Cross-Border Migration, Employment and Economic Growth

BACKGROUND RESEARCH PAPER

Frédéric Docquier

Submitted to the
High Level Panel on the Post-2015 Development Agenda

May 2013

Cross-Border Migration, Employment and Economic Growth[1]

Frédéric Docquier

FNRS and IRES, Université Catholique de Louvain

May 2013

1. Introduction

In 2000, the United Nations member states and international organizations agreed to target eight Millennium Development Goals for the year 2015. Increasing human capital (education and health), combating gender inequality and eradicating extreme poverty are among the high priorities. Another objective of the Millennium declaration is to set-up a global partnership for development that addresses the special needs of vulnerable groups, including the least developed countries, landlocked developing countries and developing small island states. This requires industrialized countries to conduct more development-friendly trade, debt relief and development assistance policies.

Although there are clearly forces that create the potential for explosive economic growth in poor countries (e.g. China, India, Brazil, etc.) and regions (East Asia), there are also opposing strong forces for stagnation or "implosive" decline. In particular, the lack of economic growth, rampant poverty and the correlates of poverty (weak institutions, discrimination, political repression, lack of freedom, etc.) motivate people to flee their own country; highly skilled workers are found to be far more responsive to economic push-pull factors when compared to the low skilled (see Grogger and Hanson, 2011, or Docquier et al., 2007). Positive selection in emigration can be harmful for poor countries, especially for the least developed countries and small island developing states experiencing a large brain drain. In the first Millennium declaration, the role of cross-border migration and migration policies is ignored. This paper provides an up-to-date and comprehensive analysis of the effect of cross-border migration on the world distribution of human capital and discusses the potential implications for development and for the effectiveness of development policies.

[1] This paper was funded by the United Nations' High-Level Panel convened to construct the post-2015 Millennium Development Goals agenda, co-chaired by President Susilo Bambang Yudhoyono of Indonesia, President Ellen Johnson Sirleaf of Liberia and Prime Minister David Cameron of the United Kingdom. I also acknowledge financial support from the Belgian French-speaking Community (convention ARC 09/14-019 on "Geographical Mobility of Workers and Firms"). The usual disclaimers apply.

I show that transfers of human capital from the South to the North have been increasing over the last few decades. Although the proportion of international migrants in the world population has been fairly stable, immigration rates in high-income countries have tripled since 1960, following the same trajectory as the world trade/GDP ratio. An increasing proportion of these migrants originate from developing countries: South-North migration is a key component of globalization. This has affected the geographic distribution of human capital across the world. With very few exceptions, emigrants from both developing and OECD source countries are more educated than those left behind. The intensity of positive selection increases with poverty and inversely with size, the smallest states being most affected. Hence, brain drain rates range from a few percent to 85 percent of the high-skilled native labor force, and the most affected countries are small, poor, English-speaking countries located under the tropics.

Second, the effect of emigration on development and welfare in the source countries is likely to be heterogeneous. Due to positive selection, many countries exhibit large brain drain rates. An increasing literature has shown that the brain drain can be the source of beneficial effects for source countries. Most likely, a situation of beneficial brain drain can only be obtained in a very limited number of relatively large, intermediate-income developing countries. In industrialized countries and in the vast majority of developing countries, the brain drain appears to be a curse. This is particularly the case of the least developed countries and developing small island states. Addressing the problem requires closer integration between development strategies and the management of migration policies. More precisely, complex (bi-directional) interactions between the brain drain and poverty can be the source of vicious/virtuous circles and multiple equilibria. Developing small island states are more exposed to the risk of coordination failure because migration is more responsive to wage differentials. Forcing people to stay put is clearly not the best option since some origin countries are characterized by high levels of political instability, violence, discrimination, corruption, etc. However the analysis presented in this paper identifies about twenty small states where the brain drain and poverty could be reduced using specific development policies such as a temporary subsidization of the repatriation of their high-skilled expatriates.

In industrialized countries, attitudes towards immigration and incentives to reform immigration policies partly depend on the economic costs and benefits of immigration. These costs and benefits are clearly related to the educational structure of the immigrants. This structure varies across countries and cohorts of immigrants. Stock data from OECD countries reveal that immigrants can be more or less educated than native populations depending on the average income level of the destination country and on its immigration policy (skill-selective or not). Data on recent migration flows show that recent immigrants are more educated than native born populations in almost all OECD countries, although comparability of national and foreign degrees is a key issue. As far as the economic impact of immigration is concerned, immigration has little labor market and fiscal effect in OECD destination countries. On average and contrary to popular belief, recent immigration has increased natives' average labor income, reduced wage inequality and decreased the fiscal pressure. The gains are larger in countries operating selective policies, implying that more selective policies could be used to magnify the economic benefits from immigration. Nonetheless, at the current level of

immigration, gains are also observed in non-selective countries. Immigration should be seen as a more explicit component of development policies and international coordination is desirable to internalize the beneficial spillover effects of South-North, low-skilled migration.

Finally, I also investigated the global benefits that could be induced by a further liberalization of cross-border migration. The gains appear to be limited. This is because, according to survey data on desired migration, the number of additional migrants would be relatively low. These new migrants mainly come from developing countries and want to emigrate to the United States, Europe and Saudi Arabia. They are slightly more educated than those left behind, but much less educated than non-migrants at destination. Hence, liberalizing migration would reduce human capital in virtually all the regions of the world. If productivity depends on the average percentage of high-skilled workers in a country, productivity would fall in almost all regions. This effect almost balances the huge income gains experienced by new migrants themselves. The estimates provided in this paper reveal that in some pessimistic albeit realistic scenarios, liberalizing labor mobility could increase world GDP by about 3.5 percent. The inequality effects of liberalization are unclear. Income per worker would decrease in poor countries due to positive selection of their emigrants. However, at current remittance rates, remittances sent to those left behind could exceed the decrease in local revenues.

The remainder of this paper is organized as follows. Section 2 uses recent migration databases to analyze the evolution of cross-border migration and its effects on the geographical distribution of human capital. Section 3 studies the economic implications of immigration for OECD receiving countries and discusses some policy issues. Section 4 reviews the literature on emigration and investigates the complex interactions between the brain drain and development. In Section 5, I explore the possible consequences of a complete liberalization of cross-border migration on the world economy. Section 6 concludes.

2. Size and structure of cross-border migration

Although many aspects of migration have been analyzed by demographers, economists, sociologists and other social scientists, data constraints have long impeded some important research avenues. Recently, several databases have been constructed to document human migration by country of origin, country of destination, gender and education level. These studies confirm that cross-border migration is a powerful force that shapes the distribution of human populations across the globe thereby affecting their social, political, and economic structures. In this section, I will refer to a number of recent migration datasets to analyze the size, development, and spatial distribution of international migration. I first describe the global trends observed during the last five decades (Section 2.1). Then I'll focus on the nineties and characterize the education levels of immigrants and emigration (Sections 2.2 and 2.3). Finally, I will introduce the concept of "balance of brains" and study how cross-border migration affects the geographical mobility of human capital (Section 2.4).

2.1. Global assessment

The United Nations' International Migrant Stock database provides time series data on the numbers of immigrants, by country of destination, by age and by sex. It reveals that the number of international migrants increased from 75 million in 1960 to 214 million in 2010, at about the same pace as the world population, meaning that the world migration rate increased only slightly, from 2.5 to 3.1 percent of the world population. The major part of this change is actually artificial and due to the dislocation of the former Soviet Union and Eastern European countries. Workers born in the new Republics were treated as Soviet, Yugoslavian or Czechoslovakian natives in the 1985 wave; they have been treated as international migrants since 1990. As apparent from Figure 1.a, the proportion of international migrants rose from 2.3 to 2.9 percent between 1985 and 1990. Correcting for the fall of the Berlin wall, the actual proportion of cross-border migrants has remained fairly stable since 1960. Over the same period, the world trade/GDP ratio increased threefold, rising from 0.1 to 0.2 between 1960 and 1990 and from 0.2 to 0.3 between 1990 and 2000 (grey curve on Figure 1.a). The ratio of foreign direct investment (FDI) to world output, on the other hand, increased threefold during the 1990s alone. One might conclude that globalization is mainly about trade and FDI, not migration.

The picture changes once the focus is narrowed to migration to developed countries. The proportion of cross-border migrants residing in high-income countries increased from 43 to 60 percent between 1960 and 2010. As shown on figure 1.b, the average immigration rate to high-income countries, as measured by the share of the foreign-born in the total population of these countries, has tripled since 1960 and doubled since 1985, following the same trajectory as the trade/GDP ratio (although the scale of migration differs from that of trade).

Where do these migrants come from? The United Nations International Migrant Stock database lacks a bilateral dimension. This problem is addressed in Ozden et al. (2011), (referred to as OPSW henceforth). OPSW collected and harmonized over 1,000 censuses and population registers to construct comprehensive matrices of origin-destination stocks that correspond to the last five completed census rounds. They specified a standard and common set of countries for the entire period, disaggregating data for the countries that no longer exist on the basis of more recent migration figures. There is no artificial variation due to the dislocation of the Eastern Block. Finally, the OPSW database focuses on economic migrants and does not include refugees, as opposed to the International Migrant Stock database of the United Nations. The OPSW data reveal that the global migrant stock increased from 92 to 165 million between 1960 and 2000. As a proportion of the world population, the migrant stock declined between 1960 and 1990, from 3.05% to 2.63%; after which it again rose to 2.71% in 2000.

The OPSW database provides a comprehensive picture of bilateral global migration over the last half of the twentieth century. Figure 1.c and 1.d disentangle the stock of migrants by country of destination and country of birth. I distinguish here the 30 High-income OECD member states (referred to as the North, and labeled HIOECD) and the other countries (referred to as the South, and labeled non-HIOECD). The HIOECD group includes members

of the OECD except for four Upper-Middle-Income countries: Chile, Latvia, Mexico, and Turkey.

As shown on Figure 1.c, South-South migration dominates the global migrant stock: the number of South-South migrants amounted to 72.6 million in 2000, constituting about 44.6 percent of all international migrants. Then comes South-North (55.4 million) and North-North migrations (28.3 million), representing 34.0 and 17.4 percent of all migrants. North-South corridors are the least used. The trend reveals that the growth in the number of migrants is largely driven by the emigration from the South to the North, which increased from 10.8 million to 55.4 million between 1960 and 2000; the number of North-North migrants has remained fairly stable.

Table 1 identifies the main migration corridors in 2000 and corridors with the greatest increase in the number of migrants over the period 1960-2000. The United States appears as the destination for many important North-North and South-North corridors. The situation is more diversified for South-South corridors. Due to their size, India and Russia are important destinations. The data reveal the emergence of Saudi Arabia and other oil producing countries as major destination countries.

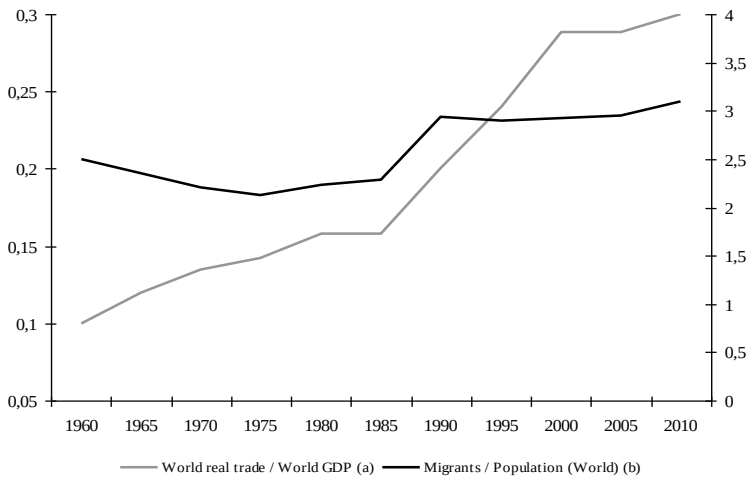
2.2. Structure of immigration to OECD destination counties

Migration of the highly skilled (or educated) is a particular source of concern for some countries as it has significant growth and development implications for origin and destination countries. I have already shown that immigration rates in high-income OECD countries are larger than in the rest of the world, that they have increased significantly faster in the last 50 years, and that an increasing share of these migrants are originating from the South. As cliché as it may seem, the media of most industrialized countries commonly portrays a massive flow of poorly educated individuals from poor countries to rich. Is it the case?

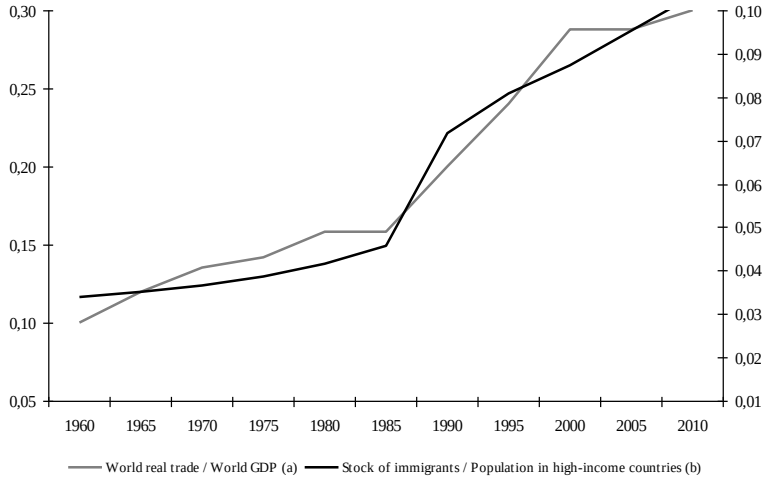
The OPSW longitudinal database cannot be used to address this question. While it significantly broadens the time, gender and geographical coverage of the available data, different skills or education levels are not distinguished. Another set of studies has investigated the education structure of cross-border migration. Docquier and Marfouk (2006) and Dumont and Lemaitre (2004) collected detailed census and register data on immigration from all the host countries of the OECD. Docquier, Ozden, Parsons and Artuc (2012) (referred to as DOPA henceforth) generalized these works and built comprehensive matrices of bilateral immigrant and emigrant stocks for 195 countries in 1990 and 2000 for two skill/education levels, denoted by *s*. They used the OECD immigration data from Docquier and Marfouk (2006) and supplemented them with similar census data from 46 and 31 additional destination countries in 2000 and 1990, respectively. For the rest of the destination countries where census data is not available, they predicted bilateral migrant stocks using a gravity framework. Their methodology is described in greater detail in Docquier et al. (2012).

Figure 1. Global migration patterns, 1960-2010

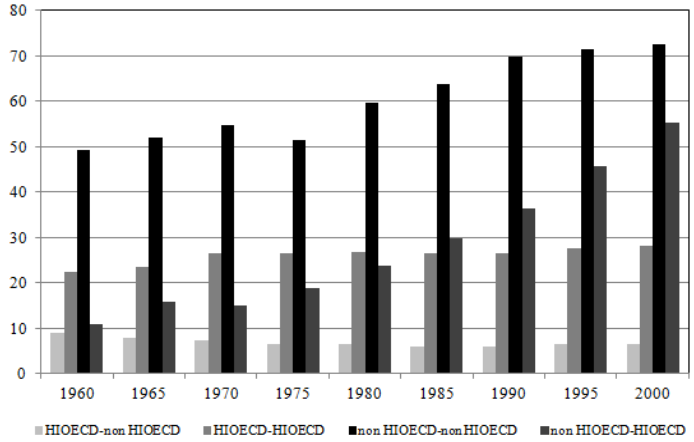
1.a. World migration and trade 1960-2010



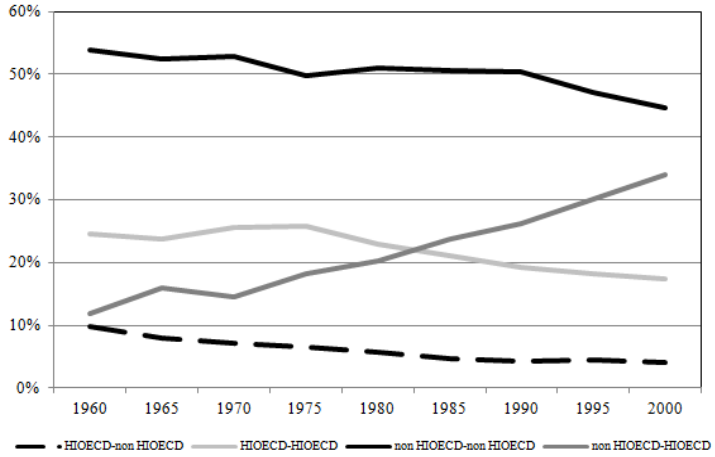
1.b. Immigration to high-income countries and trade 1960-2010



1.c. Geographic structure of international migration (million)



1.d. Geographic structure of international migration (percent)



Sources: (a) Barriel, M. and M.R.W. Dean (2004), "Why has World Trade Grown Faster than World Output?". Bank of England Quarterly Bulletin (http://ssrn.com/abstract=700072); (b) United Nations, Population Division, available at http://esa.un.org/migration/; (c) Ozden, Parsons, Schiff and Walmsley (2011)

Table 1. Main migration corridors

Stock of migrants in 2000			Change in migration stocks, 1960-2000		
Origin	**Destination**	**No. of migrants**	**Origin**	**Destination**	**No. of migrants**
From OECD to OECD			From OECD to OECD		
Poland	Germany	1,999,975	Korea	United States	884,080
Germany	United States	1,250,815	Ireland	UK	622,658
United Kingdom	Australia	1,026,553	Italy	Germany	412,729
Canada	United States	950,549	Japan	United States	385,546
Korea	United States	896,982	Poland	France	325,959
United Kingdom	United States	833,858	Greece	Germany	321,351
Poland	France	800,387	New Zealand	Australia	304,643
Korea	Japan	685,943	UK	Australia	302,157
Italy	Germany	629,291	Slovakia	Czech Republic	266,119
Ireland	UK	623,521	Germany	United States	215,546
From non-OECD to OECD			From non-OECD to OECD		
Mexico	United States	9,367,910	Mexico	United States	8,757,123
Turkey	Germany	2,008,979	Turkey	Germany	1,981,993
Philippines	United States	1,505,820	Philippines	United States	1,394,019
Algeria	France	1,057,135	India	United States	1,027,410
India	United States	1,041,320	Vietnam	United States	1,014,035
Vietnam	United States	1,028,454	China	United States	911,028
China	United States	1,016,412	El Salvador	United States	820,130
Russia	Germany	978,793	Cuba	United States	809,399
Cuba	United States	894,560	Dominican Republic	United States	693,629
El Salvador	United States	827,583	Russia	Germany	692,584
From non-OECD to non-OECD			From non-OECD to non-OECD		
Russia	Ukraine	3,833,773	Bangladesh	India	3,776,876
Bangladesh	India	3,789,377	Kazakhstan	Russia	1,441,729
Ukraine	Russia	3,497,193	India	Saudi Arabia	995,200
Kazakhstan	Russia	2,539,368	Egypt	Saudi Arabia	968,095
India	Pakistan	2,512,906	Uzbekistan	Russia	901,847
China	Hong Kong	2,164,744	Indonesia	Malaysia	879,930
Russia	Kazakhstan	1,944,419	Burkina Faso	Cote d'Ivoire	849,561
Pakistan	India	1,331,659	India	UAE	750,421
Burkina Faso	Cote d'Ivoire	1,252,098	Azerbaijan	Russia	730,093
India	Saudi Arabia	1,007,649	Afghanistan	Iran	719,907

Source: Ozden, Parsons, Schiff and Walmsley (2011).

The DOPA dataset only records individuals (migrants and non-migrants) aged 25 and over as a proxy of the working-age population. This choice maximizes the comparability between migration and labor force data for a given level of education (the well-known Barro and Lee's database on educational attainments documents the education levels of resident workers aged 15+ or 25+ in many countries). Furthermore, it excludes a large number of students who emigrate temporarily to complete their education or children who migrate with their families and are not yet active in the labor market (this explains why the 25+ category is preferred to the 15+). High-skilled individuals are those with college education ($s=h$) and the others are the less educated ($s=l$). The database is composed of four 195×195 matrices (one for each skill level and for each year).

Denoting by $M_{ij,t}^{s}$ the number of migrants with education level s ($s=h,l$) from country i to country j at year t, the resident and native populations are respectively defined as:

$$L_{i,t}^{s} \equiv \sum_{j} M_{ji,t}^{s} \ , \ N_{i,t}^{s} \equiv \sum_{j} M_{ij,t}^{s} \ .$$

The stock of immigrants to country i is defined as

$$I_{i,t}^{s} \equiv \sum_{j \neq i} M_{ji,t}^{s} \ .$$

To characterize the structure of immigration, I computed the following indicators:

$$i_{i,t}^{s} \equiv I_{i,t}^{s} / N_{i,t}^{s} \ , \ ni_{i,t}^{s} \equiv (I_{i,2000}^{s} - I_{i,1990}^{s}) / N_{i,1990}^{s}$$

for all education types or for high-skilled workers only. Variable $i_{i,t}^{s}$ gives the stock of immigrants of type s at year t as percentage of the native population of the same type. Variable $ni_{i,t}^{s}$ gives the net change in the stock of immigrants of type s between 1990 and 2000 (a measure of "net immigration flows") as percentage of the native population at the starting date 1990. Immigration reduces the proportion of college graduates in the economy if $(n)i_{i,t}^{h} < (n)i_{i,t}^{l}$, or equivalently, $(n)i_{i,t}^{h} < (n)i_{i,t}^{l+h}$.

Results for all OECD countries are presented in Table 2. It is worth noticing that census data is available for all OECD countries. Imputed/estimated data is only used to capture emigration to non-OECD destination countries, a variable used to proxy the size of the native labor force in the DOPA database.

Focusing on stock data for the year 2000, it appears that the greatest immigration rates are observed in Israel, Estonia, Switzerland, Luxembourg, Canada and New Zealand. On the contrary, immigration is low in Chile, Hungary, Japan, Mexico, Korea or Slovakia. In half of the sample, high-skilled immigration rates exceed average immigration rates: this is the case in countries conducting selective immigration policies (Canada, Australia, and New Zealand), Scandinavian countries and less advanced countries where immigration rates are low (Eastern Europe, Southern Europe, Mexico, and Turkey). On the contrary, in many Western European

countries, immigration is biased towards the less educated and reduces the proportion of educated workers. This is particularly the case in Austria, Belgium, France, Germany where the stock of immigrants includes many low-skilled migrants who arrived before the oil crisis of the seventies (as a consequence of guest-worker programs) and their family members. Similar patterns were observed in 1990.

Focusing on recent migration flows (net flows observed over the nineties), the picture is different. In all OECD countries with positive net immigration rates (with the exception of Austria), immigration rates for college graduates were larger than the average rates. In some prominent destinations such as Israel, Ireland, Iceland, Canada, Australia and the United Kingdom, the immigration rates for college educated workers were more than twice as large as the overall immigration rates. Therefore, recent immigration contributed to increase the share of college educated individuals in the labor force of all countries in our sample (again with the exception of Austria). Estonia had negative immigration rates, implying large returns of existing immigrants and even larger return rates for college educated immigrants. The data used so far covers migration patterns in the 1990's. Only with the collection and dissemination of data from the 2010 censuses, will an analysis of the last decade of migration for different education groups be possible. However, European Data from the EU Labor Force surveys and US data from the American Community Survey reveal the same patterns for the period 2000-2007, a period of large immigration flows from Northern Africa and the Middle East to Europe, and from Latin America to the US (see Docquier, Ozden and Peri, 2013).

The migration data is less than perfect. For example, undocumented migrants are not fully measured among immigrants, and schooling is an imperfect measure of their human capital levels. I will tackle some of these issues in the next sections. However the view of a massive flow of uneducated individuals from poor countries to OECD is not confirmed by the primary data. The share of college graduates among recent immigrants exceeds the share among natives in virtually all OECD countries. These patterns have clear implications for the potential labor market and the fiscal effects of immigration, especially on less-educated native workers (see Section 3.1).

Table 2. Immigration rates to high-income OECD destination countries

Country	Net flows 2000-1990 (a)		Stocks in 2000 (b)		Stocks in 1990 (b)	
	Total	College	Total	College	Total	College
Australia	0,053	0,202	0,379	0,565	0,409	0,512
Austria	0,092	0,071	0,148	0,076	0,060	0,025
Belgium	0,028	0,057	0,136	0,093	0,116	0,061
Canada	0,062	0,133	0,273	0,322	0,246	0,294
Czech Republic	0,004	0,049	0,059	0,059	0,060	0,027
Denmark	0,025	0,028	0,062	0,047	0,039	0,027
Estonia	-0,252	-0,670	0,299	0,486	0,598	1,867
Finland	0,016	0,022	0,023	0,021	0,008	0,006
France	0,009	0,034	0,098	0,064	0,099	0,042
Germany	0,027	0,038	0,081	0,066	0,058	0,044
Greece	0,002	0,003	0,053	0,050	0,058	0,077
Hungary	-0,001	0,001	0,007	0,007	0,008	0,006
Iceland	0,052	0,145	0,124	0,214	0,088	0,135
Ireland	0,057	0,191	0,100	0,193	0,048	0,076
Israel	0,232	0,711	0,677	0,955	0,824	0,323
Italy	0,010	0,010	0,021	0,018	0,013	0,014
Japan	0,005	0,008	0,010	0,012	0,007	0,007
Korea	0,000	0,001	0,004	0,005	0,005	0,009
Luxembourg	0,150	0,185	0,435	0,314	0,305	0,225
Netherlands	0,027	0,068	0,180	0,170	0,175	0,145
New Zealand	0,060	0,091	0,225	0,361	0,210	0,449
Norway	0,031	0,059	0,075	0,099	0,049	0,070
Poland	-0,011	-0,008	0,028	0,031	0,042	0,051
Portugal	0,013	0,026	0,018	0,027	0,007	0,015
Slovakia	0,003	0,011	0,004	0,010	0,002	0,003
Slovenia	-0,001	0,013	0,114	0,086	0,133	0,125
Spain	0,033	0,059	0,055	0,067	0,029	0,042
Sweden	0,029	0,069	0,133	0,120	0,110	0,082
Switzerland	0,020	0,105	0,292	0,289	0,299	0,207
United Kingdom	0,021	0,101	0,088	0,148	0,071	0,083
United States	0,063	0,072	0,151	0,123	0,101	0,107

Notes. (a) Net flow is defined as the difference between the immigration stock in 2000 and the immigration stock in 1990, expressed as proportion of the native population in 1990. (b) Stock of immigrants at year t, expressed as proportion of the native population at year t. Source: Docquier, Ozden, Parsons and Artuc (2012).

2.3. Structure of emigration

A major novelty of the DOPA comprehensive matrices is that they can be used to characterize the size and structure of low-skilled and high-skilled emigration stocks for all countries of origin. The stock of emigrants from country *i* is defined as

$$E_{i,t}^{s} \equiv \sum_{j \neq i} M_{ij,t}^{s} \ .$$

To characterize the structure of emigration, I computed the following indicators:

$$e_{i,t}^{s} \equiv E_{i,t}^{s} / N_{i,t}^{s} \ , \ ne_{i,t}^{s} \equiv (E_{i,2000}^{s} - E_{i,1990}^{s}) / N_{i,1990}^{s}$$

for all education types or for high-skilled workers only. Variable $e_{i,t}^{s}$ gives the stock of emigrants of type *s* at year *t* as a percentage of the native population in the same education category. Variable $ne_{i,t}^{s}$ expresses the net change in the stock of emigrants of type *s* between 1990 and 2000 (a measure of "net emigration flows") as a percentage of the native population at the starting date 1990. Emigration reduces the proportion of college graduates in the economy if $(n)e_{i,t}^{h} > (n)e_{i,t}^{l}$, or equivalently, $(n)e_{i,t}^{h} > (n)e_{i,t}^{l+h}$.

The empirical literature has revealed interesting emigration patterns (e.g. Docquier et al., 2007, Grogger and Hanson, 2011). First, the analysis of aggregate emigration rates reveals that high-skilled emigration rates exceed low-skilled and average emigration rates in virtually all countries. This result also holds true for both developing countries and OECD member states. Second, average emigration rates are clearly endogenous: they decrease with the size of the origin country (larger, less open), decrease with distance from the nearest OECD country, increase if English is an official language. There is also, to a lesser extent, a mixed effect by development level (GDP per capita): the greatest emigration rates are observed in middle-income countries where incentives to leave are important and liquidity constraints are not too binding. Third, the level of development is the major determinant of positive selection, measured as the gap between high-skilled and low-skilled emigration rates: poorer countries exhibit greater positive selection. Combining these findings, countries with the largest "brain drain" rates are small, poor, English-speaking countries located under the tropics.

In Table 3, I describe the results obtained for the 40 countries with the greatest high-skilled emigration rates in 2000. It excludes countries with less than one million inhabitants aged 25 and over. As explained above, positive selection is a very robust pattern of international migration: high-skilled emigration rates exceed by far the average emigration rates. We identify 6 countries losing more than half of their college educated population and two countries (Haiti and Jamaica) losing more than 80 percent of their native brains. Many other small states with less than one million workers are in the same situation. High-skilled workers are more and more mobile: net emigration rates observed during the nineties are important and exhibit stronger selection than in 1990.

Table 3. Emigration rates by education level (40 countries with the greatest brain drain)

Country	Net flows 2000-1990 (a)		Stocks in 2000 (b)		Stocks in 1990 (b)	
	Total	College	Total	College	Total	College
Jamaica	0,145	0,659	0,350	0,850	0,306	0,856
Haiti	0,069	1,022	0,123	0,809	0,081	0,725
Lebanon	0,077	0,293	0,249	0,566	0,267	0,673
Liberia	-0,078	0,333	0,164	0,558	0,282	0,610
Laos	0,075	0,540	0,123	0,504	0,090	0,470
Sierra Leone	0,021	0,264	0,053	0,504	0,037	0,486
Eritrea	0,022	0,149	0,134	0,457	0,135	0,483
Somalia	0,017	0,309	0,079	0,448	0,070	0,344
Afghanistan	-0,017	0,226	0,057	0,447	0,102	0,319
Yemen	0,001	0,307	0,064	0,438	0,100	0,937
Kenya	0,004	0,287	0,025	0,431	0,030	0,498
Uganda	0,019	0,266	0,036	0,419	0,028	0,438
Ireland	-0,030	0,159	0,252	0,400	0,295	0,395
Cambodia	0,025	0,308	0,047	0,364	0,039	0,308
Bosnia/Herz.	0,083	0,086	0,272	0,362	0,212	0,335
Congo, Rep	0,178	0,557	0,127	0,347	0,047	0,202
Sri Lanka	0,015	0,250	0,043	0,345	0,040	0,384
Nicaragua	-0,006	0,213	0,155	0,338	0,207	0,325
Jordan	0,087	0,270	0,251	0,337	0,366	0,530
Togo	0,167	0,250	0,370	0,328	0,364	0,357
El Salvador	0,138	0,397	0,207	0,327	0,168	0,353
Hong Kong	0,068	0,178	0,150	0,319	0,134	0,301
Macedonia	0,063	0,197	0,188	0,314	0,161	0,306
Croatia	0,029	0,041	0,177	0,313	0,155	0,435
New Zealand	0,059	0,201	0,162	0,305	0,136	0,254
Rwanda	-0,057	0,589	0,063	0,302	0,120	0,260
Cuba	0,025	0,118	0,110	0,293	0,110	0,318
Vietnam	0,031	0,337	0,039	0,285	0,023	0,249
Armenia	0,066	0,050	0,128	0,265	0,058	0,222
Honduras	0,070	0,280	0,094	0,263	0,074	0,279
Serbia/Mont.	0,029	0,162	0,108	0,253	0,089	0,192
Zambia	0,017	0,291	0,034	0,253	0,026	0,318
Guatemala	0,064	0,233	0,090	0,247	0,058	0,214
Pakistan	0,005	0,158	0,033	0,239	0,039	0,225
Morocco	0,038	0,218	0,101	0,235	0,099	0,299
Dominican Rep	0,105	0,236	0,143	0,233	0,093	0,265
Mali	0,086	0,232	0,280	0,231	0,273	0,216
Senegal	0,072	0,229	0,135	0,230	0,110	0,203
Albania	0,037	0,108	0,204	0,229	0,177	0,185
Benin	0,085	0,173	0,216	0,227	0,212	0,284

Notes. The table includes countries with labor force above one million; countries are ranked by emigration rates of college graduates in 2000; (a) Net flow is defined as the difference between the emigration stock in 2000 and the emigration stock in 1990, expressed as proportion of the native population in 1990. (b) Stock of emigrants at year t expressed as proportion of the native population at year t. Source: Docquier, Ozden, Parsons and Artuc (2012).

2.4. Balance of brains

The DOPA database also permits comparing entries and exits of workers and computing migration balances for college graduates and the less educated for all nation states. The balance of brains determines the effect of cross-border migration on the world distribution of human capital.

I defined a migration balance as the difference between emigration and immigration rates; a positive balance reflects a migration-induced deficit of workers (a negative balance reflect a surplus, respectively). Hence, the migration balance measures the net loss of workers as a percentage of the native labor force and establishes the link between the resident and the native labor force:

$$b_{i,t}^{s} \equiv e_{i,t}^{s} - i_{i,t}^{s} \Leftrightarrow L_{i,t}^{s} = N_{i,t}^{s}(1-b_{i,t}^{s}) \, .$$

As human capital is usually perceived as a key engine of growth and development, what matters for a country is the joint effect of high-skilled and low-skilled migration on the skill ratio (i.e. ratio of college graduates to less educated workers in the resident labor force). This effect can be written as follows:

$$\frac{L_{i,t}^{h}}{L_{i,t}^{l}} \equiv \frac{N_{i,t}^{h}(1-b_{i,t}^{h})}{N_{i,t}^{l}(1-b_{i,t}^{l})} \, .$$

In particular, the ratio of staying rates (one minus the net migration deficit) gives the total direct effect of cross-border migration on human capital accumulation. It is worth noting that migration balances and the ratio of staying rates can also be computed using migration net flows rather than migration stocks ($nb_{i,t}^{s} \equiv ne_{i,t}^{s} - ni_{i,t}^{s}$).

When computing migration balances (i.e. comparing entries and exits), I implicitly assumed a perfect equivalence between the quality of national and foreign education/degrees. It is widely documented that many immigrants with higher education tend to find jobs in occupations typically staffed by less educated natives (see Mattoo et al, 2008). In particular, highly educated immigrants trained in developing countries may be less productive in high-skill jobs than natives with similar educational degrees. Evidence of such heterogeneity in the quality of education was provided by Coulombe and Tremblay (2009): they compared the skill intensity and schooling levels of Canadian immigrants and natives who were both submitted to standardized tests in literacy, math, and problem-solving. These tests provide measures of proficiency that are comparable across countries and over time. On this basis, Coulombe and Tremblay estimated a "skill-schooling gap" expressed in years of schooling. A skill-schooling gap of *n* years for a given country means that Canadian nationals with say 10 years of schooling are as productive as immigrants with 10+ *n* years of schooling. The larger the skill-schooling gap, the lower the quality of education in the country of origin. Simple bivariate OLS regressions show that the skill-schooling gap is a decreasing function of income per worker in the origin country. Their -0.10 point estimate of the slope coefficient indicates that the skill-schooling gap is one year less per worker when income increases by US$10 000 in

the origin country. Using this estimate and cross-country data on income per worker, I constructed an indicator of skill-schooling gap for each origin country. Then, assuming that one year of schooling generates a productivity gain of 8 percent, I estimated the relative productivity of educated immigrants and natives in each country, with a benchmark value of one for workers trained in Canada (as well as workers trained in richer origin countries, i.e. the upper limit of this index is one). For example, college graduate immigrants from Angola and Portugal have productivity levels equal to 0.73 and 0.85 percent of Canadian college graduates, respectively.

Table 3 reports the net deficits of college graduates workers ($b_{i,t}^{h}$) and the total direct effects of cross-border migration on the skill ratio, $(1-b_{i,t}^{h})/(1-b_{i,t}^{l})$, using stock data for 2000 and net flow observed during the 1990's, controlling or not for the quality of education (*A* or *U* standing for adjusted and unadjusted, respectively). The top of the table gives the twenty main losers of human capital; the bottom of the table gives the twenty main winners. I excluded countries with less than one million inhabitants aged 25 and over.

Unsurprisingly, the main losers are countries with the greatest brain drain rates listed in Table 2. In these countries, entries are very small and their net deficit of brains is almost identical to the gross brain drain rates. Controlling for the quality of education has a very small impact on the deficits; the correlation rate between adjusted and unadjusted balances of brains is around 0.99. In Jamaica and Haiti, cross-border migration reduces the skill ratio by about 80 percent. Many smaller states are in the same situation. In the other countries, it reduces the skill ratio by 25 to 50 percent. In most cases, the recent brain drain observed in the nineties is lower than the long-run trends; exceptions are Laos, the Democratic Republic of Congo, Yemen, El Salvador and Haiti, where the recent evolution is worrisome (recent brain drain is around 90 percent).

The main winners are rich countries where entries of high-skilled workers exceed exits (their deficit of brains is negative). Hence, high-skilled migration increases the number of college graduates by 2.5 percent in Spain, by 96.5 percent in Saudi Arabia, and by 326 percent in the United Arab Emirates; and cross-border migration is responsible for an increase in the skill ratio by 0.4 percent in Spain, 36 percent in Saudi Arabia and 123 percent in the United Arab Emirates. Cross-border migration also increases human capital in countries conducting selective immigration policies such as Australia, New Zealand, Canada, the United States and Scandinavian countries.[2] If the world stock of human capital was fixed, cross-border migration would clearly make its geographic distribution more unequal. However, in Section 4, I will establish a link between skilled-biased migration prospects and education decisions which may invalidate or attenuate this effect.

[2] Other remarkable exceptions are countries of mass, low-skilled emigration such as Mali, Guinea, Turkey, and Turkmenistan. Although their brain drain can be important, these countries experience massive low-skilled emigration flows or host more college graduates from neighboring countries: this contributes to improving the skill ratio.

Table 3. Balance of brains (twenty main losers and winners)

Net deficit of brains					Net effect on the skill ratio				
Country	**2000-*U***	**1990s-*U***	**2000-*A***	**1990s-*A***	**Country**	**2000-*U***	**1990s-*U***	**2000-*A***	**1990s-*A***
Jamaica	0,847	0,652	0,845	0,649	Jamaica	0,203	0,375	0,274	0,410
Haiti	0,807	0,901	0,807	0,900	Haiti	0,210	0,099	0,229	0,100
Liberia	0,558	0,355	0,558	0,355	Cote d'Ivoire	0,482	0,859	0,382	0,820
Sierra Leone	0,504	0,264	0,504	0,264	Liberia	0,483	0,592	0,509	0,572
Eritrea	0,457	0,149	0,457	0,149	Sierra Leone	0,493	0,751	0,494	0,759
Somalia	0,448	0,309	0,448	0,309	Somalia	0,592	0,699	0,620	0,706
Laos	0,440	0,537	0,434	0,538	Afghanistan	0,602	0,734	0,630	0,726
Afghanistan	0,424	0,249	0,421	0,251	Hong Kong	0,611	0,996	0,562	0,936
Lebanon	0,415	0,178	0,425	0,185	Laos	0,614	0,490	0,667	0,512
Kenya	0,367	0,190	0,378	0,207	Eritrea	0,616	0,870	0,674	0,883
Uganda	0,352	0,167	0,352	0,168	Kenya	0,632	0,795	0,623	0,774
Bosnia/Herz	0,347	0,101	0,340	0,108	Lebanon	0,641	0,845	0,670	0,852
Congo, Rep	0,344	0,633	0,344	0,636	Uganda	0,651	0,861	0,653	0,870
Yemen	0,330	0,608	0,306	0,691	Yemen	0,690	0,392	0,739	0,312
El Salvador	0,323	0,411	0,323	0,416	Sri Lanka	0,702	0,756	0,712	0,760
Nicaragua	0,317	0,217	0,313	0,218	Ghana	0,722	0,729	0,663	0,699
Sri Lanka	0,315	0,254	0,312	0,254	Congo	0,731	0,576	0,786	0,834
Togo	0,307	0,297	0,306	0,303	Vietnam	0,739	0,683	0,755	0,695
Cuba	0,293	0,118	0,293	0,118	Cuba	0,768	0,893	0,830	0,908
Macedonia	0,290	0,200	0,285	0,199	Nicaragua	0,768	0,766	0,872	0,765
Spain	-0,025	-0,029	-0,022	-0,027	Singapore	0,995	1,291	0,944	1,213
Belgium	-0,028	-0,028	-0,012	-0,018	Thailand	0,997	1,003	1,007	1,014
Norway	-0,029	-0,046	-0,021	-0,039	Italy	1,002	0,980	1,009	0,976
Kyrgyzstan	-0,035	-0,099	-0,039	-0,103	Turkmenistan	1,003	1,030	0,997	1,013
Paraguay	-0,046	-0,067	-0,081	-0,106	Spain	1,004	0,996	0,995	0,984
Netherlands	-0,051	-0,038	-0,024	-0,029	Turkey	1,026	1,033	1,044	1,042
New Zealand	-0,057	0,110	-0,056	0,123	Belarus	1,033	0,932	1,236	0,919
Cote d'Ivoire	-0,064	0,042	-0,076	0,039	Portugal	1,039	0,921	1,087	0,921
Latvia	-0,065	0,418	-0,013	0,371	Mali	1,060	0,870	1,265	0,908
Sweden	-0,067	-0,045	-0,047	-0,030	Canada	1,062	1,089	0,958	1,031
Nepal	-0,084	0,037	-0,206	0,074	Nepal	1,065	0,962	1,169	0,924
United States	-0,116	-0,069	-0,082	-0,046	Paraguay	1,074	1,119	1,135	1,204
Singapore	-0,161	-0,272	-0,117	-0,214	Mauritania	1,082	0,940	1,322	1,132
Switzerland	-0,176	-0,064	-0,133	-0,048	Guinea	1,150	1,062	1,265	1,102
Canada	-0,258	-0,113	-0,202	-0,081	Australia	1,184	1,193	1,076	1,153
Australia	-0,517	-0,177	-0,443	-0,153	Israel	1,266	1,879	1,016	1,540
Libya	-0,622	-0,445	-0,622	-0,443	Saudi Arabia	1,358	1,584	1,159	1,526
Israel	-0,771	-0,654	-0,586	-0,520	Libya	1,412	1,479	1,303	1,481
Saudi Arabia	-0,965	-0,609	-0,940	-0,593	Burkina Faso	1,589	1,021	2,403	1,042
UAE	-3,258	-1,236	-3,234	-1,226	UAE	2,233	1,624	1,861	1,445

Note. Net deficit of brains is defined as the difference between high-skilled emigration and immigration, as percentage of the native high-skilled labor force. Net change in the skill ratio is the "after-to-before" ratio the skill ratios. Data is provided for the year 2000 or for the nineties (1990's), unadjusted (U) or adjusted for the quality of education (A). Source: Docquier, Ozden, Parsons and Artuc (2012), Coulombe and Tremblay (2009).

3. Implications of immigration for destination countries

Immigration impacts economic performance and the welfare of natives in destination countries through multiple channels (see Borjas, 2009). It modifies the number and characteristics of workers in the labor market; it impacts physical capital accumulation through changes in savings and/or foreign investments; it affects fiscal policies through changes in taxes, impacts government consumption and transfers; it changes the demand for domestic products since migrants and natives have heterogeneous preferences for domestic and imported goods. The combination of these channels determines how migration impacts natives' average income in source and host countries.

According to opinion surveys on attitudes towards immigration, the majority of host-country citizens believe that the impact of immigration on welfare is negative, the labor market and fiscal effects being perceived as the most important economic channels. Immigrants are seen as taking jobs away from locals, or inducing downward pressures on their wages; and immigration is mainly perceived as a massive flow of uneducated individuals from poor countries who are trying to gain access to the welfare systems. This view is not supported by academic studies. In this section, I review the literature on the labor market effect of immigration to OECD destinations (Section 3.1) and its fiscal impact (Section 3.2). I then discuss related policy implications (Section 3.3).

3.1. Wage and employment effects of immigration to OECD countries

To predict the wage and employment effects of immigration, I use "consensus micro-foundations" described in detail in Docquier, Ozden and Peri (2013). The structure of my labor market model is common to virtually all recent studies in the literature. Labor demand for each type of worker is derived profit maximization by a representative firm; equalizing labor demand and labor supply determines the equilibrium wage rate and employment for each type of worker.

The model relies on a set of standard assumptions:

- Output is produced with a constant returns-to-scale production function with two factors, physical capital and a composite labor input (first stage). The labor input is a nested CES (constant elasticity of substitution) production function of high-skilled and low-skilled labor (second stage). High-skilled and low-skilled labor inputs are themselves nested CES combinations of native and foreign labor forces (third stage). This nested CES framework has been used in many recent empirical studies of the labor market effects of immigration and has been applied to many countries. I used a Cobb-Douglas function in the first stage.

- Physical capital is internationally mobile (its supply is perfectly elastic) and each single destination country is assumed to be too small to affect global capital markets. It follows that returns to physical capital are equalized across countries. This "arbitrage" condition determines the stock of capital per worker in each economy.

When this amount is plugged into the first stage production function, total production can be expressed as the product of total factor productivity (TFP) by the labor input.

- Total factor productivity (the scale factor in the production function) is an increasing function of the proportion of college graduates in the labor force.

- Each country is a single labor market and the profit-maximizing labor demand function is such that the equilibrium wage rate is equal to the marginal productivity of labor for each type of worker.

- As far as labor supply is concerned, I assumed that the participation rate of each native worker is an increasing log-linear function of the wage rate (an outcome of the individual's utility maximization program). This allows me to predict the labor market impact of migration accounting for employment responses of natives.

Simple labor demand, labor supply and wage equations can easily be derived from the model. The parameters of these equations must be calibrated to match country-specific data on total production, participation rate, size and education structure of the working-age population. Then, starting from the baseline equilibrium, counterfactual scenarios without immigration can be simulated to quantify the wage and employment responses to immigration. In this case, I calibrated the model on the year 2000, and then simulated the counterfactual labor market equilibrium when net immigration flows observed in the nineties (described in Table 2, columns 1 and 2) are equal to zero.

Simulation results depend on the value of four important parameters: the elasticity of substitution between highly- and less-educated workers (second stage of the production function), the elasticity of substitution between natives and immigrants with the same education level (third stage of the production function), the elasticity of total factor productivity to the proportion of college graduates in the labor force, and the labor supply elasticity to wages of more and less educated natives.

The literature provides a wide set of estimates for these elasticities. The values used in my simulations are thus chosen to span the range found in the empirical literature. I defined three scenarios: a pessimistic scenario combining elasticities maximizing the negative impact on natives (or minimizing the positive impact), and optimistic scenario maximizing the positive impact (or minimizing the negative impact), and an intermediate scenario based on the average of the estimated elasticities.

Table 4 gives the parameter values used in the three scenarios. Figure 2 presents the results for the wage effect of immigration under these three scenarios. Figure 2.a gives the effect on less educated natives; Figure 2.b gives the average effect on all natives. Figure 3 presents the results for the employment effects of immigration.

Table 4. Parameter values in three scenarios

	Pessimistic	Intermediate	Optimistic
Elasticity of substitution between college graduates and the less educated	2.00	1.75	1.30
Elasticity of substitution between immigrants and natives	∞	20.0	6.00
Elasticity of TFP to human capital	0.00	0.45	0.75
Elasticity of labor supply to wage	0.20	0.10	0.00

A number of interesting features emerge. First, all simulated wage effects on less educated natives (with the exception of Estonia, Latvia, and the "pessimistic" scenario for Austria, Estonia and Latvia) are positive. This indicates that in virtually all countries, less educated native workers are likely to benefit from the labor market impact of recent immigration. For some countries with high immigration rates (such as Ireland, Canada, or Australia), the wage gains for less educated natives are quite significant and reach values as high as 6%. For other countries with intermediate levels of immigration, such as Belgium, the United Kingdom, and Switzerland, the effects are non-negligible and are between 1 and 2%. The median effect on the wage rate for less educated workers ranges from 0.2% in the pessimistic scenario to 0.8% in the optimistic scenario (see Figure 2.a).

The effects on the average wage of natives are positive in the optimistic scenario. The gain exceeds 3% in countries like Canada, Ireland and Australia. The effect on average wages is lower because highly educated natives experience a wage decrease or lower gains (see figure 2.b).

The magnitude of the wage effect of immigrants depends critically on the ratio of the highly educated to the less educated among the immigrants. Countries where laws explicitly favor more educated immigrants (such as Australia and Canada) experience larger positive effects for both the less educated natives and the total workforce. However, other countries without such explicit laws (such as Ireland, UK, and Switzerland) also enjoy significant positive effects since the composition of their immigrants is also tilted towards the highly educated. On the other hand, if the skill composition of immigration flows is not biased in favor of the educated, then the net wage effect on natives becomes quite small albeit positive.

In figure 3.b, the effects on employment have the same qualitative features as the wage changes but they are smaller in magnitude. They range between 0 and 0.5% in most of the countries in any scenario.

This analysis does not support the view that recent immigration contributed to increase inequality through the labor market. In virtually all high-income OECD countries, it is likely that recent immigration has increased income of the less educated and decreased income of the richest. The simulation results are fully determined by the composition of recent immigration flows and by the chosen parameters. Although the elasticity of labor supply to wages has almost no effect on native employment, elasticities in the production function govern the results. However, when elasticities vary to span the range of estimates found in the

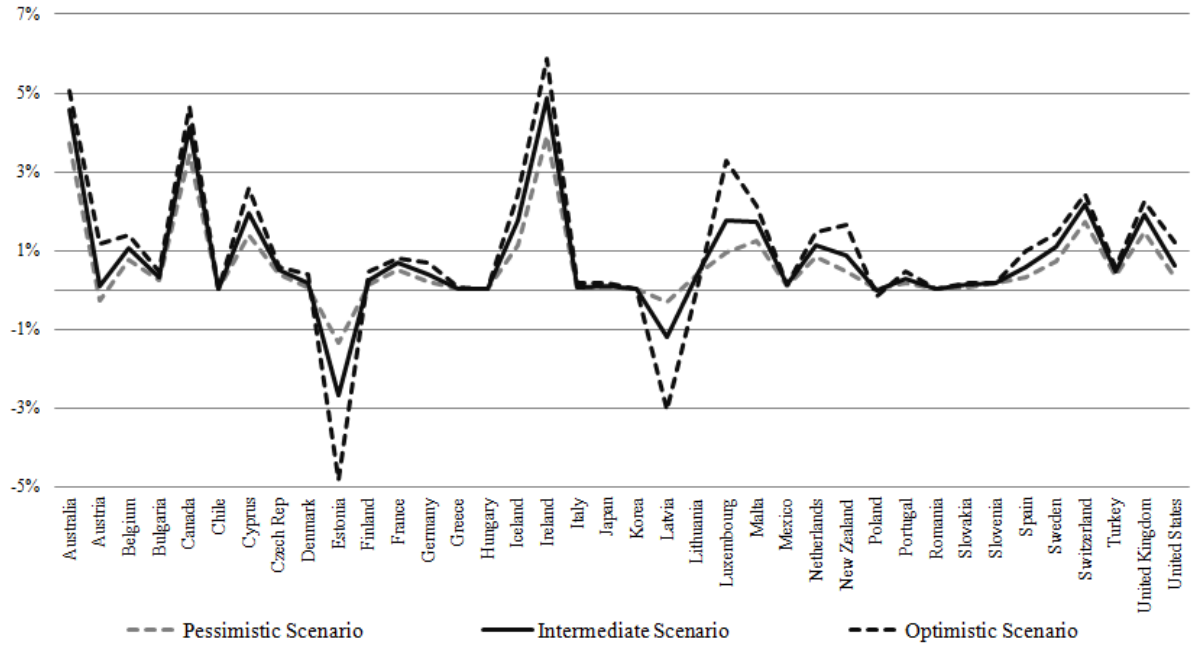
empirical literature, the wage response is positive almost everywhere and the gains are non-negligible in many countries.

The simulated wage and employment effects of immigration are obviously subject to caveats and possible measurement error. Migration data is less than perfect. For example, some emigration flows to some poor countries are imputed, undocumented migrants are not fully measured among immigrants, and schooling is an imperfect measure of actual skills. In addition, the simulation exercise considers data from the 1990s which misses some recent large immigration flows from North Africa and the Middle East to Europe, and from Latin America to the US. These recent immigrant cohorts are also believed to be less educated which would influence my results. Docquier, Ozden and Peri (2013) have undertaken a series of robustness checks to account for all these issues (downgrading education acquired in poor countries, accounting for illegal immigrants, using labor force survey data for the period 2000-2007). None of the corrections eliminates or reverses (although some may attenuate) the findings of positive long-run effects of immigrants on the mean wage and employment of native workers, and more beneficial effects for the less educated.

Other globalization mechanisms must be used to explain the observed increase in income inequality (such as trade, foreign direct investments and their effects on the demand for low-skilled-intensive goods in rich countries). As documented in Table 2, presence of older generations of migrants might have induced detrimental effects on income inequality in Western European countries where past immigration was biased towards the less educated (especially in countries such as Austria, Belgium, France, Germany). This is not the case of countries where selective immigration policies were conducted, Scandinavian countries and emerging countries.

Figure 2. Wage impact of net immigration flows 1990-2000 on native workers

2.a. Percentage effect on less educated native wages



2.b. Percentage effect on average native wages

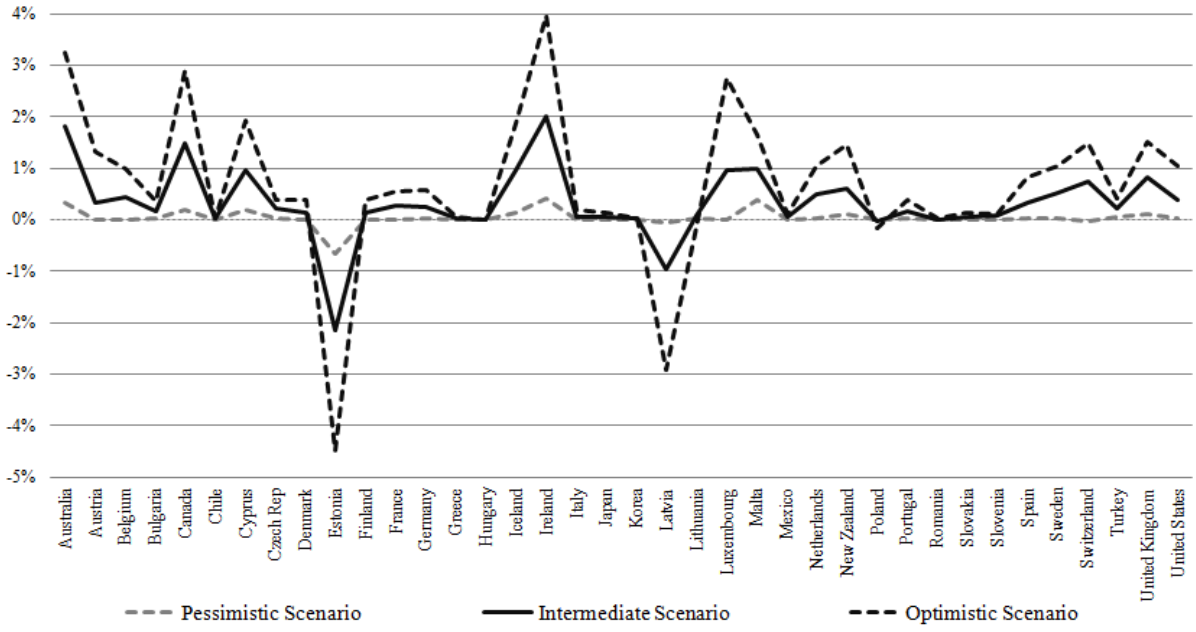
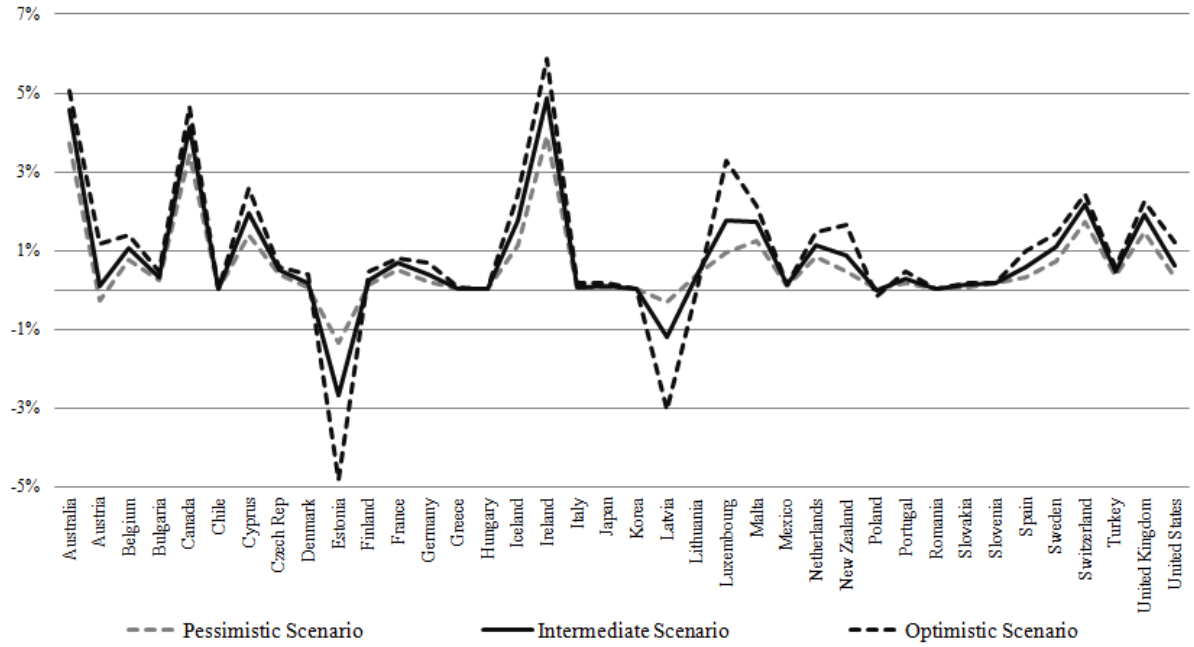
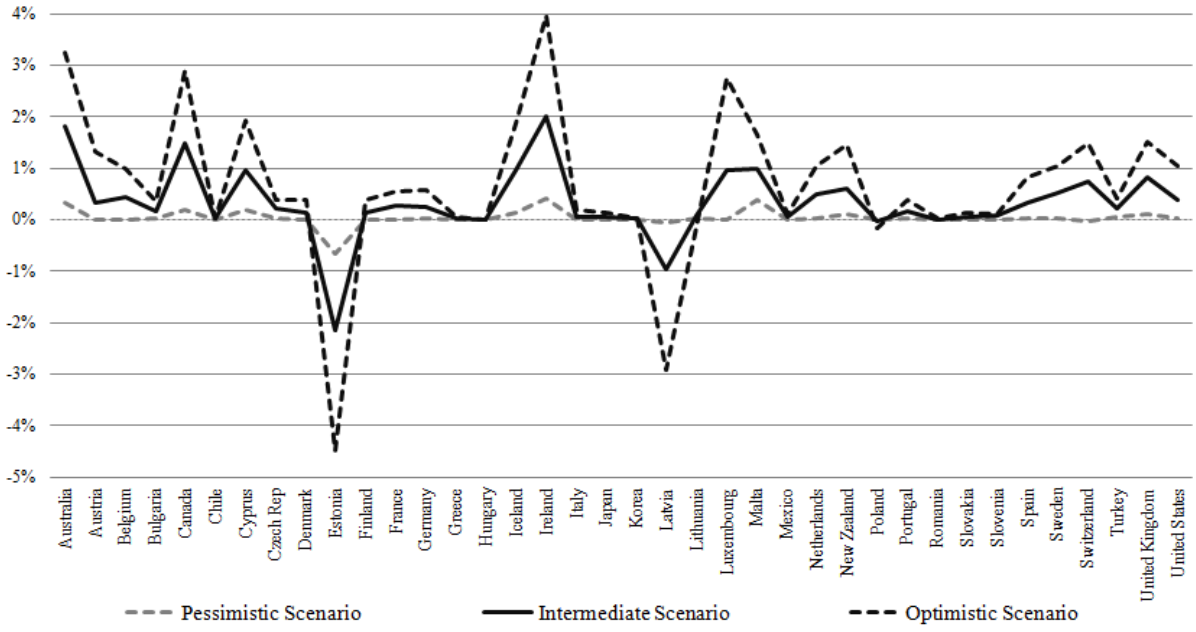


Figure 3. Employment impact of net immigration flows 1990-2000 on native workers

3.a. Percentage effect on employment of less educated natives



3.b. Percentage effect on employment of all natives

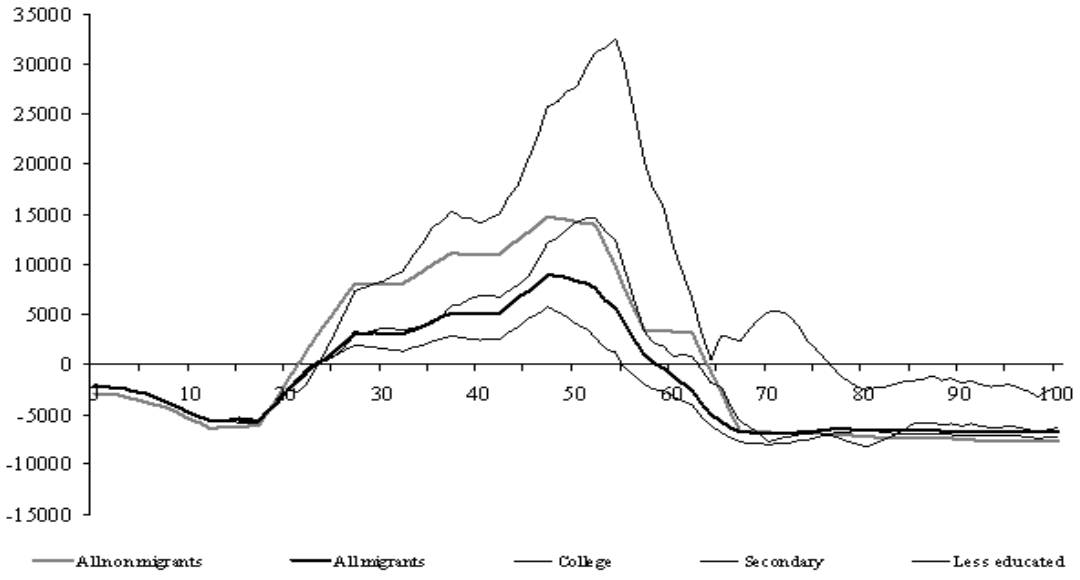


3.2. Fiscal impact of immigration

The analysis of the fiscal impact of immigration has been conducted in fewer studies. Distinguishing the short-run and long-run fiscal effects of immigration is a complex task. Cross-country comparative studies have focused on the short-run effect, i.e. change in public finance related to the presence of immigrants of the first generation. Barbone et al. (2009) used household survey data on average incomes and taxes paid and benefits received by migrant and native households to quantify the fiscal impact of immigration in a large set of European countries. The authors found no evidence supporting the view that European immigrants contribute less in taxes than the natives, or consume significantly higher benefits. On the contrary, they found that migrant workers make a net contribution to the national tax and benefit systems of European Union countries. These results have been confirmed in other country-specific studies showing that the fiscal impact of immigrants is positive albeit small, in the United States (Auerbach and Oreopoulos, 1999) or even in non-selective immigration countries such as France, Spain or Germany (see Chojnicki, 2006, Colado et al., 2003, or Bonin et al., 2000).

Chojnicki's study is the most detailed one. First, it disentangles public expenditures into two categories, public transfers/benefits directly allocated to individuals (including education subsidies) and the residual government consumption (justice, military spending, infrastructure, etc.). Population changes directly impact taxes and public transfers, but have uncertain effects on the amount of residual government consumption. When immigration is doubled, the overall fiscal impact is positive if the residual government consumption is kept constant; the impact is negative albeit small if the residual consumption is proportional to total population. Second, it identified net taxes (i.e. total taxes minus transfers/benefits) paid by immigrants with college, secondary and lower education. Results for the year 2000 are presented on Figure 3.

Figure 3. Net taxes paid by migrants and nationals in Euros, France 2000



Working-aged educated immigrants contribute more than the average native. On the contrary, the less educated contribute less than nationals, although their net contribution is positive. Over their lifetime and in discounted value, low-skilled permanent migrants receive more than what they pay. However a permanent entry of young low-skilled immigrants can be beneficial for public finance if the residual public consumption does not increase too much.

3.3. Immigration and development policies

Several opinion surveys on attitudes towards immigrants reveal that host-country citizens believe that immigrants induce detrimental effects on the labor market and public finance. They see immigrants as taking their jobs away, or inducing downward pressures on their wages. Some ten years ago, the Eurobarometer Opinion Poll on "Racism and Xenophobia in Europe" revealed that one third of Europeans openly describe themselves as "quite racist" or "very racist"; another third describe themselves as "a little racist". Fear of becoming unemployed and insecurity about the future are among the main characteristics of those at the top of the racism scale. These presumptions are not new and probably date back to the stagflation episode of the seventies. They are invalidated by a majority of academic studies.

This might reflect the misperception that citizens have about immigration. For example, the TTI survey (Transatlantic Trends/Immigration, 2009) shows that the vast majority of respondents grossly overestimate the share of immigrants in their countries by a factor around two. Americans thought that 35 percent of the population in the U.S. is foreign born, Canadians estimated 37%, and Europeans estimated an average of 24%. The actual shares are around 14, 20 and 10 percent, respectively.

It is the responsibility of policymakers to inform citizens that the labor market and fiscal impacts of immigration are in fact low for natives, and even beneficial in many cases. This does not mean that unrestricted immigration would not generate negative effects. But at the current level of immigration, the economic effects are likely to be positive for natives. If immigration, legalization or asylum seeking policies had to be more restrictive, it can only be justified by non-economic motives (crime, aversion for diversity), which are difficult to quantify. Obviously, selective immigration policies could be used to increase the benefits from immigration in rich destination countries. On the contrary, increasing the number of low-skilled immigrants to OECD countries would reduce the size of the beneficial effects for natives and could even induce income losses. However, it could be the source of large gains for migrants, their families and, most importantly, for the sending countries.

By relaxing labor market constraints at origin and increasing the amounts of remittances, low-skilled migration could be seen as an explicit component of the development policy of the rich world. In the Global Economic Prospects, the World Bank reported that international remittances received by developing countries (around 170 billion US dollars in 2005, two thirds of which was sent from developed countries) have doubled since 2000. In 2005, the amount of remittances was twice as large as the amount of official development aid. Records still underestimate the full scale of remittances: unrecorded flows through informal channels

may conservatively add 50 percent to official flows. Although the growth/economic impact of remittances is unclear, remittances do obviously play an important role in reducing poverty. Migration has other economic implications for poor countries beyond remittances. It raises the demand for low-skilled workers at the margin, leading to higher wages, lower unemployment and greater labor force participation. It creates ties between countries, reducing transaction and informational costs. Hence, it is not surprising that some development agencies promote migration of the less educated. For example, the Commitment to Development Index (CDI) computed by the Center for Global Development, an independent American think tank that works to reduce global poverty and inequality, rewards immigration of low-skilled people in its index of generosity of advanced countries towards developing countries. Development and immigration policies should be more connected in the future.

Economic incentives and political mechanisms are essential to understand or influence immigration policies in rich countries. Increasing low-skilled immigration and reducing global inequality can be a source of gains for receiving rich-countries if policymakers and citizens care about extreme poverty, as predicted by many experimental games. Altruism governs, albeit to a small extent, the design of immigration and development policies. An important implication of altruism is that all host states receive benefits when any state welcomes low-skilled immigrants from poor countries. Altruism confers the nature of a public good to immigration. Hence, non-coordinated policies are subject to the prisoner's dilemma problem. Although households in rich countries are pained by the idea that people in developing countries are really poor, it is not in their best interest to vote to welcome additional migrants since they will bear the costs alone while the benefits accrue to everyone in the world who cares about global justice.

de la Croix and Docquier (2013) exploited the potential efficiency gains underlying this prisoner's dilemma to minimize extreme poverty subject to implementation constraints in rich countries. They showed that if altruism and aversion towards extreme poverty are as strong as predicted by experimental games, international coordination of immigration policies could produce a significant increase in global migration. Even for low levels of altruism, the effect of coordinating policies would not be negligible. Coordination could generate huge welfare gains for millions of additional migrants and for the billions of individuals still in the poor developing world. They also showed that citizens of high-income countries who care about extreme poverty should be less reluctant about increasing immigration than increasing the level of development aid. This result is due a dilution effect: each dollar paid by citizens of developed countries is divided by the demographic ratio. Even the United States (168 million adult citizens) only represent 6.7 percent of the developing world’s adult population. And the whole set of high-income countries represents only about 20 percent of the developing world’s population. This reduces the effectiveness of development assistance and the small altruism factor found in experimental studies is not large enough *per se* to justify the positive amounts of aid observed today. The difference with immigration is that even without altruism, a positive level of low-skilled immigration would be observed whereas the optimal level of aid is negative. Starting from the “nationalist” optimal level of immigration, internalizing the

externalities between immigration policies allows significant increase in global migration and decrease in extreme poverty.

4. Implications of emigration for origin countries

Lacking comparable data, the literature on the consequences of cross-border migration has, until recently, mostly focused on immigration. The literature on emigration remained essentially theoretical until the middle of the last decade. Since then, the new databases described in Section 2 have permitted an assessment of the economic implications of emigration for origin countries.

Recent studies have documented and explained the widespread presence of positive selection patterns in emigration (e.g. Grogger and Hanson, 2011). Although positive selection based on skills and education is particularly pronounced in the case of poor sending countries, it also characterizes emigration from OECD countries. In this section, we first focus on the wage and employment effects of emigration for OECD countries (Section 4.1). Then we focus on developing countries and review the literature on the brain drain and development (Section 4.2).

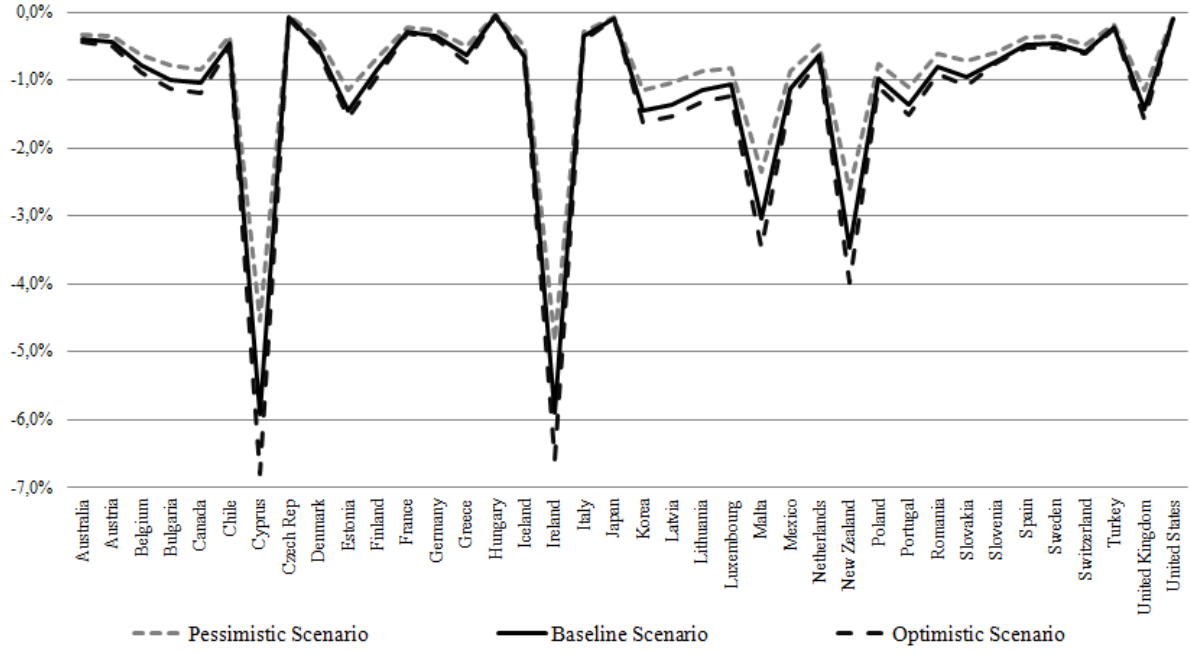
4.1. Wage and employment effects of emigration from OECD countries

The model depicted in Section 3.1 can also be used to quantify the effects of emigration from OECD countries. We start from the same initial equilibrium calibrated to match data for the year 2000, and then simulate the counterfactual labor market equilibrium when net emigration flows observed in the nineties (described in Table 3, columns 1 and 2) are equal to zero. We do this exercise using the scenarios depicted in Table 4. Notice that in this case the optimistic scenario is the one that produces the most negative effects of emigration (on wages and employment of non-migrants). This is because the parameter configuration that made skill-intensive immigration good for the average native implies that skill-intensive emigration has a negative effect on the native labor market outcomes. The pessimistic scenario produces the smallest (negative) effects. Figure 4 presents the results for the wage effect of emigration. Figure 4.a gives the effect on less educated natives; Figure 4.b gives the average effect on all natives. Figure 5 presents the results for the employment effects of emigration.

The most striking result is that the wage impact of emigration is the opposite of what is obtained for immigration. Net emigration involves a larger percentage decline of college educated workers and, hence, it has a negative effect on less educated native workers and total factor productivity. Hence, in all scenarios and for all countries, emigration causes wage and (to a much smaller extent) employment levels of less educated natives to decrease. While the median loss is small (ranging between -0.4% and 0), the less educated in some countries lose as much as 9%. In addition, in most parameter configurations emigration decreases average native wages (although it increases wages of more educated native non-movers).

Figure 4. Wage impact of net emigration flows 1990-2000 on native workers

4.a. Percentage effect on less educated native wages



4.b. Percentage effect on average native wages

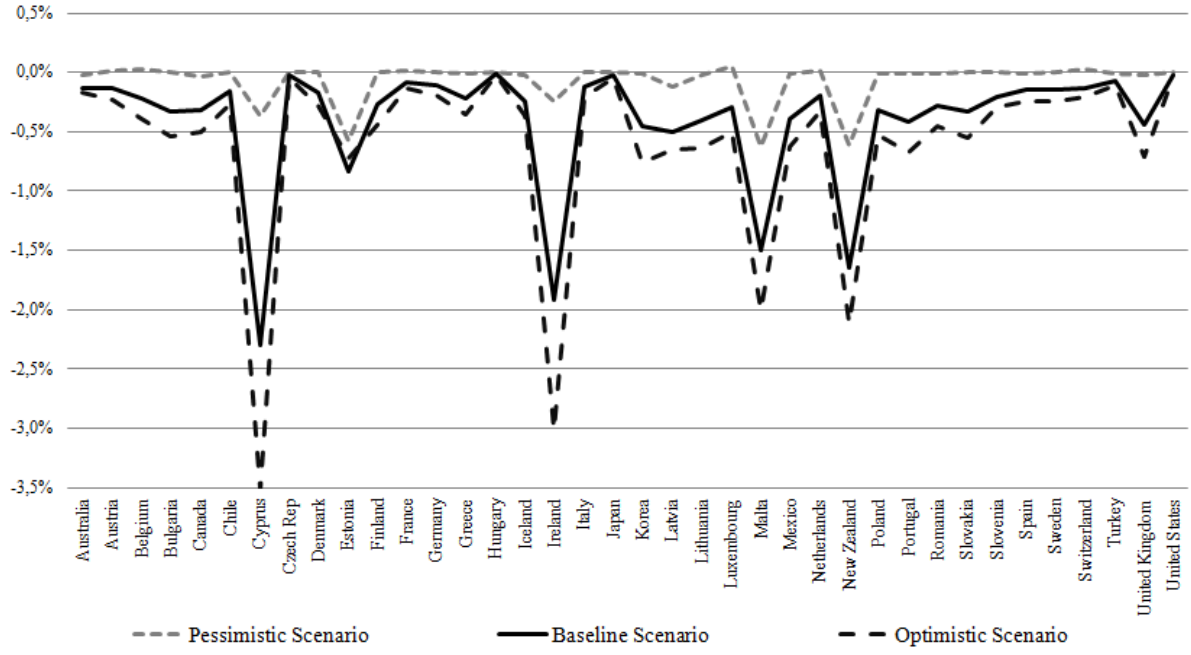
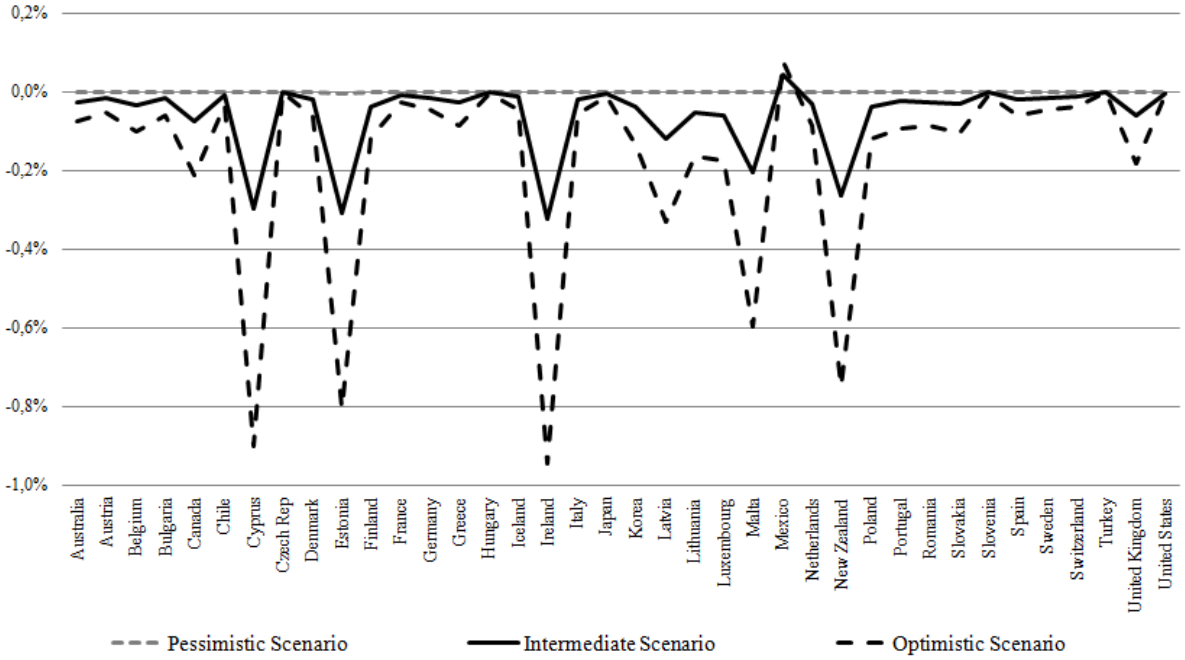
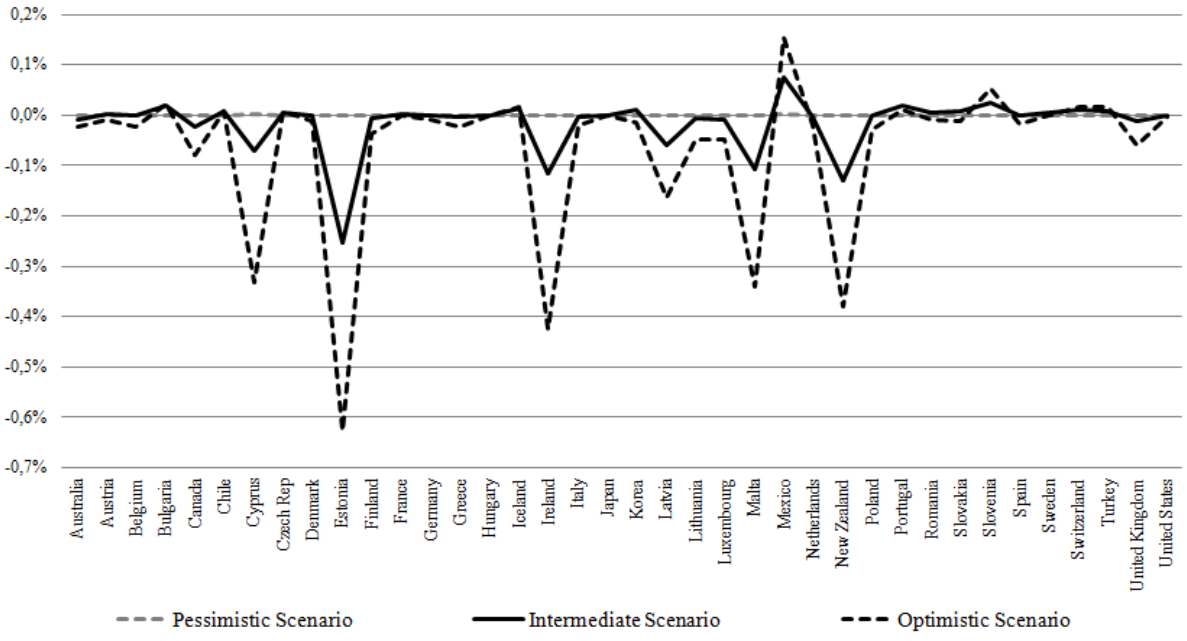


Figure 5. Employment impact of net emigration flows 1990-2000 on native workers

5.a. Percentage effect on employment of less educated natives



5.b. Percentage effect on employment of all natives



In countries with large emigration rates (such as Cyprus, Malta, Ireland, New Zealand, and Portugal), the income loss for less educated natives is important. The range is between -1% (Portugal) and -6% (Ireland and Cyprus depending on the elasticity scenario). The effects on employment levels of less educated non-migrants are much smaller but still negative. In countries like Cyprus, Ireland and New Zealand, employment levels decline by 0.6 to 0.8% in the most optimistic scenario, because of the decrease in productivity spillovers. Even at intermediate rates of emigration, some countries still experience negative wage effects on the less educated workers of around -1% (e.g. Latvia, South Korea, United Kingdom, and Canada). These effects are due to the lost externalities from the departure of college educated individuals.

Overall the employment effects of emigration are very small on less educated workers as well as the average worker. Note that highly educated non-movers usually benefit from emigration (results are unreported here). This is because competition is reduced and skill biased emigration makes the highly educated scarcer in the country. Some of the countries that experience negative average effects from emigration (such as Ireland and the UK) offset these effects, partially or completely, with the positive effects of immigration. Others, however, such as Cyprus, Poland and Malta, fail to do so.

4.2. Effect of emigration in developing countries: brain drain versus brain gain

If emigration is detrimental for non-migrants in OECD countries, it could be even more detrimental for non-migrants in developing source countries because, as explained above, positive selection in emigration increases with poverty.

Hence, the brain drain has long been viewed as a serious constraint on poor countries' development where a significant fraction of the talented workforce emigrates abroad (see Tables 3 and 4). In line with our findings for OECD emigration countries, this is due to the fact that social returns to human capital are likely to exceed its private returns given the many externalities (fiscal, technological, sociological) involved. This externality argument is central in the early brain drain economic literature (Bhagwati and Hamada, 1974), which emphasized that the brain drain entails significant losses for those left behind and contributes to increase inequality at the world level. Another negative aspect of the brain drain is that it can induce shortages of manpower in certain activities, for example when engineers, teachers or health professionals emigrate in disproportionately large numbers, thus undermining the ability of the origin country to adopt new technologies, educate its young generations or deal with health problems. This can be reinforced by governments distorting the provision of public education away from general (portable) skills when the graduates leave the country, with the country ending up educating too few nurses, doctors, or engineers, and too many lawyers (Poutvaara, 2004).

The argument, however, can be reversed as the prospect of migration may create a bias in the opposite direction. The prospect of migration can also impact on the very decision as to what to study. When education is seen as a passport to emigration (in poor countries, the

probability to emigrate of a college graduate is 10 to 20 times greater than that of a less educated), migration prospects create additional incentives to invest in human capital. If migration is probabilistic in that people are uncertain about their chances of future migration when they make educational decisions, then under certain circumstances described in a series of recent theoretical papers (e.g., Mountford, 1997, Stark et al., 1998, Beine et al., 2001), this can be turned into a gain for the source country. The existence of such an incentive mechanism has been confirmed empirically by Beine et al. (2008), who found a positive and significant effect of migration prospects on human capital formation in a cross-section of 108 developing countries after dealing with endogeneity problems. This view has also been supported by an increasing number of country-specific case studies:

- Batista et al. (2012) found that emigration prospects are among the main driving forces of human capital formation in Cape Verde.

- Gibson and McKenzie (2011) showed that nearly all the very top high-school students (85 percent) contemplated emigration while still in high school, which led them to take additional classes (e.g., during school vacations, supplementary English classes) and to make changes to their course choices (favoring disciplines such as science and commerce) in Tonga and Papua New Guinea

- Chand and Clemens (2008) compared the educational attainment of ethnic Fijians with that of Fijians of Indian ancestry in the aftermath of the 1987 military coup (which resulted in physical violence and discrimination policies against the Indian minority). Using diff-in-diff techniques, they found a strong correlation between changes in emigration propensity and human capital investments.

- Lucas (2005) also provided an illuminating analysis of the Filipino higher education market in relation with emigration.

From a development perspective, however, what matters is not how many of their native-born engage in higher education, but how many remain at home. Brain drain is beneficial to the origin country if it increases the proportion of college graduates in the remaining population. There are two conditions for such a beneficial brain drain to be obtained:

- first, the level of development in the origin country should be low enough to generate strong incentive effects, but not so low that liquidity constraints on education investment become strongly binding (in which case the incentive effect cannot operate);

- second, the probability of highly skilled emigration should be sufficiently low (say below 15 percent). And on average, the optimal brain drain rate of a developing country is around 10 percent. This optimal level varies across countries and decreases with development and the effectiveness of the higher education system.

To estimate country-specific net effects, Beine et al. (2008) used counterfactual simulations to predict the effect of a change in the brain drain rate on human capital accumulation. They found that countries combining relatively low levels of human capital and low skilled

emigration rates are likely to experience a net brain gain. There appears to be many more losers than winners (88 losers and 20 winners). Importantly, the former incur substantial losses while the latter exhibit only small gains. The situation of many African, Central American, and small countries appears extremely worrisome. In contrast, the largest developing countries (India, China, and Brazil) are among the winners and seem to experience moderate gains.

The global impact of the brain drain on income of those left behind depends on other feedback effects operating ex-post, i.e. after migrants have left their country:

- *Remittances.* For some time now, scholars have conjectured that remittances from highly skilled emigrants can serve to replenish the stock of human capital potentially depleted by the brain drain. The literature is still unclear about the relative propensity to remit of high-skilled and low-skilled migrants; and the economic consequences of remittances vary across recipient countries. Combining fourteen household surveys on immigrants in eleven destination countries, Bollard et al. (2011) showed a mixed relationship between education and the likelihood of remitting, but a strong positive relationship between education and the amount remitted conditional on remitting. Overall, high-skilled migrants remit more but this results does not hold for all surveys, suggesting that the link between education and remittances is diverse and vary across migration corridors. Finally, in the absence of surveys matching sending and receiving households and looking at the relationship of interest, it remains difficult to quantify the effect of high-skilled migrant remittances on investments, poverty or inequality.

- *Return migration and brain circulation.* Promoting return migration is a promising route for letting destination and origin countries share the benefits from high-skilled labor mobility. In developing countries, the perspective of emigrating abroad induces the same incentive mechanisms as probabilistic migration (by increasing the returns to education); and returnees' accumulated additional knowledge and financial capital while abroad has been shown to generate important benefits, especially with respect to technology adoption, entrepreneurship and productivity. Again, survey data used in Bollard et al. (2011) show that return intentions are similar across skill groups. However the intensity of return decisions is clearly endogenous. Although return migration is probably the most understudied aspect of international migration, it is commonly accepted that large waves of returnees should be seen more as a consequence rather than a cause of development.

- *Diaspora externalities.* A large sociological literature emphasizes the potential for high-skilled migrants to reduce transaction and other types of information costs and thus facilitate trade, FDI and technology transfers between their host and home countries. This has first been confirmed in the field of international trade (Gould 1994, Head and Ries 1998, Rauch and Casella 2003, Kugler and Rapoport 2006, etc.). It is also only recently that diaspora externalities in terms of institutional quality and governance and the role of foreign-educated elites on democracy, have been explored. Spilimbergo (2009) considered dynamic-panel regressions to investigate the effects of

foreign students, respectively, on home-country institutions (as measured by standard democracy indices). Following the literature on institutions and human capital, he endogenized the quality of the institution as a function of its lagged value (to capture inertia), on human capital, and the average level of democracy in training countries (i.e. a weighted sum of democracy indicators in students' destination countries, with weights equal to the proportion of migrant students). He found that foreign-trained individuals promote democracy in their home countries only if the foreign education was acquired in a democratic country. While he did not identify the exact mechanisms through which such an influence takes effect, Spilimbergo suggested a number of possible channels (e.g., the fact that foreign educated leaders and technocrats may want to preserve the quality of their alumni networks by serving reasonably democratic regimes and share a sense of common identity with the international democratic community). More generally, the presence of foreign-educated individuals makes it more difficult for dictatorial regimes to maintain repression: repressive activities become more costly since foreign-trained individuals have easier access to external media and foreign governments.

While the brain drain has long been viewed as detrimental to poor country's growth potential, recent economic research has emphasized that alongside positive feedback effects arising from skilled migrants' participation in business networks, one also has to consider the effect of migration prospects on human capital creation in source countries. This new literature suggests that a limited degree of high-skilled emigration could be beneficial for growth and development. Empirical research shows that this is indeed the case for a limited number of relatively large, intermediate-income developing countries. For the vast majority of poor and small developing countries, however, current skilled emigration rates are most certainly well beyond any sustainable threshold level of brain drain.

4.3. Interdependencies between brain drain and development

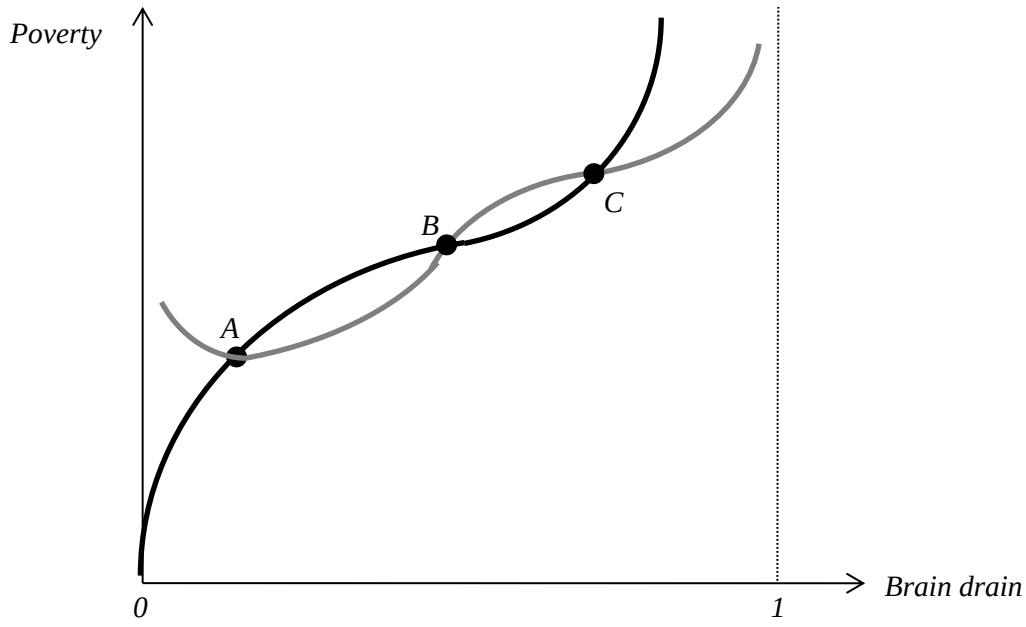
If the brain drain affects economic development, it is also largely recognized that the lack of economic growth and rampant poverty - going hand in hand with discrimination, political repression and lack of freedoms - are what motivate people to flee their own country. Docquier, Lohest and Marfouk (2007) showed that the brain drain increases with political instability and the degree of internal fractionalization, and decreases with the level of development in the origin country. Grogger and Hanson (2008) found that a simple model of income maximization accounts for positive selection in emigration. Rosenzweig (2008) used micro-data to demonstrate that there are larger per-capita numbers of foreign students in the United States from lower skill-price countries than from high skill-price countries, and host countries with higher skill prices attract more foreign students.

Is the brain drain a cause or a consequence of poverty? In fact, the brain drain and economic development are two interdependent processes. Studying interactions between these two variables is key to understanding the process of development. These interactions can be the source of vicious and virtuous circles linked to strategic complementarities in individual

migration decisions. Indeed, when a significant brain drain movement is initiated, it might have damaging effects on the economy and induce other waves of high-skilled emigration (e.g. Iran after the 1978-79 cultural revolution, Ireland in the early eighties, ex-USSR Republics after 1991). On the contrary, when a significant movement of return operates, it gives incentives to other waves of returnees to come home (Ireland after the fiscal reform of 1987, Taiwan in the eighties).

As illustrated in Figure 6, the brain drain increases with poverty (migration-setting curve in black) and poverty increases with the brain drain (poverty-setting curve in grey), at least when the brain drain rate exceeds a threshold value of about 15 percent (above which the costs of high-skilled emigration exceed the benefits). Intersections between the two curves are potential equilibria. Under certain conditions (i.e. analytical forms for the distribution of migration costs and technology), the system generates indeterminacy and multiple equilibria. Multiplicity implies that two countries sharing particular characteristics may end up in different equilibria, a good one with low poverty and low brain drain, or a bad one with high poverty and high brain drain. These equilibria and their properties need not be identical across nations. They depend on the exogenous characteristics of nations and their policies.

Figure 6. Interdependencies between brain drain and development



When multiplicity in static Nash equilibria is observed, it is very common to question the "stability" of these equilibria. A relevant stability criterion is that of the trembling-hand perfect Nash equilibrium. It selects Nash equilibria that are robust to the possibility that some players may make small mistakes. In Figure 6, consider equilibrium A and C and suppose that somebody made a mistake and that, for example, the brain drain rate slightly increases (i.e.

deviates from the black curve). As the poverty-setting curve in grey is quite flat around A and C, this change has only a slight positive effect on poverty and the migration rate comes back to its initial level. On the contrary, equilibrium B is unstable. It follows that two countries with identical characteristics can be badly coordinated at equilibrium C, or well coordinated at equilibrium A.

de la Croix and Docquier (2012) constructed such a model and calibrated its country-specific parameters to fit the situation of 147 developing countries. Once calibrated, the model matches perfectly the 2000 levels of GDP, human capital and high-skilled emigration observed in each of these countries. The configuration they obtained is similar to that illustrated in Figure 6. Besides the calibrated equilibrium, the theory predicts that there is another possible equilibrium, with a higher or lower brain drain. They identified the precise situation of each country (high or low equilibrium). Which equilibrium is observed is an outcome of the model, either good or bad. They found that in the majority of developing countries, the best equilibrium is selected and that the observed brain drain is inevitable. In 22 small developing countries however, the worst equilibrium prevails, implying that poverty and the brain drain are increased by coordination failure. This is the case of small countries such as Cape Verde, Grenada, Guyana, Haiti, Jamaica, Mauritius, Saint Vincent and Grenadines, Suriname, etc. This might explain why (i) the dispersion/variance of brain drain rates is greater among small states and (ii) many small states loose around 75 percent of their high-skilled labor force. Small states are more exposed to the risk of coordination failure because migration is more responsive to wage differentials. These results are robust for the identifying assumption and to the inclusion of a brain gain mechanism.

Provided that mass brain drain is a relatively recent phenomenon and a good equilibrium is locally stable, the likelihood to observe a coordination failure depends on how people might have deviated from the best equilibrium when historical shocks occurred in the recent past. Small states are much more likely to be badly coordinated because the elasticity of migration to economic performance is greater. In these badly coordinated countries, moving to the best equilibrium could increase average wages and GDP per capita by more than 100 percent in the most affected countries. These small countries require appropriate development policies, such as a temporary subsidization of the repatriation of their high-skilled expatriates.

5. Effects of a complete liberalization of cross-border migration

Predicting the effect of a complete liberalization of cross-border migration on the world economy is a complex task. The reason is that there is no database measuring the size of migration costs and in particular, of policy-induced costs borne by the migrant to overcome the legal hurdles set by national authorities in destination and origin countries.

A few existing studies have attempted quantifying the effect of liberalization on the world GDP (see Clemens 2011 for a summary). They predict huge efficiency gains in the range of 50 to 150 percent of world GDP: liberalization increases the world GDP by 147.3 percent in Hamilton and Whalley (1984), 122 percent in Klein and Ventura (2007), 96.5 percent in

Moses and Letnes (2004), and 67 percent in Iregui (2005). This suggests that migration barriers leave "trillion dollar bills on the sidewalk" (Clemens, 2011). These results are also echoed by Pritchett (2006) who argues that laws and regulations restricting migration from the South to the North carry considerable economic costs for developing countries and serve to compound existing income inequalities.

However these studies suffer from two main limitations. First, they assume no (or small) differences in inherent productivity of people (i.e. a Mexican worker migrating to the US is as productive as a US citizen); they do not account for differences in education and productivity between people originating from different countries. Second, they assume that liberalization will lead to wage equalization or small wage disparities across countries, disregarding the existence of incompressible migration costs and the endogeneity of migration decisions. If migration was so powerful that wages could be equalized, we would not observe wage disparities between regions of the same country, or between countries belonging to free-mobility areas such as the European Union or Scandinavian countries.

An alternative way to gauge the potential effects of a liberalization is to compare effective and desired migration data. In particular, the Gallup World Poll Survey provides estimates of the number of people who would like to leave their country if they were given the opportunity to move. Data is available by education level, country of origin and country of destination. These numbers can be seen as upper-bounds of the number of additional migrants that could be generated by a removal of all migration restrictions. Indeed, for some people, it is likely that "having the opportunity" means obtaining a visa and being able to pay private migration costs or getting a job offer. Furthermore, some people mentioning a desire to leave might end up emigrating, even in the absence of reform of immigration policies.

According to the Gallup survey, liberalizing cross-border migration would increase the world stock of migrants from 100.5 to 627.0 million, i.e. from 3% to 19% of the world population. This is much less than in the studies described above; they predict that half of the world population would live in a foreign country after a complete liberalization.

How would such additional migration flows affect the world economy? Table 6 presents the effect on emigration and immigration stocks (columns 1 and 2), on the proportion of college graduates in the labor force and GDP at constant wages (columns 3 and 4), on income per worker, per native and per stayer when wages and migration decisions are endogenized (columns 5, 6 and 7), and on income per capita when some additional externalities are factored in (columns 8 and 9).

Columns 1 and 2 are simple inputs from the Gallup World Poll Survey. In columns 3 and 4, I computed the effect of liberalizing migration on the proportion of college graduates and the level of income per worker when wages are constant and calibrated to match the pre-liberalization GDP data for the year 2000.

In columns 5. 6 and 7, I accounted for the fact that production is governed by a CES combination of high-skilled and low-skilled labor (as in Section 3.1), and used an elasticity of substitution of 3.0. This value generates realistic skill premiums in developed and developing

countries. I endogenized wages and computed the effect of the liberalization on three variables of interest: income per worker is the average income of workers employed in a given country, income per native is the average income of national workers born in a given country wherever they live, and income per stayer is the average income of natives staying in their country of birth. The latter variable includes remittances sent by expatriates, which are assumed to be proportional to expatriates' income and calibrated to match the ratio of remittances to GDP observed in 2000.[3]

In columns 8, I introduced additional technological externalities. As in Section 3.1, I assumed total factor productivity is an increasing function of the proportion of college graduates (elasticity of TFP to human capital equal to 0.3), I added congestion effects (elasticity of TFP to the size of the labor force equal to -0.03), I corrected for the quality of education using the downgrading factors presented in Section 2.4, and I allowed for imperfect substitution between migrants and natives (elasticity of substitution between migrants and natives equal to 20 in each education group). In column 9, based on column 8, I accounted for the fact that established migrant networks play an important role on the migration decisions of current would-be migrants. I used an elasticity of private migration costs to the size of the diaspora of 0.05 for college graduates and 0.20 for the less educated.

As stated above, liberalizing cross-border migration would increase the world stock of migrants by 523.7 percent (from 100.5 to 627.0 million) and the fraction of workers living outside their country of birth would increase from 3% to 19%. The increase is stronger for the low-skilled (+627.9%) than for the high-skilled (+227.8%). Typical migration destinations (such as US, EU27, CANZ and GCC) experience a larger increase in immigration than in emigration. Asian countries face a dramatic increase in labor movements, which have to be considered in the light of the rather low levels of immigration and emigration at the initial equilibrium. Finally, typical emigration regions such as North- and Sub Saharan Africa or Latin America see their populations decrease.

The education composition of the moving workers is crucial for the effects on the average income. The average worker's education level in a region varies if the proportion of educated workers among the new immigrants differs from that of the residing population. Data shows that additional migration features positive selection in the sending regions and negative selection in the receiving regions. In other words, college educated workers emigrate proportionally more from the sending countries while the fraction of college graduates among the immigrants is below the pre-liberalization level observed in the receiving countries. Hence, all regions, except for Middle East and Northern Africa (MENA), end up with a lower fraction of skilled workers among their workforce. In the latter case, the region loses proportionally more low- than high-skilled workers. In a partial equilibrium framework with constant wages, GDP per capita would decrease almost everywhere. Exceptions are the MENA (increase in the proportion of college graduates), Asia and Latin America (due to internal reallocation of the labor force towards more productive countries such as Chile or Brazil). Despite these negative impacts on productivity in the main destination countries, the

[3] I also account for the endogeneity of migration decisions, although it plays a minor role quantitatively. More details on the methodology can be found in Docquier, Machado and Sekkat (2012).

movement of workers from poor to rich regions generates a global 17.7 percent increase in the world GDP. At constant wages, new migrants are the only beneficiaries and there is no loser.

Table 6. Effect of a complete liberalization of cross-border migration (Percentage deviation from the baseline in 2000)

	Migration		Partial equlib.		General equilibrium			With externalities	
	Immig.	Emig.	Hum.	GDP	Worker	Native	Stayer	Techn.	Network
USA	+385.0	+177.1	-16.7	-3.3	-3.4	+0.3	+0.6	-16.2	-20.8
EU27	+384.2	+251.4	-16.6	-0.6	-0.8	+2.1	-0.8	-12.6	-15.9
CANZ	+370.6	+228.4	-18.8	-3.6	-4.0	+0.8	+1.0	-21.7	-28.3
GCC	+656.5	+20.5	-47.9	-8.3	-6.7	-0.7	-0.4	-23.9	-27.9
MENA	+511.7	+408.9	+3.8	+14.9	+14.2	+36.6	+14.5	+0.8	+1.4
SSA	+504.6	+639.6	-24.7	-0.9	-1.3	+26.0	+7.4	-6.7	-6.0
CIS	+285.8	+295.9	-8.5	-1.7	-1.9	+9.9	+2.6	-7.3	-8.2
Chind	+1136.4	+1658.4	-3.1	-0.9	-1.4	+36.5	+12.8	-2.2	-0.2
Asia	+1481.9	+609.2	-15.6	+15.7	+14.8	+79.3	+41.4	-2.4	-2.0
LAC	+773.5	+394.5	-14.7	+18.3	+16.6	+18.8	+9.8	-4.3	-7.9
World	+523.7	+523.7	+0.0	+17.7	+16.7	+16.7	+9.2	+2.0	+3.3

Note: Regions: USA = United States, EU27 = 27 members of European Union; CANZ = Canada, Australia and New Zealand; GCC = countries of the Gulf Cooperation Council; MENA = Middle East and Northern Africa; SSA = Sub-Saharan Africa; CIS = Commonwealth of Independent States (ex-Soviet Union); CHIND = China and India; ASIA = Rest of Asia; LAC = Latin American and Caribbean countries.

When wages and migration decisions are endogenized (columns 5, 6 and 7), the effects on GDP per worker are slightly less important than in partial equilibrium. On the contrary, income per native increases in all regions except the GCC. The latter region experiences a tremendous increase in immigration while at the same time suffering the highest decrease in its proportion of college graduates among stayers due to selected emigration. Moderate increases are observed in rich regions, either because a few emigrants move to richer countries (e.g. European Union citizens moving to the United States), or because immigration generates a surplus for non-migrants. Large increases in income per natives are observed in developing regions, an effect mostly driven by the income gains for new emigrants. As far as income per stayer is concerned, a first noticeable change is the slightly negative evolution of EU27 stayers' income. This is caused by the emigration of high-skilled workers and simultaneous immigration of low-skilled workers. Developing regions continue to benefit from improved revenues particularly due to the remittances sent back by the diasporas established abroad. The main beneficiaries are stayers in ASIA (+41.4%), MENA (+14.5%) and CHIND (+12.8%). Combining the three different income measures it can be concluded that the main beneficiaries are the emigrants themselves, and many stayers in poor countries. Remittances sent to these stayers exceed the revenue loss caused by the positive selection of emigrants.

Finally, when all technological externalities are introduced, efficiency gains of liberalization are much reduced. The world GDP increases by merely 2 percent and GDP per worker

decreases in immigration receiving countries with income losses of 16.2 percent in the US, 12.6 percent in the EU27 and 23.9 percent in GCC. However, sending regions are also largely worse off in this scenario with average income in LAC changing from +16.6 percent in the benchmark to -4.3 percent and in ASIA, from +14.8 percent to -2.4 percent. The marked differences in outcomes are explained by the negative effects of the technological externalities on sending and receiving countries. More productive natives leave the country thereby reducing the proportion of college graduates; TFP decreases in all the regions due to the positive selection of emigrants (on average, emigrants are more educated than those left behind) and negative selection of immigrants (on average, immigrants are less educated than non-migrants at destination). Accounting for network externalities leads to minor differences. We conclude that liberalizing labor mobility would increase world GDP by a maximum of about 3.5 percent. Smaller effects could be obtained with fixed capital stock or with trade. Thus, global efficiency gains have probably been overestimated in the existing literature.

6. Conclusion

By 2010, an estimated 214 million people had moved to a foreign country for a variety of reasons, including economic (lack of economic growth, poverty, unemployment, etc.) and non-economic ones (discrimination, political repression and lack of freedom, etc.). This paper focuses on the global economic implications of international migration for the world economy and for its developing areas. Migration is a selective process affecting the growth potential of countries and the welfare of non-migrants. In particular, high-skilled emigration rates currently exceed low-skilled and average emigration rates in virtually all countries, and a complete liberalization of cross-border migration would probably reduce the skill bias in emigration rates but would not eliminate it. The new brain drain literature has shown that a limited degree of high-skilled emigration could be beneficial for growth and development. For the vast majority of poor and small developing countries, however, current skilled emigration rates are most certainly well beyond any sustainable threshold level of brain drain. In many instances, cross-border migration (especially recent migration flows) is making rich countries richer at the expense of poor countries.

In the quest for a global partnership for development, international institutions should promote better interactions between development and immigration policies. First, low-skilled immigration from the South should be considered as a development tool, in line with the Commitment to Development Index constructed by the Center for Global Development. Second, selective emigration is a key issue for vulnerable groups such as the least developed countries and developing small islands states. Authoritarian restrictions on high-skilled emigration from these countries could have damaging effects on growth (smaller incentives to educate and to invest) and the welfare of their residents (greater exposure to corruption, discrimination, political repression, etc.). However, promoting return migration and brain circulation is a promising route for letting destination and origin countries share the benefits from high-skilled labor mobility. Appropriate subsidization policies could be implemented to initiate such processes.

References

Auerbach A.J. and P. Oreopoulos (1999). Analyzing the fiscal impact of US immigration. American Economic Review 89, 176-180.

Barbone, L, M. Bontch-Osmolovsky, S. Zaidi (2009). The foreign-born population in the European Union and its contribution to national tax and benefit systems. World Bank Policy Research Working Paper n. 4899. The World Bank: Washington DC.

Batista, C., A. Lacuesta and P.C. Vicente (2012). Testing the 'brain gain' hypothesis: Micro evidence from Cape Verde. Journal of Development Economics 97 (1), 32-45.

Beine, M., F. Docquier and H. Rapoport (2001). Brain Drain and Economic Growth: Theory and Evidence. Journal of Development Economics 64 (1), 275–89.

Beine, M., F. Docquier and H. Rapoport (2008). Brain Drain and Human Capital Formation in Developing Countries: Winners and Losers. Economic Journal 118 (528), 631–52.

Bhagwati, J. and K. Hamada (1974). The Brain Drain, International Integration of Markets for Professionals and Unemployment: A Theoretical Analysis. Journal of Development Economics 1 (1), 19–42.

Bollard, A., D. McKenzie, M. Morten and H. Rapoport (2011). Remittances and the Brain Drain Revisited: The Microdata Show That More Educated Migrants Remit More." World Bank Economic Review 25 (1), 132–56.

Bonin H., B. Raffelhüschen, and J. Walliser (2000). Can immigration alleviate the demographic burden? FinanzArchiv 57(1).

Borjas, G. (2009). The Analytics of the Wage Effect of Immigration. NBER Working Papers 14796.

Chand, S., and M.A. Clemens (2008). Skilled Emigration and Skill Creation: A Quasi-experiment. Center for Global Development Working Paper 152.

Chojnicki, X. (2006). Vieillissement démographique et immigration: un modèle de comptabilité générationnelle appliqué à la France. Economie et Prévisions 174 (3), 39-57.

Clemens, M.A. (2011). Economics and Emigration: Trillion Dollar Bills on the Sidewalk? Journal of Economic Perspectives 25 (3), pp. 83-103.

Collado, M.D., I. Iturbe-Ormaetxe, and G. Valera (2003). Quantifying the Impact of Immigration in the Spanish Welfare State. International Tax and Public Finance 11 (3), 335-353.

Coulombe, S. and J.-F. Tremblay (2009). Migration and Skills Disparities across the Canadian Provinces. Regional Studies, 43 (1), 5-18.

de la Croix, D. and F. Docquier (2012). Do brain drain and poverty result from coordination failures? Journal of Economic Growth 17 (1), 1-26.

de la Croix, D. and F. Docquier (2013). An Incentive Mechanism to Break the Low-skill Immigration Deadlock. Manuscript.

Docquier, F., O. Lohest and A. Marfouk (2007). Brain drain in developing countries. World Bank Economic Review 21, 193-218.

Docquier, F., J. Machado and K. Sekkat (2012). Efficiency gains from liberalizing labor mobility. IRES Discussion Paper n. 2012-018. UCLouvain: Belgium.

Docquier, F., and A. Marfouk (2006). International migration by educational attainment (1990-2000). In C. Ozden and M. Schiff (eds): International Migration, Remittances and Development. Palgrave Macmillan: New York.

Docquier, F. , C. Ozden, Ch. Parsons and E. Artuc (2012). A global Assessment of Human Capital Mobility: the Role of non-OECD Destinations. IRES Discussion Paper n. 2012-022.

Docquier, F. , C. Ozden and G. Peri (2013). The labor market effects of immigration and emigration in OECD countries. Economic Journal, forthcoming.

Dumont, J.C., and G. Lemaître (2004). Counting immigrants and expatriates in OECD countries: a new perspective. Mimeo: OECD.

Dumont, J.C., J.P. Martin and G. Spielvogel (2007). Women on the move: the neglected gender dimension of the brain drain. IZA Discussion Paper 2920.

Gibson, J. and D. McKenzie (2011). The Microeconomic Determinants of Emigration and Return Migration of the Best and Brightest: Evidence from the Pacific. Journal of Development Economics 95 (1), 18–29.

Gould, D.M. (1994). Immigrant Links to the Home Country: Empirical Implications for U.S. Bilateral Trade Flows. Review of Economics and Statistics 76 (2), 302–16.

Grogger, J. and G. Hanson (2011). Income maximization and the selection and sorting of international migrants. Journal of Development Economics 95(1), 42-57.

Hamilton, B. and J. Whalley (1984). Efficiency and Distributional Implications of Global Restrictions on Labour Mobility. Journal of Development Economics 14 (1), 61-75.

Head, K. and J. Ries (1998). Immigration and Trade Creation: Econometric Evidence from Canada. Canadian Journal of Economics 31 (1), 47–62.

Iregui, A.M. (2005). Effciency Gains from the Elimination of Global Restrictions on Labour Mobility. In Poverty, International Migration and Asylum, ed. G.J. Borjas and J. Crisp, 211-238. New York: Palgrave Macmillan.

Klein, P. and G. Ventura (2007). TFP Differences and the Aggregate Effects of Labor Mobility in the Long Run. The B.E. Journal of Macroeconomics 7 (1), Article 10.

Kugler, M. and H. Rapoport (2007). International Labor and Capital Flows: Complements or Substitutes? Economics Letters 94 (2), 155–62.

Lucas, R.E.B. (2005). International Migration and Economic Development: Lessons from Low-Income Countries. Cheltenham: Edward Elgar Publishing.

Mattoo, A., I.C. Neagu and C. Ozden (2008). Brain waste? Educated immigrants in the US labor market. Journal of Development Economics 87 (2), 255-269.

Moses, J.W. and B. Letnes (2004). The Economic Costs to International Labor restrictions: Revisiting the Empirical Discussion. World Development 32 (10), 1609-1626.

Mountford, A. (1997). Can a brain drain be good for growth in the source economy? Journal of Development Economics 53 (2), 287-303.

Ozden, C., C.R. Parsons, M. Schiff and T. Walmsley (2011). Where on earth is everybody? The evolution of global bilateral migration 1960-2000? World Bank Economic Review 25 (1), 12-56.

Poutvaara, P. (2008). Public education in an integrated Europe: studying to migrate and teaching to stay? Scandinavian Journal of Economics 110 (3), 591-608.

Pritchett, Lant (2006). Let Their People Come: Breaking the Gridlock on Global Labor Mobility. Center for Global Development; University Presses Marketing.

Rauch, J.E. and A. Casella (2003). Overcoming informational barriers to international resource allocation: Prices and Ties. Economic Journal 113 (484), 21-42.

Rosenzweig, M.R. (2007). Higher education and international migration in Asia: brain circulation. Paper presented at the World Bank Annual Regional Conference, Beijing, January 2007.

Spilimbergo, A. (2009). Democracy and foreign education. American Economic Review 99 (1), 528-43.

Stark, O., C. Helmenstein and A. Prskawetz (1998). Human capital depletion, human capital formation, and migration: a blessing or a 'curse'? Economics Letters 60 (3), 363-7.

United Nations (2010). Trends in International Migrant Stock : Migrants by Age and Sex. New York: United Nations Publications.