Remittances and Credit Provided by the Banking Sector: Evidence from Sub-Saharan Africa

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Abstract
Recorded international remittances to sub-Saharan African countries reached US $28 billion in 2009 and are projected to increase to reach US$ 41 billion in 2016. However, empirically it is unclear how these private transfers affect the financial sector. This paper investigates the effect of international remittances on the level of credit provided by the domestic banking sector in sub-Saharan Africa using a panel of thirty countries over five time periods, composed of non-overlapping averages from 1990 to 2012. Though sub-Saharan African region receives the least portion of the total recorded remittance flows to all developing regions, the study finds that international remittances have positive and significant effect on aggregate level of credit provided by the banking sector in the region after controlling for macroeconomic variables that are commonly used to explain financial development in developing countries. The results hold after accounting for potential endogeneity of remittances (other explanatory variables) in a system GMM estimation using both internal and external instruments for the remittance variable. The paper recommends that policy should be focused on increasing remittances through the formal financial system.
Keywords: Remittances, Bank Credit, system GMM, Sub-Saharan Africa (SSA)

1. Introduction
The effect of international remittances on credit provided by the domestic banking sector in developing countries is inconclusive (Brown, Carmignani & Fayad, 2013). While some studies (e. g. Aggarwal, Demirgüç-Kunt & Martinez Peria, 2011; Gani & Sharma, 2013) argue that remittances have positive effects on credit provided by the banking sector in developing countries, other studies (Giuliano & Ruiz-Arranz, 2009; Brown & Carmignani, 2012) argue that remittances have negative effects on bank credit.

Orozco and Fedewa (2007) explain that remittances transferred through financial institutions can pave the way for recipients to demand and gain access to other financial product and services, which they might not have otherwise. By providing remittance transfer services, banks "get to know" and reach out to the unbanked recipients or recipients with limited financial intermediation (Demirgüç-Kunt, Lopez-Cordova, Martinez Peria & Woodruff 2010). Remittances might have a positive effect on credit market development if banks become more willing to extend credit to remittance recipients because the transfers they receive from abroad are perceived to be significant and stable (i.e., serve as collateral). However, even if bank lending to remittance recipients does not materialize, overall credit in the economy might increase if banks' loanable funds surge as a result of deposits linked to remittance flows (Aggarwal et al., 2011).

On the other hand, some studies (e. g. Brown & Carmignani, 2012; Brown et al., 2013) argue that because remittances can help relax individuals' financing constraints, they lead to a lower demand for credit and have a dampening effect on credit market development. Also, a rise in remittances might not translate itself into an increase in credit to the private sector if these flows are instead channelled to finance the government or if banks are reluctant to lend and prefer to hold liquid assets. Finally, remittances do not increase bank deposits if they are immediately consumed or if remittance recipients distrust financial institutions and prefer other ways to save these funds (Gheeraert, Mata & Traca, 2010).

Given the fact that financial sectors are generally underdeveloped in sub-Saharan Africa (SSA), with banking system accounting for the preponderance of financial sector assets and activities and also the fact that banks play a leading role in the supply of external finance in most sub-Saharan African countries, some studies (e.g. Coulibaly, 2015) have investigated the effect of remittances on financial development in sub-Saharan Africa. Using panel Granger causality testing approach based on SUR multivariate systems and Wald test with country specific bootstrap critical values, he found that remittances positively affect credit only in Sudan out of 19 SSA countries. He therefore concluded that there is no strong evidence supporting the view that remittances promote financial development in sub-Saharan Africa. Brown et al. (2013) argue that methodological choices, such as the instruments used to account for endogeneity, the composition of the sample used for estimation, and the empirical definition of financial development account for differences in results when investigating the effects of remittances on financial development.

Against this background, this paper uses the system GMM estimation technique different from the methodology of Coulibaly (2015), including more SSA countries in its analysis since increasing sample size enhances reliability of parameter estimates. This paper contributes to the literature by accounting for the possibility of dynamic endogeneity in the hypothesized relationship which has the overall effect of ensuring that the quality of results obtained are much more reliable.The paper proceeds as follows. The literature review is presented, followed by the methodology, results and discussion, conclusion and recommendations.

2. Literature Review

There are two main lines of enquiry with respect to the literature on international remittances, financial development and economic growth. One set of studies (such as Giuliano & Ruiz-Arranz, 2009, Mundaca, 2009 and Bettin & Zazzaro, 2012) explore the remittances-financial development relationship indirectly by investigating how the given level of financial development in a country affects the impact of remittances on growth. In these indirect growth-focused studies, the country's degree of financial development is taken as given in the sense that no allowance is made for the possible impact of remittances on financial development in the recipient economy. The other set of studies (such as Aggarwal et al., 2011; Brown et al., 2013) examines the relationship between international remittances and financial development, with a view to assessing the effects of remittances on financial development.

Studies that have investigated the direct effect of remittance inflows on financial development are few (Brown, Carmignani & Fayad, 2013; Baah-Kumi, 2014). For instance, Demirgüç-Kunt et al. (2010) show that remittance inflows have directs positive effect on the breadth and depth of the banking sector. Using municipality-level data for Mexico for 2000, they showed that in municipalities where a larger share of the population receives remittances, the number of branches, number of accounts, and value of deposits to GDP is higher. Aggarwal et al. (2011) explained that the contribution of remittances to financial development is not specific to Mexico but persists across countries and over a long time. Using panel data of 109 developing countries during 1975 to 2007, Aggarwal et al. (2011) uncover a positive effect of remittance inflow on financial depth (bank deposits and credit to GDP). The study used fixed effects (FE), dynamic system GMM and fixed effects Instrumental Variable (FE-IV) estimation techniques using both "internal" and "external" to solve for endogeneity problem resulting from reverse causality, omitted variables and measurement error in the remittance variable. Brown and Carmignani (2012) and Brown et al. (2013) find that remittance inflows have a negative effect on financial depth.

Some studies have also focus on various developing regions. Martinez Peria et al. (2008) investigate the impact of remittances on financial development in twenty-five (25) Latin American countries from the period 1975 to 2003 using fixed and random effect and fixed effect instrumental variable estimation methods. They conclude that remittance inflows have a positive effect on financial depth (bank deposits and credit to GDP) in Latin American countries. Hernandez (2009) also assesses the effect of remittance inflows on financial development in twenty-seven (27) Latin American countries from 1975 to 2007 using fixed effects (FE)/random effects (RE) and system GMM estimation techniques. He concludes that remittance inflows have positive effect on financial depth (M2 and bank deposits to GDP). Male (2009) investigates the effect of remittances on financial depth using a panel of thirteen (13) South-Eastern and Eastern-European countries from 1994 to 2007 using fixed effects/random effects estimation techniques. She concludes that remittance inflows have positive effect on financial depth (Bank deposits and credit to GDP). Gani and Shama (2013) examine the effect of remittance inflows on financial depth in a panel of fifty-seven (57) developing countries from 1995 to 2008 using fixed effects (FE) /random effects (RE) estimation techniques. They find a positive effect of remittance inflows on financial depth (credit provided by the banking sector).

It can be observed from the review of the empirical literature that most studies are done on either all developing countries combined or regions such as Latin America and Caribbean and South Eastern and Eastern European countries and as such cannot represent the sub-Saharan African experience. Studies that have focus on sub-Saharan Africa such as Gupta et al. (2009) did not use bank credit as a proxy for financial development. Kalule (2010) used three countries in East Africa and static panel estimation technique which does not take into consideration endogeneity in remittances. Coulibaly (2015) using panel Granger causality testing approach based on Seemingly Unrelated Regressions (SUR) multivariate systems and Wald test with country specific bootstrap critical values, find that remittances positively affect credit only in Sudan out 19 SSA countries. He therefore concluded that there is no strong evidence supporting the view that remittances promote financial development in sub-Saharan Africa. This study contributes to the literature by extending the discussion on the effect of remittance flows on credit provided by the banking sector by using more sub-Saharan African countries. Also the use of the dynamic system GMM framework is to account for the possibility of dynamic endogeneity in the hypothesized relationship in the region and this has the overall effect of ensuring that the quality of results obtained in the study are much more reliable.

Journal of Economics and Sustainable Development
www.iiste.org
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.6, No.20, 2015

3. Methodology

Following Aggarwal et al. (2011) the effect of remittance inflows on credit provided by the banking sector is specified as:

$$FD = f(REM, PINC, EXP, OCF, INF) \tag{1}$$

Where *FD* refers to the share of bank credit to the private sector expressed as a percentage of GDP, *REM* is remittance inflows as a percentage of GDP, *PINC* is per capita income, *EXP* is exports as a percentage of GDP, *OCF* = FDI and ODA inflows as a percentage of GDP and *INF* = Rate of change in consumer price index.

Chinn and Ito (2006), and Baltagi et al. (2009), suggest that past financial development have positive effect on current financial development which supposes that lag values of the dependent variables (credit) must be included in the explanatory variables to avoid misspecification. The dynamic panel model of equation (1) can be specified as:

$$FD_{it} = \gamma FD_{it-1} + \eta_i + \alpha REM_{it} + \beta X_{it} + \varepsilon_{it} \tag{2}$$

Where *i* refers to the country (*i*=1, 2, 3....30); *t* refers to the time period composed of a non-overlapping five-year averages from 1990 to 2012 (*t*=1, 2, 3, 4, 5); FD_{it-1} = First lag of FD, *X* = Set of control variables; η = the unobserved country-specific effect and ε = the error term assumed to be serially uncorrelated.

More specifically equation (2) can be specified as follows:

$$FD_{it} = \gamma FD_{it-1} + \eta_i + \alpha REM_{it} + \beta_1 PINC_{it} + \beta_2 EXP_{it}$$
$$+ \beta_3 OCF_{it} + \beta_4 INF_{it} + \varepsilon_{it} \tag{3}$$

As a starting exercise the study estimates equation (2) by pooled ordinary least squares (OLS) and static panel models – fixed and random effects to cater for the country specific effect which control for unobesrved country characteristics.

To account for potential endogeneity resulting from reverse cuasality between remittance inflows (and other endogenous expalnatory variables) and bank credit, omitted factors that can explain both the evolution of remittance inflows and of bank credit and measurement errors, the study estimate equation (2) and (4) using Arrelano-Bover/Blundell-Bond dynamic system GMM estimation technique:

$$FD_{it} - FD_{it-1} = \gamma(FD_{it-1} - FD_{it-2}) + \alpha(REM_{it} - REM_{it-1})$$
$$+ \beta(X_{it} - X_{it-1}) + \varepsilon_{it} - \varepsilon_{it-1} \tag{4}$$

In equations (2) and (4), the use of instruments is required to deal with the potential endogeneity of the explanatory variables (most notably, remittance inflows and per capita income) and with the fact that in both equations the error term is correlated with the lagged dependent variable. Assuming that the error terms are serially uncorrelated, the explanatory variables are uncorrelated with future realization of the error terms, and there is no correlation between the changes in the explanatory variables and the country specific effects, η_i, then the following moment conditions can be applied to obtain unbiased estimates of the explanatory variables:

$$E[FD_{i,t-s}(\varepsilon_{it} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; \ t = 3,...,T \tag{5}$$

$$E[REM_{i,t-s}(\varepsilon_{it} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; \ t = 3,...,T \tag{6}$$

$$E[X_{i,t-s}(\varepsilon_{it} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; \ t = 3,...,T \tag{7}$$

$$E[(FD_{i,t-s} - FD_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s = 1 \tag{8}$$

$$E[(REM_{i,t-s} - REM_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s = 1 \tag{9}$$

$$E[(X_{i,t-s} - X_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s = 1 \tag{10}$$

Hence, laggged values of the difference of the explanatory variables can be used as instruments to estimate the equation in levels (i.e. equation 2) and lagged values of the level of explanatory variables can be used as instruments to estimate the equation in first difference (i.e. equation 4). While using lagged values of the variables as instruments can help deal with the problem of reverse causality between remittance inflows and bank credit, it does not address biases arising due to measurement error, since lagged values of the explanatory variables (in particular, remittance inflows) are likely to suffer from this problem as well. Therefore, as a double check, the study also present a system GMM estimate where for all the explanatory variables internal instruments are used, except for remittance inflows that is instrumented with the per capita income in top five remittance-sending countries.

Economic condition such as per capita income in remittance-sending countries was used as external

instrument for the remittance flows to the recipient countries in our sample as used by Aggarwal et al. (2011). Per capita income in the remittance-sending countries is likely to affect remittance flows that migrants are able to send, but are not expected to affect bank credit in the remittance-receiving countries directly, after we control for other variables that are also affected by per capita income in remittance-sending countries such as exports to GDP, other capital flows to GDP, and domestic per capita income. To test for the joint validity of the instruments used, the Hansen test for over-identifying restrictions was performed as suggested by Roodman (2009). The Arellano-Bond zero-correlation test was performed to be certain that there is no second-order autocorrelation in the idiosyncratic disturbance terms.

3.1 Data Description, Sources and Panel Structure

Secondary data was employed. Cross-country time series datasets consisting of thirty (30) sub-Saharan African countries were used. Following the vast majority of cross-country empirical studies, the sample period 1990-2012 is split into five non-overlapping five-year periods (except for the last period for which the data was averaged for only three years). The study used five-year periods rather than shorter time spans because, although the bank credit data are available on a yearly basis for most countries in our sample, they might be subject to business cycle fluctuations, which we control for by averaging over longer time periods. This is done to minimize effects of business cycles and other noise in the data. Studies (such as Bond et al., 2001), explain that averaging data over fixed intervals has the potential for eliminating business cycle fluctuations and makes it easier to capture the relationships of interest. Also averaging helps to slove for inconsistency caused by data gaps.

International Remittances is defined as the sum of three components:(a) workers' remittances recorded under the heading "current transfers" in the current account of the balance of payments; (b) compensation of employees which includes wages, salaries, and other benefits of border, seasonal, and other non-resident workers (such as local staff of embassies) and which are recorded under the "income" subcategory of the current account; and (c) migrants' transfers which are reported under "capital transfers" in the capital account of the IMF's Balance of Payments (BOP) Yearbook. These data are based on World Bank staff estimates using data from the International Monetary Fund (IMF). Data on all variables were obtained from African Development Indicators (ADI) and the Global Financial Development (GFD) databases of the World Bank. The countries in the study were strategically selected on the basis of availability of data. Data on the external instrumental variable that is weighted per capita income was obtained from bilateral remittance data from Ratha and Shaw, (2007) and World Development Indicators (WDI). Remittances data primary capture flows intermediated by banks and non banks in the BOP statistics (Irving, Mohapatra, and Ratha, 2010).

Table 1: Measurement and Expected Signs of Variables

Variable	Measurement	Sign
BD	Bank Deposits as a percentage of GDP	
BC	Bank Credit as a percentage of GDP	
REM	Remittance inflows as a percentage of GDP	+
PINC	Per capita GDP in constant dollars	+
EXP	Exports as a percentage of GDP	+
OCF	FDI inflows plus ODA inflows as a percentage of GDP	+
INF	Rate of change in consumer price index	_
PINC*	Per capita GDP of top five remittance-sending countries weighted by their share of remittances sent to countries in SSA	

Source: Author's construct

4. Results and Discussion

In Table 2, column 1 presents the estimates of the system GMM estimator where for the endogenous explanatory variables the lags of lag 1of bank credit, remittances and per capita income are used as internal instruments while column 2 presents the estimates of the system GMM estimator where for the endogenous explanatory variables the lags of lag 1of bank credit and per capita income are used as internal instruments except remittances which is instrumented with the current and lag values of per capita income of remittance-sending countries as external instruments to cater for measurement error. For this study the GMM instruments were specified only to be constructed for lags (2 3) to keep the number of instruments manageable since large number of instruments causes the Hansen test to be weak.The results of the diagnostic tests suggest that the efficiency and reliability of the estimated parameters are not undermined by the choice of invalid instruments or second-order autocorrelation. The difference-in-Hansen test indicates that the instruments for the levels equation based on lagged differences of the dependent variable are valid meaning that system GMM is the appropriate estimator. The number of instruments is less than the number of countries in the sample which means the estimations do

not suffer from instrument proliferation. At one percent level of statistical significance, the F statistics shows that the explanatory variables jointly explain the dependent variable in the models.

From Table 2, the coefficient of remittances to GDP implies that one percentage point increase in the share of remittance inflows to GDP leads to 0.358 percentage point increase in the share of credit provided by banks to GDP, at one percent significant level, other things being equal. Therefore, we fail to reject the hypothesis of the study that the inflow of remittances affects the level of credit provided to the private sector by the banking sector in SSA. This result is consistent with the studies of Gani and Sharma (2013), Aggarwal et al. (2011), Kalule (2010), Male (2009) and Martinez Peria et al. (2008). However the result contradicts the results by Guiliano and Ruiz-Arranz (2009), Brown and Carmignani (2012) and Brown et al. (2013). The coefficient of lag 1 of bank credit to GDP implies that one percentage point increase in the share of credit provided by banks to GDP in previous year leads to 0.811 percentage point increase in the share of credit provided by banks to GDP in the current year, at one percent significant level, other things being equal. This means that credit provided by banks in the previous period positively affect credit provided by banks in the current period. This is consistent with the results by Chinn and Ito (2006) and Baltagi et al. (2009).

With respect to the control variables, for per capita income, the coefficient implies that one dollar increase in the level of per capita income leads to 0.006 percentage point increase in the share of credit provided by banks to GDP at one percent significant level, all other things being equal. The coefficient of per capita income means that higher per-capita income increases bank credit, meaning that richer countries can generally afford wider and deeper financial intermediation.

Table 2: Effects of international remittances on bank credit in sub-Saharan Africa, Two-step Arellano-Bover/Blundell-Bond System GMM-IV estimates

Dependent Variable: Bank Credit as a percentage of GDP

Independent Variables	(1)	(2)
Lag 1 of Bank Credit to GDP	0.835	0.811
	(35.94) ***	(30.22) ***
Remittances to GDP	0.237	0.358
	(5.98) ***	(5.29) ***
GDP Per Capita	0.005	0.006
	(11.47) ***	(7.64) ***
Exports to GDP	0.023	0.018
	(3.57) ***	(2.49) **
Other Capital Flows to GDP	0.127	0.111
	(9.98) ***	(8.31) ***
Rate of Inflation	-0.085	-0.079
	(-5.00) ***	(-4.31) ***
No. of Observations	120	120
No. of Countries	30	30
No. of Instruments	27	27
P-value F-stat	0.000	0.000
P-value AR(1)	0.347	0.320
P-value AR(2)	0.563	0.668
P-value Hansen test (OIR)	0.227	0.217
P-value Diff.-in-Hansen test	0.350	0.201

Note: Windmeijer (2005) finite-sample correction for the two-step covariance matrix was applied to correct the standard errors for two-step estimation.

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: STATA 13 output from WDI, GFD and ADI databases of World Bank.

For exports, the coefficient implies that that one percentage point increase in the share of exports to GDP leads to 0.018 percentage point increase in the share of credit provided by banks to GDP at five percent significant level, all other things being equal. This is consistent with the results of Aggarwal et al. (2011) but contradicts the results by Brown and Carmignani (2013).The effect of exports on bank credit is smaller than the effect of remittance inflows. Theoretically, this depends on the structure of exports – manufacturing exports are likely to have a more positive effect, while primary commodity exports may have a less positive effect on bank credit – this prevails in this study.

For other capital flows, the coefficient implies that one percentage point increase in the share of FDI and ODA flows to GDP leads to 0.111 percentage point increase in the share of credit provided by banks to GDP at one percent significant level, other things being equal. Smaller coefficient of other capital flows indicates that

they contribute less to the banking sector. This is expected because our measure of financial depth is purely bank based and other capital flows might be mostly channeled through the capital markets instead of being intermediated by banks and other non-bank financial institutions. Also, this result is consistent with Chinn and Ito (2006) who find that banking sector depth indicators do not appear to be affected by financial openness when focusing exclusively on developing countries.

For inflation, the coefficient implies that one percentage point increase in the rate of inflation leads to 0.079 percentage point reduction in the share of credit provided by banks to GDP, at one percent significant level, other things being equal. The results are consistent with theory and empirical studies such as Aggarwal et al. (2011) and Chin and Ito (2006) which explain that inflation is found to reduce bank credit, most likely because it reduces individuals incentive to save in financial assets (as opposed to real assets) and hence discourages financial intermediation.

5. Conclusion and Recommendations

Empirically, the effect of international remittances on credit by the banking sector in developing countries is inconclusive. While some studies argue that remittance inflows promote bank credit, other studies argue that because remittances help relax individuals' financing constraints it has no effect on bank credit. This study tested the hypothesis that remittance inflows affect the level of credit provided by the domestic banking sector in sub-Saharan Africa. The conclusion of this study validates the prediction of the migrant remittance optimists' perspective that, as far as banking sector development is concerned, international migration can be beneficial to sub-Saharan African countries through increased inflows of international migrant remittances. This implies that in order to promote banking sector development in sub-Saharan Africa; there is the need for policymakers within the sub-Saharan African region to improve conditions to attract more remittances to the region through formal (officially approved) channels as well as improving the traditional macroeconomic variables especially per capita income, trade and capital account openness and reducing inflation. Since remittances primarily go to households, future research can focus on micro study – the effect of remittances on access to finance by households.

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Appendix

A. List of Countries used in the Study

Benin, Botswana, Burkina Faso, Cameroon, Congo, Côte d'Ivoire, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Sudan, Swaziland, Tanzania, Togo, and Uganda.

B. How Per capita income of remittance-sending countries (PINC*) was Calculated

Focusing on remittance-receiving SSA country Z, and assuming that the top five remittance-sending countries to Z are countries A, B, C, D and E, the weighted GDP per capita is constructed as: Sum over i[GDP per capita for i * (remittances from i to Z)/(sum of remittances received by Z from A through E)], where i=A to E.