Africa on the move:
an extended gravity model of intra-regional migration

Glenn Rayp and Ilse Ruyssen[1]

Department of Economics, Ghent University, Tweekerkenstraat 2, 9000 Gent, Belgium

Abstract

Despite great accomplishments in the migration literature, little is known about the determinants of South-South migration. In an attempt to fill this gap, we examine what has been driving intra-regional migration in sub-Saharan Africa, using the World Bank's bilateral migration database. An extended gravity model of immigration is estimated in order to take into account the specific circumstances in which African migration takes place. Due to the presence of origin-invariant variables, we follow a Hausman-Taylor and fixed effects vector decomposition estimation approach. In line with the general conclusions from the descriptive literature on border-crossings in the region, our results suggest that sub-Saharan African migration is driven by economic and demographic factors rather than sociopolitical circumstances. We find that growth prospects and opportunities for employment and education are the main determinants of migration in the region.

1. Introduction

Migration is considered one of the defining issues characterizing the economic and social circumstances on the African continent. More people are on the move today than at any other point in time. The growing recognition of the potential of migration to disrupt and destabilize the continent has drawn attention to the need to properly manage migration. In this light, it is crucial to understand the factors defining the social contexts of immigrants which prompt them to leave.

The motivations for migration have received a great deal of attention in migration studies since the 1980s. The main focus of recent research has been on the principal channels of mass-migration in the twentieth century. These include European migration to North America or Australia, migration from former colonies to Europe and migration in the context of guest worker programs and exile. Yet, little is known about the determinants of migration between developing countries. Agadjanian (2008) brought together a number of studies on the determinants of regional migration systems and forced migration in sub-Saharan Africa. He argued that despite its large volume and diversity, international migration within Africa south of the Sahara has received relatively little scholarly attention. Most studies focus on the so-called Southern and to a lesser extent also Western migration systems and

[1] Corresponding author. Tel.: +32 9 264 42 42, fax: +32 9 264 35 99.
E-mail addresses: Genn.Rayp@Ugent.be, Ilse.Ruyssen@Ugent.be

mainly involve cases studies such as mine migrancy in South-Africa (Crush and Wilmot, 1995), border-crossing between Zimbabwe and Mozambique (Hughes, 1999) or Mozambican refugees in Malawi (Koser, 1997).

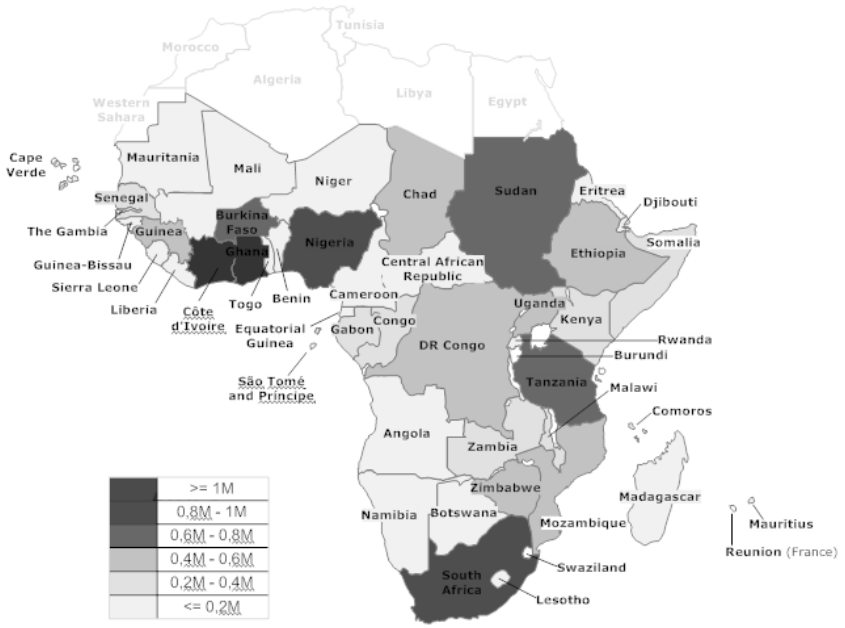
Only a few studies have tried to empirically define the determinants of South-South migration on a more comprehensive level. Chi Man Ng (2008), for instance, considered how technological growth affects labor migration between Asian countries for the period 1960-2004. The paper showed that technological advancement lowers the cost of migration which in turn positively affects the migrant stock as well as net migration. For the African region, Hatton and Williamson (2005) estimated the determinants of net out-migration rates (calculated as a residual from demographic accounting) in countries across sub-Saharan Africa. They found that Africans are especially driven by wage gaps between sending and receiving regions and demographic booms in the sending countries. However, since the authors did not know where immigrants went or where they came from, overseas migration (which accounts to 30% of total African migration, cfr. infra) could not be ruled out. Yet, we cannot take for granted that the motivations for South-South migration are identical to those for South-North migration.

In his overview of the African migration history, Mafukidze (in Cross et al., 2006) reported that during the days of colonialism there was little migration between African regions: communication and transport networks were not readily supportive of mobility. As country after country attained independence in the 1960s and after, migration greatly increased. So did the economic and political terrain of Africa. The founding of regional economic communities, such as the Economic Community of West African States by 1975, led to increased regional socio-economic interaction and subsequently greater migration in the African regions. Postcolonial conflict, however, destabilized many African countries, especially in Central and West Africa, throwing refugees and asylum seekers across their borders. East Africa continued to experience large migration within the region as well as from other regions, particularly from Southern Africa. In the Southern region, migration patterns were mainly defined by the labor migrant system, liberation struggles and the apartheid in South Africa. Later, the resolution of the region's political struggles slowed the outflows and led to return migration on a significant scale. This backdrop in the number of refugees has shifted attention away from sociopolitical factors driving migration towards demographic, economic and ecological ones. More specifically, the descriptive literature generally puts forward rapid population and labour force growth, unstable politics, escalating ethnic conflicts, persistent economic decline, severe poverty and worsening ecological conditions as the driving forces behind international migration in sub-Saharan Africa (see e.g. Adepoju, 2000; Akokpari, 2000; Zlotnik, 2004).

The United Nations estimated that in 2005 the total number of international migrants in Africa accounted to only 1,9% of its population. Yet, the total immigrant stock in sub-Saharan Africa, as estimated by the UN, rose from 9 million in 1960 to nearly 17 million in 2005. The largest increase occurred between 1960 and 1980, when the number of international migrants in Africa rose from 9

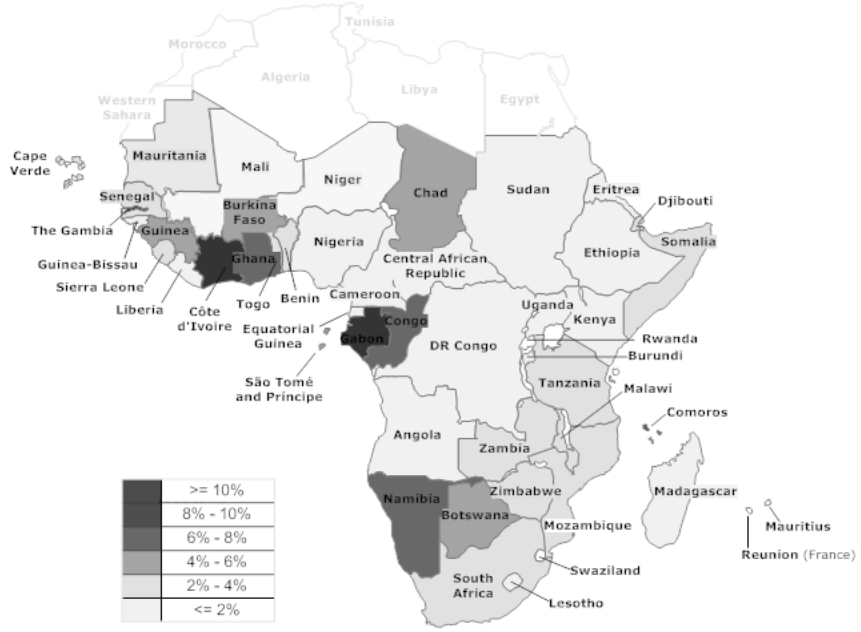
million to 14 million. Since 1980, that number has changed less, reaching 16 million by 1990 and barely changing during 1990-2000.

Figure 1. Sub-Saharan African migrant stock, 2005



Source: Constructed by the authors based on "World Migrant Stock: The 2005 Revision Population Database" from the United Nations.

Figure 2. Sub-Saharan African migrant stock as a percentage of the population, 2005



Source: Constructed by the authors based on "World Migrant Stock: The 2005 Revision Population Database" from the United Nations.

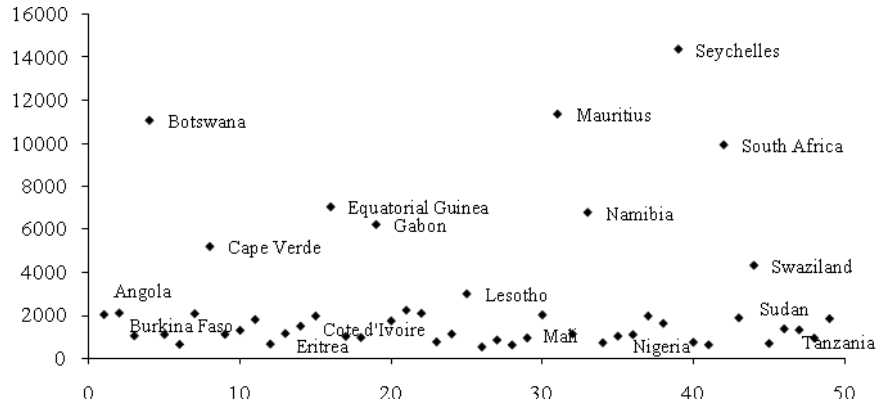
In their analysis of the extent of South-South migration, Ratha and Shaw (2007) put forward that 69% of the movement in sub-Saharan Africa is South-South migration and 30% is South-North migration. The share of migration to other developing regions is negligible, which suggests a great deal of border crossing on the African continent. As estimated by Ratha and Shaw (2007), roughly 10 million sub-Saharan Africans are intra-regional migrants.

Figure 1 indicates for each country in sub-Saharan Africa the total migrant stock in 2005. A quick glance at the figure reveals substantial differences between countries. Some countries house over a million immigrants (Côte d'Ivoire and Nigeria) while others have less than 200 thousand international immigrants (Mali and Namibia).

At first sight, the number of migrants is not related to country size in terms of surface (see e.g. South Africa and Angola which have approximately the same size but do not at all house the same number of immigrants). Adjusting for population size however causes great shifts in the country ranking. Figure 2 reveals the sub-Saharan African migrant stock as a percentage of the population in 2005. Correcting for the size of the population, Namibia for instance becomes a very important host country. The opposite is true for South Africa.

In the traditional literature, income differences are found to be the most robust determinant of South-North migration. It seems doubtful that this will also be the case for sub-Saharan Africa. Figure 3 presents information on gdp per capita in sub-Saharan Africa. Most countries have a gdp per capita lower than 3000 constant 2000 international $. Only 9 countries cross this threshold, with Seychelles, Mauritius and Botswana taking the lead. Yet, as will become clear in the data section, these countries are not the most important receiving countries. This suggests that sub-Saharan African migration is not necessarily from lower income to higher income countries. As pointed out by Ratha and Shaw (2007), this might indicate that differences in country income play a limited role in intra-regional sub-Saharan African migration.

Figure 3. Gdp per capita (PPP cte 2000 international $) in sub-Saharan Africa



Source: Constructed by the authors based on ADI 2007.

More specifically, this preliminary result suggests that we might need a broader view of how to define expected income in our setting. Economic theory postulates that expected income is a function of wages and employment opportunities. But since in sub-Saharan Africa wages are generally low and differences are small, simply the prospect of economic prosperity might be enough to migrate. Consequently, we could also take into account income growth as one of the aspects defining the formation of expectations about future earnings.

Against this background, it immediately becomes clear that different factors are at work in a South-South setting. This paper tries to fill the gap in the literature on migration between developing countries by estimating an extended gravity model of migration that takes account of the specific characteristics of this context.

The rest of the paper is organized as follows. Section 2 outlines the empirical model and discusses the estimation method. In section 3 we describe the data. Section 4 deals with the estimation results. Section 5 concludes.

2. Empirical model and estimation method

2.1. Empirical model

Economic theory suggests that individuals maximize their utility subject to a budget constraint. The migration decision is based on the comparison between expected payoffs and costs from migration. If the first exceed the latter, the net present value of migration is positive and the individual will migrate. This is the basic idea of the human capital model of migration (see e.g. Sjaastad, 1962; Massey et al., 1998). In empirical analysis, however, the net present value of migration can not be observed directly. Therefore, the standard practice is to include the underlying principle of Sjaastad's (1962) conceptual framework in an empirical specification where the number of migrants is regressed on proxies for the benefits and costs of migration (see Naryan and Smyth, 2006). On that account, Karamera et al. (2000) developed an empirical gravity model of migration, derived from a system of demand and supply relationships. Similar to the gravity model of international trade, supply and demand for migrants can be linked systematically to the size of respective countries' populations and the size of national income or per capita income. This basic model is easily extended to include other factors potentially determining the benefits and costs of migration.

Karamera et al. (2000) denote the origin country *o* and the destination country *d*. Migration from *o* to *d* will be a function of supply (push) factors $S_o = \lambda_0 I_o^{\lambda 1} N_o^{\lambda 2}$ and demand (pull) factors $D_d = \upsilon_0 I_d^{\upsilon 1} N_d^{\upsilon 2}$ where I denotes expected income and N the size of the population. We assume expected income is a function of the actual income Y, income growth G and employment possibilities

E, or $I = \rho_0 Y^{\rho 1} G^{\rho 2} E^{\rho 3}$. The exponents in the equations above and below represent migration elasticities. Combining S_o and D_d yields an immigrant flow equation as:

$$M_{do} = aS_o^{a1} D_d^{a2} / R_{do}^{a3} . \qquad (1)$$

where R_{do} represents factors aiding or restraining migrant flows from *o* to *d*, such as distance. Taking logs of both sides of equation (1), and replacing S_o, D_d and R_{do} by their functional expressions, yields the basic migration model:

$$m_{do} = \alpha_0 + \alpha_1 y_o + \alpha_2 y_d + \alpha_3 g_o + \alpha_4 g_d + \alpha_5 e_o + \alpha_6 e_d + \alpha_7 n_o + \alpha_8 n_d + \alpha_9 c_{do} + z(.) \qquad (2)$$

where m_{do} is the flow of immigrants in *d* from country *o*; y is the income; g is the income growth[2]; e is the employment rate; and n is the population. c_{do} and $z(.)$ replace R_{do} in equation (1), and denote travel costs and immigration policies, respectively. Equation (2), in its simplest form, where $z(.)$ is just an error function, is a gravity model of migration proposed by Sjaastad (1962), Nieladeorn and Becholt (1969), Greenwood (1975) and Borjas (1987, 1989) (see Karamera et al., 2000). Migration from country *o* to country *d* is a negative (positive) function of income, growth and the employment rate in the home (host) country, a positive function of the population size of both countries, and a negative function of monetary and psychological costs of moving to the host country.

To empirically estimate equation (2) in its most general form, arguments of $z(.)$ have to be identified. From the literature, we know that these include economic, demographic and political factors representing characteristics of countries of origin and destination as well as both natural and artificial factors enhancing or restraining migrant flows to the host country, such as limitations on freedom of travel and residence abroad, or transport, information and psychological costs. For sub-Saharan Africa, Adepoju (2008) for example indicated that the trends and patterns of international migration are strongly influenced by the demographic momentum, unstable political landscape, escalating ethnic conflicts, persistent economic decline, severe poverty and worsening ecological conditions. Grouping a number of possible arguments proposed in the literature yields an empirical specification of the migration equation of the form:

[2] Taking the log of income growth would result in a sample selection bias since all countries with negative growth would be thrown out of the sample. To avoid this bias, income growth is defined as $g = (\ln y_t - \ln y_{t-\tau}) / \tau$.

$$
\begin{aligned}
m_{do} = {} & \alpha_0 + \alpha_1 y_o + \alpha_2 y_d + \alpha_3 g_o + \alpha_4 g_d + \alpha_5 e_o + \alpha_6 e_d + \alpha_7 n_o + \alpha_8 n_d \\
& + \alpha_9 ur_o + \alpha_{10} ur_d + \alpha_{11} ed_o + \alpha_{12} ed_d + \alpha_{13} le_o + \alpha_{14} le_d + \alpha_{15} p_o + \alpha_{16} p_d \\
& + \alpha_{17} cf_o + \alpha_{18} cf_d + \alpha_{19} pr_o + \alpha_{20} pr_d + \alpha_{21} cl_o + \alpha_{22} cl_d + \alpha_{23} fr_o + \alpha_{24} fr_d \\
& + \alpha_{25} fp_o + \alpha_{26} fp_d + \alpha_{27} di_{do} + \alpha_{28} la_{do} + \alpha_{29} co_{do} + \alpha_{30} bo_{do} + u_{do}
\end{aligned} \quad . \tag{3}
$$

There are three sets of explanatory variables in equation (3). The first set contains economic and demographic variables: income (y_o, y_d), growth (g_o, g_d), employment (e_o, e_d), population (n_o, n_d), urbanization (ur_o, ur_d) and education (ed_o, ed_d). The hypothesis is that the potential income gain from migration depends on the expected incomes at home and abroad, which are in turn a function of wages, employment opportunities and economic prosperity (captured by income growth) in *o* and *d*. Urbanization is often seen as the result of a combination of population growth and internal migration (see also Krugman and Bhagwati, 1976). People from the rural areas are drawn to the city because it offers better access to public services such as electricity, clinics, schools, as well as better prospects for recreation. Higher urbanization means better access to information and more people living in traffic intersections, resulting in both lower transaction and transportation costs. As put forward by Lewer and Van den Berg (2008), the more people there are in a source country, the more people are likely to migrate, and the larger the population in the destination country, the larger is the labor market for immigrants. Finally, a South-South migration context concerns primarily less educated people. Therefore we may expect migrants to go to countries which offer greater education opportunities and away from those in which education prospects are poor.

The second set of variables in the model accounts to the sociopolitical environment: life expectancy (le_o, le_d), poverty (p_o, p_d), years in conflict (cf_o, cf_d), political rights (pr_o, pr_d), civil liberties (cl_o, cl_d), relative freedom (fr_o, fr_d), and financial performance (fp_o, fp_d). Immigrants are expected to move in search for a higher standard of living, reflected in factors such as higher life expectancy and lower poverty. It is hypothesized that immigrants will move to countries with less conflict and more political stability (see also Karamera et al., 2000; Lewer and Van den Berg, 2008). We also expect that better (worse) financial performance or creditworthiness in major financial markets in the host (source) country will enhance the migration process. It is expected that a better ability to compete for foreign credit is an indication of better future economic opportunities, which, ceteris paribus, leads to a decrease in economic migration (see also Karamera et al., 2000).

The third set of explanatory variables represents geographical and cultural proximity: distance di_{do}, the presence of a common language la_{do}, a common colonial past co_{do}, and a common border bo_{do}. It is expected that a shorter distance and the presence of a common border between two countries will enhance migration between them. As pointed out by Karamera et al. (2000), an increase

in the distance between two countries discourages migration between them because costs and logistics needs increase with distance and reduce the propensity to migrate. This result supports the classical theory of spatial equilibrium. Also the existence of a common language and a common colonial past is likely to positively influence the size of migration. In fact, these variables reflect the monetary and psychological cost of migration. Migration to more distant countries, on the one hand, results in higher transport and communication costs. Countries with similar languages and a common colonial past, on the other hand, may share more cultural similarities which makes it less hard to adapt to the new environment.

Finally, u_{do} denotes an i.i.d. error term. In order to take account of unobserved heterogeneity among the host countries, we assume that it is composed of country specific effects α_d and an innovation ε_{do}. This allows us to control for any common omitted variable, such as migration policy, or a global shock that affects each destination country in a different way. The final estimation equation then becomes

$$\begin{aligned} m_{do} = {} & \alpha_0 + \alpha_1 y_o + \alpha_2 y_d + \alpha_3 g_o + \alpha_4 g_d + \alpha_5 e_o + \alpha_6 e_d + \alpha_7 n_o + \alpha_8 n_d \\ & + \alpha_9 ur_o + \alpha_{10} ur_d + \alpha_{11} ed_o + \alpha_{12} ed_d + \alpha_{13} le_o + \alpha_{14} le_d + \alpha_{15} p_o + \alpha_{16} p_d \\ & + \alpha_{17} cf_o + \alpha_{18} cf_d + \alpha_{19} pr_o + \alpha_{20} pr_d + \alpha_{21} cl_o + \alpha_{22} cl_d + \alpha_{23} fr_o + \alpha_{24} fr_d \\ & + \alpha_{25} fp_o + \alpha_{26} fp_d + \alpha_{27} di_{do} + \alpha_{28} la_{do} + \alpha_{29} co_{do} + \alpha_{30} bo_{do} \\ & + \alpha_d + \varepsilon_{do} \end{aligned} \quad . \qquad (4)$$

2.2. Estimation method

The destination specific effect can be interpreted as either random or fixed, leading to random effects (GLS) or fixed effects (within-group) estimation methods. In the first case, the specific effects are assumed to be randomly distributed and uncorrelated with the explanatory variables and the residuals. In the latter case, we assume that the unobserved heterogeneity is constant over origins but potentially correlated with the explanatory variables. Because of the deviations-from-mean transformation, the fixed effects estimator (FE) eliminates all origin-invariant variables (e.g. y_d in (4)), so that their parameters cannot be estimated. To overcome this flaw, Hausman and Taylor (1981) proposed an alternative estimation method (HT) that requires no assumptions about the specification of the components of α_d, but rather makes assumptions about the correlations between the explanatory variables and α_d. Rewrite (4) as

$$m_{do} = \alpha_0 + X_{do}\beta + Z_d\gamma + \alpha_d + \varepsilon_{do} \qquad (5)$$

where $X_{do}\beta$ stands for a vector of origin-variant variables and $Z_d\gamma$ for a vector of origin-invariant variables. Further suppose that α_d is correlated with at least one of the origin-variant variables and at least one of the origin-invariant variables:

$$\operatorname*{plim}_{N\to\infty}\frac{1}{N}X'_{1do}\alpha_d = 0;\ \ \operatorname*{plim}_{N\to\infty}\frac{1}{N}X'_{2do}\alpha_d \neq 0 \tag{6}$$

and

$$\operatorname*{plim}_{N\to\infty}\frac{1}{N}Z'_{1d}\alpha_d = 0;\ \ \operatorname*{plim}_{N\to\infty}\frac{1}{N}Z'_{2d}\alpha_d \neq 0\,. \tag{7}$$

Using (6) and (7) we can rewrite equation (4) as

$$m_{do} = \alpha_0 + X_{1do}\beta_1 + X_{2do}\beta_2 + Z_{1d}\gamma_1 + Z_{2d}\gamma_2 + \alpha_d + \varepsilon_{do} \tag{8}$$

Hausman and Taylor (1981) suggested using the exogenous variables that vary over origins and are uncorrelated with the destination specific effects (X_{1do}) to instrument the variables correlated with the specific effects (X_{2do} and Z_{2d}). Deviations from the mean of X_{1do} are used to produce unbiased estimates for the origin varying variables (X_{2do}) and the mean of X_{1do} is used as an instrument for the origin-invariant variables that are correlated with the destination specific effects (Z_{2d}).

Baltagi et al. (2003) suggested a test procedure to determine the appropriate estimation method by a pairwise comparison of the RE, FE and HT estimators. Typically, the choice between the RE and FE estimators is made based upon the standard Hausman test. Only if this standard Hausman test can not reject the null hypothesis that the conditional mean of the disturbances given the regressors is zero, it is appropriate to use the RE estimator. Otherwise, as put forward by Baltagi et al. (2003), a second Hausman test should be carried out to choose between the FE and the HT estimators.

In their analysis of the estimation of time-invariant variables in panel data models with individual effects, Plümper and Troeger (2007) questioned the adequacy of three procedures that have frequently been employed to overcome this problem (the pooled OLS, RE and HT estimators). They referred to the bias caused by ignoring individual effects altogether in pooled OLS; the possible inconsistency and biased results of the RE estimator; and the arbitrary choice of regressors that might be correlated with the individual effects in the HT estimation. The authors suggested a vector decomposition procedure to estimate the time-invariant variables in an augmented fixed effects approach, which we can apply to our model with origin-invariant regressors. The fixed effects vector decomposition (FEVD) procedure implies three stages: the first stage runs a fixed-effects model without origin-invariant variables, the second stage decomposes the specific effects vector into a part explained by the origin-invariant variables and an error term, and the third stage re-estimates the first stage by pooled OLS including the

origin-invariant variables plus the error term of the second stage. Monte Carlo simulations demonstrate that this method works better than its alternatives. For technical details regarding the estimation procedure, see Plümper and Troeger (2007).

3. Data

The data on migrant stocks were obtained from the bilateral migration database of the World Bank. This database augments and updates the bilateral migration matrix originally created by the University of Sussex (as described in Parsons et al., 2005), making it the most comprehensive database on South-South migration available at present.[3] It mostly consists of statistics on foreign born wherever possible, and foreign nationals otherwise. The data are taken from national censuses. The original data are scaled (up or down as appropriate) to add up to the UNPD estimates of migrants stocks for 2005. In the database appear 48 sub-Saharan African countries, either as host or source country for international migrants. Unidentified immigrants for which both the source and destination country is unknown are allocated to two broad categories, "Other South" and "Other North". Since these immigrants cannot be assigned to a specific source country, they were removed from the sample.

Specifically, the database provides statistics on the stock of migrants from 46 origin to 35 destination countries.[4] Given that migration between sub-Saharan Africa and Northern Africa is very small (the World Bank reports not a single sub-Saharan African migrant in North-Africa and also in the other direction there is little border crossing) and mainly consists of transit migration, we exclude the Northern part of the African continent in our migration sample.

Early studies of immigration between countries as well as studies of internal movements defined their dependent variable as the number of persons, born in a given place of origin, residing in each of the destination localities at the date of the census. That is, a migrant stock, rather than a flow variable was used. As a result no distinction can be made between recent and earlier migrants nor between those who settled directly in the observed destination and those who arrived through a succession of moves. Furthermore, the migrant stock reflects the result of a process taking place over many years, while the explanatory variables are measured at one point in time. Consequently, the determinants may not reflect the conditions existent at the time of the actual move (Dunlevy, 1980). Later on, governments started to keep track of migrant flows in more detail which resulted in a larger data availability. This allowed researchers to use the migrant flow as their dependent variable instead of the migrant stock. Yet, for some countries, these data are still unavailable or at least far from complete. This is especially the case for developing countries. Therefore, though conscious of the drawbacks described above, we use the migrant stock as our dependent variable (see also Grogger and Hanson,

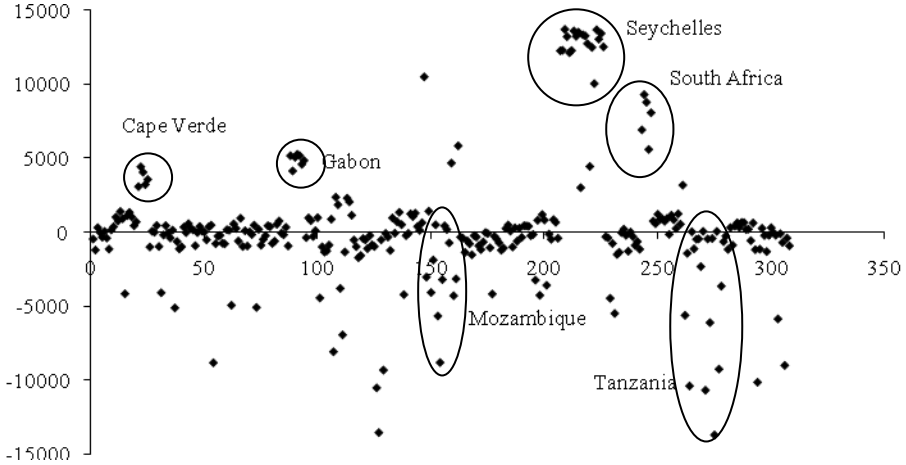
[3] The data set on bilateral migration stocks is posted at www.worldbank.org/prospects/migrationandremittances.
[4] For an overview of the sample of origin and destination countries, see Appendix tables A1 and A2.

2008). In fact, the work done by Grogger and Hanson (2008) and Ortega and Peri (2009) brings to light a great interchangeability between the migrant flows and stocks as dependent variable in the empirical specification. Building on a new dataset on migrant flows and stocks for 14 OECD destination countries and 74 sending countries for each year over the period 1980-2005, the authors estimate a pseudo-gravity empirical specification of economic and legal determinants of international migration. Their results indicate that, in accordance with the idea that migrant stocks are in fact the long-run accumulation of yearly flows, the determinants of the first seem to also determine the latter.

Appendix table A1 reports the absolute and relative stocks of migrants in our destination countries. In absolute terms, Côte d'Ivoire houses the largest number of foreign people, that is 2 million, followed by South Africa with 1 million and Nigeria with 700 thousand migrants. Total immigrant stocks in our sample amount to nearly 10 million, which accounts for 60% of all foreign born living in sub-Saharan Africa, regardless of their origin. Yet, as pointed out by Ratha and Shaw (2007), this estimate is likely to be low, as the official data tend to undercount irregular migrants. "Irregular migration is probably even more common in South-South than South-North migration because of tight restrictions on immigration in many developing countries, coupled with limited enforcement, the high cost of travel documents, and unclear immigration rules in the South" (Ratha and Shaw, 2007).

Appendix table A2 reveals the absolute and relative stocks of immigrants from each origin country in our sample. The most important source countries are Mali, Burkina Faso with more than one million emigrants and Eritrea with nearly 700 thousand emigrants. Yet, taking into account differences in population size changes the picture. In relative terms, the main host and source countries are respectively Gambia, Côte d'Ivoire and Gabon where 10% to 15% of the population is foreign, and Eritrea, Lesotho and Mali which have sent out 7% to 15% of their population.

Figure 4. Income differences between destination and origin countries



Source: Constructed by the authors based on ADI 2007.

The data also show that, typically, immigration takes place between neighboring countries. In Côte d'Ivoire, for instance, most foreigners come from Burkina Faso, Mali and Ghana. Remarkably, the immigrant stock is also larger in countries which have important host countries as their neighbors. This is the case for Côte d'Ivoire and Burkina Faso, Tanzania and Uganda, Nigeria and Chad, Ethiopia and Sudan, etc. This might be an indication for the substitutability between adjacent countries. When access is denied in one country, immigrants may move on to the most proximate country in the neighborhood. Also interesting is that some countries act as important host and sending countries at the same time. Burkina Faso, for example, listed as the second most important source country in our sample, sent nearly 1,3 million people abroad. At the same time, it is housing over half a million foreigners itself, making it the sixth most important destination country in our sample. The same holds for Mozambique, which sent more than 600 thousand emigrants while housing itself nearly 300 thousand foreigners.

In order to avoid problems of endogeneity, the explanatory variables are lagged 10 years, until 1995, unless stated otherwise. The data were obtained from the following sources.

For data on gdp per capita, in ppp (purchasing power parities) in constant 2000 international $, we consulted the African Development Indicators (ADI) 2007. Figure 4 illustrates differences in gdp per capita between destination and origin countries. Some of the migration goes to well-known and rich receiving countries such as Seychelles and South Africa. Yet, there is also a reasonable extent of migrants going to countries such as Tanzania and Mozambique with lower per capita income than the sending countries. Still, as suggested in the introduction, most of the migration takes place between countries with small income differences.

Income growth reflects the growth in gdp per capita between 1986-1995, ppp in constant 2000 international $, taken from the ADI 2007. Employment rates are approximated by the ratio of the number of employed persons to the entire population. We use the proportion of the population that is undernourished as a proxy for poverty. These data were obtained from Unctad. Data on life expectancy at birth (in years), school enrollment at secondary schools (the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education) and urban population (% of total population) were collected from the ADI 2007. For the school enrollment, we have complete data only from 1999 onwards. Following other research (see e.g. Karamera et al., 2000; Vogler and Rotte, 2000), the variables defining the political landscape were provided by Freedom House[5]. In particular, political rights represent the degree of implementation or non-implementation of a country's democratic processes. Civil liberties reflect civil rights and desires in education, freedom of religion and choice of residence. Political rights and civil liberties are measured on a 1-to-7 scale, with 1 representing the highest degree of freedom and 7 the lowest. The freedom status index takes the values free, partly free and not free (see Gastil, 1987). The

[5] For details see http://www.freedomhouse.org/template.cfm?page=439.

OECD provided an index measuring the country risk on a scale from 0 to 7 with 0 representing the lowest country risk and 7 the highest. This index measures the country credit risk, i.e. the likelihood that a country will service its external debt. We use this measure for the year 1999 (the earliest available) as a proxy for financial performance. Data on linkages between countries such as contiguity, a common colonizer after 1945, a common ethnological language (if a language is spoken by at least 9% of the population in both countries) and distance between the main cities (in terms of population) comes from the CEPII distance database.[6] Finally, information on the number of years in conflict since the Second World War until 1995 comes from *Encyclopedia of conflicts since World War II* (Ciment, 2006).

4. Estimation results

Table 1 presents the estimation results of the four estimation procedures that have been mentioned above: RE, FE, HT and FEVD.

First of all, the *F*- and *Wald chi2*-test statistics reveal that for all estimators, the null hypothesis of zero coefficients for all regressors can be rejected at the 99% confidence interval. Since the first Hausman test rejects the null hypothesis that the regressors are uncorrelated with the country specific effects at the 99% confidence interval, the RE estimator is inconsistent[7]. Consequently, as suggested by Baltagi et al. (2003), we need a second Hausman test to choose between FE and the Hausman-Taylor model. Taking income and growth in the destination country as the only endogenous regressors, we find that the regressors we have selected as strictly exogenous are indeed uncorrelated with the error term at the 99% confidence interval.[8] To sum up, when choosing between the RE, FE and HT estimators, the last one should be preferred in our setting. Yet, as put forward by Plümper and Troeger (2007), the estimated coefficients of the HT estimator largely vary with the decision which variables are endogenous and which variables are exogenous to the individual effects.[9] On that account, the FEVD estimates should be considered the most suitable in our migration context. Putting those next to the results obtained from the HT estimator, the difference is only slight. In fact, the results are remarkably robust across all estimation methods. The difference lies in the fact that the FEVD estimator attaches more significance to destination country characteristics.

[6] For details see http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

[7] To make sure that the Hausman test compares the same model in both the FE and RE estimation, the origin-invariant regressors are excluded from the model and assumed to be captured by the error term.

[8] For testing more than one parameter, Arellano (1993) and Wooldridge (2002) suggested to use an F-statistic version of the Hausman test. Schaffer and Stillman (2006) developed a test of overidentifying restrictions (the orthogonality conditions) using this artificial regression approach. For this test, the empirical specification is re-estimated augmented with additional regressors consisting of the original regressors transformed into deviations-from-mean form. The test statistic is a Wald test of the significance of these additional regressors is also in favour of the HT estimator.

[9] We perform various HT estimations using different sets of regressors assumed endogenous to the individual effects. Mostly, the Sargan test of overidentifying restrictions does not reject the null that the excluded instruments are valid instruments. Indeed, the results significantly differ according to this choice.

Table 1. Estimation results

	Random Effects		Fixed Effects		Hausman-Taylor		FE vector decomp.	
Variable	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Economic and demographic characteristics								
Income d	0.36	0.60			0.75	1.30	0.35	0.50
Income o	0.10	0.52	0.31	0.45	0.27	0.42	0.31	0.43
Growth d	35.37***	12.71			11.83	26.83	31.64***	10.37
Growth o	8.12*	6.35	13.20***	5.50	12.21***	4.77	13.20***	4.79
Employment d	6.40***	1.65			6.02*	3.90	6.52***	1.56
Employment o	0.38	1.26	-0.73	1.03	-0.45	1.15	-0.73	1.15
Urbanization d	0.82*	0.51			0.64	1.06	0.66*	0.52
Urbanization o	1.22***	0.49	1.02***	0.43	1.04***	0.37	1.02***	0.37
Education d	0.90**	0.43			0.47	0.92	0.94***	0.36
Education o	-0.52*	0.37	-0.53**	0.31	-0.54**	0.30	-0.53**	0.30
Population d	0.86***	0.18			0.74**	0.42	0.93***	0.16
Population o	0.43***	0.16	0.54***	0.14	0.52***	0.15	0.54***	0.15
Sociopolitical environment								
Life expectancy d	2.05	1.94			2.94	3.95	2.60*	1.62
Life expectancy o	-0.37	0.47	-1.13	1.25	-1.02	1.40	-1.13	1.38
Poverty d	0.32	0.36			0.37	0.90	0.28	0.33
Poverty o	-0.23	0.32	0.12	0.28	0.07	0.26	0.12	0.26
Conflict d	-0.15	0.14			0.09	0.27	-0.14	0.11
Conflict o	0.06	0.10	0.02	0.77	0.02	0.09	0.02	0.09
Political rights d	0.90	0.74			0.83	1.87	0.84	0.79
Political rights o	-1.05	0.85	-0.64	0.68	-0.70	0.71	-0.64	0.72
Civil liberties d	-1.12	1.08			-1.13	2.77	-1.52*	1.07
Civil liberties o	0.41	0.85	0.22	0.71	0.27	0.83	0.22	0.84
Freedom d	-0.36	1.04			-0.14	2.13	-0.54	0.90
Freedom o	-0.06	0.81	0.17	0.70	0.13	0.67	0.17	0.68
Financial performance d	2.33*	1.51			1.29	3.11	2.25*	1.39
Financial performance o	1.58*	1.06	2.46***	0.95	2.28***	0.93	2.46***	0.94
Geographical and cultural proximity								
Distance	-1.04***	0.22	-1.03***	0.22	-1.02***	0.20	-1.02***	0.18
Common language	0.49*	0.33	0.37	0.30	0.40*	0.28	0.37*	0.27
Common colonial past	0.42*	0.28	0.61**	0.28	0.57**	0.27	0.61***	0.26
Common border	2.19***	0.37	1.40***	0.33	1.50***	0.30	1.40***	0.30
Constant	-58.35***	16.05	4.62	7.70	-56.02**	29.95	-58.14***	13.76
F- and *Wald chi2*-test	chi2(30) = 448.60 Prob > chi2 = 0.00		F(17,186) = 10.83 Prob > F = 0.00		chi2(30) = 185.75 Prob > chi2 = 0.00		F(32,173) = 19.07 Prob > F = 0.00	
Hausman test	chi2(17) = 36.15 Prob > chi2 = 0.00							
Sargan test of overid. restrictions			chi2(17) = 6.46 Prob > chi2 = 0.98 chi2(15) = 14.41 Prob > chi2 = 0.49					
Number of observations	233		233		233		233	

Notes: Standard errors for the random and fixed effects estimators are robust to heteroskedasticity and clustered by destination country. Student's *t*-tests are one-sided. * Significant at the 90% confidence interval. ** Significant at the 95% confidence interval. *** Significant at the 99% confidence interval.

Economic characteristics

The estimated coefficients on per capita incomes are insignificant. This is exactly what we expected from the comparison of per capita incomes which we discussed in the introduction. Because of the small potential income gains of migration from one sub-Saharan African country to another, the per capita incomes in source and destination countries play no significant role in determining migration.

The positive and high elasticities on income growth and employment rates in the destination country imply that immigrants are rather moving to faster growing economies with higher employment opportunities. Our estimates suggest that a 1 percent point increase in income growth will lead to a 32 percent increase in the migrant stock. Also income growth in the source country seems to positively affect migration. Analogous to the common positive impact of the income level in the source country, this finding might also point to the existence of a so-called poverty trap.

As suggested by Karamera et al. (2000), the insignificance of the estimated coefficient on the employment rate in the origin country might be explained as a result of universally high unemployment rates in the source countries.

The urbanization rate is interpreted as a proxy for transaction and transportation costs. The estimated results indicate that higher urbanization in the origin country indeed positively affects the immigrant stock. Living in the city improves access to other countries in terms of lower travel and information costs.

Demographic characteristics

As expected, there is more immigration between larger countries (in population terms) because they have more capacity to either send or receive migrants. Furthermore, we find that better (worse) education possibilities in the destination (origin) country encourage migration. Unlike in the context of South-North migration, where it is often found that higher educated people are more likely to immigrate, we find that in our setting, people are moving from low education to high education countries. This result corresponds to the well-known fact that the higher educated are typically the ones migrating out of the sub-Saharan African region, while the lower educated do not get the same opportunities and are restricted to intra-regional migration.

Life expectancy in the destination country has a positive and significant coefficient. Given the current harrowing living conditions in some countries of sub-Saharan Africa, it is no surprise to see people are moving to countries offering better chances of survival in terms life expectancy.

Sociopolitical environment

The estimated results indicate that worse financial performance in the origin country encourages migration. This confirms that lesser ability to compete for foreign credit is an indication of worse future economic opportunities, which, *ceteris paribus*, leads to a rise in economic migration (see also Karamera et al., 2000). Against expectations, also worse financial performance in the destination country are found to significantly augment the migrant stock, though only at the 10% significance level. The same holds for civil liberties in the destination country which seem to have a perverse effect on migration.

Furthermore, no statistical evidence was found in support of an influence of poverty, political rights, relative freedom or conflict. It might be argued that this individual insignificance may be caused by multicollinearity due to high correlation between these variables or with income. There might still be a collective impact of the political determinants of migration. Yet, an F-test of joint significance points out that the null hypothesis cannot be rejected even at the 10% significance level. It seems that in the context of sub-Saharan Africa, migration is less driven by the sociopolitical considerations than we would have expected at first sight.

Geographical and cultural proximity

Finally, much importance is attributed to geographical and cultural proximity. Distance, a common colonial past and a common border strongly influence immigration in the expected way (see e.g. Karamera et al., 2000; Lewer and Van den Berg, 2008). Their accompanying parameters suggest elasticities of -1.02%, 0.61% and 1.40% respectively. Also a common language has the expected positive sign and suggests an elasticity of 0.37%, though only at the 10% significance level. The coefficient on the common border dummy on the other hand is significant at the 1% significance level. This confirms the widespread observation that migration in sub-Saharan Africa especially takes place between adjacent countries. Also cultural proximity in terms of a common colonial past significantly increases the migrant stock (see also Lewer and Van den Berg, 2008).

Given the lack of empirical studies on intraregional migration for all regions of the developing world (be it sub-Saharan Africa, Latin America or Asia), our results can only be compared to either descriptive studies for regions as a whole or empirical studies for internal migration in large countries such as Brazil or India.

To our knowledge, only one author empirically investigated the determinants of South-South migration and that is Chi Man Ng (2008). The article shows that technological growth together with lower gdp per capita and higher unemployment in the source country positively affect migration between Asian countries for the period 1960-2004. A descriptive study of the UN (ECLAC, 2006) on

international migration in Latin America and the Caribbean, indicated that mobility within the region underwent a resurgence in the 1990s. Intraregional migrants now total nearly three million, and they tend to go primarily to countries bordering their own or to nearby countries. Pellegrino (2002) investigated trends in international migration in the same region and concludes that population growth is a decisive factor of international migration. More specifically, population growth coupled with urbanization and industrial development, were found to bring about intra-regional mobility, which is in line with the results in our study for sub-Saharan Africa. Furthermore, she also pointed to the difficulty of categorizing migrants as victims of violence or of economic hardship, since both phenomena are often related. This remark might also be true for the case of sub-Saharan Africa. Maybe our variables reflecting political stability have turned out insignificant because those fleeing from violence cannot be separated from those migrating for economic reasons.

As mentioned above, we could also compare our results to the findings of studies on the determinants of internal migration in large countries. Golgher et al. (2005) used a neoclassical human capital model to empirically analyze the determinants of migration in Brazil. They found that population in origin and destination, contiguity, urbanization and income in both the origin and destination positively influence migration, while distance has a negative impact. Most of these findings are in line with our results. Mitra and Murayama (2008) estimated the determinants of rural to urban migration in India. They found that population mobility is especially large in relatively poor and backward states, which points to a search for a livelihood. Yet, the mobility was also seen to be prominent in the relatively advanced states which indicates a search for better job opportunities. The social and cultural diversity in the Indian context seemed to be a major hindrance to migration. Social networks, on the other hand, were especially prevalent among the short distance migrants.

5. Conclusion

Despite great accomplishments in the migration literature, little is known about the determinants of South-South migration. In an attempt to fill this gap, we examine what has been driving intra-regional migration in sub-Saharan Africa, using the World Bank's bilateral migration database developed by Ratha and Shaw (2007). We estimate the determinants of the stock of immigrants from 46 origin to 35 destination countries, for the year 2005.

Our theoretical framework is based on the extended gravity model of migration developed by Karamera et al. (2000). The model captures the benefits and costs of migration in a sub-Saharan African setting. We include variables reflecting economic, demographic and sociopolitical characteristics of the origin and destination countries, and some variables defining geographical and cultural proximity.

Given the characteristics of our model, we need to find a way to estimate the coefficients of origin-invariant variables, which leads us to the use of the Hausman-Taylor and fixed effects vector

decomposition estimators. Using a number of econometric tests, we compare these different estimators and find that results are highly robust.

Using the World Bank's bilateral migration database on migrant stocks in 2005, our results suggest that, in line with the general conclusions of the descriptive literature, economic factors rather than sociopolitical circumstances determine sub-Saharan African migration. In other words, South-South migration in the African region seems to be driven by the same forces as the well-documented South-North migration.

In particular, as expected, we find that immigrants are not driven by income differences in the narrow sense. Rather, they move to countries which offer good economic prospects reflected by high growth rates, employment prospects and education opportunities. High urbanization in the origin country results in a higher immigrant stock. It is shown that larger countries both send and attract more migrants. Despite social unrest and conflict in many sub-Saharan African countries, immigrants do not seem to be in search for political stability and relative freedom. If anything, they move to obtain a better living standard in terms of higher life expectancy. Our results indicate that geographical proximity plays a major role in defining the size of the immigrant stock. Larger distances demotivate migration because of increased transport and communication costs. It is also shown that migration in sub-Saharan Africa especially takes place between adjacent countries. Finally, also cultural proximity derived from a common colonial past and a common language notably increase the migrant stock.

References

Adepoju, A., 2008. Migration in sub-Saharan Africa. Nordic Africa Institute.

Agadjanian, V., 2008. Research on international migration within sub-Saharan Africa: foci, approaches, and challenges. The Sociological Quarterly 49, 407-421.

Akokpari, J., 2000. Globalisation and migration in Africa. African Sociological Review 4 (2), 72-92.

Arellano, M., 1993. On the testing of correlated effects with panel data. Journal of Econometrics 59 (1-2), 87-97.

Baltagi, B.H., Bresson, G., Pirotte, AK, 2003. Fixed effects, random effects or Hausman-Taylor ? A pretest estimator. Economics Letters 79 (2003), 361-369.

Barrios, S., Bertinelli, L., Strobl, E., 2006. Climatic change and rural-urban migration : the case of sub-Saharan Africa. Journal of Urban Economics 60 (2006), 357-371.

Chi Man Ng, 2008. Globalization and Labor Migration: Evidences in Asia. International Trade and Finance Association Conference Papers. Working Paper 12

Ciment, J.D., 2006. Encyclopedia of conflicts since World War II, Second Edition.

Cross, C., Gelderblom, D., Roux, N., Mafukidze, J., 2006. Views on migration in sub-Saharan Africa. Proceedings of an African Migration Alliance Workshop, HSRC Press.

Crush, J., Wilmot, J., 1995. Crossing boundaries: mine migrancy in a democratic South Africa. Cape Town, South Africa and Ottawa, Canada: IDRC.

Dunlevy, J.A., 1980. Nineteenth-century European immigration to the United States: intended versus lifetime settlement patterns. Economic Development and Cultural Change 29 (1), 77-90.

ECLAC, 2006. International migration, human rights and development in Latin America and the Caribbean. Summary and conclusions. Thirty-first session of ECLAC, Montevideo, Uruguay, 20-24 March 2006.

Freedom House, 2009. Freedom in the world. http://www.freedomhouse.org/template.cfm?page=439

Golgher, A.B., Rosa, C.H., de Araújo, A.F., 2008. Determinants of migration in Brazil: regional polarization and poverty traps. Universidad Autónoma del Estado de México, Papeles de Población, abril-junio, número 056.

Grogger, J., Hanson, G.H., 2008. Income Maximization and the Sorting of Emigrants across Destinations. National Bureau of Economic Research Working Paper 13821, Cambridge, Ma.

Hatton, T.J., Williamson, J.G., 2003. Demographic and economic pressure on emigration out of Africa.

Hatton, T.J., Williamson, J.G., 2005, CEPR Discussion Papers 3559.

Hausman, J.A., 1978. Specification tests in econometrics. Econometrica 46 (6), 1251-1271.

Hausman, J.A., Taylor, W.E., 1981. Panel data and unobservable individual effects. Econometrica 49 (6), 1377-1398.

Hughes, D.M., 1999. Refugees and squatters: immigration and the politics of territory on the Zimbabwe-Mozambique border. Journal of Southern African Studies 25 (4), 533-552.

IMF, 2008. World Economic Outlook Database October 2008. IMF data and statistics. http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

Karamera, D., Iwuagwu, O., Davis, B., 2000. A gravity model analysis of interntaional migration to North America. Applied Economics 32, 1746-1755.

Koser, K., 1997. Information and repatriation: the case of Mozambican refugees in Malawi. Journal of refugee studies 10 (1), 1-17.

Krugman, P.R., Bhagwati, J., 1976. The decision to migrate. The brain drain and taxation. MIT Press.

Lewer, J.J., Van den Berg, H., 2008. A gravity model of immigration. Economics letters 99 (2008), 164-167.

Massey, D.S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., Taylor, J.E., 1998. Worlds in motionl international migration at the end of the millenium. New York: Oxford University Press.

Mitra, A., Murayama, M., 2008. Rural to Urban Migration: a district level analysis for India. Institute of developing economies (IDE) discussion paper 137.

Narayan, P.K., Smyth, R., 2006. What determines migration flows from low-income to high-income countries? An empirical investigation of Fiji-U.S. migration 1972-2001. Contemporary Economic Policy 24 (2), 332-342.

OECD, 2009. Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export Credits. http://www.oecd.org/document/49/0,3343,en_2649_34171_1901105_1_1_1_1,00.html

Ortega, F., Peri, G., 2009. The causes and effects of international migrations: evidence from OECD countries 1980-2005. National Bureau of Economic Research Working Paper 148333.

Parsons, C., Skeldon, K., Walmsley, T., Winters, L.A. 2005. Quantifying the international bilateral movements of migrants. Migration DRC Working paper T13.

Pellegrino, A., 2002. Trends in International Migration in Latin America and the Caribbean. International Social Science Journal 52 (165), 395-408.

Plümper, T., Troeger, V.E., 2007. Efficient estimation of time-invariant and rarely changing variables in finite sample panel analyses with unit fixed effects. Political Analysis 15 (2), 124-139.

Ratha, D., Shaw, W., 2007. South-South migration and remittances. World Bank working paper no. 192.

Schaffer, M.E., Stillman, S., 2006. xtoverid: Stata module to calculate tests of overidentifying restrictions after xtreg, xtivreg, xtivreg2 and xthtaylor. http://ideas.repec.org/c/boc/bocode/s456779.html

Sjaastad, L.A., 1962. The costs and returns of human migration. The Journal of Political Economy 70 (5) Part 2: Investment in human beings, 80-93.

UN, 2009. United Nations Development Goals Indicators. United Nations Statistics Division. http://unstats.un.org/unsd/mdg/Data.aspx

United Nations' Trends in Total Migrant Stock: The 2005 Revision, http://esa.un.org/migration

Vogler, M., Rotte, R., 2000. The effects of development on migration theoretical issues and new empirical evidence. Journal of Population Economics 13, 485-508.

Wooldridge, J.M., 2002. Econometric analysis of cross section and panel data. Cambridge, MA: MIT Press.

Worldbank, 2007. Africa Development Indicators. ADI CD-ROM 2007.

Zlotnik, H., 2004. International migration in Africa: an analysis based on estimates of the migrant stock. Migration Policy Institute, http://www.migrationinformation.org/USfocus/print.cfm?ID=252.

Appendix

Appendix table A1 Absolute and relative migrant stocks in our sample.

Destination	Absolute migrant stocks	Relative migrant stocks
Benin	156857	1,86
Burkina Faso	534420	4,04
Cameroon	115290	0,71
Cape Verde	7562	1,49
Central African Republic	73315	1,82
Chad	371682	3,81
Comoros	21025	3,50
Congo, Rep.	253524	6,34
Cote d'Ivoire	2131092	11,74
Ethiopia	467284	0,66
Gabon	150474	10,87
Gambia, The	218223	14,38
Guinea-Bissau	16490	1,04
Lesotho	3439	0,19
Liberia	39325	1,20
Madagascar	11770	0,06
Malawi	220046	1,71
Mauritania	58243	1,90
Mauritius	1809	0,15
Mozambique	272568	1,38
Namibia	121838	6,00
Niger	111884	0,80
Nigeria	770531	0,59
Rwanda	115727	1,28
Sao Tome and Principe	5640	3,60
Senegal	259476	2,23
Seychelles	889	1,05
Sierra Leone	112316	2,03
South Africa	1104331	2,36
Sudan	600900	1,66
Swaziland	34703	3,07
Tanzania	731924	1,91
Togo	151297	2,46
Uganda	493005	1,71
Zambia	227747	1,95
Total	9966645	1,80

Note: Absolute (relative) migrant stocks are calculated as $\sum_o MST_{od}$ ($\sum_o MST_{od} \big/ Pop_d$).

Appendix table A2 Absolute and relative migrant stocks from each origin country.

Origin	Absolute migrant stocks	Relative migrant stocks
Angola	210024	1,32
Benin	445777	5,28
Botswana	28558	1,62
Burkina Faso	1010055	7,64
Burundi	275161	3,65
Cameroon	119784	0,73
Cape Verde	39248	7,74
Central African Republic	121523	3,01
Chad	148110	1,52
Comoros	13134	2,19
Congo, Dem. Rep.	399471	0,69
Congo, Rep.	96629	2,42
Cote d'Ivoire	54654	0,30
Eritrea	682351	15,50
Ethiopia	128920	0,18
Gabon	10575	0,76
Gambia, The	15645	1,03
Ghana	602166	2,72
Guinea	441721	4,70
Guinea-Bissau	65479	4,13
Kenya	144063	0,42
Lesotho	234981	13,09
Liberia	22197	0,68
Madagascar	21731	0,12
Malawi	67151	0,52
Mali	1051130	7,78
Mauritania	71723	2,34
Mauritius	1768	0,14
Mozambique	628020	3,17
Namibia	8800	0,43
Niger	391095	2,80
Nigeria	371646	0,28
Rwanda	158842	1,76
Sao Tome and Principe	3904	2,49
Senegal	214186	1,84
Seychelles	1011	1,20
Sierra Leone	10713	0,19
Somalia	168168	2,04
South Africa	203552	0,43
Sudan	208096	0,57
Swaziland	84639	7,48
Tanzania	89759	0,23
Togo	162727	2,65
Uganda	43133	0,15
Zambia	94039	0,81
Zimbabwe	600587	4,62
Total(above)	9966645	1,34

Note: Absolute (relative) migrant stocks are calculated as $\sum_d MST_{od}$ ($\sum_d MST_{od} \big/ Pop_o$).