhiambo (2015a, 2015b); Okafor, Piesse and Webster (2017); Muazu and Alagidede (2017); Kumi, Muazu and Yeboah (2017); Kreuser and Newman (2018); Maryam and Jehan (2018) and Yaya and Cabral (2017).

[6] "*Our justification for employing two control variables in the GMM specification is very solid because employing more than two variables will lead to findings that do not pass all post-estimation diagnostic tests owing to instrument proliferation, even when the option of collapsing instruments is taken on board in the estimation exercise. There is a choice here between having valid estimated models and avoiding variable omission bias. Hence, adding more control variables will produce invalid estimations (Bruno et al., 2012; Osabuohien & Efobi, 2013…)*" (Asongu & Odhiambo, 2020, p. 678).

3.2 Methodology

3.2.1 GMM Specification

The adopted empirical strategy is informed by contemporary studies on the relevance of adopting an empirical approach that is in line with data behaviour (Li et al., 2014, 2016; Kou et al., 2012, 2014, 2016, 2019a, 2019b; Zhang et al., 2019; Vu & Asongu, 2020; Osinubi & Asongu, 2020). Some preliminary insights into the choice of the GMM estimation technique have been provided in the data section, notably: the requirement of the number of countries to exceed the corresponding number of years in each country (Tchamyou, 2020; Akinyemi, Efobi, Asongu & Osabuohien, 2019; Tchamyou, Asongu & Nwachukwu, 2018). Other complementary requirements motivating the choice of the estimation technique include: (i) persistence in the indicators for value added across economic sectors in the light of the fact that the correlations between level and first lag variables are higher than 0.800 which is used to confirm the presence of persistence in GMM-centric literature (Tchamyou, 2019) and (ii) two dimensions of endogeneity are taken on board, notably simultaneity or reverse causality with the use of internal instruments and the usage of time-invariant omitted indicators to account for the unobserved heterogeneity.

The level and first difference equations pertaining to the main system GMM specification are provided respectively, in Equation (1) and Equation (2) below.

$$VA_{i,t} = \sigma_0 + \sigma_1 VA_{i,t-\tau} + \sigma_2 R_{i,t} + \sigma_3 RR_{i,t} + \sum_{h=1}^{3} \delta_h W_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (1)$$

$$VA_{i,t} - VA_{i,t-\tau} = \sigma_1(VA_{i,t-\tau} - VA_{i,t-2\tau}) + \sigma_2(R_{i,t} - R_{i,t-\tau}) + \sigma_3(RR_{i,t} - RR_{i,t-\tau})$$

$$+ \sum_{h=1}^{3} \delta_h(W_{h,i,t-\tau} - W_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \qquad (2)$$

where $VA_{i,t}$ denotes value added in one of the three economic sectors (i.e. value added in the

service sector, value added in the agricultural sector and value added in the manufacturing

sector) of country i in period t; R denotes remittances; RR represents the quadratic

interaction of remittances ("remittances" × "remittances"); σ_0 is a constant; τ is the degree of

auto-regression that is one and reflects to seven year lag because such a lag appropriately

captures past information; W represents the set of control variables adopted for the study

(*FDI, Population and Education)*, η_i is the country-specific effect, ξ_t is the time-specific constant and $\varepsilon_{i,t}$ the error term. The specification is a *two-step* process because such

accounts for heteroscedasticity. This is different from the *one-step* specification that only accounts for homoscedasticity.

The GMM option considered in the empirics is an improved version of Arellano and Bover (1995) by Roodman (2009) which has been established to be preferable to the traditional technique (i.e. *difference* and *system* GMM estimators) because it mitigates the proliferation of instruments that are susceptible of biasing estimated coefficients (Boateng, Asongu, Akamavi & Tchamyou, 2018; Asongu & Odhiambo, 2019a, 2019b; Tchamyou *et al*., 2019). It is also important to clarify that having a quadratic specification (i.e. "remittances" × "remittances") is to enable the establishment of minimum levels of remittances needed for value added across economic sectors. This is consistent with the objective of the study as well as the contemporary literature on thresholds needed for a favourable incidence on the outcome variables (Asongu & Acha-Anyi, 2020).

3.2.2 Identification, simultaneity and exclusion restrictions

In order to provide a robust GMM specification, elucidating concerns pertaining to the identification, simultaneity and exclusion restrictions is worthwhile. On the front of identification, the corresponding issue consists of eliciting three types of variables, notably: the outcome, the endogenous explaining or predetermined and the strictly exogenous variables. Consistent with the motivation of the study and the narratives in the previous section, the outcome variables are value added across the three economic sectors, namely: value added in the agricultural sector, value added in the manufacturing sector and value added in the service sector. The predetermined variables are understood as remittances (i.e. independent variable of interest) and elements in the conditioning information set (i.e. set of control variables). Moreover, the strictly exogenous variables are the years which have been argued by Roodman (2009) to be ideal because they cannot be endogenous after a first difference. In essence, the adopted procedure to identification, simultaneity and exclusion restrictions is consistent with contemporary GMM-centric literature (Meniago & Asongu, 2018; Tchamyou & Asongu, 2017). Building on this approach to identification, the exclusion restriction assumption is examined by confirming that the engaged strictly exogenous variables affect the value added in the various economic sectors exclusively through the channel of endogenous explaining variables.

Second, the issue of reverse causality is tackled with forward differenced instrumental variables which involve the engagement of Helmet transformations to remove fixed effects

that are correlated with the lagged outcome variable and by extension bias estimated models. The process used to purge fixed effects is consistent with authoritative literature on the subject, notably: Arellano and Bover (1995), Love and Zicchino (2006) and Roodman, (2009). Accordingly, such a process that is designed to cancel-out fixed effects results in orthogonal or parallel conditions between lagged and forward differenced observations.

Third, the engaged exclusion restriction assumption elucidated in the first strand is investigated by means of the Difference in Hansen Test (DHT) for instrument exogeneity. In essence, according to the null hypothesis of the underlying test, the exclusion restriction assumption is valid. In other words, remittances and the employed elements in the conditioning information set are the main channels by which the values added across economic sectors are affected. It follows that in the findings that are disclosed in section 4, the null hypothesis of the DHT pertaining to the exclusion restriction assumption should not be rejected in order for the exclusion restriction assumption to hold. This process used to consider and validate the strict exogeneity of instruments accords with standard instrumental variable techniques in which the Sargan/Hansen test should not be rejected in order for the engaged strictly exogenous variables to affect value added across the three economic sectors exclusively via remittances and the adopted elements in the conditioning information set (Beck, Demirgüç-Kunt & Levine, 2003; Amavilah, Asongu & Andrés, 2017).

4. Empirical results
4.1 Presentation of results

The empirical findings are provided in this section in Table 1, which is categorized in three main fractions: the first showing results on added value to the agricultural sector, the second presenting results on added value in the manufacturing sector while the last shows findings on the service sector. For each fraction in the table, three specifications related to each of the adopted elements in the conditioning information set are apparent. Only one control variable is considered for each specification in order to limit concerns pertaining to instrument proliferation. In essence, the adoption of limited variables in the conditioning information set is in line with mainstream scholarship that is GMM-centric. In other words, when the importance of deriving robust estimations (while limiting elements of the conditioning information set is at stake), the attendant literature even tolerates scenarios in which no control variables are taken on board. Osabuohien and Efobi (2013) and Asongu and Nwachukwu (2017) are some examples of GMM-oriented studies that have engaged no

control variable for the purpose of obtaining robust estimations that are void of instrument proliferation.

To investigate whether the estimated models withstand robustness, four criteria of information are employed as in contemporary GMM-oriented scholarship.

"*First, the null hypothesis of the second-order Arellano and Bond autocorrelation test (AR (2)) in difference for the absence of autocorrelation in the residuals should not be rejected. Second the Sargan and Hansen over-identification restrictions (OIR) tests should not be significant because their null hypotheses are the positions that instruments are valid or not correlated with the error terms. In essence, while the Sargan OIR test is not robust but not weakened by instruments, the Hansen OIR is robust but weakened by instruments. In order to restrict identification or limit the proliferation of instruments, we have ensured that instruments are lower than the number of cross-sections in most specifications. Third, the Difference in Hansen Test (DHT) for exogeneity of instruments is also employed to assess the validity of results from the Hansen OIR test. Fourth, a Fischer test for the joint validity of estimated coefficients is also provided*" (Asongu & De Moor, 2017, p.200).*

In view of these criteria of information, the estimated models are overwhelmingly valid. Moreover, in order to assess the relevance of improving remittances on value added across the three different sectors of the economy, net impacts are calculated for every specification, in accordance with attendant contemporary studies on interactive regressions (Agoba, Abor, Osei & Sa-Aadu, 2020; Asongu & Odhiambo, 2018a, 2018b). It is worthwhile to clarify that the computation of the corresponding net effect entails the sum of the unconditional impacts of remittances and the conditional or marginal effects of remittances.

The highlighted computational insights can be put into more perspective in the fourth column of Table 1 in which the net effect of enhancing remittances on manufacturing added value is 0.128 (2×[-0.001 × 4.768] + [0.138]). In this calculation, the average value of remittances is 4.768, the marginal effect of remittances is -0.001, the related unconditional influence of remittances is 0.138 while 2 is derived from the quadratic equation. In the reporting of findings, "na" or "not applicable" is used to reflect specifications where net effects cannot be computed because at least one estimated coefficient needed for the computation of net effects is not significant.

In the light of the information criteria and corresponding net effects, the following findings can be apparent from Table 1. First, no significant net effects on added value to the agricultural sector are apparent. Second, enhancing remittances engenders a positive net effect on added value to the manufacturing sector. Third, there are negative net effects on added

value to the service sector. Fourth, as for the control variables, the positive incidence (though insignificant) of FDI to added value in the agricultural sector and significant negative incidence on added value to the service sector is an indication that FDI in the sampled countries is largely oriented towards the primary sector, compared to the tertiary sector.

Table 1: Value added across sectors and remittances

	Dependent variable: Value added across sectors								
	Agricultural value added			**Manufacturing value added**			**Service value added**		
Value added (-1)	**1.025***	**0.931***	**0.931***	**0.896***	**0.860***	**0.890***	**0.994***	**0.958***	**0.950***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Remittances (Remit)	-0.011	0.017	-0.042	**0.138***	**0.116***	**0.095***	-0.035	**-0.097****	**-0.088***
	(0.855)	(0.672)	(0.376)	**(0.000)**	**(0.000)**	**(0.000)**	(0.373)	**(0.010)**	**(0.001)**
Remit × Remit	-0.0008	**-0.001**	0.0009	**-0.001***	**-0.001***	0.00002	0.0008	**0.001***	**0.001***
	(0.277)	**(0.028)**	(0.190)	**(0.000)**	**(0.009)**	(0.934)	(0.115)	**(0.002)**	**(0.001)**
FDI	0.087	---	---	-0.042	---	---	**-0.289***	---	---
	(0.436)			(0.410)			**(0.000)**		
Population	---	0.536	---	---	0.095	---	---	-0.285	---
		(0.257)			(0.747)			(0.556)	
Education	---	---	**-15.420***	---	---	**-7.220*****	---	---	0.802
			(0.000)			**(0.000)**			(0.707)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Net Effects	na	na	na	0.128	0.106	na	na	-0.087	-0.078
AR(1)	(0.019)	(0.019)	**(0.110)**	**(0.134)**	**(0.129)**	**(0.184)**	(0.045)	(0.017)	**(0.150)**
AR(2)	**(0.614)**	**(0.536)**	**(0.428)**	**(0.228)**	**(0.173)**	**(0.149)**	**(0.999)**	**(0.910)**	**(0.420)**
Sargan OIR	**(0.228)**	(0.077)	**(0.666)**	(0.021)	(0.002)	(0.011)	**(0.245)**	(0.081)	(0.036)
Hansen OIR	**(0.306)**	**(0.114)**	**(0.386)**	**(0.204)**	**(0.263)**	**(0.152)**	**(0.261)**	**(0.215)**	**(0.102)**
DHT for instruments									
(a)Instruments in levels									
H excluding group	**(0.729)**	**(0.599)**	**(0.115)**	**(0.334)**	(0.042)	(0.024)	**(0.133)**	(0.072)	**(0.274)**
Dif(null, H=exogenous)	**(0.230)**	(0.081)	**(0.538)**	**(0.187)**	**(0.552)**	**(0.444)**	**(0.350)**	**(0.374)**	(0.098)
(b) IV (years, eq(diff))									
H excluding group	**(0.157)**	**(0.125)**	**(0.489)**	**(0.126)**	**(0.447)**	(0.053)	**(0.288)**	**(0.164)**	(0.073)
Dif(null, H=exogenous)	**(0.692)**	**(0.230)**	**(0.254)**	**(0.502)**	**(0.153)**	**(0.784)**	**(0.276)**	**(0.406)**	**(0.359)**
Fisher	**61735***	**348796***	**2087***	**1.85e+06***	**2.38e+06***	**1.86e+06***	**954.44***	**781149***	**1.72e+06***
Instruments	18	18	18	18	18	18	18	18	18
Countries	23	23	23	23	23	23	23	24	24
Observations	82	82	72	82	82	72	86	86	74

***,**,*: significance levels at 1%, 5% and 10% respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. Gov't: Government. na: not applicable because at least one estimated coefficient required for the computation of net effects is not significant. The mean value of remittances is 4.768. Constants are included in all regressions. P-values are provided in brackets.

4.2 Extension with policy thresholds

While the net effect of enhancing remittances on the manufacturing sector is positive, the corresponding net effect of remittances on the service sector is negative. Fortunately, for the underlying net negative effects, the marginal effects are positive, which is an indication that enhancing remittances beyond a certain threshold can nullify the established negative net effects. The narrative on threshold is consistent with contemporary studies on critical masses or thresholds that are worthwhile for favourable macroeconomic effects (Batuo, 2015;

Asongu & Odhiambo, 2019c; Tchamyou, 2019). Such understanding of thresholds is also the premise for the establishment of U shapes and inverted U shapes in the literature (Ashraf & Galor, 2013; Asongu, le Roux & Tchamyou, 2019).

Given the above insight, the remittances thresholds in the last two columns of Table 1 are respectively, 48.5 (0.097/ [2×0.001]) and 44.0 (0.088/ [2×0.001]) % of gross domestic product (GDP). For instance in the last column of Table 1, when remittances are 44.0% of GDP, the net effect of enhancing remittances on the service sector is zero (2×[0.001 × 44.0] + [-0.088] =0) while in the penultimate column of Table 1, when remittances are 48.5% of GDP, the net effect of enhancing remittances on the service is also zero (2×[0.001 × 48.5] + [- 0.097] =0). Therefore, above the computed thresholds, enhancing remittances engenders positive net effects on value added to the service sector. Moreover, for the established thresholds to have economic meaning and significantly inform policy makers they should be within the statistical bounds or ranges (i.e. minimum to maximum) disclosed in the summary statistics. It follows that the established thresholds have economic meaning and policy relevance because they are within the disclosed range of remittances in the summary statistics (i.e. 0.003 to 89.354). In a nutshell, remittances should be enhanced to above 48.5% of GDP in order for remittances to improve added value to the service sector.

5. Conclusion, caveats and future research directions

This research assesses the relevance of enhancing remittances on value added across economic sectors in 25 countries in sub-Saharan Africa using data for the period 1980 to 2014. The empirical evidence is based on the Generalised Method of Moments. The following findings are established. First, no significant net effects on added value to the agricultural sector are apparent. Second, enhancing remittances engenders a positive net effect on added value to the manufacturing sector. Third, there are negative net effects on added value to the service sector. Given that the unfavourable net incidence of remittances to the service sector is associated with a positive marginal or conditional effect, the analysis is extended by computing thresholds at which remittances induce net positive effects on added value to the service sector. The extended analysis shows that a remittance threshold of 48.5% of GDP is the critical mass needed for further enhancement of remittances to engender positive net effects on value added to the service sector.

In the light of the above, the main policy implication is that policy makers should encourage remittance inflows into the sampled countries in view of boosting value added

across economic sectors. These remittances represent an alternative source of funding because as we have noted in section 2, the sub-region is characterized by issues of surplus liquidity that are caused by *inter alia*, concerns of collateral requirements and information asymmetry. This obviously leaves room for further research on assessing how remittances can contribute to reducing surplus liquidity and improving financial access for value chains in SSA.

A caveat to the study is that internal instruments were used because of the difficulty of finding external instruments. While Akobeng (2016) has used GDP per capita and the unemployment rate of the remittance-sending countries as external instruments, the Financial Development and Structure Database (FDSD) from which the remittance data used in this study is sourced, did not enable the present study to establish the corresponding specific remittance-sending countries. Hence, future studies should consider the remittance-sending countries when selecting the source of data in order to use the instruments employed by Akobeng (2016) within the framework of a Two-Stage Least Squares (TSLS) Instrumental Variable (IV) approach.

6. List of Abbreviations

GDP: Gross Domestic Product

SSA: Sub-Saharan Africa

ICT: Information and Communication Technology

GMM: Generalised Method of Moments

WDI: World Development Indicators

UNCTAD: United Nations Conference on Trade and Development

FDSD: Financial Development and Structure Database

FDI: Foreign Direct Investment

DHT: Difference in Hansen Test

TSLS: Two-Stage Least Squares

IV: Instrumental Variable

7. Declaration

Appendices
Appendix 1: Definitions and sources of variables

Variables	Signs	Variable Definitions (Measurements)	Sources
Agriculture value added	Agri	Agricval: Agriculture, hunting, forestry, fishing (ISIC A-B)Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	WDI
Manufacturing value added	Manu	Manufacturing value added (% of GDP) (ISIC D). Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	UNCTAD
Service value added	Service	Service, value added (% of GDP).Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	WDI
Remittances	Remittances	Personal remittances, received (% of GDP)	WDI
Foreign Direct Investment	FDI	Foreign Direct Investment Inflows(% of GDP)	UNCTAD
Population	Population	Logarithm of Population (in millions)	WDI
Education	Education	SEPSGPI: School enrollment, primary and secondary (gross), gender parity index (GPI)	WDI

WDI: World Development Indicators. GDP: Gross Domestic Product.UNCTAD: United Nations Conference on Trade and Development. FDSD: Financial Development and Structure Database.

Appendix 2: Summary statistics

	Mean	SD	Minimum	Maximum	Observations
Agriculture value added	26.673	13.910	2.527	56.751	116
Manufacturing value added	12.916	6.933	2.152	36.895	116
Service value added	19.339	7.015	0.000	32.825	120
Remittances	4.768	12.917	0.003	89.354	107
Foreign Direct Investment	1.903	2.795	-3.440	22.118	124
Population	2.515	0.818	-0.242	4.165	125
Education	0.854	0.177	0.465	1.341	107

S.D: Standard Deviation.

Appendix 3: Correlation matrix (uniform sample size:123)

Agri	Manu	Service	Remit	FDI	Pop	Education	
1.000	-0.365	-0.212	-0.164	-0.073	0.037	-0.551	Agri
	1.000	0.220	-0.041	-0.055	-0.212	0.051	Manu
		1.000	-0.208	0.094	0.382	-0.190	Service
			1.000	0.057	-0.079	0.462	Remit
				1.000	0.045	0.244	FDI
					1.000	0.007	Pop
						1.000	Education

Agri: Agricultural value added. Manu: Manufacturing value added. Service: Service value added.
Remit: Remittances. FDI: Foreign Direct Investment. Pop: population growth.

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