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What drives remittance inflows to Sub-Saharan Africa: A Dynamic Panel Approach

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Abstract

This paper investigates the factors that drive and constrain remittance inflows into SubSaharan Africa (SSA) using annual data for 35 SSA countries from 1980 to 2008, generalised method of moments by Arellano and Bover (1995) and LSDV with Driscoll and Kraay (1998) corrected standard errors. We find that when cross-sectional dependence of the error term and individual effects are controlled for, host country economic conditions override home country income in driving remittances to SSA The quality of financial service delivery and investment opportunities in the home country and exchange rate considerations are also significant to remittance inflows to SSA. This is more consistent with self interest motives for remittance inflows than altruism. However there are country level differences.

Keywords: migration, remittances, Sub-Saharan Africa

JEL Classification: F22, F24, O55

1 Introduction

The issue of migration is at the core of global policy dialogue today as developed countries grapple with unexpected arrivals of migrants from different countries and by various means. SubSaharan Africa (SSA), one of the poorest and economically deprived regions of the world is no exception to this trend. SubSaharan Africa lags behind in several human development indicators as compared to other developing regions (Human Development Indicators, 2009). These factors among others have resulted in consistent migration of both skilled and unskilled labour in search of better working and living conditions. The heaviest toll of this brain drain is mostly felt in the health and education sectors of SubSaharan African countries (Kapur, 2005).

One of the outcomes of migration is remittance inflows, which has emerged as both a positive and negative externality to the migration epidemic and consequently one of the key links between human mobility and development. Its current levels in excess of Official Development Assistance (ODA), portfolio investments and in some cases Foreign Direct Investment (FDI), and its characteristics and diverse economic impact on recipient economies have resulted in increased research and policy interest over the last two decades.

In terms of levels, remittances to developing countries as at end 2008, stood at 330 billion US dollars, thrice the value of official development assistance and also exceeded 10% of GDP in 23 developing countries worldwide (Mohapatra et al., 2009). In Sub-Saharan Africa remittance inflows have steadily increased from 1.4 billion US dollars in 1980 to 21.3 billion US dollars in 2008, approximately 2.2% of the regional GDP (World Bank, 2008).

Regarding its characteristics, remittances have been found to be relatively more stable than other forms of foreign inflows (Ratha, 2003) even during the recent global financial crisis. Contrary

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to a projected decline of 6.7% between 2007 and 2008, remittance inflows to developing countries increased by 28% from 265 billion US dollars in 2007 to 338 billion US dollars in 2008, and declined by a meager 6% to 316 billion US dollars from 2008 to 2009. FDI on the other hand fell by approximately 30% coupled with a total collapse in private portfolio investment and scarce donor funds to developing countries due to the credit crunch during this period (World Bank, 2010). Remittances are also unrequited funds, thus they do not result in any contractual or debt servicing obligations (Kapur, 2005). Furthermore, unlike other forms of foreign inflows, remittances are not usually withdrawn *ex-post* from a recipient economy. Consequently, they have been found to sometimes mitigate volatility and reversibility in other capital inflows (Bugamelli and Patterno, 2006).

With respect to its economic impact, remittances have emerged as both a positive and negative externality to migration. As a positive externality, remittances have been found to smooth consumption and income for households thereby reducing poverty (Ratha, 2003). Remittances have contributed to employment creation by providing capital for microenterprises (Woodruff and Zenteno, 2000). In countries with underdeveloped financial systems remittance inflows have enhanced access to finance for the poor and financially excluded (Gupta et al., 2007). Furthermore, remittances have increased economic growth by providing finance for investment (Guiliano and Ruiz-Arranz, 2005). Due to the multiplier effect of remittance inflows, non-recipient households have also benefited indirectly through labour income and payment for goods and services by recipient households (Durand et al., 1986). Remittances have served as a vital source of foreign exchange for some developing countries in the Euro-Mediterranean region, improved their sovereign rating and enhanced their access to international capital markets to raise finance for development (Herzberg, 2006).

As a negative externality remittance inflows have been known to widen the poverty gap due to the creation of pockets of more affluent remittance receiving households in relatively poor neighbourhoods (Carrasco and Ro, 2007). Recipient households have sometimes supplied less labour than non-recipient households, thereby aggravating unemployment (Funkhouser, 1992; Amuedo-Dorantes and Pozo, 2004). From the labour supply perspective remittance inflows have been found to reduce economic growth (Chami et al., 2003). Most remittances are spent on consumption goods, thereby generating inflationary pressures on the domestic economy (Gupta et al., 2007). Remittances could also appreciate the domestic exchange rate in small open economies. This adversely affects export competitiveness thereby worsening the current account deficit (Corden and Neary, 1982). As a result of high transaction costs, eligibility and identification constraints, informal channels are often used by migrants to remit home. This remains a major policy challenge worldwide with serious implications for money laundering, terrorism finance, illegal foreign exchange markets and fraud (Pearce, 2006).

These trends, characteristics and varying economic impact of remittances have generated substantial research and policy interest. The aim is to ascertain the specific impact of remittance inflows on various regions and corridors and how the benefits of these inflows could be optimised whiles effectively addressing the associated negative externalities. This research posits that a critical step to achieving this is to first of all establish which factors drive and constrain these inflows and how remittance inflows respond to changes in these factors. Countries which have been able to achieve this critical step have realised substantial net benefits from remittance inflows by implementing the necessary regulatory, market and technological reforms at the required levels (Ratha, 2006; Ketley, 2006; Herzberg, 2006).

SubSaharan Africa lags woefully behind other regions in efforts at effectively harnessing the benefits of remittance inflows whiles minimising negative externalities associated therewith. This has been attributed to several factors such as inadequate awareness of the drivers and constraints to these inflows through formal channels, overregulation, underdeveloped financial systems and markets, lack of the requisite structures and enabling environment. (Ketley, 2006; Bokkerind, 2006; Bester, 2006). Consequently, SubSaharan Africa receives only 5% of formal global remittances to developing

countries as compared to 25% that goes to Latin America, 14.4% to the Middle East and North Africa, 24% to East Asia and Pacific, 20% to South Asia and 13% to East and Central Asia. Informal inflows to Sub-Saharan Africa have been estimated to be 45 to 65% of formal inflows, as compared to 5 to 20% for Latin America (IMF BOPSY, 2006; Freud and Spatafora, 2005).

The objective of this paper therefore is to investigate which factors drive and constrain remittance inflows into SubSaharan Africa and how remittances respond to changes in these factors. We find that when cross-sectional dependence of the error term and individual effects are controlled for, host country economic conditions are a stronger driver of remittance inflows to SSA than home country income. This aligns with earlier findings of Huang and Vargas Silva (2006) for 11 Latin American and the Caribbean countries. The quality of financial service delivery in the home country is key to the ability of SSA countries mitigating the use of informal channels and harnessing remittances for more productive uses. SSA migrants would respond to investment opportunities in the home country (denoted by higher home country interest rates) conditional on a strong exchange rate since returns on investment are assumed to be in home country currency units. This is more consistent with self interest motives for remittances than altruism. This finding also modifies Katseli and Glystos (1986) who found no relationship between home country interest rates and remittance inflows, and aligns with earlier finding by Higgins et al. (2004) that exchange rate considerations as a measure of risk is a determining factor in remittance inflows to developing countries. There are also country specific differences which imply that policies aimed at maximising the benefits of remittance inflows would differ between countries

The rest of this paper is organised as follows: section 2 reviews the related literature and details the theoretical framework, section 3 describes the data and methodology used, section 4 discusses empirical results and section 5 the addresses the conclusion, policy implications and future research.

2 Related Literature

The literature identifies two main reasons why migrants remit money home which are altruism and selfinterest motives. Altruism refers to the migrant's assistance to the family back home to meet basic family needs (Chami et al., 2005) whiles self?interest motives refer to returnsseeking purposes for remitting back home (Docquier et al. 2006). Remittance inflows sometimes involve a complex arrangement that incorporate features of both self interest and altruism such as risk diversification, consumption smoothing and intergenerational financing of investments (Docquier and Rapoport, 2006). Migrants also remit home, aimed at maintaining good family ties to improve their standing for inheritance purposes or ensure that their assets back home are properly taken care of. This is referred to as "enlightened self interest" (Lucas and Stark, 1985).

Remittances are also sent by migrants to reimburse their families for the cost of migration and education abroad and also serves as a co?insurance mechanism in which remittances sent home helps to support the migrant's family in times of crisis. This is based on the assumption that crisis times in the host and home countries are negatively correlated. Conversely for the migrant, having a family doing well back home to return to if need be is reassuring as "bad times" could also occur in the host country (Solimano, 2003; Addison, 2004).

Differences in patterns of migration have also been found to impact on migrant remittances with temporary migrants more geared towards returns?seeking purposes whiles permanent migrants display more altruistic behaviour (Glystos, 1997). Additionally, the degree of integration between the economies of host and home countries also plays a role. Where the degree of integration is high, an improvement in the host country's economic conditions results in some improvement in home country economic conditions. Consequently, although the income position of the migrant might have improved, from the altruistic perspective it does not trigger increased remittances back home since economic conditions of the migrant's family back home might also have improved (Coulibaly, 2009).

There is also the portfolio allocation choice perspective in which investment opportunities in the home country drive remittance inflows (Katseli and Glystos, 1986). Consequently, such inflows are influenced by the interest rate differential between home and host country, exchange rate expectations, institutional quality and economic policies in the home country. This is based on the assumption that the migrant maximises the total returns on his portfolio in the home country currency units. The relationship between the host country interest rate and remittance inflows *a priori,* has been found to be ambiguous. In the short run, an increase in the host country interest rates could cause the migrant to increase his investments in the host country, adversely affecting remittances sent back home. However in the medium to long term, returns on his investments would improve his level of income and wealth, which is likely to have a positive impact on remittances sent home. In terms of high home country interest rates Katseli and Glystos (1986) found no relationship with remittance inflows.

The factors that drive remittance inflows into Sub-Saharan Africa as well as specific corridors within Sub-Saharan Africa have been addressed to a much lesser extent than other foreign inflows such as FDI, aid and portfolio investments (Opoku-Afari et al. 2004; Quartey and Blankson 2004; Sackey, 2001). However this is not the first paper to address the determinants of remittance inflows into Sub-Saharan Africa. Recently, the determinants and macroeconomic impact of remittance inflows have been looked at by Singh et al. (2010) for 36 Sub-Saharan African countries from 1990 to 2005. Using fixed effects/fixed effects 2SLS they found that remittances to Sub-Saharan Africa were largely altruistic in nature, consistent with the countercyclicality literature on remittance inflows, and that countries with more citizens in the diaspora or in wealthier host countries received more remittance inflows. Singh et al. (2010) also found that although remittances negatively affected economic growth countries with well functioning domestic institutions were better placed to optimise the benefits of remittance inflows towards enhancing economic growth.

Using annual data from 1980 to 2008, this paper seeks to add to scarce literature on remittance inflows to Sub-Saharan Africa by determining which of these factors identified in the literature drive remittances into Sub-Saharan Africa and how remittances respond to changes in these factors. This paper further seeks to ascertain whether remittances to Sub-Saharan Arica are predominantly driven by altruism or self-interest motives.

We differ from most previous work by testing for cross-sectional dependence between the countries in the panel using the Pesaran (2004) CD test[1] and controlling for it with Driscoll and Kraay (1998) robust standard errors, thereby addressing one major critique of panel data estimations. Cross-sectional dependence implies that the error term is contemporaneously correlated across cross-sections. In the presence of cross sectional dependence of the error terms, methods that assume cross sectional independence would result in estimators that are inefficient with biased standard errors, which leads to misleading inference. Consequently panel data estimations using instrumental variable and generalised method of moments approaches would provide very little efficiency gain over OLS estimators (Coakley et al. 2002; Baltagi, 2008; Phillips and Sul 2003). Thirdly, the use of real GDP per capita alone as a measure of host country economic conditions is also improved on in this paper. Using a similar approach as in Huang and Vargas-Silva (2006) we measure host country economic conditions using a composite variable created by principal component analysis. It consists of the real GDP per capita, end of period inflation rate, M2 and the Federal Fund Rate (FFR) of the US. The basis for this is that the rate of inflation affects the migrant's cost of living in the host country. Real GDP per capita is an acceptable measure of income level in the host country. The FFR is a policy signal of the cost of borrowing or returns on investment whiles M2 measures the deposit gathering ability or quality of financial service delivery in the host country which has a bearing on the migrant's access to finance. These variables together better captures the economic conditions of the migrant in the host country his level of income, his portfolio allocation choices between the host and home countries and therefore his ability to remit back home.

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[1]The properties of other tests such as the Frees (1995) test and Friedman (1937) test for cross sectional dependence are suited for static panel data estimations and not dynamic panel estimations.

3 Theoretical framework[2]

Following the literature on why migrants remit home (see Bougha-Hagbe, 2004; Funkhouser, 1995; Lucas & Stark, 1985), we assume that the representative migrant's expected lifetime utility is maximised by allocating his resources between his consumption, his family's consumption back home and investment opportunities in the home and host countries. These investments include both financial holdings (interest bearing assets) and nonfinancial assets such as physical property. We differ from previous work by considering only the migrant's financial holdings in the host country in this model and not the possibility of the migrant acquiring physical assets in the host country. This is based on the assumption that the migrant's primal objective is to improve his standard of living and future prospects and that of his family back home and not in the host country. Thus the level of investments required to acquire physical assets in the host country is detrimental to the achievement of this primal objective. The representative migrant therefore solves the problem

$$MaxU_t = \sum_{t=1}^{T} \beta^t (\gamma_t LnA_t + \theta_t LnC_t^m + \phi_t LnC_t^h) \tag{1}$$

where A_t denotes the size of the representative migrant's non financial assets in his home country, C_t^m is the migrant's consumption in the host country, C_t^h is the consumption of the migrant's family back home. β is the discount factor applied to the expected stream of future returns, γ represents the extent of the migrant's "attachment" to his home country, θ represents the migrant's marginal propensity to consume out of current income, whiles ϕ represents the migrant's degree of altruism towards his family back home. The migrant's degree of attachment to his home country and his family is capable of varying overtime by changes in confidence levels or the relationship with his family. The migrant is constrained in each period t by the following budget constraints and income flows.

$$P_t^m C_t^m + R_t^m + F_t^m - F_{t-1}^m = Y_t^m + i_t^m F_{t-1}^m \tag{2}$$

$$F_t^h = F_{t-1}^h (1 + i_t^h) + e_t R_t^m - P_t^h (A_t - A_{t-1}) - e_t r_t^m \tag{3}$$

$$A_t > 0 \tag{4}$$

$$P_t^h C_t^h = P_t^h Y_t^h + e_t r_t^m \tag{5}$$

R_t^m denotes the total amount of remittances sent home by the migrant in foreign currency, P_t^m the price level in the host country, F_t^m denotes the migrant's end of period net financial assets held abroad in foreign currency. The migrant's income in the host country in foreign currency is T_t^m while i_t^m is the host country interest rate. Nominal income in the home country is denoted by Y_t^h, P_t^h is the home country level of prices and F_t^h the migrant's net financial assets in the home country in home country currency units. The exchange rate is e_t while r_t^m is the remittances sent by the migrant to his family for altruistic reasons in host country currency units[3].

The migrant's budget constraint is given by equation (2), which shows that his total income in the host country is allocated between his consumption total remittances sent home and his financial asset accumulation in the host country. The migrant's financial holdings in the home country is depicted by equation (3). It is an increasing function of home country interest rates, the net of total remittances and the remittances for altruistic reasons, and decreases with the need to acquire or maintain non?financial assets which is assumed positive in equation (4). To simplify the model equation (5) assumes that the migrant's family back home does not build any significant financial assets out of their income or the remittances received from the migrant.

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[2] Available on request from corresponding author.

[3] This entire model is from the perspective of the representative migrant. Thus altruistic remittances is viewed in host country currency units converted by the exchange rate to tell the migrant how much his family actually receives in home country currency units.

Let $\lambda_{1,t}$, $\lambda_{2,t}$ and $\lambda_{3,t}$ be the Lagrangian multipliers for constraints (2), (3) and (5). The Lagrangian for optimizing equation (1) is given by

$$L = \sum_{t=1}^{T} \beta^t [(\gamma_t LnA_t + \theta_t LnC_t^m + \phi_t LnC_t^h) + \lambda_{1,t}(Y_t^m + i_t^m F_{t-1}^m - P_t^m C_t^m - R_t^m - F_t^m + F_{t-1}^m) + \lambda_{2,t}(-F_t^h + F_{t-1}^h(1 + i_t^h) + e_t R_t^m - P_t^h(A_t - A_{t-1}) - e_t r_t^m) + \lambda_{3,t}(P_t^h Y_t^h + e_t r_t^m - P_t^h C_t^h)] \quad (6)$$

From first order conditions and at the optimum[4]

$$\theta_t C_t^h P_t^h = e_t P_t^m C_t^m \phi_t \quad (7)$$

Equation (7) shows a direct relationship between the migrant's consumption expenditure and that of his family back home underling the assumption that the representative migrant's utility includes the consumption of his family back home. For a given level of the migrant's consumption expenditure and home country exchange rate, the consumption of his family back home is increasing in the degree of altruism (ϕ_t) the migrant attaches to his family. There is also a negative relationship between change in remittances sent home for altruistic reasons and change in the income of his family back home expressed in equation (8) as.

$$\frac{\partial r_t^m}{\partial Y_t^h} = -\frac{P_t^h}{e_t} \quad (8)$$

This is consistent with the altruism literature that migrant remittances mitigate adverse economic conditions back home to help smooth the family's consumption and income level. Equation (9) below yields a positive relationship between change in the migrant's income in the host country and change in remittances sent home for altruistic reason.

$$\frac{\partial r_t^m}{\partial Y_t^m} = \frac{\phi_t}{\theta_t} \quad (9)$$

This aligns with the literature that an improvement in the migrant's income position impacts positively on his ability to remit his family back home. It is an increasing function of the degree of altruism the migrant attaches to his family back home and a decreasing function of how much he consumes out of each dollar of income in the host country as well as the exchange rate. An appreciation of the local currency denotes favourable economic conditions back home and this has a decreasing effect on altruistic remittances.

$$\frac{\partial R_t^m}{\partial A_t} = \frac{P_t^h}{e_t} - \beta \frac{P_{t+1}^h}{e_{t+1}} \quad (10)$$

Equation (10) above shows that the need to finance or acquire physical assets back home has a positive relationship with remittances sent home by the migrant besides for altruistic reasons alone.

The migrant's allocation of financial assets between the host and the home countries depend on the returns on his financial holdings in the home and host countries. The migrant's response to investment opportunities in the host country as represented by host country interest rates is expressed in equation (11) as,

$$\frac{\partial R_t^m}{\partial i_t^m} = F_{t-1}^m \quad (11)$$

while his response to investment opportunities in the home country as represented by home country interest rates is given in equation (12) as

$$\frac{\partial R_t^m}{\partial i_t^h} = \frac{1}{e_t}[-F_{t-1}^h] \quad (12)$$

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[4]See Appendix I for details of the framework

Thus from equations (A.26) and (A.27) the theoretical framework indicates that an increase in host country interest rates has a positive impact on remittances sent home. An increase in home country interest rates will result in a decline in remittance inflows. This is because it is further conditional on exchange rate expectations since returns on investments are assumed to be in home country currency units (Katseli and Glystos, 1986; Higgins 2004).

4   Data and methodology

Table 1 below details the data used and how variables are measured. Data on all variables for the 35 Sub-Saharan African[5] countries included in the panel are obtained from the World Development Indicators of the World Bank, complimented with data from the International Monetary Fund.

4.1   Descriptive statistics and stylised facts

Table 2 contains a summary of descriptive statistics of variables used in this study. Remittance as a percentage of real GDP per capita averaged 5.4% in SubSaharan Africa from 1980 to 2008. However certain countries exceeded the regional average. Remittances to Lesotho as a percentage of GDP averaged 58.7% over the period, followed by Cape Verde 12.2% and Swaziland 7.1%. West Africa generally registered higher remittance inflows as a percentage of GDP (between 3.3% and 4.3%) than East and Southern Africa (between 0.6% to 2.5%, and 0.02% to 1.8%, respectively). It is known that West Africa generally registers lower economic growth levels and higher rates of inflation than Southern and Eastern African countries. This trend is consistent with the altruism literature that bad economic conditions attract more remittance inflows from migrants. M2 as a percentage of GDP averaged 25.3% across the period.

As a ratio to GDP in 2008, remittances to Lesotho ranks highest at 27% of GDP. Togo, Cape Verde and Senegal follow with approximately 10% of GDP, The Gambia 8.2%, Sierra Leone 7.6%, and Guinea Bissau 7% (World Bank, 2009). Figure 1 depicts remittances as a ratio to GDP in the 7 highest remittance recipient countries in Sub-Saharan Africa in 2008.

As at end 2008, remittances to Sub-Saharan Africa were 53% of ODA and 63% of FDI to the region (Figure 2). As at end 2008, remittance inflows to Sub-Saharan Africa were 54% and 57% of regional exports and imports respectively and exceeded the regional current account surplus by 5%. This underlines the relevance of remittance inflows to the balance of payments and its potential to supplement financing of the external gap in recipient countries and regions.

4.2   Cross-correlation analysis

Cross-correlation analysis is used to ascertain the correlation between remittances and the other variables. From Table 3 remittances are negatively correlated with real GDP per capita in the home country and statistically significant at the 1% level.

This is consistent with the altruism literature that remittance inflows mitigate economic downturns in the home country. Host country economic conditions are positively correlated with remittance inflows and statistically significant at the 5% level, denoting that Sub-Saharan Africa migrants remit more when an improvement in host country economic conditions improves their income positions. M2 is positively correlated with remittance inflows at the 1% level. This underlines the relevance of the quality of financial services to formal remittance inflows and confirms the literature that countries with quality institutions and welldeveloped financial sectors are better placed to receive more remittances through formal channels and thereon harness them for more productive

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[5] Benin, Burundi, Botswana, Burkina Faso, Cameroun, Cape Verde, Comoros, Cote D'Ivoire, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mauritania, Mozambique, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Seychelles, Sierra Leone, Swaziland, South Africa, Tanzania, Togo, Uganda, Zambia.

uses (Singh et al. 2010). There is also a negative and statistically significant correlation between remittances and the real exchange rate. This needs to be interpreted cautiously. An increase in the real exchange rate which denotes a depreciation of home country currency is associated with adverse economic trends and would therefore have a positive relationship with altruistic remittance inflows and a negative relationship with selfinterest/returnsseeking inflows. On the contrary, a decrease in the real exchange rate which denotes an appreciation and consequently strong economic fundamentals would have a positive relationship with self?interest remittance inflows. The interest rate differential is positively correlated with remittances but statistically insignificant.

Besides these general trends, there are country-specific differences Focusing on the seven highest recipient countries of remittances as a percentage of GDP in Sub-Saharan Africa in 2008 we report on some of these differences. First of all the crosscorrelation coefficients are much higher than in the sample wide analysis.

Table 4 uses the sign, magnitude and significance of the correlation coefficients as a proxy to determine the main driver of remittance inflows to each country. For Lesotho the negative and high correlation between remittances and home country income denotes strong altruistic patterns. For Togo and Guinea Bissau the positive and high correlation between remittances and host country income shows that host country economic conditions is the key factor to remittance inflows to these two countries. Similarly, investment opportunities in the home country evidenced by the positive correlation between remittances and the interest rate differential mainly drives remittances to Cape Verde and Gambia. Exchange rate expectations and host country income feature strongly for Sierra Leone and Senegal, however for Senegal, the quality of the financial services sector ranks highest among the other variables. This can be seen from the high and positive correlation between M2 and remittance inflows to Senegal. These results give useful insight into what the policy target should be in each of the respective countries in their efforts to harness remittance inflows as an additional source of external finance for development.

Since correlation does not necessarily imply causality there is the need to ascertain these trends empirically. We also need to establish that the relationships derived from the theoretical framework are consistent with an empirical estimation of the data

4.3 Model specification and estimation technique

As a result of the strong persistence behaviour of remittance inflows the model is specified as a dynamic panel model which includes one or more lags of the dependent variable. Tests for joint validity of individual effects reveal that both cross-sectional and time specific effects are valid. Table 5 below details the results of initial diagnostic tests performed on pooled OLS and fixed effects models.

Consequently the error term takes a two-way error component form and the model is specified as

$$y_{it} = \delta y_{i,t-1} + X_{it}\beta + \mu_i + \lambda_t + v_{it} \tag{13}$$

where μ_i represent country-specific effects, λ_t time specific effects and v_{it} the idiosyncratic error term. Tests for cross-sectional dependence of the error terms using the Pesaran (2004) CD test shows a correlation coefficient of 0.37 of the error term across cross sections although we fail to reject the null of crosssectional independence. For robustness Frees (1995) test rejects the null of crosssectional independence. It is however recognised in this study that the suitability of the Frees (1995) test for dynamic panel estimations has not yet been empirically ascertained (De Hoyos and Sarafidis, 2006). Thus on the basis of both tests we accept that there is some degree of cross-sectional dependence of the error term across cross-sections[6] To determine the order of integration of the variables we take preference to unit root methods that assume individual unit root processes due to the validity of

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[6] As a result of the correlation coefficient returned by the Pesaran (2004) Test and the results of the Frees (1995) test we control for the existence of cross sectional dependence with a LSDV estimation using the Driscoll and Kraay (1998) robust standard errors.

fixed effects and also accommodate spatial dependence to some extent. These are the Im, Pesaran and Shin Test (2003), ADFFisher Chisquare Test and PPFisher Chisquare (1932) tests (Maddala and Wu, 1999; Baltagi, 2008). Table 6 details the results of the tests for cross-sectional dependence.

Equation (13) is based on the assumption that there is no serial correlation present in the error term and the regressors are strictly exogenous E $(v_{it}|x_{i1}..., x_{in}, \mu_i) = 0$. The Hausmann test for endogeneity rejects the null of exogeneity, meaning the regressors and the fixed effect error terms are correlated. All the regressors in this model are assumed to be endogenous. This is because they are all determined by additional factors that are not specifically captured in this model and are likely to be reflected in the error term. Additionally, by construction the lag of the dependent variable $y_{i,t-1}$ is correlated with the fixed effects μ_i error term. The Lagrange Multiplier test for first order serial correlation given fixed effects rejects the null of no first order serial correlation. This violates an assumption necessary for consistency of OLS estimators resulting in biased and inconsistent estimators (Nickell, 1981).

The results of the initial diagnostics warrant the use of an estimation technique that preserves homoscedasticity, prevents serial correlation and also preserves the orthogonality between transformed variables and lagged regressors (Arellano and Bover, 1995). Consequently, the model is estimated using the Arellano and Bover (1995) two step system GMM with forward orthogonal deviations instead of differencing. For robustness LSDV estimation is also done using Driscoll and Kraay (1998) robust standard errors to correct for some level of crosssectional dependence of the error term. The Driscoll and Kraay (1998) standard errors are robust to general forms of cross-sectional and temporal dependence when T is moderately large and are suitable for both balanced and unbalanced panels.

To address the endogeneity, the data is first of all time demeaned to remove time specific effects by expressing all variables in the model as deviations from year specific means. This is also known to correct moderate levels of cross sectional dependence since it removes the mean impact of the factor loadings of the unobserved factors generating the interdependencies between cross-sections (De Hoyos and Sarafidis, 2006). The cross-sectional specific effects are then eliminated using forward orthogonal deviations thereby making it possible to use one period lags of the regressors as valid instruments since they are not correlated with the transformed error term (Love and Zichinno, 2006; Coulibaly, 2009). Another advantage of this approach is that it is more resilient to missing data. It is computable for all observations except the last for each cross-section, hence minimising data loss (Roodman, 2006).

5   Empirical results

The results of the estimation are detailed in Table 8 It can be observed that the results of the LSDV estimation which includes correction for cross sectional dependence are significantly no different from the forward orthogonal two step system GMM results. Using the twostep system GMM results the coefficient of lagged remittances is positive and statistically significant at the 1% level. Although the coefficient has been corrected downwards as compared to the OLS estimation it still denotes strong persistence behaviour in remittance inflows to Sub-Saharan Africa. Home country income as expected is negatively signed and statistically significant at the 1% level however the magnitude of the coefficient remains low. This confirms earlier findings in the cross-correlation analysis of a negative but weak relationship between remittance inflows and home country income.

The coefficient of host country economic conditions is positive and statistically significant at 1% level. This indicates that Sub-Saharan African migrants remit more when an improvement in the economic conditions of the host country improves their income levels This corroborates earlier findings by Singh et al. (2010) that countries with more migrants in wealthy countries receive more remittance inflows than otherwise. The quality of financial service delivery (M2) is positively signed and statistically significant at 1% level. This aligns with *a priori* expectations as well as earlier trends in the cross-correlation analysis. Thus the quality of financial service delivery is a key factor

to be considered in efforts aimed at directing remittance inflows through formal channels into Sub-Saharan Africa and thereon for more productive uses This is consistent with earlier findings by Gupta, Patillo and Wagh (2007).

The coefficient of the interest rate differential is positively signed and statistically significant at 1% level. This indicates that Sub-Saharan African migrants would take advantage of investment opportunities in their home countries under the right conditions.[7] This modifies earlier findings by Katseli and Glystos (1986) who found no relationship between home country interest rates and remittance inflows. However this is conditioned on exchange rate expectations being well anchored. The coefficient of the real exchange rate is negatively signed and statistically significant at the 1% level. This implies that an expected depreciation of the real exchange rate which signals adverse economic conditions back home would result in a fall in remittance inflows whiles an expected appreciation of the real exchange rate which signals strong economic fundamentals would result in an increase in remittance inflows. The assumption that returns on investment are in home country currency units means that a depreciation of the exchange rate represents a loss of value to the returns seeking migrant. These results especially the interest rate differential and the real exchange rate are consistent with self interest motives for remittances and not altruistic motives

The Arellano and Bond (1991) test for second order serial correlation fails to reject the null of no autocorrelation. The Hansen (1982) test for overidentification fails to reject the null that the overidentification restrictions are valid whiles the Difference in Hansen test also fails to reject the null that the instrument subset are strictly exogenous. Hence the results of the two step system GMM estimation with forward orthogonal deviations meet all post estimation diagnostic requirements. All coefficient estimates compare favourably with the OLS and LSDV coefficient estimates. This shows that they are likely good estimates of the true parameters of the variables.

6   Conclusion, policy implications and future research

The empirical results confirm that host country economic conditions and self interest motives are a stronger driver of remittance inflows to Sub-Saharan Africa than home country income and altruism respectively. This directly contradicts earlier findings by Singh et al. (2010).

Secondly the quality of financial service delivery in the home country is a key factor to be considered if remittance inflows into Sub-Saharan Africa through formal channels are to be maximised. This corroborates earlier findings by Singh et al. (2010) and Gupta et al. (2007) that countries with welldeveloped financial services industries stand a better chance of attracting more remittance inflows through formal channels and thereon the opportunity to channel them into more productive uses.

Furthermore, the positive and statistically significant coefficient of interest rate differential shows that Sub-Saharan African migrants would take advantage of investment opportunities under the right conditions. This improves earlier findings by Katseli and Glystos (1986) that a positive interest rate differential between home country interest rates and host country interest rates had no relationship with remittance inflows. This is more consistent with selfinterest remittance inflows than altruism. The selfinterest motive is further strengthened by the negative and statistically significant coefficient of the real exchange rate. This is understandable due to the assumption that returns on investment are in home country currency units hence a real exchange rate appreciation would be preferred to depreciation by returnsseeking migrants. This aligns with Higgins et al. (2004) who found that exchange rate uncertainty as a measure of risk is significant to remittance inflows to home countries. These results confirm that although some degree of altruism pertains in remittance inflows to SubSaharan Africa, selfinterest or returnsseeking motives are a much stronger driver of remittance inflows to Sub-Saharan Africa than altruism.

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[7]Confidence issues and exchange rate expectations are additional determining factors.

With respect to policy recommendations, economic fundamentals (e.g. the real exchange rate) need to be strong to generate the right confidence levels if countries are to be able to harness remittance inflows from the diaspora for development finance. Coupled with an improved level of market sophistication, i.e. the products and services provided by financial service providers, the enabling environment would be created to direct remittance inflows through formal channels and thereon for more productive uses. This would further mitigate its negative impact on macroeconomic variables such as money supply growth, inflation and the exchange rate. It would also help alleviate its influence on money laundering, fraud, terrorism financing and illegal forex markets. Many countries in Latin America, South Asia, Eastern Europe and Mediterranean regions have been able to finance several community based development projects through diaspora targeted debt instruments. In light of dwindling portfolio investments FDI and ODA saddled with unfavourable conditionalities, Sub-Saharan African countries could also harness remittance inflows as an alternative source of external finance for development if the right products and services are designed by financial service providers, economic fundamentals are strong, exchange rate expectations are well anchored and the right confidence levels are ensured.

It must be mentioned though that there are strong migration and remittance dynamics within Sub-Saharan Africa that need to be researched. It is estimated that about 20 percent of SSA migrants are within SSA who also remit regularly (Barajas et al. 2010). Thus in terms of future research, it would be useful for specific remittance corridors within Sub-Saharan Africa to be studied in relation to their respective dominant host countries. This would further facilitate targeted policy interventions aimed at enhancing the flow of remittances through formal channels, maximising their positive externalities whiles minimising the associated negative externalities.

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Table 1: Sources and definition of variables

	Variable	Source	Definition
GPCC	Home country income level in Sub-Saharan Africa	World Bank	Annual GDP per capita in 2000 US constant prices.
Ym	Economic conditions of the host country	IMF, World Bank	A composite variable was created using principal component analysis. It comprises of the real GDP per capita, end-of-period inflation rate, M2 and the Federal Fund Rate of the US.[1]
REM	Remittances as a percentage of GDP	World Bank	Worker's remittances and compensation of employees as a percentage of GDP in current prices (US$ Millions).
Idif	Interest rate differential	IMF, World Bank	Differential between the deposit interest rate in SSA countries and the US.
RER	Real exchange rate	IMF, World Bank	Nominal exchange rate to the U.S. dollar multiplied by the ratio of the CPI of U.S.A (2000 = 100) to the aggregate price level (GDP deflator 2000 = 100) for the SSA countries
M2	Quality of financial service delivery in home country	World Bank	Money and quasi money as a percentage of GDP.

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[1] Composite business cycle indicators (leading, coincident and lagging) were also used as an alternative measure of economic conditions in the host country. However the results were no different.

Table 2: Descriptive statistics of variables

Variable	Mean	Min	Max	Obs.
REM	5.40	0.00111	227.70	1015
Ym	987.15	-2.71	43 943.34	1015
GDPC	897.40	102.29	8 208.32	1015
M2	25.30	0.25	117.36	1015
RER	462.64	1.76	8 302.57	1015
Idif	-0.79	-26.81	51	1015

Table 3: Cross-correlations of variables

Variables	REM	REM(-1)	Idif	M2	RER	GPCC	Ym
REM	1						
REM(-1)	0.81***	1					
Idif	0.02	0.02	1				
M2	0.15***	0.15***	-0.03	1			
RER	-0.08***	-0.08**	0.04	-0.14***	1		
GDPC	-0.09***	-0.09***	0.01	0.57***	-0.15***	1	
Ym	0.07**	0.07**	0.01	0.08**	-0.05	-0.06*	1

Note: (*), (**), (***) denotes 10%, 5% and 1% level of significance respectively.

Table 4: Country-specific cross-correlations of remittances and other variables: contemporaneous analysis[2]

	CVE	GAM	GNB	LES	SEN	SLE	TOG
Idif	0.47**	0.67*	-0.35***	0.01	0.38**	-0.30	0.38**
GPCC	0.31	0.19	-0.49*	-0.62*	0.74*	-0.48*	-0.39**
RER	0.39**	0.52**	0.56*	0.61*	0.87*	0.79*	0.49*
M2	0.30	0.61*	0.46**	0.53*	0.89*	0.03	-0.20
Ym	0.43*	0.57*	0.61*	-0.60*	0.74*	0.75*	0.83*
DC	0.37**	-0.19	-0.14**	0.15	-0.35***	-0.22	-0.53*

Note: (*), (**), (***) denotes 10%, 5% and 1% levels of significance respectively.

[22] CVE (Cape Verde), GAM (Gambia), GNB (Guinea Bissau), LES (Lesotho) SEN (Senegal, SLE (Sierra Leone), TOG (Togo)

Table 5: Initial diagnostic tests

Test	Test statistic	Critical value	Inference
Joint validity of cross-sectional individual effects $H_0 : \mu_1 = \mu_2 \ldots \mu_{N-1} = 0$ H_A : Not all equal to 0	F Stat = 15.12	$F_{(0.05,\ 34,\ 939)} = 1.442$	Cross-sectional specific effects are valid.
Joint validity of time (period) fixed effects $H_0 :\qquad\quad = 0$ H_A: Not all equal to 0	F Stat = 44.51	$F_{(0.05,\ 27,\ 947)} = 1.498$	Time-specific fixed effects are valid. The error term takes a two way error component form.
Serial correlation (two-way model) LM test for first order serial correlation, given fixed effects $H_0 :\quad = 0; \quad H_A = \rho > 0$	LM = 3.44	$N(0,1) = 1.645$	First order serial correlation, given fixed effects.
Heteroscedasticity $H_0 :\qquad =$ H_A : Not equal for all i	LM = 817.59	$= 48.60$	The variance of the error term is not constant. Heteroscedasticity is present.
Hausman specification test $H_0 :E(\qquad\quad) = 0$ $H_A :E(\qquad\quad) \neq 0$	$m_3 = 160.11$	$= 12.60$	Regressors not exogenous.
Pesaran CD (2004) test for cross– sectional dependence $H_0 : corr\ (\qquad\quad) = 0\ for\ i$ $H_A : corr\ (\qquad\quad) \neq 0\ for$ some i	CD = 1.66 (0.37)	Prob = 0.90	Results inconclusive. While we fail to reject the null of cross sectional independence, a cross correlation coefficient of 0.37 is reported.

Table 2.6: Tests for cross-sectional dependence

Test	Test statistic	Prob. Value	Distribution	Inference
Frees (1995, 2004) test	6.01	$\alpha = 0.10:0.09$ $\alpha = 0.05:0.12$ $\alpha = 0.01:0.17$	Frees' Q distribution	Cross-sections are inter-dependent
Friedman (1937) test	25.472	Pr=0.85		Cross-sections are independent

Note: for all test H_0: corr ( ) = 0 for i ; H_A: corr ( ) $\neq$ 0 for some i

Table 7: Order of Integration of Variables

Variable	In levels	In first-differences	Obs.
REM	I(0)		1015
Ym	I(1)	I(0)	1015
GDPC	I(1)	I(0)	1015
M2	I(1)	I(0)	1015
RER	I(1)	I(0)	1015
Idif	I(0)		1015

Table 8: Empirical results: OLS, LSDV and ARBover (1995) Dependent variable: REM

Variable	OLS	LSDV[3]	Two-step System GMM (ARBover, 1995)[4]
REM(-1)	0.80***	0.44**	0.42***
GDPC	-0.0003*	-0.002**	-0.003***
Ym	0.02*	0.24**	0.29***
Idif	0.0007*	0.01*	0.05***
M2	0.04	0.11**	0.13***
RER	-0.0001*	0.0002	-0.0002**
C	0.06*	2.21**	
Adjusted R^2	0.64	0.71	
ABond test for second order serial correlation			Prob > z =0.32
Hansen test for over identification			Prob > 0.98
Diff. in Hansen test for exogeneity of instrument subset.			Prob > 0.98

Note: (*), (**), (***) denotes 10%, 5% and 1% levels of significance respectively.

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[3] As a result of the correlation coefficient returned by the Pesaran (2004) Test and the results of the Frees (1995) test we control for the existence of cross sectional dependence with a LSDV estimation using the Driscoll and Kraay (1998) robust standard errors.

[4] The two–step system GMM estimation involved forward orthogonal deviations of the regressors instead of lag differencing. The results of the estimation satisfy all post–estimation diagnostics, being the Arellano & Bond (1991) test for second order serial correlation and the difference in Hansen test for exogeneity of instruments. In the absence of cross–sectional dependence of the error terms these results are adequately robust and well aligned to *a priori* expectations.

Figure 1: Remittances as a ratio to GDP in highest remittance recipients in SSA in 2008
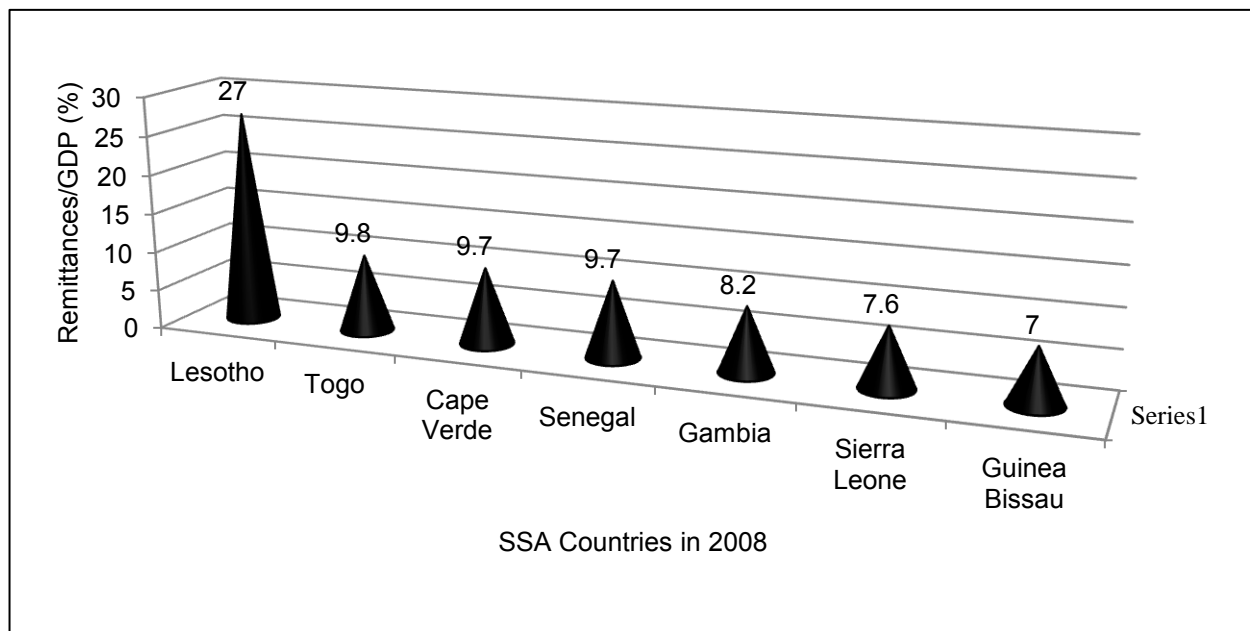
Data Source: World Development Indicators, World Bank

Figure 2: Ratio of remittances to regional aggregates in SSA in 2008
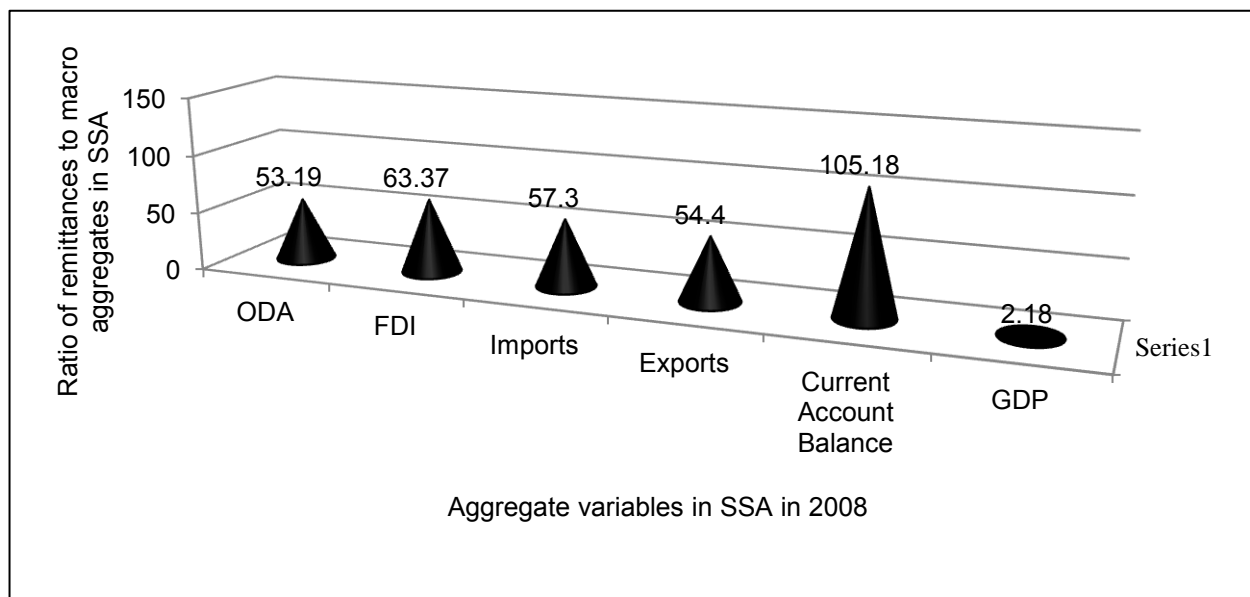
Data Source: World Development Indicators, World Bank. WDI Online