Africa Brain Drain: Scope and Determinants

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Abstract:

Abstract: There is amount of evidences indicating that better endowed nations in human capital grew more rapidly. Despite the role of education as a source of economic growth and development many African countries continue to experience high illiteracy rates and low education attainment. While, this deficit indicates that primary and secondary education remain important for Africa a large number of nations experience a high brain drain. A recent study found that ten African countries have lost more than 40 per cent of the their tertiary educated labor force and countries such Cape Verde (67 percent), Gambia (63 percent), Seychelles (59 percent), and Sierra Leone (53 percent) suffered a massive brain drain.

Relying on a unique bilateral data set on international migration, this study analyzes the determinants of the Africa brain drain. We found that wage gap, difference in terms of returns to education 'skill premium', former colonial links, and linguistic proximity between countries of origin and destination, economic and jobs opportunities, and selective immigration policy in the destination countries have a strong impact on Africa brain drain.

1. Introduction

During the last decade, the number of legal immigrants[2] in the OECD countries has increased by 17 million (or by 40 percent), from 42 million in 1990 to 59 million in 2000. The rise is mostly explained by the inflow of persons from the less developed countries. Between 1990 and 2000, the number of immigrants originating in developing countries grew by 96 percent, to compare to only 6 percent for high-income countries. As a result of these trends the share of the immigrants from developing countries in the total OECD foreign-born population has increased from 46 percent in 1990 to about 65 percent in 2000 (table 2).

These trends and the political success of "populist" anti-immigration parties combined with a general public hostility towards immigrants and immigration in a number of Western European countries has given rise to considerable debates over immigration in receiving countries. Anti-immigrant groups commonly argue that immigrants (i) increase the competition on the labor market, (ii) increase criminality and (iii) abuse social welfare programs. The results of the Eurobarometer survey conducted in 2000 revealed that 30 percent of the respondents in countries such Belgium and Germany, are not willing to accept more immigrants. When asked if immigrants "are more involved in criminality", the proportion of positive responses ranged from 30 percent for Ireland to 81 percent for Greece, see Thalhammer and al. (2001).

More importantly the conclusions emerging from a number of recent academic studies on contentious issues such as the welfare dependency of immigrants, their assimilation on the labor market, and the economic costs of immigration have played more than a minor role in the negative public opinion towards immigration, especially towards low-skilled immigrants and fuelled the debate on the reform of immigration policies in the OECD countries. For example, in a series of articles, Borjas (1985, 1994, and 1995) pointed out that the bad performances of the successive immigration cohorts on the US labor market are attributable to the decline in their "quality". This decline among the most recent waves results from a shift in the structure by country of origin. According to Borjas, recent immigrants are less skilled than earlier ones as they come from less developed countries. Building on Borjas, several studies put forward the rise in

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2 We focus on persons aged 25 years and over, referred to as adults in this article.

the "quantity" and the fall in the "quality"[3] of immigration flows in other OECD nations. See among others Baker and Benjamin (1994) for Canada, Edin et al. (2000) for Sweden and Hayfron (1998) for Norway. All these studies depict a negative picture of immigration and suggest that for receiving countries skilled immigration is "good" while unskilled immigration is "bad".

Beyond these considerations, it is essential to stress the fact that South-North emigration is increasingly concerned with the movements of high-skilled persons. This is partly due to migration selectivity in a number of OECD receiving countries. In ten years from 1990 to 2000, the total OECD foreign-born population increased by around 40 percent, while the number of high-skilled immigrants grew by 64 percent. In comparison, during the same period the total stock of immigrants from African countries increased by 54 percent to compare to 113 percent for the highly skilled workers (see table 2). As a consequence of this large outflow of highly educated individuals a number of the African countries experienced a considerable brain drain. A recent study found that ten African countries have lost more than 40 per cent of the their tertiary educated labor force due to emigration to OECD member states and number of countries, such Cape Verde (67 percent), Gambia (63 percent), Seychelles (59 percent), and Sierra Leone (53 percent), and Mozambique (45 percent), suffered a massive brain drain (see, Docquier and Marfouk, 2006). As Lowell (2002b) notes while some level of skilled emigration is necessary for developing nations to integrate into the global economy a large outflow of skilled persons can be unfavorable for growth and development.

Today, a number of OECD immigrant-receiving countries are thinking about reforms of their immigration policy. Besides controlling the immigration volume, the selection of immigrants is an issue that has caused a rising concern in the debates on immigration. In general terms, a common point to contemporary migration policies is there selectivity nature. For example, the skills-based points systems in Australia, Canada and New Zealand target candidates to emigration according to their prospective "contribution to the Australian economy". In the United States emphasis is put on the selection of highly skilled workers through a system of quotas favouring candidates with academic degrees and/or specific professional skills. In European Union (EU) countries, immigration policies are less clear and still oriented towards traditional

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3 The "quality" of immigrants is closely related to the assimilation of the immigrants on the labor market and to the immigration policy. It has been an issue of intense interest among economists. Borjas (1985) and Chiswick (1978) provided controversial results on that issue.

targets such as asylum seekers and applicants requesting family reunion. However, there is some evidence suggesting that European countries are also leaning towards becoming quality-selective.

A growing number of EU countries (including France, Ireland and the UK) have recently introduced programs aiming to attract qualified labor force (especially in the field of information, communication and technology - ICT) through the creation of labor-shortage occupation lists (see Lowell, 2002a). In Germany in February 2000, Chancellor Schröder announced plans to recruit additional specialists in the field of information technology. Green cards came into force in August 2001, giving German ICT-firms the opportunity to hire up to 20,000 non-EU ICT-specialists for a maximum of five years. In 2002, the French Ministry of Labor established a system to induce highly skilled workers from outside the EU to live and work in France.

There is no doubt that the shift of the immigration policies of the OECD countries towards an increasingly migrant's selection systems more liberal for high-skilled workers and very restrictive for low-skilled flows, especially those coming from developing world, would intensify the conflict of interest between receiving and sending countries. On one hand, the objective of the destination countries through the new orientation in immigration policies is to attract high-skilled migration and reduce inflows of low-skilled migrants. On the other hand, the impact of emigration on sending countries might be higher if future emigrants are mainly composed of low-skilled workers while the brain drain is already a major issue of concern in many African nations and could become a more critical challenge in the future.

Despite the conflicts of interest between countries of origin and countries of destination, a comprehensive analysis of the forces driving Africa high-skilled emigration to the OECD is missing in the literature. Such a study would provide valuable insights to policy-makers in both sending and receiving countries. From the point of the countries of origin understanding the migration dynamics would help policy makers to control and monitor better their losses highly skilled workers. From the point of view of the countries of destination a better understanding of the factors affecting international skilled migration would facilitate the formulation of appropriate immigration policies.

The objective of this study is to fill a part of this lack of knowledge. Relying on an original data set we focus on high-skilled emigration from Africa to OCDE countries. To the best of our knowledge, our study is the first to explore the forces driving Africa high-skilled emigration. Our

approach is also original as we explain the bilateral migration relationships between all developing countries and the 53 African nations. Most of the existing empirical literature focused on migration flows to a single destination country[4]. Thus, it was rather tentative to generalize the previous results obtained in these studies. By considering the 30 immigration OCDE nations, our study gives very general insights about the determinants of migration.

We find that the economic and non-economic considerations drive Africa high-skilled workers emigration. Our results reveal that distances, Wage gap, difference in terms of returns to education 'skill premium', former colonial links, linguistic proximity (proxy of the transferability of their skills) between countries of origin and destination, economic and job opportunities, and selective immigration policy in the OECD receiving countries, social, ethnic, religious, and linguistic fractionalization at origin countries have a strong impact on Africa brain drain.

The remainder of the paper is organized as follows. Section 2 and 3 describes the data sources and explains why we know little or not so much about Africa international emigration. In section 4 we compare the new data set used in this paper to previous studies. Section 5 focuses on Africa emigration to the OECD member states. Sections 6 and 7 present the model and the empirical results. The final section summarizes our conclusions.

2. Why do we know little or not so much about the African countries emigration?

Over the period 1965-2000, the number of international migrants in the world increased by about 3 million a year, from 75 million in 1965 to 175 million in 2000 (United Nations, 2002). This migration pressure to developed countries is expected to intensify in the coming years given the labor shortages in skilled area in these countries, the rising gap in living standards, diverging demographic trends between poor and rich countries. As a result of such a large-scale mobility of people, international migration and its impacts on countries of origin and destination has emerged as a central issue in public policy debates and stimulating the interest of the scientific community and international agencies.

Despite this growing interest, there is a large consensus that migration statistics are poor. It is well documented that emigration statistics provided by origin countries, when available, do not

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4 Due in part to difficulty to obtain basic data, the analysis had been focused on a single receiving country. Two recent exceptions are Pederson and al. (2004) and Mayda (2005).

give a realistic picture of emigration[5]. In this context, statistics provided by immigration countries or become the only source of reliable migration data. A few international agencies disseminate data on stock and/or flows of the international migrants. However, the information provided by these statistical sources remains incomplete and inaccurate. For example, the United Nations statistics provide information only on the total stock of foreign-born population by country of residence without the possibility to distinguish the country of origin. Similarly, the OECD statistics (2002) record only the stock of foreign-born population or foreigners (non-citizen) for the major sending countries[6]. The other emigration countries could not be identified since they are aggregated and considered as residual in the entry "other countries".

Consequently, this statistical source provides only partial information for countries of origin. In 2000, out of the 30 OECD member states the data was available only for only 24 countries. As a result, there was no consistent estimate to date of the total stock of immigrants living in the OECD. For example, among the 53 African countries only a limited number were identified as region of origin in the OECD data and not systematically in all the receiving countries[7]. In this context, it became impossible to present a full and realistic picture of the immigrant from a specific African country/region of origin or group of interest. In short, the magnitude of Africa countries emigration to developed countries was unknown to date.

A large number of researchers underlined that scarce and inadequate international migration data pose major obstacles in studying emigration dynamics in developing countries. Arthur (1991) stressed that "the first problem that any researcher of the Third World migration encounters is the general absence of recorded data". Since that time, the need for better migration data has been strongly emphasized by international agencies and researchers A regional conference, held in Addis Ababa in 2000, highlighted the lack of adequate data as a major problem for monitoring the scope and impact of brain drain in Africa[8]. More recently, the IOM (2005) recognized that the exact number of immigrants in Europe is still unknown. For Rosenzweig (2006) "one of the reasons that the effects of immigration on both sending and receiving countries are uncertain is

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[5] For example, Wickramasekera (2002) notes that "Thailand generally reports that 125,000 to 150,000 workers leave for overseas contractual employment every year but the total stock of Thai workers overseas is estimated to be around 450,000 at present including irregular workers".

6 The number of emigration countries varies from 2 for Ireland to 15 for the United States or Canada.

7 The number of the immigrants from Angola, Cap-Verde, and Mozambique are mentioned only for Portugal, while those from Egypt are identified only in the case of Italy.

that the quality and quantity of data describing immigrants and their families is relatively poor". Therefore, the further efforts put by statistical institutions and individual scholars to collect and disseminate international migration data would contribute towards filling an important gap in the research on international migration.

3. A new data set on skilled migration

Our analysis builds on the new international migration data set developed by Docquier and Marfouk (2006)[9]. This section describes the methodology used to compute absolute and relative emigration data by educational attainment and country of origin. The methodology relies on two steps. First, (absolute) emigration stocks by educational attainment are computed for all the world countries. In a second step, these numbers are expressed in percentage of the total labor force born in the sending country (including migrants themselves).

Skilled emigration stocks: Data on emigration can only be captured by aggregating harmonized immigration data collected in many receiving countries. Usually, detailed information about the origin and skill of immigrants can be obtained from national censuses and registers. The DM06 data set is thus based on such data collected in all OECD countries. It counts as migrants all working-aged (25 and over) foreign-born individuals living in an OECD country. Considering the working-aged population (aged 25 and over) maximizes the comparability of the immigration population with data on educational attainment in the source countries. It also excludes a large number of students who temporarily emigrate to complete their education.

Three levels of schooling are distinguished. Low-skill workers are those with primary education, medium-skilled workers are those with secondary education and high-skilled workers are those with tertiary education. The brain drain is defined as the migration of tertiary educated workers. In the DM06 data set, a special attention is devoted to the homogeneity and the comparability of the data. This induces several methodological choices. A detailed discussion of these choices is exposed in Docquier and Marfouk (2006). Let us summarize the main features:

By restricting the receiving countries to the OECD area, the DM06 data set focuses on the South-North and North-North migration. Obviously, a brain drain is observed outside the OECD area

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8 The conference was held at the initiative of the UNECA, IOM, and IDRC.
[9] Henceforth labeled as the DM06 data set.

(to the Gulf countries, South Africa, Malaysia, Hong-Kong, Singapore, Taiwan, etc.). However, given (less detailed) census data collected from various non-OECD countries, about 90 percent of high-skilled international emigrants are living OECD countries.

To allow comparisons, the number of receiving countries is the same in 1990 and 2000. Consequently, Czechoslovakia, Hungary, Korea, Poland, and Mexico are considered as receiving countries in 1990 although they were not members of the OECD.

Information about the origin country of migrants is available in all OECD countries. Migration is defined on the basis of the country of birth rather than on the concept of foreign citizenship. The concept of foreign-born allows to identify immigrant population and thus to capture the decision to emigrate. By contrast, the criteria of citizenship underestimate the emigration since the number of foreign-born is much higher than the number of foreign citizens (twice as large in countries such Netherlands or Sweden). Another reason is that the concept of country of birth is time invariant, contrary to citizenship which changes with naturalization[10]. However, in a limited number of cases, immigrants are only classified by citizenship. More precisely, information on the country of birth is available for the large majority of countries, representing 52.1 million immigrants in 2000 (i.e. 88.3 percent of the total). Information on citizenship is used for the remaining countries (Italy, Germany, Greece, Japan, and Korea).

Data on educational attainment are missing in a couple of cases. In 2000, the educational structure can be obtained or estimated in 27 countries representing 57.9 million immigrants (i.e. 98.1 percent of the total)[11]. Observations are available for 24 countries. For 3 European countries (Belgium, Greece and Portugal), the Labor Force Survey which provides less detailed information about immigrants' origins was used. It is noteworthy that these survey data are only used to characterize 2 percent of the OECD migration stock in 2000 (and 0.7 percent in 1990). In 2000, the number of migrants whose educational attainment is not described amounts to 1.287

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10 The OECD statistics report that 14.4 millions of foreign born were naturalized between 1991 and 2000. According to 1999 census data, 36 percent of the foreign-born population was French citizen. In 2001, 81 percent of the immigrants admitted in Canada during the period 1986-1995 had obtained the Canadian citizenship and this proportion reached 89 percent for those who landed in Canada before 1986 (see Citizenship and immigration Canada: http://www.cic.gc.ca/).

[11] Figures for 1990 are detailed in Docquier and Marfouk (2006).

million, i.e. 2.2 percent of the total stock. In that case, the skill distribution observed in the rest of the OECD area or in the neighboring region is transposed[12].

Skilled emigration "rates": Are obtained by comparing the emigration stocks to the total number of people born in the source country and belonging to the same educational category. Obviously, calculating the brain drain as a proportion of the total educated labor force is more appropriate to evaluate the pressure imposed on the local labor market. For example, the pressure exerted by 149,432 Egyptians high-skilled emigrants (4.6 percent of the Egypt educated total labor force) is less important than the pressure exerted by 1,525 of high-skilled emigrants from Gambia (63.3 percent of national educated labor force). We will use the term "emigration rate" which is defined by (1a) when presenting these ratios.

$$(1a) \qquad m_{h,d,t}^{H} = \frac{M_{h,d,t}^{H}}{N_{h,t}^{H} + M_{h,t}^{H}}$$

Where h, d, t, and H respectively mean country of origin, immigrants-receiving country, time, and immigrants' education level; $M_{h,d,t}^{H}$ is emigrants stock from country of origin h residing in the OECD country d, $N_{h,t}^{H}$ is the country of origin h resident population and $M_{h,t}^{H}$ is the total number of emigrants from country h.

4. Comparison with previous studies

The first serious effort to put together an harmonized international data set on migration rates by education level is due to Carrington and Detragiache (1998, 1999) from the International Monetary Fund, who used US 1990 Census data and general OECD statistics on international migration to construct estimates of emigration rates at three education levels for 61 developing countries among them 24 African countries[13]. Although Carrington and Detragiache's clearly initiated new debates on skilled migration, their estimates suffer from three main limitations:

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[12] For example, if we have no information about the skill structure of immigrants to Japan, Chinese emigrants to Japan are assumed to be distributed in the same way as Chinese emigrants to the rest of the OECD. More precisely, the educational structure in 2000 is extrapolated on the basis of the Scandinavian countries (for Iceland) or the rest of the OECD (for Japan and Korea).
[13] Adams (2003) used the same methodology to compute brain drain rates for 24 countries in 2000 among them seven African countries.

- First, although census data give an accurate picture of the US immigration, the use of OECD statistics to estimate the number of migrants to other OECD countries causes a major problem. OECD statistics only report the number of immigrants for the major origin countries only (top-10 or top-5 sending countries), which led to underestimate immigration from small countries (under-reporting bias). This bias is reinforced by the fact that immigration data were missing for a few OECD countries (Greece, Iceland, Mexico, and Turkey).

- OECD statistics give no information on immigrants' age. It is then impossible to isolate those aged 25 and more. Compared to human capital indicators available for individuals aged 15+ or 25+, considering the total number of immigrants induces an over-reporting bias.

- Second, in the absence of education information in OECD statistics, Carrington and Detragiache transposed the education structure of the US immigration to the immigration to the other OECD countries (transposition bias). For example, Surinamese migrants to the Netherlands are assumed to be distributed across educational categories in the same way as Surinamese migrants to the US. Since the US immigration policy differs from that of many countries, this assumption is highly tentative, especially for countries with a low migration rate to the USA.

By collecting Census, Register and Survey data from all OECD countries, the DM06 study allows to evaluate the size of these biases for the African countries. Biases cancel each other in a couple of cases. However, the brain drain is particularly overestimated in countries such as Algeria, Tunisia, or Morocco. By transposing the educational structure observed in the US, Carrington and Detragiache and Adams obtain high emigration rates of tertiary educated workers for these countries (between 35 and 45 percent). Taking into account the low level of education observed among emigrants to Europe (where the large majority of these migrants live), the DM06 data set gives much lower skilled emigration rates for these countries (between 9 and 17 percent). On the contrary, the brain drain is largely underestimated for a large number of African countries such Gambia, Mozambique, Seychelles, Ghana, and Uganda. Typically, the bias ranges from -51.3 percent in the case of Mauritus to +51.5 percent in the case of Sao Tome.

This appears on Figure 1 which gives high-skilled migration rates evaluated under three measurement methods: (i) a method fully based on census and administrative data - Our method *(DM06)*, (ii) the method used by Carrington and Detragiache, which is based on OECD statistics

and US educational attainment data *(OECD Statistics+ US sharing)*, (iii) an intermediate method based on census and administrative data on the number of migrants and US educational attainment data on education *(Census + US sharing).* The observations calculated with our method are ranked in a decreasing order. In comparison to our method, the second one clearly underestimates the brain drain for a large majority of countries. On the contrary, the third one overestimates the brain drain.

Figure 1: African countries high-skilled emigration rate under 3 measurement methods, (2000)
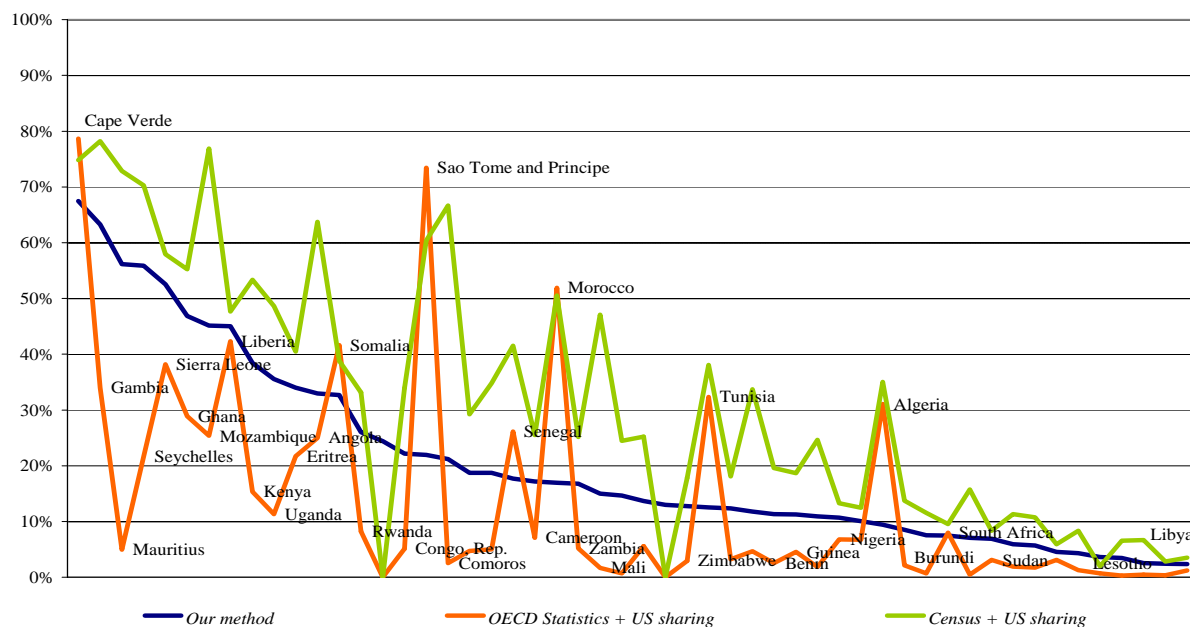
5. Emigration from Africa to OECD and the magnitude of the continent brain drain

The number of legal immigrants in the OECD countries amounted to 59 million in 2000, accounting for 7.3 percent of the total population. However, Table 1 shows that the immigration rate is strongly heterogeneous across receiving countries. Immigrants represent a very high proportion of the population in Luxemburg (27%), Switzerland (25%), Australia (25%), Canada (20%) and New Zealand (18%). By contrast, the immigrants represent a small fraction of the population in countries such South Korea (0.4%), Mexico (0.9%), and Japan (1%).

Table 2 provides a descriptive overview of the distribution of OECD immigrants by educational attainment, regions of origin and region destination. Between 1990 and 2000, the number of immigrants in the OECD countries increased by 17 million (or 40 percent), from 42 million in 1990 to 59 million in 2000. During the same period the stock of high-skilled immigrants increased by 8 million (or 64 percent) from 12 million in 1990 to 20 million in 2000. The result of this contrasting evolutions the share of high-skilled workers in the total immigrant stock increased form 30 percent in 1990 to 35 percent in 2000. These figures provide strong evidence that emigration is today more and more concerned by the movements of high-skill persons. This is partly due to the migration selectivity in number of OECD immigrant-receiving countries.

Table 1: Immigrants by country of residence, 2000

	Immigrants 25+	Population 25+	Immigrants in % of the population
Australia	4,075,721	1,2521,000	24.6
Austria	816,001	5,802,000	12.3
Belgium	867,620	7,233,000	10.7
Canada	4,661,330	20,805,000	18.3
Czech Rep	410,249	7,017,000	5.5
Denmark	169,664	3,748,000	4.3
Finland	90,511	3,580,000	2.5
France	3,755,514	40,418 000	8.5
Germany	4,746,000	60,269,000	7.3
Greece	106,041	7,750,000	1.3
Hungary	251,715	6,836,000	3.6
Iceland	16,927	174,000	8.9
Ireland	281,232	2,309,000	10.9
Italy	923,788	4,2627,000	2.1
Japan	951,302	9,2337,000	1.0
South Korea	150,812	42,289,000	0.4
Luxemburg	114,625	303,000	27.4
Mexico	417,371	45,226,000	0.9
Netherlands	1,320,320	11,109,000	10.6
New Zealand	603,606	2,400,000	20.1
Norway	204,182	3,051,000	6.3
Poland	741,517	24,675,000	2.9
Portugal	207,476	6,889,000	2.9
Slovak Rep	426,072	3,416,000	11.1
Spain	1,370,657	28,839,000	4.5
Sweden	805,143	6,219,000	11.5
Switzerland	1,704,948	5,200,000	24.7
Turkey	826,110	33,130,000	2.4
United Kingdom	3,639,907	40,353,000	8.3
United States	24,366,085	183,564,000	11.7
Total OECD	**59,022,443**	**750089000**	**7.3**

Note: Immigrants and population correspond to individuals aged 25 or older.
Source: Author's calculations based on Docquier and Marfouk (2006).

Many economists have demonstrated that immigrants are not randomly selected. An interesting selection indicator is given by the proportion of high-skilled emigrants in the total emigration stock. Among all immigrants, low-income countries are the most educated: the proportion of immigrants with tertiary education represents 45 percent in 2000. From the same table we can also see that the proportion of highly skilled African emigrants increased between 1990 and 2000 form 22 percent to 31 percent and the high-skilled emigration rate increased just 0.4 point from 10 to 10.4 percent[14]. This is due to the fact that the general level of schooling increased in the African countries.

In every group, the proportion of high-skilled among emigrants (35 percent for the world average) is much higher than the proportion observed among residents (on average 11 percent). In 2000, for Africa, considered as a whole, the high-skilled emigrants represent 31 percent of the total stock, to compare to 6 percent for the continent residents.

A number of previous studies provide strong evidence that high-skilled individuals are the most mobile. For example, Détang-Dessendre and al. (2004) found a positive relationship between migration rate of French young men and education level. 47 percent of the highly educated workers changed departments, against only 19 percent for workers with low level of education. This conclusion is supported by the data provided in table 2. In 2000, the high-skilled emigration rate (5.4 percent for the world average) was three times as high as the global emigration rate (1.8 percent). Disaggregated data by group of origin confirm that the global emigration rates are usually moderate, while the high-skilled emigration rates are much higher. For example, the Africa high-skilled emigration rate (10.4 percent) is more than 7 times as high as the average immigration rate (1.5 percent).

In 2000, Africa represents around 4.5 million of the total OECD immigrants and 1.4 million of high-skilled immigrants, corresponding to 7.6 percent of the total foreign-born population, 6.8 percent of highly skilled immigrants (13 percent of total OECD immigrants and 10 percent of the highly skilled foreign-born population in 1990). As one could expect, about 75 percent of African emigrants choose European Union member states (EU15) as destination. Focusing on the African high-skilled emigrants, it comes out that about 51 percent of them reside in one of the three so-called "traditional immigrant-receiving countries" (Australia, Canada and the US). By contrast,

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[14] The Africa unweighted average of high-skilled emigration rates (20%) is much higher than the weighted average.

the EU15, as a whole, attract only 46 percent (36 percent in 1990), to compare to 75 percent for total African foreign-born population.

Contrary to the popular belief, the African emigration flows to OECD member countries are not exclusively composed of unskilled workers. Figure 2 shows that about 31 percent of the OECD African-born immigrants had tertiary education level. This proportion represents 75 percent in Canada, 70 percent in the United States and 65 percent in Australia. Looking at specific regions of origin (see, table 3), this proportion is particularly high in countries such Nigeria (55%), South Africa (66%), and Egypt (59 percent).

Figure 2- Proportion of High-skilled among the African emigrants by destination, in 2000
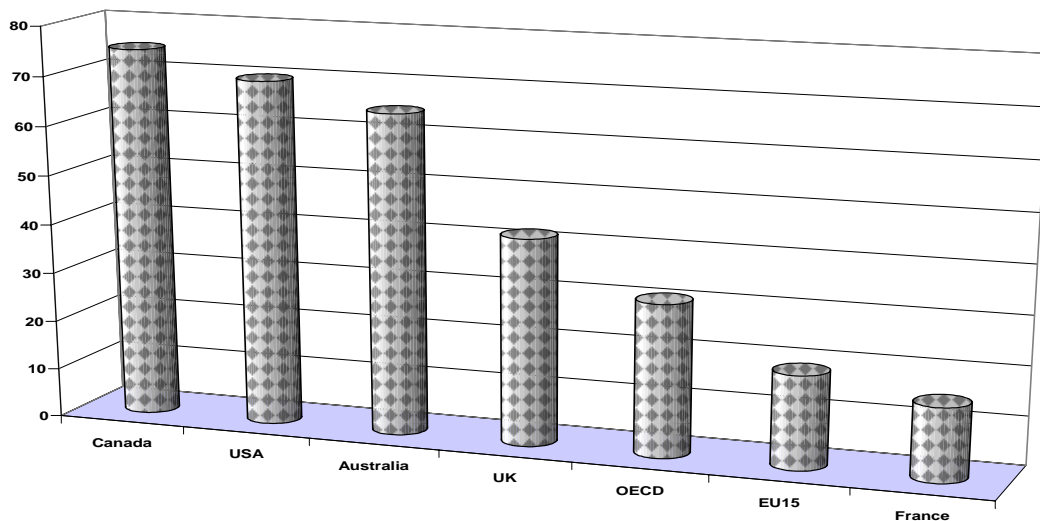
Source: Author's calculations based on Docquier and Marfouk (2006).

From figure 3 (table 3) we can see that in 2000, Northern Africa region, around 22 percent of the African population, make up the largest proportion of the African born immigrants (2.3 million or 51 percent), followed Eastern (851,657 - 19 percent), Western (777,011 - 17 percent), Middle (314,098 - 6 percent), and Southern Africa (275,925 - 7 percent). In terms of high-skilled emigration the picture is different: Northern Africans (445,718) represented 'only' 32 percent of the continent high-skilled emigration, 25 percent (347,379) of the African born were from Eastern Africa. A roughly equal number (326,478), 24 percent, were from Western Africa. Southern Africa (171,397) made up 12 percent of the African-born high-skilled population. Finally, Middle Africans (96,994) represented 7 percent.

Figure 3- Region of origin of African immigrants in the OECD by educational level, in 2000
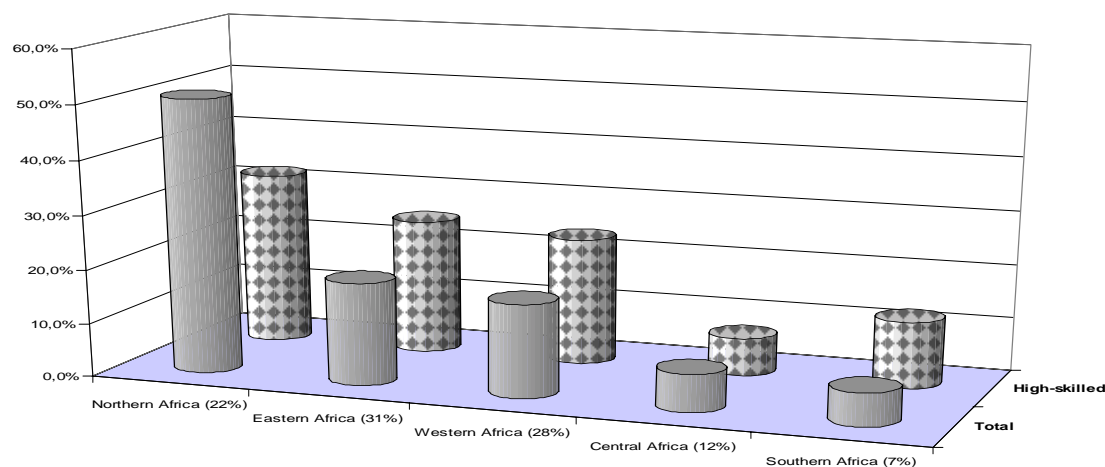
Note: Between brackets the share of the African regions in terms of the continent population aged 25 and over.
Source: Author's calculations based on Docquier and Marfouk (2006).

Table 3 depicts the situation for Africa by region of and countries of origin of African emigration in 2000. A quick look at table reveals that the Africa averages hide a huge heterogeneity between and within the continent regions. The brain drain intensity differs if it is measured in absolute or relative terms. At the countries level, in absolute terms (number of high-skilled emigrants), the largest countries are obviously strongly affected by the brain drain in favour of the OECD countries. The stock of highly skilled emigrants is high in South Africa (168,083), Nigeria (149,494), Egypt (149,432), and Morocco (141,168). In relative terms (in proportion of national educated labor force), small countries are the most affected. The emigration rate exceeds 50 percent in nations such as Cap Verde (67 percent), Gambia (63 percent), Mauritius (56 percent), Seychelles (56 percent), and Sierra Leone (52 percent). It is worth noting that African countries with large stocks of highly skilled emigrants may exhibit low rates of emigration. This is obviously the case of Egypt (4.6 percent) and Algeria (9.4 percent).

The last two columns give the 25 highest and lowest selection rates among emigrants. The highest selection rates are observed in countries such Nigeria (65 percent), South Africa (63 percent), Egypt (59 percent), and Liberia (58 percent). At the other extremity of the distribution, selection rates are very low in traditional low-skilled emigration countries such as Mali (11 percent), Equatorial Guinea (12 percent), Morocco (13 percent), Comoros (13 percent), Algeria (14 percent), and Guinea-Bissau (14 percent). Several African countries exhibit low selection rates and an important brain drain (Senegal, Gambia, Morocco, and Mozambique).

Table 2- Descriptive statistics by country groups (1990-2000)

Group of origin	Emigration structure in thousands[a]			High-skilled by destination In percentage			Labor force structure In thousands[a]			Emigration rates In percentage	
	Total emigrants	High-skilled emigrants	Share of high-skilled	In selective countries	In EU15 countries	In the rest of OECD	Total Labor force	High-skilled Labor Force	Share of high-skilled	Total	High-Skilled
YEAR 2000											
World[d]	**59,022**	**20,403**	*35%*	**73%**	**21%**	**6%**	**3,187,233**	**360,614**	*11%*	**1,8%**	**5,3%**
By region											
Africa	4,497	1,388	*31%*	51%	46%	3%	298,112	11,896	*4%*	1,5%	10,4%
Asia	15,043	7,041	*47%*	80%	14%	6%	1,917,998	119,986	*6%*	0,8%	5,5%
Europe	21,095	6,686	*32%*	59%	30%	11%	499,479	89,387	*18%*	4,1%	7,0%
Latin America and Caribbean	13,881	3,655	*26%*	89%	8%	3%	249,408	29,507	*12%*	5,3%	11,0%
From the rest of the World[b]	4,506	1,633	*36%*	63%	23%	14%	222,236	109,838	*49%*	2,0%	1,5%
By group of interest											
High-income countries	19,206	7,547	*39%*	68%	24%	8%	666,246	200,607	*30%*	2.8%	3.6%
Developing countries[c]	38,083	12,576	*33%*	76%	19%	5%	2,520,987	160,008	*6%*	1,5%	7,3%
Low-income countries	6,544	2,948	*45%*	77%	21%	1%	898,768	36,332	*4%*	0,7%	7,5%
Lower medium-income countries	17,053	6,089	*36%*	77%	17%	6%	1,298,233	76,981	*6%*	1,3%	7,3%
Upper-medium-income countries	14,486	3,539	*24%*	75%	20%	5%	323,987	46,694	*14%*	4,3%	7,0%
Least developed countries	2,510	853	*34%*	69%	29%	2%	245,974	5,635	*2%*	1,0%	13,1%

[a] *Emigrants and labor force correspond to individuals aged 25 or older.*
[b] *The rest of the World correspond to North America, Oceania, dependent territories and emigrants who did not reported their country of birth*
[c] *Developing countries correspond to the sum of low-income, lower medium-income, and upper medium income.*
[d] *The world is the sum of developing countries, high-income countries, dependent territories and emigrants who did not reported their country of birth.*
Immigrants and labor force correspond to individuals aged 25 or older.
Source: Author's calculations based on Docquier and Marfouk (2006).

Table 2- Descriptive statistics by country groups (1990-2000) – Continued

Group of origin	Emigration structure in thousands[a]			High-skilled by destination In percentage			Labor force structure In thousands[a]			Emigration rates In percentage	
	Total emigrants	High-skilled emigrants	Share of high-skilled	In selective countries	In EU15 countries	In the rest of OECD	Total Labor force	High-skilled Labor Force	Share of high-skilled	Total	High-Skilled
YEAR 1990											
World[d]	**41,865**	**12,467**	*30%*	**76%**	**17%**	**7%**	**2,765,661**	**2,765,661**	*9%*	**1,49%**	**0,45%**
By region											
Africa	2,911	652	*22%*	52%	45%	3%	227,338	5,842	*3%*	1,3%	10,0%
Asia	9,504	3,837	*40%*	78%	13%	9%	1,484,286	70,981	*5%*	0,6%	5,1%
Europe	18,807	4,804	*26%*	68%	21%	11%	469,899	65,354	*14%*	3,8%	6,8%
Latin America and Caribbean	6,978	1,856	*27%*	89%	7%	4%	191,303	17,105	*9%*	3,5%	9,8%
From the rest of the World[b]	3,665	1,318	*36%*	70%	18%	12%	392,835	17,105	*4%*	0,9%	7,2%
By group of interest											
High-income countries	18,165	5,613	*31%*	74%	17%	9%	586,069	139,458	*24%*	3.0%	3 .9%
Developing countries[c]	19,402	5,804	*30%*	79%	17%	4%	1,783,362	69,767	*4%*	1,1%	7,7%
Low-income countries	3,454	1,267	*37%*	77%	21%	2%	677,539	21,291	*3%*	0,5%	5,6%
Lower medium-income countries	8,740	2,883	*33%*	81%	14%	5%	938,974	34,948	*4%*	0,9%	7,6%
Upper-medium-income countries	7,208	1,654	*23%*	77%	19%	4%	166,848	13,528	*8%*	4,1%	10,9%
Least developed countries	1,384	373	*27%*	70%	29%	1%	185,034	3,092	*2%*	0,7%	10,8%

[a] *Emigrants and labor force correspond to individuals aged 25 or older.*
[b] *The rest of the World correspond to North America, Oceania, dependent territories and emigrants who did not reported their country of birth*
[c] *Developing countries correspond to the sum of low-income, lower medium-income, and upper medium income.*
[d] *The world is the sum of developing countries, high-income countries, dependent territories and emigrants who did not reported their country of birth.*
Immigrants and labor force correspond to individuals aged 25 or older.
Source: Author's calculations based on Docquier and Marfouk (2006).

Table 3: Emigration form Africa to OECD, by regions and countries of origin, ranked in decreasing order, situation in 2000

Region of origin	Total immigrants stock	Region of origin	High-skilled immigrants stock	Region of origin	Total emigration rate	Region of origin	High-skilled emigration rate	Region of origin	Selection rate
AFRICA	*4,496,950*	AFRICA	1,387,966	AFRICA	1.5%	AFRICA	10.4%	AFRICA	31%
Northern Africa	2,278,258	Northern Africa	445,718	Northern Africa	2.9%	Eastern Africa	*18.6%*	Southern Africa	62%
Eastern Africa	851,657	Eastern Africa	347,379	Southern Africa	1.0%	Middle Africa	*16.1%*	Western Africa	42%
Western Africa	777,011	Western Africa	326,478	Eastern Africa	1.0%	Western Africa	*14.8%*	Eastern Africa	41%
Middle Africa	314,098	Southern Africa	171,397	Western Africa	1.0%	Northern Africa	*7.3%*	Middle Africa	31%
Southern Africa	275,925	Middle Africa	96,994	Middle Africa	1.0%	Southern Africa	*6.8%*	Northern Africa	20%

Country of origin	Total immigrants stock	Country of origin	High-skilled immigrants stock	Country of origin	Total emigration rate	Country of origin	High-skilled emigration rate	Country of origin	High selection rate	Country of Origin	Low selection rate
The top-25 ranked in decreasing order											
Morocco	1,095,166	South Africa	168,083	Cape Verde	25.1%	Cape Verde	67.5%	Nigeria	65%	Congo, Rep.	40%
Algeria	607,824	Nigeria	149,494	Seychelles	19.5%	Gambia, The	63.3%	South Africa	63%	Togo	40%
South Africa	268,675	Egypt	149,432	Mauritius	10.7%	Mauritius	56.2%	Egypt	59%	Djibouti	38%
Tunisia	264,135	Morocco	141,168	Morocco	7.6%	Seychelles	55.9%	Liberia	58%	Seychelles	37%
Egypt	253,861	Algeria	85,537	Sao Tome	5.6%	Sierra Leone	52.5%	Swaziland	56%	Congo, Dem.	37%
Nigeria	229,928	Kenya	77,516	Tunisia	5.4%	Ghana	46.9%	Zimbabwe	55%	Botswana	34%
Kenya	172,918	Ghana	71,309	Equatorial Guinea	4.5%	Mozambique	45.1%	Libya	54%	Cote d'Ivoire	31%
Ghana	161,800	Ethiopia	51,392	Algeria	4.5%	Liberia	45.0%	Gabon	53%	Burkina Faso	30%
Angola	120,779	Tunisia	39,350	Comoros	3.8%	Kenya	38.4%	Benin	53%	Mauritius	29%
Ethiopia	105,632	Uganda	34,970	Liberia	3.5%	Uganda	35.6%	Sudan	52%	Somalia	28%
Somalia	99,069	Congo, Dem.	33,085	Somalia	3.3%	Eritrea	34.0%	Tanzania	51%	Guinea	26%
Senegal	94,001	Zimbabwe	32,676	Gambia, The	3.3%	Angola	32.9%	Namibia	51%	Mauritania	22%
Congo, Dem.	90,286	Tanzania	32,255	Congo, Rep.	3.0%	Somalia	32.6%	Burundi	51%	Gambia, The	20%
Mauritius	79,850	Somalia	27,916	Angola	2.8%	Rwanda	26.0%	Sierra Leone	50%	Sao Tome	18%
Uganda	75,736	Mauritius	23,043	Senegal	2.8%	Guinea-Bissau	24.4%	Lesotho	50%	Mozambique	18%
Tanzania	62,886	Cameroon	21,822	Eritrea	2.5%	Congo, Rep.	22.2%	Cameroon	50%	Angola	17%
Mozambique	60,340	Liberia	20,842	Guinea-Bissau	2.2%	Sao Tome	22.0%	Niger	49%	Senegal	17%
Zimbabwe	59,368	Angola	20,449	Ghana	2.2%	Comoros	21.2%	Ethiopia	49%	Cape Verde	15%
Cape Verde	53,649	Sudan	18,789	Sierra Leone	2.1%	Togo	18.7%	Zambia	48%	Tunisia	15%
Cameroon	44,071	Sierra Leone	18,010	Kenya	1.6%	Malawi	18.7%	Rwanda	48%	Guinea-Bissau	14%
Cote d'Ivoire	39,359	Senegal	15,729	Zimbabwe	1.4%	Senegal	17.7%	Chad	48%	Algeria	14%
Congo, Rep.	36,231	Congo, Rep.	14,672	South Africa	1.3%	Cameroon	17.2%	Uganda	46%	Comoros	13%
Sudan	36,127	Zambia	13,739	Togo	1.2%	Morocco	16.9%	Kenya	45%	Morocco	13%
Sierra Leone	35,763	Eritrea	13,144	Mauritania	1.2%	Zambia	16.8%	Ghana	44%	Equatorial Guinea	12%
Liberia	35,638	Cote d'Ivoire	12,088	Uganda	1.1%	Mali	15.0%	Madagascar	43%	Mali	11%

Note: emigrants correspond to individuals aged 25 or older.
Source: Author's calculations based on Docquier and Marfouk (2006).

6. Theoretical foundations and the empirical model

The purpose of our analysis is to evaluate the determinants of emigration rates. The theoretical foundation of our empirical studies can be found is the extended Roy's model (1951), presented in Borjas (1987) and more recently by Mayda (2005). Individuals born in the sending country compare the expected income gain from emigration to the global migration cost, including psychic and monetary components. Staying in the home country h, they obtain an income offer equal to:

(1)
$$y_h^i = \alpha_h + \sum_{n=1}^{N} \alpha_h^n X_h^n + \alpha_h^H H^i + \sum_{m=2}^{M} \alpha_h^m X_m^i + \varepsilon_h^i$$

where X_h^n is a set of variables related to the host country (technological level, institutional factors, social expenditure, etc.), H^i is the individual level of schooling, X_m^i is a set of variable related to individual i other than human capital (such as linguistic ability, physical and human talents not captured by schooling, etc.), ε_h^i is a iid process with zero mean and variance σ_h^2, α_h^x are parameters associated to the determinant x.

Emigrating to a destination country d, their income becomes:

(2)
$$y_d^i = \alpha_d + \sum_{n=1}^{N} \alpha_d^n X_d^n + \alpha_d^H H^i + \sum_{m=2}^{M} \alpha_d^m X_m^i + \varepsilon_d^i$$

Where X_d^k is a set of variables related to the destination country, ε_h^i is an iid process with zero mean and variance σ_d^2, α_d^x are parameters associated to the determinant x.

Finally, the global cost of moving from h to d is endogenous are can be written as

(3)
$$c_{hd}^i = \alpha_c + \sum_{k=1}^{K} \alpha_c^k X_{hd}^k + \alpha_c^H H^i + \sum_{m=2}^{M} \alpha_c^m X_m^i + \varepsilon_c^i$$

Where X_{hd}^k is a set of variables measuring the relationships between countries h and d (such as distances, colonial link, linguistic proximity, etc.), ε_c^i is an iid process with zero mean and variance σ_c^2, α_c^x are parameters associated to the determinant x.

Emigration is optimal if $y_d^i - y_h^i - c_{hd}^i > 0$. This happens with a probability

$$P\left\{(\alpha_h - \alpha_d - \alpha_c) + (\alpha_h^H - \alpha_d^H - \alpha_d^H)H^i + \sum_{m=2}^{M}(\alpha_h^m X_m^i - \alpha_d^m X_m^i - \alpha_c^m X_m^i)\right.$$

$$\left. + \sum_{n=1}^{N}(\alpha_h^n X_h^n - \alpha_d^n X_d^n) - \sum_{k=1}^{K}\alpha_c^k X_{hd}^k + (\varepsilon_h^i - \varepsilon_d^i - \varepsilon_c^i) > 0\right\}$$

Or equivalently:

$$(4) \qquad P\left[v_{hd}^i > -ZS_{hd}^i\right]$$

With

$$ZS_{hd}^i \equiv (\alpha_h - \alpha_d - \alpha_c) + (\alpha_h^H - \alpha_d^H - \alpha_d^H)H^i + \sum_{m=2}^{M}(\alpha_h^m X_m^i - \alpha_d^m X_m^i - \alpha_c^m X_m^i)$$

$$+ \sum_{n=1}^{N}(\alpha_h^n X_h^n - \alpha_d^n X_d^n) - \sum_{k=1}^{K}\alpha_c^k X_{hd}^k$$

$$v_{hd}^i \equiv \varepsilon_h^i - \varepsilon_d^i - \varepsilon_c^i$$

The value of Z_{hd}^i depends on all the characteristics of individuals, sending and receiving countries; the error term v_{hd}^i is assumed to follow a normal distribution of zero mean and a variance equal to $\sigma_v^2 = \sigma_h^2 + \sigma_d^2 + \sigma_c^2 - 2\rho_{hd} - 2\rho_{hc} + 2\rho_{dc}$ (where ρ_{xy} is the correlation between x and y)

Denoting by the cumulative distribution function of the standard normal, the probability that agent i wants to emigrate is given by

$$(5) \qquad PS_{hd}^i = 1 - \Phi\left(\frac{-ZS_{hd}^i}{\sigma_v}\right)$$

This probability captures the self-selection process of emigrants. In a second step, candidates to emigration face a probability to be accepted in the receiving country. This probability depends on the immigration policy (size of emigration and the selection process) as well as on individual characteristics (H^i and X_m^i) and country ties (X_{hd}^k). Let us write the individual score in the selection process as

$$(6) \qquad s_{hd}^i = \alpha_s + \sum_{k=1}^{K}\alpha_s^k X_{hd}^k + \alpha_s^H H^i + \sum_{m=2}^{M}\alpha_s^m X_m^i + \varepsilon_s^i$$

With $\varepsilon_s^i \to N(0, \sigma_s)$, and assumes that emigration occurs if $s_{hd}^i > 0$. The probability that agent I can be accepted in country d is given by

$$(7) \qquad PO_{hd}^i = 1 - \Phi\left(\frac{-ZO_{hd}^i}{\sigma_s}\right)$$

With $ZO_{hd}^i \equiv \alpha_s + \sum_{k=1}^{K} \alpha_s^k X_{hd}^k + \alpha_s^H H^i + \sum_{m=2}^{M} \alpha_s^m X_m^i$. This probability captures the out-selection process facing all the candidates to emigration. The probability of effective emigration combines the self-selection and the out-selection processes. It amounts to the conditional probability:

$$(8) \qquad PE_{hd}^i = P\left[\varepsilon_s^i > -ZO_{hd}^i \,\middle|\, v_{hd}^i > -ZS_{hd}^i\right]$$

If v_{hd}^i and ε_s^i are not correlated, we simply have

$$(8') \qquad PE_{hd}^i = \left[1 - \Phi\left(-ZS_{hd}^i / \sigma_v\right)\right] \times \left[1 - \Phi\left(-ZO_{hd}^i / \sigma_s\right)\right]$$

Otherwise, the expression is more complex and depends on the correlation between the error terms. Anyway, in our regressions, we will explain the macroeconomic bilateral emigration rates from each country h to each country d using a set of variables reflecting individual average characteristics, home country and destination-country characteristics as well as indicators of proximities between each pair of countries.

6.1. Living standards and liquidity constraints

The neoclassical migration theory predicts that differences in terms of living standards between receiving and sending nations encourage international migration (i.e. when the gap in living standards increases the emigration rates goes up and vice versa). Building on the World Bank (2005) development indicators, we used the annual gross national income (GNI) per capita, adjusted in purchasing power parity (PPP). For example, the high-income countries exhibit a GNI per capita (29,580 $) 14 times higher than low-income countries (2,110 $). For Malawi, the 2003 GNI is estimated to 590 $, to compare to 27,690 $ for the United Kingdom. These figures reveal the existence of huge disparities between developed and developed countries.

It cannot be denied that the substantial differences in terms of per capita income are one of the main forces driving South-North migration. However, despite large inequalities in terms of living

standards, the emigration from less developed countries to developed nations is relatively small. There is a fair amount of evidence and stylized facts suggesting that the emigrants essentially do not come from low-income group. Why do less developed regions, in contrast to migration theory, experience low emigration rates despite stronger incentives?

Although the relationship between migration and development is a central question, only a few empirical studies until now have paid attention on to this issue. Faini and Venturini (1993), focusing on migration from Southern to Northern Europe, found that migration increases with the country-of-origin per capita income and decrease with their capita income squared. Schiff (1996) stressed that liquidity constraints play an important role in the probability of individuals to emigrate: the effect is likely to be more pronounced at low-income level. Similar conclusions are reached by Vogler and Rotte (2000), who also found that constraints on financial resources explain why poor countries send few emigrants and experience low emigration rates. These works support the existence of inverted-U shaped relationship between migration and economic development. In brief, economic development stimulates emigration at low level of income by relaxing the liquidity constraint. At a higher level, after development has token place, the migration pressure tends to decline and the relationship becomes downward sloping.

This relationship explains why at the world level middle-income countries experience the highest emigration rates and why high-income and low-income countries exhibit the lowest rates. DM06 reveals that low income countries (Chad, Niger, Mali, etc.) and high income countries (such Brunei, Saudi Arabia, and Qatar) are among the countries with the lowest emigration rates while middle income countries (Lebanon, Turkey, Morocco, Suriname, Guyana, etc.) exhibit high emigration rates.

In this study, we used (GNI_d / GNI_h) the Gross National Income per capita, PPP adjusted, as a proxy of difference in living standards between the countries of origin and destination, to capture the incentive to emigrate. The inclusion of the levels of GNI per capita (GNI_h) and of the GNI squared (GNI_h^2) allows us to test for the inverted-U relationship capturing liquidity constraints. In terms of World Development Indicators, we compute the average levels over the period 1975-2000.

6.2. Geographical distance

Most migration studies emphasize that geographical proximity is an important factor of migration. Migration involves monetary costs due to expenses in travel costs and initial expenditures (for visas, settlement in the country of destination, etc.). Moving also induces non-monetary or "psychic" costs which result from the break of social ties (separation from friends and family). Some moving costs are invariant with respect to distance. Proximity induces the same initial expenditures (visa, etc.). However, many components of migration costs are closely related to the distance. Transportation costs and information costs are inversely correlated with distance. Psychic costs may also increase with distance since proximity induces more perspectives of temporary return and visits. From a brief inspection of the data provided in Table 4, we can see that an increase in distance results in a lower emigration rate to the United States.

Table 4 – Emigration rates to the United States by countries of origin in 2000

distance	Average (unweighted) High-skilled emigration rates, in percent
All distances	11.2
Less than 3,000	51.6
From 3,000 to 4,000	37.0
From 4,001 to 5,000	22.8
From 5,000 to 6,000	7.5
More than 6,000	6.4

The unweighted average emigration rate for countries located at less than 3,000 kilometers from the US is more than twice as large as the rate observed for countries located between 4,001 and 5,000 kilometers, 7 times as large as the rate observed for countries located between 5,001 and 6,000 kilometers, and 8 times as large as the rate observed for countries located at more than 6,000 kilometers. Bogue and Thompson (1949) argue that distance is one of the principal factors affecting the number and the characteristics of migrants and Schwartz (1973) claims that distance should have a greater impact on low-skill emigrants than on high-skill emigrants. We used the log of the number of kilometers between countries of origin and destination ($\ln dist_{h,d}$), as a proxy monetary and no monetary migration costs. We expect that higher the distance, the lower the volume of migration.

6.3. Colonial, linguistic and historical links

For historical reasons, migration primarily occurs between former colonies and their past dominant state. This is clearly illustrated in table 5. There is no doubt that former colonial ties explain the large concentration of emigrants from Mozambique (87 percent), Angola (80 percent), Sao Tome (84 percent) in Portugal and those from Comoros (97 percent) and Madagascar (79 percent) in France.

Table 5- Proportion of the colonizer in the emigration stock of the former colony in 2000

Country of origin	Proportion of the total OECD emigrants stock	Country of residence
Comoros	97.4	France
Madagascar	79.3	France
Malawi	81.1	UK
Kenya	66.4	UK
Uganda	65.3	UK
Zambia	60.9	UK
Mozambique	87.0	Portugal
Angola	80.0	Portugal
Sao Tome and Principe	84.5	Portugal
Congo, Democratic Republic	44.7	Belgium

Beside the former colonial link, sharing a common language between the country of origin and destination plays an important role in the orientation of the migration flows. Emigrants from French-speaking countries mainly choose France as destination while English-speaking countries choose the US, the UK or Australia. The proficiency of the destination official language is a central element of the immigration policies in a number of the OECD countries. For example, under the points systems in Australia, Canada, and New-Zealand the skilled workers applicants are awarded points based their level of education, age, and other criteria among which language skills. For example, the Canadian immigration points system attributes a maximum of 25 points for skilled workers applicants possessing a PhD or Master degree with at least 17 years of full-time study but the candidates to emigration can award approximately equivalent points (24 points maximum) for their proficiency in Canada's official languages.

Linguistic proximity and former colonial ties are important forces driving South-North migration. They play a crucial role in migrants' location decision by affecting the transferability of skill and the access to information about the destination, and the magnitude of migration costs. Several scholars have argued that common language increases the expected returns to migration and thus

facilitates migration decision. The literature on labor market assimilation suggests that migrants receive substantial wage premium for their language skills. Chiswick and Miller (1992) found a positive correlation between the language skill and the earning of migrants. Funkhouser and Ramos (1993) argued that the skills accumulated prior to migration are not equally transferable to all the potential countries of destination. Recent studies concentrated on Canada reached the same conclusions. For example, DeVoretz and al. (2000) found that the proficiency in Canada's official languages has a positive effect on immigrants' earnings performance and employment opportunities. Hiebert (2002) underlines that the education of the immigrants and their proficiency in the official language are complements in the Canadian labor market.

From the conclusions of these studies, it is clear that the proficiency in official languages of the destination country increase migration probability, particularly for qualified workers. In this context, it is not surprising to note that the majority of the emigrants from Portuguese-speaking countries (such as Angola and Mozambique) choose Portugal as a destination country. Similarly, the migrants from French-speaking countries (such Algeria, Senegal) tend to move mainly to France. In order to capture the past colonial ties and linguistic proximity we used a dummy variable ($col_{h,d}$) which is equal to 1 if the countries of origin and destination share a past colonial tie and to 0 otherwise[15]. We consider if there is a past colonial link between countries i and j then they share a common language.

6.4. Demographic structure at origin

The increase of the population, particularly young cohorts at origin is a potential factor that drives South-North migration. Census data indicate that migrants are in general young persons. For example, the 15-29 age group represents over 36 percent of the immigrants admitted in the United States during the fiscal the period 1986-2000. Following previous studies such as Clark et al. (2002), Hatton and Williamson (2002) and Mayda (2005), we control for the proportion of persons aged 15-29 (POP_{15-29_h}). This variable captures the demographic pressure. Data are taken from the United Nations demographic database. We used the average 1970-2000.

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15 Our source of information is the CIA world factbook. We have introduced a couple of corrections. For example, we have added a colonial link between Morocco and Spain.

6.5. Religious, ethnic and linguistic fractionalization at origin

Many conflicts in developing countries are related to religious and ethnic differences (for example, the Hutu-Tutsi violent conflicts in Burundi and Rwanda, the religious conflicts in Nigeria. While a large number of international migrants leave their homelands (voluntary migration) for better opportunities in developed counties, other people are driven by ethnic and religious discrimination. Their quest for safety forces them to emigrate. According to UNHCR statistics, the world accounts around 9 million of refugees, among them 2.6 million reside in Europe and Northern America. As argued by Mauro (1995) and la Porta et al. (1999), ethnic and religious heterogeneity, which are associated to lateness tensions and bad quality of institutions, may affect positively emigration flows.

It is important to note that fractionalization and political instability are likely to be linked. Several scholars provided strong evidence that religious, ethnic and linguistic fractionalization increase the risk of the interstate armed conflicts, see for example Reynal-Querol (2002). We introduced ethnic, religious and linguistic fractionalization at origin. These indicators capture the probability that two randomly selected individuals belong to different groups. We used the data from Alesina et al. (2003). In order to capture the social fractionalization we calculated a composite indicator as follow:

$$FRA_d = Relig \ x \ Eth \ x \ Lang + Max \ (Relig, \ Eth, \ Lang)$$

Where *Relig, Eth* and *Lang* correspond respectively to religious, ethnic and linguistic fractionalization. By adding the maximum of the different fractionalization indexes we avoid considering a country as homogenous (a value of 0) if one component is equal to zero. The impact of this variable on the emigration rate is expected to be positive.

6.6. Welfare magnet and unemployment

There is a large debate in the migration literature on the welfare impact on immigrants' decision. See, for example, Borjas and Trejo (1991), Borjas (1999), Khoo (1994). In Borjas' terms (1999), the role of welfare programs in migrant's location choices has been referred to the "welfare magnet" theory. We included the variable SOC_d which measures the total social expenditures in percent of GDP. We expect that this variable will positively affect the emigration rates.

6.7. Economic and job opportunities

The next variable, UN_d, the receiving country unemployment rate, captures job opportunities for migrants. We used the OECD statistics[16] and compute the average rates for the period 1980-2000.

The log of the population at destination ($\ln POP_d$) captures the immigration capacity of receiving countries. It also captures the size of the market and economic opportunities at destination. The source of the data is the United Nations; we used the average 1970-2000. The migration size varies to a large extent between the OECD receiving countries. The proportion of immigrants in the population varies from less than 1 percent for South Korea, and Mexico to more than 25 percent in Australia, Luxemburg, and Switzerland.

## 6.8. Returns to education "skill premium"

An important strand of migration literature initiated by Borjas (1987) has analyzed the relation between the income distribution in the source and host countries and the abilities of the migrants. Borjas' self-selection model predicts that in the countries of origin with lower income inequalities compared to the country of destination there will be a positive self-selection of migrants (i.e. individuals with higher abilities will have a great incentive to migrate). In contrast, larger income dispersion in source countries with compared to destination countries will leads to negative self-selection of migrants (persons with lower abilities will be particularly attracted). To test for the self-selection hypothesis with regard to the education level of the migrants we consider the Gini-index on inequality provided by the World Bank' World development report as a proxy of difference in terms of returns to education 'skill premium' between countries of origin and destination. We expect that an increase of the returns to education in countries of destination relative to the countries of origin will have a positive impact on the high skilled persons' emigration rate.

6.9. Small African countries suffer huge brain drain

In absolute numbers, the main emigration countries are the largest one (Morocco, Nigeria, Kenya,…) whilst the smallest numbers are obtained for small countries. However, the DM data set reveals that in general small islands African nations, such Cape Verde (67 percent),

Seychelles (56 percent), Mauritius (56 percent), and Guinea-Bissau (24 percent), tend to exhibit the highest emigration rate while landlocked countries, such Lesotho (4 percent), Botswana (4 percent), Chad (2 percent), Central Africa Republic (7 percent), and Burundi (9 percent) have lower emigration rate. The graph 4 illustrates clearly this situation. In 2000, the average high-skilled emigration rate (41%) is obtained for small islands. By contrast, the landlocked African countries exhibit the lowest emigration rate (11%). We introduced in our model two dummy variables for islands and landlocked nations to capture that islands (landlocked countries) are in general more affected (less affected) by the brain drain.

Figure 4: High-skilled emigration rates (unweighted average) in landlocked and small islands African nations, in 2000
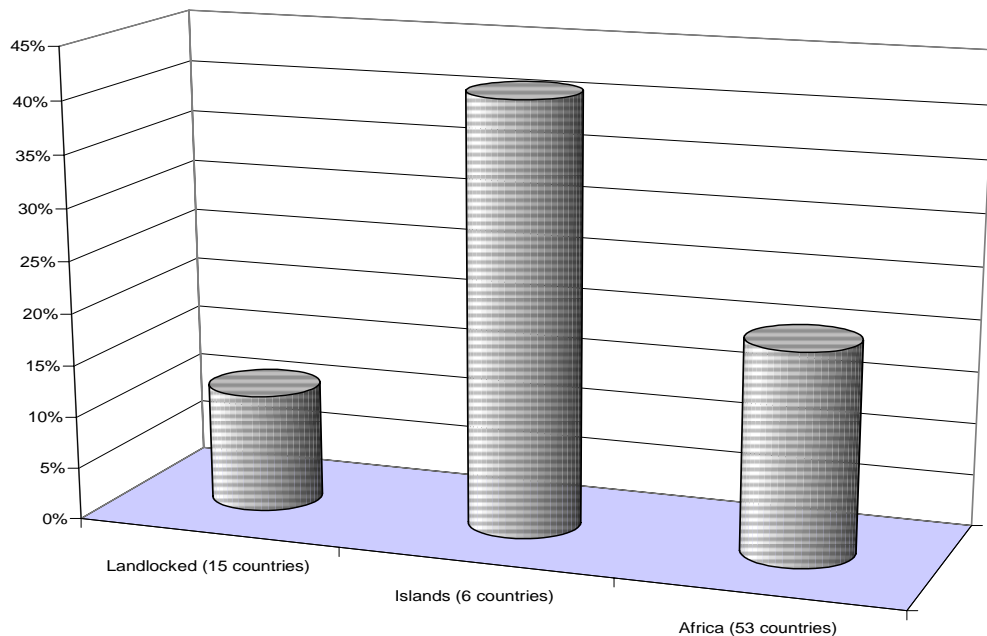
Between brackets the number of countries forming the different groups.
Source: Author's calculations based on Docquier and Marfouk (2006).

6.10. Immigration policy

Immigration policies also affect significantly both the size and the "quality" (skill composition) of migrants. While European countries did not select their immigrants the existence of selective programs such as point-systems in Canada, Australia and New Zealand, and H1B visas in the

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16 The data are available at: http://www.oecd.org/dataoecd/56/37/31613113.xls.

United States encourage skilled workers and discourage low-skilled migrants. Despite the importance of immigration policy, most of the previous empirical studies ignored the role of these variables as a determinant of migration flows, perhaps due to the difficulty of capturing these effects. Here, we included two dummy variables grouping countries with "similar" immigration policies. The first dummy $Ipol_{UE15}$ is equal to 1 if the immigrants-receiving country is a member of the 15 members of the European Union. The second $Ipol_{sel}$ is equal to 1 in countries where significant selective programs existed, i.e. in Australia, Canada, New Zealand and the USA. As the latter countries exhibit high immigration rates, we expect that $Ipol_{sel}$ will have a positive effect high-skilled workers emigration. By contrast, $Ipol_{UE15}$ is expected to exert a positive impact a negative or no effect (neutral). Because of the potential implications of our results, it is important to stress the limit of this indicator. In this context, the impact of this variable must be interpreted with extreme caution since the dummies can also capture regional specific effects unrelated to migration policies.

7. Empirical results

Our equation can be written as fellow:

$$
\begin{aligned}
m_{h,d}^{H} = {} & \beta_0 + \beta_1 \ln(GNI_d / GNI_h) + \beta_2 GNI_h + \beta_3 GNI_h^2 + \beta_4 \ln dist_{h,d} + \beta_5 col_{h,d} + \beta_6 ling_{h,d} \\
& + \beta_7 \ln POP_d + \beta_8 UN_d + \beta_9 SOC_d + \beta_{10} POP15-29_h + \beta_{11} civilwar_h + \beta_{12} FRA_h + \beta_{13} \ln(Gini_d / Gini_h) \\
& + \beta_{14} Islands_h + \beta_{15} Ipol_{UE15} + \beta_{16} Ipol_{sel} + \varepsilon_{h,d}
\end{aligned}
$$

(9)

Our dependent variables are the rates of emigration given by (1a). As emigration rate is based on emigration stocks and thus refers to past and recent emigration decisions, we used long-run averages for all explanatory time-varying variables. Among the determinants, we include a set of economic and non-economic factors described in section 6. Due to unavailability of information on Gini-index a proxy for skill premium 'returns to education' two receiving countries have been excluded (Czech and Slovak republics). We used emigration rates to 28 OECD receiving countries in 2000 and 53 African countries, i.e. for 1,484 observations. A small number of countries of origin have been excluded due to unavailability of information on independent variables.

One of the common characteristics between international migration, foreign direct investment, trade, and international aid is that many bilateral flows are equal to zero. Some of these null observations correspond to true zero flows, while others correspond to unreported information[17]. In our dataset the emigration rates are equal to zero in large number of cases (about 36 percent of censored values). Most empirical models of international migration have been estimated by standard OLS or IV methods by considering only positive values. Ignoring censored values would lead to a serious sample selection bias. To account for this problem, we used the Tobit model. As the Tobit estimates measure the impact of an explanatory variable on the latent dependent variable, interpretation is made clearer by computing their marginal effect, see MacDonald and Moffit (1980). For the continuous explanatory variables, these marginal effects are used to calculate elasticities at the sample means. For the discrete variables, the marginal effects are used to calculate percentage changes in the dependent variable when the variable shifts from zero to one.

Table 7 reports the results of the best specifications based on the most significant effects when multicollinearity problems are eliminated. The first column presents the benchmark model in which we introduced as explanatory variable a composite indicator capturing countries of origin' social fractionalization (ethnic, linguistic and religious). The other columns report the estimations of alternative specifications in which we consider different dimension of fractionalization separately. Table 8 reports for the different models the elasticities estimates at the sample mean.

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[17] Mayda (2005, p.11) in a study analyzing the determinants of migration flows to the OECD countries notes: "The data set includes zero flows in correspondence of some country pairs (immigrants inflows from Italy to the United States, from example)"

Table 7 - Tobit regressions, the benchmark model, dependent variable = high-skilled emigration rates (in percent)

	Benchmark model	Variant 1	Variant 2	Variant 3
Country of origin/destination variables				
GNI, PPP adjusted, per capita "destination/origin" in log	1.854***	1.865***	1.691***	1.886***
	(4.29)	(4.31)	(4.37)	(4.35)
Geographic distance (origin-destination), in thousand kilometers, in log	-1.516***	-1.324***	-0.838***	-1.491***
	(4.53)	(4.12)	(2.96)	(4.31)
Former colonial ties "destination/origin"	10.289***	10.305***	10.056***	10.265***
	(16.41)	(16.43)	(17.88)	(16.34)
Skill premium (Gini-index): destination/origin	1.975***	1.969***	1.408***	1.801***
	(3.90)	(3.88)	(3.03)	(3.59)
Country of origin variables				
GNI, PPP adjusted (origin), in thousand	1.556***	1.519***	1.288***	1.323**
	(3.25)	(3.18)	(3.02)	(2.84)
GNI, PPP adjusted, (origin), in thousand, squared	-0.112**	-0.101**	-0.088**	-0.083*
	(2.27)	(2.10)	(2.03)	(1.76)
Population 15-29 (origin), in percent of the total population	12.456	10.959	8.581	8.063
	(1.02)	(0.90)	(0.80)	(0.67)
Social fractionalization: linguistic, religious, ethnic (origin)	1.214***	-	-	-
	(2.91)			
Ethnic fractionalization (origin)	-	1.835***	-	-
		(2.64)		
Linguistic fractionalization (origin)	-	-	1.585***	-
			(3.23)	
Religious fractionalization (origin)	-	-	-	1.190**
				(2.03)
Small islands (origin)	1.933***	1.919***	0.971**	1.755***
	(4.00)	(3.96)	(2.04)	(3.68)
Landlocked (origin)	-0.653**	-0.494	-0.792***	-0.873***
	(2.24)	(1.59)	(3.03)	(3.03)
Country of destination variables				
Population (destination), in log	0.992***	0.988***	0.837***	0.994***
	(9.84)	(9.80)	(9.28)	(9.83)
Unemployment rate (destination), in percent	-0.165***	-1.588***	-0.118***	-0.162***
	(3.67)	(3.54)	(2.94)	(3.58)
Public social expenditures, (destination), in percent of GDP	0.191***	0.192***	0.165***	0.188***
	(5.74)	(5.78)	(5.51)	(5.66)
Immigration policy (EU15)	-0.386	-0.362	-0.347	-0.383
	(0.99)	(0.92)	(0.99)	(0.98)
Immigration policy (CAN, AUS, NEZ, USA)	4.735***	4.629***	3.834***	4.693***
	(9.86)	(9.72)	(9.03)	(9.72)
Constant	-19.990***	-21.254***	-20.294***	-17.952***
	(3.84)	(4.03)	(4.33)	(3.45)
Log-likelihood	-2471	-2472	-2261	-2474
Number of uncensored observations	818	818	783	818
Number of censored observations	470	470	449	470
Number of observations	1288	1288	1232	1288

*Note: Numbers between brackets are the absolute values of the t-ratios; *** significant at 1%; ** significant at 5%.*
* significant at 10%.

Table 8 - Marginal effects (computed at the mean values), benchmark model, dependent variable = high skilled workers emigration rate (in percent)

	Benchmark model	Variant 1	Variant 2	Variant 3
Country of origin/destination variables				
GNI, PPP adjusted, per capita "destination/origin" in log	0.647***	0.651***	0.672***	0.657***
	(4.27)	(4.29)	(4.34)	(4.33)
Geographic distance (origin-destination), in thousand kilometers, in log	-0.529***	-0.462***	-0.333***	-0.519***
	(4.50)	(4.10)	(2.95)	(4.29)
Former colonial ties "destination/origin"	8.086***	8.102***	8.114***	8.059***
	(13.24)	(13.26)	(14.72)	(13.17)
Skill premium (Gini-index): destination/origin	0.644***	0.642***	0.517***	0.586***
	(3.89)	(3.87)	(3.03)	(3.58)
Country of origin variables				
GNI, PPP adjusted (origin), in thousand	0.952***	0.929***	0.886***	0.807***
	(4.50)	(3.17)	(3.01)	(2.83)
GNI, PPP adjusted, (origin), in thousand, squared	-0.221**	-0.200**	-0.196**	-0.164*
	(2.27)	(2.09)	(2.03)	(1.76)
Population 15-29 (origin), in percent of the total population	1.155	1.016	0.905	0.746
	(1.02)	(0.90)	(0.80)	(0.67)
Social fractionalization: linguistic, religious, ethnic (origin)	1.324***	-	-	-
	(2.90)			
Ethnic fractionalization (origin)	-	0.404***	-	-
		(2.64)		
Linguistic fractionalization (origin)	-	-	0.399***	-
			(3.21)	
Religious fractionalization (origin)	-	-	-	0.206**
				(2.03)
Small islands (origin)	0.966***	0.959***	0.457*	0.864***
	(3.43)	(3.40)	(1.85)	(3.19)
Landlocked (origin)	-0.266**	-0.203	-0.322***	-0.353***
	(2.30)	(1.62)	(3.15)	(3.14)
Country of destination variables				
Population (destination), in log	0.346***	0.345***	0.332***	0.346***
	(9.60)	(9.57)	(9.07)	(9.59)
Unemployment rate (destination), in percent	-0.408***	-0.392***	-0.331***	-0.398***
	(3.66)	(3.53)	(2.94)	(3.57)
Public social expenditures, (destination), in percent of GDP	1.324***	1.334***	1.300***	1.304***
	(5.71)	(5.75)	(5.48)	(5.63)
Immigration policy (EU15)	-0.162	-0.152	-0.147	-0.161
	(0.92)	(0.92)	(0.99)	(0.97)
Immigration policy (CAN, AUS, NEZ, USA)	2.768***	2.691***	2.208***	2.736***
	(7.91)	(7.82)	(7.31)	(7.81)
Log-likelihood	-2471	-2472	-2261	-2474
Number of uncensored observations	818	818	783	818
Number of censored observations	470	470	449	470
Number of observations	1288	1288	1232	1288

*Note: Numbers between brackets are the absolute values of the t-ratios; *** significant at 1%; ** significant at 5%.*
* significant at 10%.

As expected, the income differential has a positive effect on Africa high-skilled emigration to the OECD member states. Relying on the Benchmark model estimation results, a ten percent increase in living standards (Gross national income per capita, PPP adjusted) between the OECD member states and the African countries leads to an increase of the continent high-skilled emigration rate by 6 percent (column 1 table 8). However, the gross national income per capita at origin unambiguously impacts on emigration rates (the linear term is positive while the squared term is negative). This supports the predictions of Schiff (1996), Faini and Venturini (1993), Vogler and Rotte (2000), and Hatton and Williamson (2001) who argued that the relationship between income per capita and emigration rate can be depicted by an inverted U-shaped function.

Our results show that the effect of distance "a proxy of monetary and no monetary migration costs" is negative. Relying on the marginal effect reported in table 8 (column 1) ten percent increase in distance leads to a decrease of high-skilled emigration rate by 5 percent.

Unsurprisingly, past colonial links and linguistic proximity between African countries and the OECD member states appeared to be important forces driving Africa high-skilled emigration. The explication is that the skills acquired prior to migration are more transferable to the destination countries sharing the same language. This result supports Funkhouser and Ramos' (1993) argument that skills prior to migration are not equally transferable to all potential host countries and the fact that education of the immigrants and their proficiency in the official language are complements in the labor market, Hiebert (2002) and Chiswick and Miller (2002). Mayda (2005) found that sharing a common language was not always a significant effect while Pederson et al. (2004) found a positive effect on migration flows. Analysing the determinants of migration flows into the OECD member states[18], Mayda (2005) found the former colonial ties has no effect on emigration rates. Pederson et al. (2004) found a significant relationship.

Our results also reveal that high-skilled emigration rates are inversely related to unemployment rate at destination. A one percent point increase in unemployment rate at destination countries induces a decrease in high-skilled emigration rate by 0.4 percent.

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18 Pederson et al. (2004) and Mayda (2005) data sets cover respectively 27 destination OECD countries and 127 countries of origin, over the period 1990-2000 and 14 destination countries over the period 1980-1995.

We found that the population in the receiving country is a proxy of the immigration capacity and of economic opportunity at destination. A ten percent increase in the destination country population (in logs) generates a 3 percent rise in skilled migration rate.

The social welfare programs in receiving countries affect positively the African countries high-skilled emigration rate. A one percent point increase in public social expenditure in percent of the GDP at destination induces an increase in high-skilled emigration rate by 1.3 percent.

We obtain a positive and significant effect of country of origin fractionalization (social, religious, ethnic and, linguistic and religious), proxy of lateness tensions and bad quality of institutions, on the Africa brain drain.

Difference in terms skill premium 'returns to education' between countries of destination and origin also has an important impact on high skilled emigration from Africa. The result suggests that higher returns to education in the receiving countries relative to countries of origin increase the Africa brain drain.

The four traditional immigration nations (Australia, Canada, New Zealand, and the United States) immigration policies encourage high-skilled workers emigration from Africa. In contrast, the European Union countries immigration policies have no effect (neutral) on high-skilled workers emigration form Africa. These result suggests that the shift of the immigration policies of the OECD countries towards an increasingly migrant's selection systems more liberal for high-skilled workers and very restrictive for low-skilled flows, especially those coming from developing world, would intensify the Africa brain drain.

Finally, our estimations show that the effect of the population increase in the young cohort at origin is not statistically significant.

8. Conclusions

There is amount of evidences indicating that better endowed nations in human capital grew more rapidly. Despite the role of education as a source of economic growth and development many African countries continue to experience high illiteracy rates and low education attainment. While, this deficit indicates for Africa primary and secondary education remain important a large number of the continent nations face a substantial skilled emigration to developed countries. The consequence of this large outflow of highly educated population a number of African countries

experienced a high brain drain. A recent study found that ten African countries have lost more than 40 per cent of the their tertiary educated labor force due to emigration to OECD member states and number of countries, such Cape Verde (67 percent), Gambia (63 percent), Seychelles (59 percent), and Sierra Leone (53 percent), and Mozambique (45 percent), suffered a massive brain drain (see, Docquier and Marfouk, 2006). This large outflow of highly skilled persons can be unfavorable for Africa growth and development.

Today, a number of OECD immigrant-receiving countries are thinking about reforms of their immigration policy. Besides controlling the immigration volume, the selection of immigrants is an issue that has caused a rising concern in the debates on immigration. There is no doubt that the shift of the immigration policies of the OECD countries towards an increasingly migrant's selection systems more liberal for highly skilled workers and very restrictive for unskilled flows, especially those coming from developing world, would intensify the Africa brain drain. In this context, a comprehensive analysis of the forces driving Africa high-skilled emigration would help policy makers in emigration countries to control and monitor better their losses highly skilled workers.

Relying on a unique bilateral data set on international migration by education attainment, this study analyzes the determinants of the African brain drain. We found that wage gap between countries of origin and destination, former colonial links and linguistic proximity, economic and jobs opportunities in destination countries, and selective immigration policy in OECD receiving countries are significant determinants of Africa migration. These findings suggest that the Africa brain drain results from multiple possible causes, many of which cannot be affected by policy makers (such as geographical specificities, proximity between countries of origin). Focusing on areas that can be influenced by public policy, such as increase of the returns to education 'skill premium', the creation of economic and job opportunities for high-skilled in regions of origin workers could help to reduce Africa brain drain.

References

Adams R. (2003), "International Migration, Remittances and the Brain Drain: A Study of 24 Labor-Exporting Countries", Policy Research Working Paper 2972, Washington, D.C.: World Bank.

Alesina A., Devleeschauwer A., Easterly W., Kurlatand S., and Wacziarg R (2003),"Fractionalization", Journal of Economic Growth (2003) 8(2):155–94.

Arthur, A. J. (1991), "International Labor Migration patterns in West Africa", African Studies review, 34(3), p.p. 65-87.

Baker M. and Benjamin D. (1994), "The performance of immigrants in the Canadian labor market", Journal of labor economics, 12(3), p.p. 369-405.

Bogue D. J. and Thompson W. S. (1949), "Migration and distance", American Sociological Review, 14(2), p.p. 236-244.

Borjas G.J. (1985), "Assimilation, change in cohort quality, and the earnings of immigrants", Journal of labor economics, 3(4), 463-489

Borjas G.J. (1987), "Self selection and the earnings of immigrants", American Economic Review, 77(4), 531-553

Borjas G. J. 1994. "The Economics of immigration", Journal of Economic Literature, 32(4), p.p. 1667-1717.

Borjas G. J. 1995, "The Economics benefits from migration", The Journal of Economic perspectives, 9(2), p.p. 3-22.

Borjas G. J. (1999), "Immigration and welfare magnets", Journal of Labor Economics, 17(4), p.p. 607-637.

Borjas G. J. and Trejo S. J. (1991), "Immigrant participation in the welfare system", Industrial and Labor Relations Review, 44 (2), pp. 195-211.

Carrington W. J. and Detragiache E. (1998), "How Big Is the Brain Drain?", IMF Working Paper 98/102, Washington, D.C.: International Monetary Fund.

Carrington W. J. and Detragiache E. (1999), "How Extensive Is the Brain Drain? ", Finance and Development, 36(2), p.p. 46–49.

Chiswick B.R. (1978), "The effect of Americanization on the earnings of foreign-born man", Journal of Political Economy, 86(5), p.p. 897-921.

Chiswick B.R. and Miller P.W. (1992), "Language in the labor market: the immigrant experience in Canada and the United States", in Chiswick, B.R (eds.), Immigration, language and ethnic issues: Canada and the United States, American Entreprise Institute, Washington.

Clark X., Hatton T.J. and Williamson J.G. (2002), "Where do U.S. immigrants come from, and why?", NBER, No. 8998;

Détang-Dessendre C., Drapier C. and Jayet H. (2004), "The impact of immigration on wage: empirical evidence from French youth", Journal of Regional Science, 44(4), p.p. 661-691.

DeVortez D.J., Hinte H. and Werner Ch. (2000), "Some immigrant language lessons from Canada and Germany", Research on immigration and integration in the metropolis (RIIM), Working Paper Series, No. 00-20, October.

Docquier F., Lohest O., and Marfouk A. (2007), "Brain drain in developing countries", World Bank Economic Review, June.

Docquier F. and Marfouk A. (2006), "International migration by educational attainment (1990-2000)", in C. Ozden and M. Schiff, International migration, remittances and development, Parlgrave Macmillan, New York.

Docquier F., Lohest O., and Marfouk A. (2005), "Brain drain in developing regions (1990-2000)", IZA Discussion Paper, No. 1668, IZA-Bonn.

Docquier F., Lohest O., and Marfouk A. (2005), "Union européenne et migrations internationales: L'UE contribue t-elle à l'exode des travailleurs qualifiés", Revue Economique, Vol. 56(6), November.

Docquier, F. and A. Marfouk (2004), "Measuring the international mobility of skilled workers (1990-2000)–release 1.0 " , Policy Research Working Paper, No. 3382, World Bank.

Edin P-A., Lalonde R.J. and Aslund O. (2000), "Emigration of immigrants and measures of immigrant assimilation: Evidence from Sweden", Swedish Economic Policy Review, 7, p.p. 163-204.

Faini R. and Venturini A. (1993), "Italian migrations: the pre-war period", in Hatton and J. Williamson (eds.), International Migration and World Development, 1850-1939, London: Routledge.

Funkhouser E. and Ramos F.A. (1993), "The choice of migration destination: Dominican and Cuban to the mainland United States and Puerto Rico", International Migration Review, 27(3), p.p. 537-556

Hatton T.J. and Williamson J.G. (2002), "What fundamentals drive world migration?", Centre for economic policy research, Discussion paper, No. 458, December, Australian national university.

Hatton T.J. and Williamson J.G. (2001), "Demographic and economic pressure on emigration out of Africa", NBER, Working papers Series, No. 8124, February.

Hayfon J.E. (1998), "The performance of immigrants in the Norwegian labor market", Journal of Population Economics, 11, p.p. 293-303.

Hiebert D. (2002), "Canadian immigration and the selection-settlement service trade-off: Exploring immigrant economic participation in British Columbia", Research on immigration and integration in the metropolis (RIIM), Working Paper Series, No. 02-25, October.

IOM (2005), World migration 2005: Costs and Benefits of international migration, International Organization for Migration. Geneva.

Khoo S.E. (1994), "Correlates of welfare dependency among immigrants in Australia", International Migration Review, 28(1), p.p. 68-92.

Lacina B. and Gleditsch N.P. (2005), "Monitoring trends in global combat: A new dataset of battle deaths" European Journal of Population, 21, p.p. 145-166.

La Porta R., Lopez de Silanes F., Shleifer A., and Vishni R. (1999), "Quality of government", Journal of Law, Economics and Organization, 15(1), p.p. 222-279

Lowell L.B. (2002a): Policy responses to the international mobility of skilled labour, International Migration Papers 45, International Labor Office (ILO), Geneva.

Lowell L.B. (2002b): Some developmental effects of the international migration of highly skilled persons, International Migration Papers 46, International Labor Office (ILO), Geneva.

Marfouk A. (2006), "Emigration Stopper l'Hémorragie", in L'Etat de l'Afrique 2006, Jeune Afrique, No. 12, p.p. 128-131.

Mauro P. (1995), "Corruption and growth." Quarterly Journal of Economics 110, pp. 681–712.

Mayda A.M. (2005), "International migration: a panel analysis of economic and non-economic determinants", IZA Discussion Paper, n. 1590.

OECD (2002): Trends in international migration, Paris: OECD Editions.

Pedersen P.J., Pytlikova M., and Smith N. (2004), "Selection or network effects? Migration flows into 27 OECD countries, 1990-2000", IZA Discussion Paper No. 1104, Bonn.

Reynal-Querol M. (2002), "Ethnicity, political systems, and civil war", the Journal of Conflict Resolution, 46 (1), p.p. 29-54.

Roy A.D. (1951), "Some thoughts on the distribution of earnings", Oxford Economic Papers, 3, 151-146.

Schiff M. (1996): South-North migration and trade - a survey, World Bank Policy Research, Working Paper, No. 1696.

Schwartz A. (1973), "Interpreting the effect of distance on migration", Journal of Political Economy, 81, p.p. 1153-1169

Thalhammer E., Zucha V. , Enzenhofer E., Salfinger B., and Ogris G. (2001), Attitudes towards minority groups in the European Union, a special analysis of the Eurobarometer 2000 survey on the behalf of the European monitoring centre on racism and xenophobia, Sora, Vienna, March.

United Nations (2002), International migration report, UN Population Division, New York.

Vogler M. and Rotte R. (2000), "The effect of Development on Immigration Theoretical Issues and new Empirical Evidence", Journal of Population Economics, 131, p.p. 485-508.

Wickramasekera P. (2002): Asian labour migration: issues and challenges in the era of globalization, International Migration Papers, 57, International Labor Office (ILO), Geneva.

World Bank (2005), World Development Indicators, World Bank, Washington D.C.