Remittances provide resilience against disasters in Africa
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Remittances Provide Resilience against Disasters in Africa

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Abstract. How responsive are remittances to various disasters, both natural and human-made? And would remittances be affected by systemic financial crises (such as the 2008/09 financial crisis)? Using panel data on 23 Sub-Saharan African (SSA) countries over the period 1980 to 2007, we find that remittances are slow to respond to natural disasters, unresponsive to outbreaks of conflict, and will decline, albeit slowly, after a global financial crisis only to the extent that the crisis affects incomes, migration stocks, exchange rates, and the banking system. The relative persistence of remittances suggests that it is a good bulwark against natural disasters and global financial crises in SSA.

1. Introduction

Sub-Saharan Africa may seem to be disaster prone. It was the region that suffered from the largest number of droughts in the world between 1974 and 2003 (Centre for Research on the Epidemiology of Disasters (CRED), 2004:122). Drought has had a significantly negative impact on economic growth rates in SSA; Barrios et al. (2003) estimate that declining rainfall could explain up to 36 per cent of the gap in average per capita GDP between SSA countries and other developing countries. Similarly, SSA has suffered extensively from conflict (Nillesen and Verwimp, 2010) - setting back consumption and production and destroying infrastructure and assets just as natural disasters do. And the global financial crisis of 2008-09 illustrated that African economies are particularly vulnerable to external economic and financial shocks because of its openness (Naudé, 2010a).

Being subject to these hazards means that African countries and people are highly vulnerable. Human migration and the associated flow of remittances have been recognized as a source of resilience. Over the past 30 years, the stock of migrants worldwide has increased from 84 million in 1970 to over 194 million by 2005, and the value of remittances in US $ rose from US $2 billion in 1970 to over US $433 billion in 2008[1]. Before, during and after disasters, remittances can improve resilience in receiving countries by allowing households to diversify income sources, acquire more robust and safe housing, continue to invest in human capital formation, smooth consumption, encourage entrepreneurial activity and fund reconstruction efforts.

The question is how responsive are remittances to various disasters? And how are remittances affected by global (or systemic) financial crises such as the 2008-09 financial crisis? In this paper, we investigate these questions using data on 23 Sub-Saharan African (SSA) countries over the period 1980 to 2007. We choose these countries due to SSA's vulnerability to external financial shocks, conflicts and natural disasters. It has also been characterized by growing rates of out-migration (Naudé, 2010b) and rising remittances. Moreover, SSA has been relatively neglected in economic research on both migration (Naudé, 2010b) and remittances (Barajas et al., 2010).

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[1] Source of migration and remittance data: World Bank Development Indicators Online.

The paper is structured as follows. In section 2, we provide a review of the relevant literature on remittances and disasters, and we draw out some implications and hypotheses. Section 3 describes our methodology. Section 4 contains our regression results. Section 5 concludes.

2. Literature Survey: Remittances and Disasters

In this section we discuss the relationship between remittances and each of the three types of disasters discussed in the previous section: natural disasters, conflict and global financial crises. We first however discuss the measurement and determinants of remittances.

2.1 Measurement and determinants

'Remittances' include (i) current transfers by migrants currently resident and employed abroad; (ii) employee compensation, *i.e.* salaries, wages and other benefits earned in countries other than in which they are resident; and (iii) migrants' transfers that constitute a flow of funds resulting from a change in the residency of a country by a migrant (Chami *et al*., 2008). Most developing countries do not report on these components separately but rather only total remittances. Inadequate financial recording, underdevelopment of the financial sectors, as well as "In kind" remittances imply that remittance data is generally under-reported (Page and Plaza, 2006).

Much has been written about the determinants of remittance (see e.g. Lucas and Stark, 1985). A full discussion of these falls outside the scope of this paper. We should however mention that our regression model (see section 4) is informed by these standard determinants such as (i) both host- and home-country characteristics, (ii) the characteristics of migrants, and (iii) their destination country (see e.g. Freund and Spatafora, 2008; Page and Plaza, 2006; El-Sakka and McNabb, 1999; Beck and Peria, 2009; Singh *et al.*, 2009; Farrant et al. 2006; Charmi *et al.* 2008; Bollard *et al.*2010).

2.3 Remittances and natural disasters

On 12 January 2012 Haiti suffered from an earthquake that claimed more than 200,000 lives. Can remittances play a role in helping Haitians to recover? According to Ratha (2010) it could, seeing that more than a million Haitians are migrants. He estimated that if the average remittance per migrant could only increase by 20 per cent, that it would provide, over three years, an additional US $1 billion for the reconstruction of the economy. The question is whether remittances are indeed so responsive. Mohapatra et al. (2009) provide a number of examples of

countries where remittance flows have in fact increased after a natural disaster, such as Bangladesh (1998), China (1999), El Salvador (1986), Guyana (2004), Honduras (1998), India (1992) and Jamaica (1989;2004). In these cases, the natural disasters in question were sudden-onset, such as earthquakes, hurricanes, floods and landslides. They point out that in slower-onset disasters, such as drought, we might not always observe a sudden spike in remittances as in these countries 'remittances are factored into the intertemporal consumption decisions' (Mohapatra et al., 2009:4). In analysing the patterns of remittances in the face of natural disasters for SSA, where droughts are the predominate natural disaster, and migration very often a deliberate livelihood strategy to mitigate the impact of drought, this need to be kept in mind - in the case of drought SSA may not experience an increase in remittances.

Finally, sometimes remittances may be reduced by natural disasters in a sending country. This can happen when the natural disaster is such that it destroys or damages banking and other infrastructures used to send remittances (David, 2010).

2.4   Remittances and armed conflict

Like the impact of a natural hazard, the outbreak of armed conflict could adversely affect a household's welfare, by destroying or reducing their income sources and assets. In such cases, one could expect remittances to increase to conflict countries.

In a situation of prolonged conflict a country would have a larger share of its population abroad as a Diaspora. In such countries remittances could show an upward trend following the outbreak of conflict as the number of refugees rises, although this may take a while to show up in national accounts. Many countries with high ratios of remittances to GDP are in fact countries in conflict or countries that had been in conflict (Haiti is a good example).

However, while the above suggests an increasing trend for remittances in response to conflict or post-conflict reconstruction, it may be difficult to remit funds to households in conflict countries. Banks are often adversely affected, or regulated, and migrants/refugees often do not trust these institutions. Governments in conflict countries may be antagonistic towards their Diasporas and could interpret remittances as undermining or fuelling conflict. And 'remittances themselves become a highly prized resource attractive to thieves and even warring parties' (Young, 2006:28). Hence, in conflict situations, officially measured remittances may fall or not show significant growth, whereas more informally remitted funds may increase.

2.5   Remittances and global economic shocks

A global financial crisis may be expected to reduce remittances to developing countries through (i) a reduction in migration from developing to developed countries, in the light of reduced opportunities in these countries; (ii) a negative income shock suffered by migrants, as many will lose their jobs, or earn less; and (iii) a reduction in the amount of money remitted per migrant, as they make do with reduced incomes (Calì and Dell'Erba, 2009).

Barajas et al. (2010) found that most African migrants remain within Africa. The implication is that they are less likely to be affected than countries where most migrants are in the USA or Europe. They conclude that 'the impact of the global fall in remittances on African countries' GDP growth is expected to be fairly mild' (Ibid, p.10). Ratha et al. (2008) found that remittances are more resilient than portfolio, FDI or foreign aid flows, and that migrants often maintain their remittances even if their host countries' economic conditions deteriorate. Therefore, we can conclude that whereas SSA's possible lack of extensive and diversified out-migration has left it a relatively bit less exposed to the drop in remittances as a result of a global financial or economic crisis, it may be more exposed to natural hazards and conflict.

3. Methodology

3.1 Hypotheses

Based on the disaster profile of SSA and the brief literature surveyed we will investigate the following hypotheses in the remainder of this paper.

> *H1: Remittances to SSA countries are not significantly responsive to natural disasters or the outbreak of conflict, and will not show an immediate increase after these.*
>
> *H2: Remittances to SSA countries will decline during a globally synchronized financial crisis.*

Hypothesis H1 is derived from the fundamental determinants of remittances such as a country's migrant stock and the sophistication of its financial system – aspects that are relatively stable over the short term. Furthermore, in SSA, as we mentioned most disasters are relatively slow-onset disasters to which migration is an age-old response or coping strategy. Hypothesis H2 results from the standard determinant that a host country's income is an important determinant of remittances. Because a significant number of African migrants find themselves in the EU, a global financial crisis could affect their ability to remit. We have three reasons, however, to

suspect that H2 may be rejected. One is that many migrant workers in the EU may be in jobs that are more recession-proof. A second is that there are also in fact more SSA migrants in other SSA countries than EU countries, and to the extent that SSA incomes are not as much affected by global financial crises may insulate remittances. And three is that a global financial crisis may see SSA countries' exchange rates depreciate, which may lead to increased remittances to benefit from the drop in the relative price of the home currency.

3.2 Estimation strategy

Our estimation strategy is to estimate a regression equation of the determinants of remittance inflows. The estimating equation is informed by the standard determinants of remittances as well as our desire to include data reflecting natural disasters, conflict and globally synchronized financial. Our panel regression estimating equation follows Freund and Spatafora (2008) and Lueth and Ruiz-Arranz (2006) and can be written in log-linear form as:

$$R_{it} = \tau_t + x_{it}\beta + c_i + u_{it} \tag{1}$$

For $i = 1,….N$ and $t = 2,….T$ and where R_{it} = remittances to country i in period t; $x_{it} = a\ 1 \times K$ vector of explanatory variables. Some of these vary over t; c_i = unobserved country characteristics that are constant (fixed) over the time period, and influence R_{it}; τ = year-specific fixed effects, and u_{it} = a random error term with the usual properties.

x_t is a vector containing the explanatory variables. These include firstly the variables of interest, namely:

- The number of disasters to be experienced by country i in year t. If our hypothesis **H1** holds, we will find the coefficient on this variable to be positive and significant.
- Whether a country is in conflict, or not, in year t (a dummy variable). If our hypothesis **H1** holds, we will find the coefficient on this variable to be positive and significant.
- Whether there has been a globally synchronized recession in year t, or not (a dummy variable). If our hypothesis **H2** holds, we will find the coefficient on this variable to be negative and significant.

If our hypothesis **H2** holds, then the absolute value of the coefficient on the dummy for globally synchronized recessions will be larger in size than in the case of disasters and conflicts.

Furthermore, the control variables are also contained in x_{it}. They are:

- GNI per capita of the home country. If the coefficient heron is $_1 > 0$, then remittances are pro-cyclical, and if <0, then remittances are counter-cyclical.

- GNI per capita of the host country. It is expected that if the coefficient hereon is > 0, and if it is moreover > 1, then it would indicate that increases in host country incomes are passed on more in proportion to their home countries (see Freund and Spatafora, 2008).

- Credit extended to the private sector in country i. This is a proxy for the financial development of country i. The higher it is, the easier it will be to remit, and therefore we expect a positive coefficient.

- The level of the domestic (home country) exchange rate. As remittances are sent as foreign currency, changes in the exchange rate will change the local currency value. If the coefficient on this variable is found to be larger than zero, it would indicate that in case of depreciation in the domestic (home country) exchange rate, a large dollar amount of remittances will be sent in order to make use of the higher, more favourable rate.

- Official Development Assistance (ODA) to country *i*. Literature indicates that ODA is often claimed to affect remittances. For instance, some consider that an increase in ODA to a country will offset remittances to the country. If this is the case, the coefficient on ODA to a country will be negative[2].

- The population of a country. More populous countries will have larger migrant populations in absolute terms, and therefore a higher absolute level of remittances. We include a country's population in the regression analysis to control for the effect of population size.

Finally, we will also, where applicable, including dummy variables to capture any time trends between 1980 and 2007 and country dummies to capture country fixed effects.

We have also investigated other control variables, such as host country unemployment, interest rates and inflation, but these were insignificant and did not affect the results.

3.3   Estimator

As for the estimator, we will estimate (1) by first using a pooled-data OLS, with robust standard errors to account for heteroscedasticity for our benchmark regressions. However, we are aware

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[2] The effects and interplay of ODA and remittances is discusses by the OECD (2005) in Remittances as development finance.

that using a static OLS estimation method may bias our coefficients due to possible endogeneity (reverse causality) and lack of dynamic effects. For instance, remittances may affect the level of the exchange rate, or the volume of aid, or GNI per capita. Also, remittances may be dynamic and depend on past levels (reflecting networks, 'family and friends' and a country's migrant stock). To allow for these considerations and include lagged values of remittances in (1), we will therefore also use a 'difference' (Arellano-Bond) GMM estimator.

3.4   Data and variables

We used data of 23 SSA countries[3] for the period 1980 to 2007. We used data starting only from 1980 due to availability considerations and also because early estimates of remittances were subject to considerable measurement error (Calì and Dell'Erba, 2009). The variables and the sources of data are summarised in Table 2.

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[3] The countries are Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Comoros, Cote d'Ivoire, Ethiopia, The Gambia, Ghana, Kenya, Lesotho, Madagascar, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Sudan, Swaziland and Togo.

Table 2: Summary of variables and data sources

Measures	Description	Sources of data
Dependent Variable: Remittances		
Remittances	Inflows measured in US$	WB *World Development Indicators* online (WDI)
Variables: Disasters		
Natural disasters[4]	The total number of natural disasters in a country in a particular year. Time varying.	CRED online
Conflict[5]	A dummy variable = 1 if there was conflict in the country in that year. Conflict is defined as at least 25 battle deaths occurring.	UCDP PRIO Armed Conflict dataset: Available at: www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/
Globally synchronized recession	A dummy variable = 1 if there was a globally synchronized recession in the particular year. According to the IMF, these were in 1987, 1997 and 2002.	IMF - Laeven, L. and Valencia, F. (2008).
Variables: Controls		
GNI per capita in home country	The gross national product per capita in the home (African) country in period t.	WDI
GNI per capita in host country	The gross national product per capita in the host country in period t. Here we take the host country income to be that of the SSA average – the main destinations of African migrants are other African countries.	WDI
Credit to the private sector	The credit extended to the private sector in an African home country in period i, as a proportion of GDP.	WDI
Exchange rate level	The local currency value of a US$.	WDI
Aid received	The amount, in US$, of aid from the European Union received.	WDI
Population	The total population in a country in a particular year.	WDI
Time dummies	To control for time varying shocks and trends	

(Source: Authors' compilation)

4 Empirical results

4.1 Regression results

Tables 4 and 5 contain the pooled OLS regression results. Table 4 contains the results when no controls are included. It shows that natural disasters have a positive and significant impact on remittance flows to SSA, but that the impact of conflict is insignificant. Global financial crises have, as can be expected, a negative and significant impact on remittance inflows.

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[4] Natural Disaster occurrences are used as the data number of people affected in Africa is not readily available.

[5] The of the Conflict variable relies on the methodology of UCDP PRIO Armed Conflict dataset: Available at: www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/

Table 5 contains the results from four specifications[6]: (1) a basic regression without any of the variables of interest, as a base case, and three further models, introducing (2) natural disasters, (3) conflict and (4) global financial crises.

A few comments are in order before we study the results. We performed the Breusch-Pagan test for heteroscedasticity, finding $\chi^2 (1) = 10.9$ and hence rejecting the null of constant variances. Therefore, to obtain the results in Table 6, we used the White-Huber procedure (within Stata 10.0) to estimate robust standard errors for the coefficients.

In all regressions we included time-dummies and dummies for country fixed-effects.

Table 4: Pooled OLS regression results (Dependent variable = log of remittances in US$): No control variables

Variable	(1) Natural disasters	(2) Conflict	(3) Global financial crises
Constant	18.37 (68.5)*	18.49 (71.3)*	18.49 (71.6)*
No. of disasters	0.08 (2.77)**		
Incidence of conflict		-0.00 (-0.03)	
Global financial crises			-1.25 (-4.37)*
Diagnostics			
R-square	0.77	0.77	0.77
Time dummies	YES	YES	YES
Country fixed effects	YES	YES	YES
N=	644	644	644
F=	66.18*	66.21	67.16

*(Source: Authors' estimations. Robust t-ratios in brackets. An * indicates significance at 1% level, a ** at the 5% level and a *** at the 10% level)*

Table 5: Pooled OLS regression results (Dependent variable = log of remittances in US$): Controls included

Variable	(1) Basic model	(2) With natural disasters	(3) With conflict	(4) With global financial crises
Constant	-8.72 (-0.59)	-8.18 (-0.56)	-8.76 (-0.59)	-8.72 (-0.59)
GNI home	-1.92 (-5.86)*	-1.88 (-5.79)*	-1.92 (-5.80)*	-1.92 (-5.86)*
Income host (SSA GDP pc)	0.44 (2.10)***	0.42 (2.03)***	0.44 (2.08)***	0.44 (2.10)***
Credit private sector	0.61 (5.23)*	0.61 (5.16)*	0.61 (5.23)*	0.61 (5.23)*
Exchange rate	0.33 (4.52)*	0.31 (4.44)*	0.33 (4.52)*	0.33 (4.52)*
Aid from EU	0.02 (0.17)	-0.00 (-0.01)	0.02 (0.17)	0.02 (0.17)
Population	2.30 (2.56)**	2.26 (2.54)***	2.29 (2.55)***	2.29 (2.56)***
No. of disasters		0.05 (1.79)***		
Incidence of conflict			0.01 (0.08)	
Global financial crises				-0.90 (-1.32)
Diagnostics				
R-square	0.85	0.86	0.86	0.86
Time dummies	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES
N=	300	300	300	300
F=	75.29*	70.12*	73.19*	75.29*

(Source: Authors' estimations. Robust t-ratios in brackets. An * indicates significance at 1% level, a ** at the 5% level and a *** at the 10% level)

Table 5 shows that neither conflict nor global financial crises have statistically significant impacts on remittances in the presence of controls. Conflict has little impact on remittances and financial crises impact negatively through their impact on credit extended to the private sector (the banking sector) and on income of the host country.

Natural disasters have a significant and positive effect on remittances, even in the presence of controls. This implies that remittances do respond positively to natural disasters in SSA, even if these disasters are slow-onset. We can thus accept H1 – disasters will lead to a positive response in remittances, but conflict not.

Regarding the control variables, the estimates are robust across the different models. The single largest determinant of the level of remittances is a country's population. This is indicative of the fact that larger countries can have, in absolute terms, larger migrant populations. To the extent that a country's population is a proxy for its migrant stock the finding is consistent with the proxy supposition. In a dynamic model, this would mean that lagged remittances ought to have a substantial and significant effect.

Table 5 also indicates that a country's home GNI per capita is an important determinant of remittances – poorer countries receive more remittances than richer countries. The negative coefficient suggests that remittances in SSA are counter-cyclical- a resilience factor. In many other studies however (e.g. Freund and Spatafora, 2008) home country income is pro-cyclical.

We find that the host country's income per capita, in this case of SSA in general, is significant. A decline in SSA income per capita, such as during a global economic crisis may thus have a strong negative impact on remittances to SSA.

Credit extended to the private sector and the level of the local currency against the US $ have positive signs. Therefore, a better-developed financial system is important to raise remittances. In the case of SSA it seems that remittances may rise in response to nominal exchange rate depreciation. There is no evidence of any significant relationship between remittances and aid (ODA) from the EU – aid does not seem to displace remittances in the case of SSA.

Table 6 contains the 'difference' GMM dynamic panel estimation results. The dependent variable is the changes in remittances. All the explanatory variables, except for the dummy variables for crises and conflict, are in first differences. These results therefore focus on the short-term impacts of disasters as opposed to the results in Table 5, which are the longer-term impacts.

Table 6: Difference-GMM dynamic panel estimation results (Dependent variable: first difference of remittances)

Variable	(1) Basic model	(2) With natural disasters	(3) With conflict	(4) With global financial crises
Constant	0.06 (0.55)	0.06 (0.58)	0.06 (0.58)	1.31 (1.31)
ΔRemittances lagged	0.43 (6.73)*	**0.43** (6.72)*	**0.41** (6.62)*	**0.71** (18.8)*
ΔGNI home	0.35 (0.72)	0.24 (0.45)	0.23 (0.46)	-0.30 (-1.14)
ΔGNI host[i]	0.06 (0.67)	0.05 (0.62)	0.07 (0.82)	-25.00 (-1.40)
ΔCredit private sector	-0.16 (-1.36)	-0.16 (-1.36)	-0.21 (-1.73)	0.10 (1.58)
ΔExchange rate	0.13 (0.85)	0.11 (0.71)	0.14 (0.92)	0.14 (3.50)*
ΔAid from EU	-0.02 (-0.44)	-0.02 (-0.53)	-0.02 (-0.53)	0.02 (0.45)
ΔPopulation	2.13 (1.32)	1.87 (1.11)	2.50 (1.54)	-0.25 (-0.44)
No. of disasters	-	0.00 (0.55)		-
Incidence of conflict	-	-	0.06 (1.52)	-
Global financial crises	-	-		-0.50 (-1.02)
Diagnostics				
Wald χ^2	93.90	93.36*	95.77	666.82
Time dummies	YES	YES	YES	YES
Number of observations	213	213	213	560
Number of groups	23	23	23	23
Sargan test	211.78	209.85	215.90	340.31

*(Source: Authors' estimations. z-ratios in brackets. An * indicates significance at 1% level, a ** at the 5% level and a *** at the 10% level; In the case of specification (4), we used GNI per capita of EU, as that of SSA was collinear with the dummy for the financial crises)*

Table 6 shows that the dynamic panel estimations are overall significant. The Sargan tests cannot reject the null that the over-identifying restrictions are valid. The results indicate that, lagged values of remittances are the single most significant and important determinant of current remittances. There is thus considerable persistence in remittances - consistent with the earlier finding that remittances tend to be stable and less volatile than other inflows. Migrant stocks thus matter for remittances. Given that the results in Table 6 are based on differences in the data, it essentially reports the short-term adjustments in remittances, and hence shows that unlike the more long-term level determinants in Table 5, over the short-term, remittances will only be influenced by previous remittances (migration stocks) and that incomes, exchange rates and financial sector development have a longer-term impact on the level of remittances, with the response of remittances to disasters rather more long-term than short-term in the case of SSA.

5 Concluding Remarks

Africa is particularly susceptible to both human-made and natural disasters. Human migration and corresponding remittance flows have for many decades acted as a potential bulwark against the impact of these disasters. It is potentially a source of resilience for households facing disasters.

We established that remittances to SSA are relatively unresponsive over the short term to all types of disasters, being driven largely by proxies for migration stock. However, remittances are less volatile than other forms of financial flows, and are therefore a source of resilience during a global financial crisis. Over the longer term, remittances to SSA are mainly determined by incomes in the host and home countries, migration, the sophistication of the financial system, and the exchange rate. Only natural disasters have a significant impact on remittances (in that remittances tend to increase after natural disasters) even in the presence of controls, while a global financial crisis does not have a significant impact on remittances in the presence of controls. The latter suggests that remittances do respond to natural disasters in SSA, independently of incomes, exchange rates or the banking sector, while global financial crises reduce remittances through their impacts on incomes, exchange rates and the banking sector. Migration that leads to the inflow of remittances is therefore an important source of resilience in the face of various disasters in SSA.

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