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Migration of the Highly Skilled: A Tentative and Quantitative
Approach

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A paper submitted to the IARIW 30th General Conference, Slovenia, August 24-30, 2008
Parallel Session 4A: Global and National Flows of People and Jobs

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Content

List of Tables.....	2
Introduction.....	3
Aggregate and stylised facts.....	4
Impact of migration of the highly skilled on skilled labour force.....	6
Data on the migration of the highly skilled.....	9
Highly skilled migrants vs. internationally mobile students	12
Why and how much of the highly skilled migrate: A statistical analysis.....	15
First order redistribution effects of migration of the highly skilled.....	21
Conclusions and further research.....	23
Appendix 1.	28
Regions and Countries included in the estimation of Highly Skilled Migrants.....	28

List of Figures

Figure 1 Highly skilled migrants as % of the highly skilled labour force in OECD destination countries.....	7
Figure 2 Highly skilled migrants as % of the highly skilled labour force in the country of origin.....	7
Figure 3 Highly skilled migrants from countries of origin 1990 and 2000.....	10
Figure 4 X-Y plots of cumulative distributions of highly skilled migrants and international students (share in total of 2000, country of origin).....	12
Figure 5 Highly skilled migrants in OECD destination countries in 2000.....	13
Figure 6 International mobile students in 2000.....	14
Figure 7 Estimated Stocks of Highly Skilled Migrants, 2000, N=19.1 Million.....	20

List of Tables

Table 1 Origin of migrants in OECD countries.....	4
Table 2 Origin of Internationally mobile students	11
Table 3 RegressionA results: the highly skilled Diasporas in OECD countries.....	18
Table 4 Differences in GDP per head in the regions of the world and the accompanying income redistribution effects.....	22

Introduction

Migration of the highly skilled is a phenomenon that has been labelled very differently in the course of time. In the nineteen fifties and sixties it was labelled 'brain drain' stressing the assumed negative impact on the European countries of the migration of the highly skilled towards the traditional emigration countries like US, Canada, Australia and New Zealand. Later it was labelled 'brain gain' because destination as well as origin countries may profit from the migrating highly skilled (IOM, 2005). The road in the middle was called 'brain strain' emphasising that out migration can be either positive or negative for the origin countries (Lindsay-Lowell *cs.*, 2004). A synthesis appeared as migration of the highly skilled was perceived as 'brain circulation' (Saxenian, 2002) or as 'transmigration' (Danby, 2004). Migration from the perspective of brain circulation is not an end in itself, but the beginning of a circular process in which everyone might be better off. The direction the highly skilled go cannot be seen in isolation from other influences. Circulation of the highly skilled is embedded in the global flows of technology, capital and the media (Castells, 1997, 1999, 2000 and Appadurai, 1996). Migration of the highly skilled therefore is not simply leaving the periphery for the core; on the contrary it consists of decentralised two way flows of skills, capital and technologies between regional economies with different specialities. (Saxenian, 2006).

Despite an enormous literature on migration it is impossible to draw a systematic global quantitative picture of migration of the highly skilled. Therefore discussions in terms of brain drain, brain strain or brain circulation are either theoretical or end unresolved. A global picture cannot be drawn with the help of data on South-North migration of the highly skilled (Docquier and Marfouk, 2004). South-South and North- South migration data is not systematically covered by the international statistical institutes. It is the aim of this paper to include as many as possible countries in the analysis of the migration of the highly skilled in order to unveil the drivers of migration as well as the major effects related to migration in all origin as well as all destination regions. This picture can be constructed by using Docquier and Marfouk, 2004 and UNESCO data; these sources facilitate preliminary calculations and/or estimations of the missing migration flows, as will be explained below.

Migration of the highly skilled depends on several factors that can be summarized by saying that migrants pursue of better quality of life and work and therefore go abroad. Drivers are income differentials, a friendlier environment to entrepreneurship, better training and educational opportunities (Uebelmesser, 2006) and a more advanced knowledge infrastructure especially when linguistic and historical ties are close. But surprisingly few facts on the pull and push factors for migration of the highly skilled have been established in the literature (Thorn and Holm Nielsen, 2006). In general wage and taxation differentials are seen as important push and pull factors¹. However the meaning of these factors are different for different occupations: for professionals practice has become a transnational matter (Iredale, 2001), for scientists the most important factor to go abroad is the desire to be in touch with other research environments and getting access

¹ Especially for professionals like engineers, see Mahroum (2005)

to scientific equipment (Todisco et al. 2003), while migration of managers and executives are mainly affected by corporate policies regarding expanding activities overseas (Mahroum, 2001). Therefore migrants are sometimes called ‘transmigrants’ to express that migrants often function in a complex world (social, political, economic and cultural spaces) amid the claims of multiple states. (Danby, 2004) Other push factors are quality of society like human rights, democracy and political stability (Lindsay Lowell et al., 2004, OECD, 2001).

This paper is organised as follows: Based on the available data including the estimated ‘missing data’ drivers of migration can be revealed. This can be done using a simple linear regression model to select the most important ones out of those mentioned in the literature. Furthermore based on the produced data on the origin and destination of the highly skilled a destination/origin matrix of migration of the highly skilled in 8 regions reveals the (in and out) flows of highly skilled migrants for the Arab States, Central and Eastern Europe, Central Asia, East Asia and the Pacific, Latin America and the Caribbean, North America and Western Europe, South and West Asia, Sub Sahara Africa. By imposing differences in income levels on this matrix an impression of first order (welfare) effects can be obtained. The paper ends with suggestions for a framework for further research a framework that is better suited to account for the welfare effects.

Aggregate and stylised facts

An aggregate view on migration towards OECD is exhibited in Table 1. In 1990 40.3 million migrants lived in the OECD area while a third of them (i.e. 12.1 million) can be regarded as highly skilled. Since then migration of the highly skilled grew with more than 5% annually. Taking this growth and other indications into account we can safely say that in 2007 the number of migrants in the OECD area will exceed 73 million and almost 40% (i.e. 29 million) will be highly skilled, while non-OECD origins exhibit a faster growth rate than OECD origins.

Table 1 Origin of migrants in OECD countries

Highly Skilled migrants (millions)				
		OECD	Non-OECD	Total
	1990	6.0	6.1	12.1
	2000	8.5	11.5	20.1
	2007E	10.9	18.1	29.0
average annual growth 1990-2000 (%)		3.6%	6.6%	5.2%
Composition				
	1990	49.6%	50.4%	100.0%
	2000	42.5%	57.5%	100.0%
All migrants (millions)				
	1990	22.6	17.7	40.3
	2000	28.3	28.7	57.0
	2007E	33.0	40.3	73.3
average annual growth 1990-2000 (%)		2.3%	5.0%	3.5%
Composition				
	1990	56.1%	43.9%	100.0%
	2000	49.6%	50.4%	100.0%

source: Docquier and Marfouk, 2004

2007E: these values have been estimated based on the 1990-2000 growth

Among these highly skilled migrants the main categories of professions are ICT and health staff, intra company workers other consultants, highly specialized contractual service suppliers and independent professionals particularly in a North-North or North-South context, but increasingly also in a South-North context.² However data on these North-South and South-South flows are not available. Given this situation it is our aim to describe the migration of the highly skilled as complete as possible with the help of additional data on the international mobility of students, in order to sketch the consequences of migration for human capital in origin as well as destination countries.

Often, and as stated above, the consequences of migration for the countries of origin are formulated in terms of gaining and losing. This well explored field of research delivered no clear answers. The answers depend firstly on the period one takes into account. In the short term countries of origin lose directly a part of their human capital: well educated people that leave the country imply a loss because the public investments in human capital during the period of education are not compensated by productivity gains and taxes paid if these people were employed at home. Secondly in the long term these negative short run effects might be compensated by positive long term effects, due to the network effects of the Diaspora that gives access to the knowledgebase in the country where they live. The importance of the size and concomitant network effects of the Diaspora are mentioned in Mahroum (2005), Ackers, (2005) and Korys (2003). Specific effects of large Diasporas are given in Chalamwong (2004), Kapur (2001), Commander et al. 2003, Kuptsch (2006) and in Costa (2004, 2006).

Despite the sheer impossibility to summarise the mechanisms and evidence discussed in this literature in a few lines, it might be clear that a large Diaspora can be exploited in several ways by the country of origin. This varies from initiatives that aim at compensating for the brain drain by stimulating return migration in the future to enhancing capital flows, technology transfer and exports of the country of origin. Ireland (Barrett, 2002) and Hong Kong China (Ley and Kobayashi, 2005) might serve as examples of economies that exploited the Diasporas abroad. The Hsinchu-Science Park in Taipei, China was also greatly supported by the Taiwanese Diaspora in the US. Sometimes returning highly skilled migrants are even the main driving force behind a particular industry as is the case in the software industry in India, China and Korea (Kapur and McHale, 2005).

In some places brain circulation and return migration is considerable as Mayer and Peri (2008) show: 20-30% of the highly skilled migrants from Eastern Europe and Asia return (from the US) to their home country. Retirement is not the reason on the contrary the returning migrants are still productive and (according anecdotal evidence) many of them receive a significant wage premium, which implies that return migration is an important element in brain circulation and contributes significantly to brain gain.

Returning or circulating migrants may bring some welfare gains for the country of origin it possibly also functions as an example for young people.

² <http://www.unctad.org/Templates/Page.asp?intItemID=3887&lang=1>

Welfare gain or losses are a matter of proportions: countries that combine relatively low levels of human capital and low skilled emigration rates are more likely to experience a beneficial brain drain (net positive effect) and conversely. The main globalising countries of today (Brazil, China and India) all experience non-negligible gains from their migrating highly skilled, while many small countries in Sub Sahara Africa and Central America lose. However, migration of the highly skilled leads to an increase of the number of highly skilled in developing countries and important distributional effects among developing economies (Beine, Docquier and Marfouk, 2008).

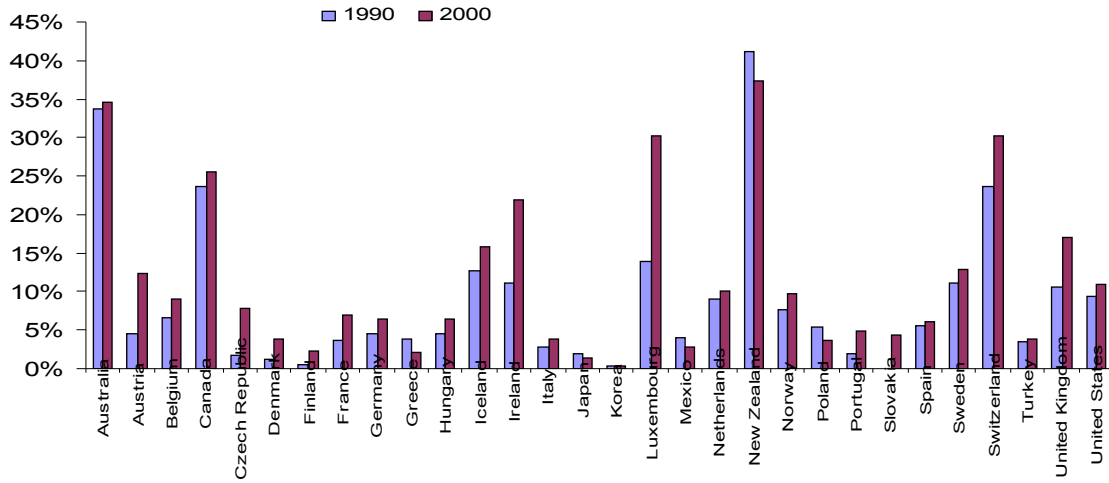
What are the countries that exhibit high levels of migration of the highly skilled? The next paragraph shows how migration weighs on the highly skilled labour force in destinations well as in origin countries.

Impact of migration of the highly skilled on skilled labour force

A direct measurable consequence of migration of the highly skilled is the impact on the highly skilled labour force. This is exhibited in Figure 1 for destination countries and in Figure 2 for destination countries. The data allows us only to describe OECD as destination countries, while countries of origin can be chosen from almost all countries in the world. Given this restriction we see that the traditional 'receiving countries' like Australia, Canada, Ireland and Luxembourg (since 2000), New Zealand and Switzerland exhibit rather large effects caused by highly skilled migrants on their highly skilled labour force. New Zealand tops the palm with 40% of their highly skilled labour force coming from abroad, compared with the US with only around 10%.

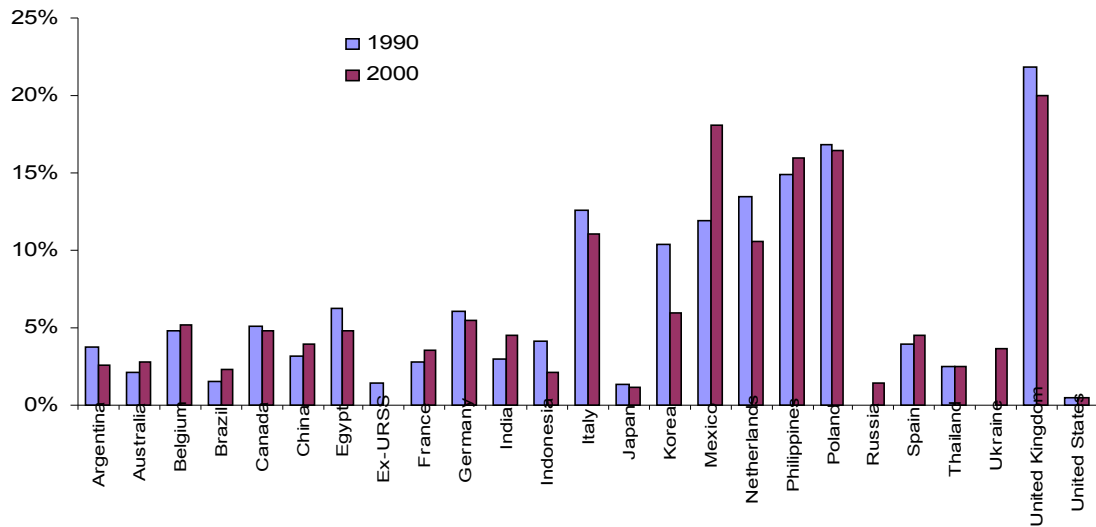
Immigration of the highly skilled rose between 1990 and 2000 in almost all (OECD) destination countries more than the indigenous highly skilled labour force. The ratio of highly skilled migrants as percentage of the highly skilled labour force increased in many of the OECD countries but not in Greece, Japan, Mexico, New Zealand and Poland. The ratio skyrocketed in Austria, Czech Republic and Luxembourg. This might be caused by events like the collapse of COMECON, the unification of Germany but also by migration policy changes. Migration policy became more restrictive and more selective in these countries; this has reduced the proportion of immigrants dependent on family relationships and increased the proportion of the highly skilled. (UN, 2004)

Figure 1 Highly skilled migrants as % of the highly skilled labour force in OECD destination countries



Source: UNU-MERIT based on Docquier and Marfouk, 2004

Figure 2 Highly skilled migrants as % of the highly skilled labour force in the country of origin



Source: UNU-MERIT based on Docquier and Marfouk, 2004

The most important countries³ of origin of the highly skilled migrants are exhibited in Figure 2. Large effects –between 10 and 20%- of the highly skilled in terms of the highly skilled labour force in the country of origin are to be found in Italy, Korea, Mexico, Netherlands, Philippines, Poland and the UK. Surprisingly the US (and Japan) exhibit very small effects of migration of the highly skilled labour force, while the effects in China and India are more pronounced but still far below the 10-20% magnitude of the earlier mentioned countries.

The use of OECD-bound migration data has the disadvantage of leaving other possible important destinations out of sight⁴; therefore we revert to UNESCO data on international mobile students. It seems that highly skilled migrants and students follow collective paths in finding their way in the world and therefore student mobility and international mobility of highly skilled workers might be (closely) related. There is ample evidence for the hypotheses that were international mobile students go the highly skilled go.

Tremblay (2002) provides many sources that show that students that went abroad have several advantages to stay or return to the destination country for a job. This author derives from the Science en Engineering Indicators 2000 that among the Indian students in the US 60% have firm plans to stay after graduation; this is more than 50% for Chinese, UK and Peruvian students. Many more examples can be derived from the literature –on a case by case basis- but we abstain from these details because we pursue here the global pattern of migration of the highly skilled. Others emphasize that mobility during the actual university study leads to much greater likelihood of international mobility after graduating (Teichler and Jahr, 2001, King and Ruiz-Gelices, 2003 and Findlay et al, 2006).

The evidence from this work inspired me to use UNESCO data on international mobile students to fill gaps (i.e. the non-OECD destinations) in the OECD bound migration data. In the next section we discuss the main data sources we use in this paper: the Docquier and Marfouk database of OECD bound migration of the highly skilled and the UNESCO data on international mobile students.

³ “Most important” here means the countries with above average migration of the highly skilled, observe that these countries are different for 1990 and 2000 and therefore the figure does show all countries that meet this criterion for 1990 and/or 2000.

⁴ Like Russia, Ukraine, India, Saudi Arabia, Pakistan, Kazakhstan, Cote D’Ivoire and Iran. These countries are together with the larger OECD economies the main immigration countries in and around the year 2000, as Parsons cs. (2005) has shown. However they describe the aggregate bilateral migration stocks and not the highly skilled among the immigrants as we do here.

Data on the migration of the highly skilled

OECD bound migration of the highly skilled

The Docquier and Marfouk data⁵ covers 190 origin and 30 destination countries in 2000 and 170 origin and 29 destination countries in 1990, the destination countries are the OECD member states in these years. The data has been collected from Census or register data and embraces immigration from source countries to OECD countries incorporating information on immigrant's educational attainment. When no information on educational attainment from a source country is available it is assumed that the distribution is equal to that of immigrants of the same nationality towards another country for which such information is known. In 2000 the stock of adult immigrants in the OECD area is about 57 million from about 40 million which is an increase of 42.5% or 3.5% annually, while the number highly skilled migrants in 2000 was 29 million from 12 million, an increase of 5.3% annually⁶.

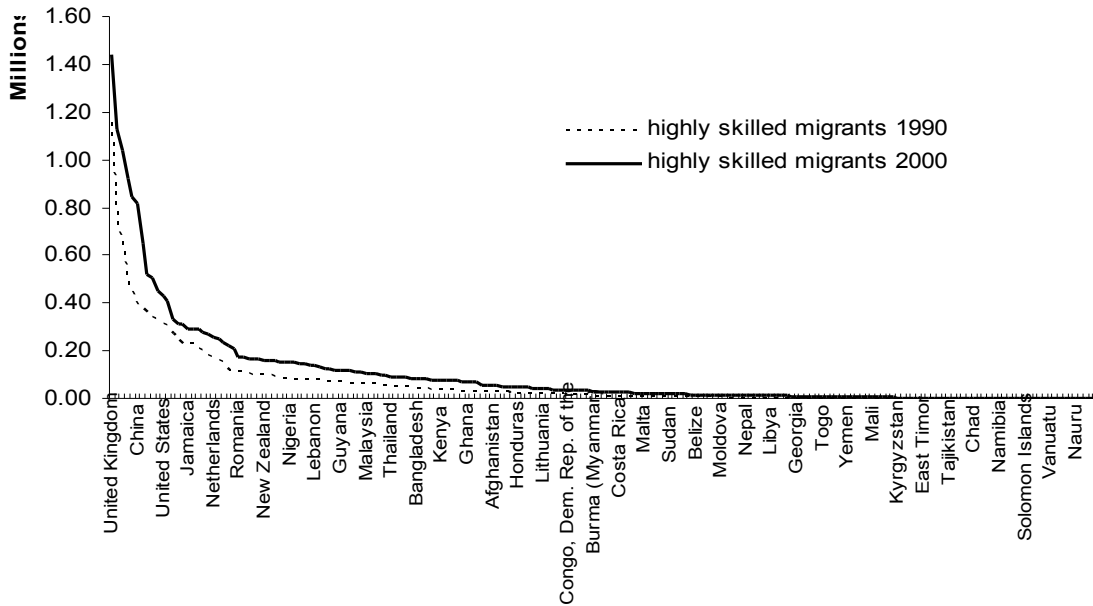
In absolute numbers the Diasporas of the UK, the Philippines, India, Mexico, Germany, China, South Korea, Canada, Viet Nam, Poland, United States, Italy, Cuba, France, Iran, Jamaica, Hong Kong, Russia, Taiwan, Japan, the Netherlands, Colombia and Pakistan are the top 23 most numerous in 2000. These absolute numbers of highly skilled (HSM) migrants from countries of origin are exhibited in . The top 23 origin countries account for more than 63% of the total HSM migrants in 2000.

In absolute terms the European and Asian Diasporas are the largest two while the African and Central-Latin-South American and Caribbean Diaspora are much smaller. Remark that the Diasporas that settled in other than OECD countries cannot be described with this data, which from a development point of view is very interesting, because brain circulation in a region only exists if the region is part of the global circulation of the highly skilled. To complete the global picture we use UNESCO data on International Students and see what we can derive from this source.

⁵ http://siteresources.worldbank.org/INTRES/Resources/Dataset_BD_DocquierMarfouk.xls

⁶ Consistency with the Barro and Lee database on educational attainment is pursued and no illegal immigrants are captured in this data. The migrants are aged 25 and above as in Barro and Lee. Migration has been defined based on country of birth rather than citizenship (a UN recommendation). Docquier and Marfouk made some specific assumptions: When Censuses were not available: wherever necessary data of European Council (10 countries measured based on citizenship), Census, Registers and Labour Force Surveys have been "crossed". Labour Force Statistics are also used to eliminate the people under 25 year of age

Figure 3 Highly skilled migrants from countries of origin 1990 and 2000⁷



Internationally mobile students in 2000

UNESCO data on international mobile students (IMS) describes the numbers of students that leave their country and move to another country with the objective of studying. Internationally mobile students are distinguished with citizenship, permanent residence and prior education. The data presented in the UNESCO database may not be entirely comparable among countries due to differences in the criteria used to report the data concerning IMS and describes the situation around 1990 and 2000.⁸ (See for more details on definitions the statistics portal of UNESCO-UIS/OECD/Eurostat, 2005⁹)

For some countries- China being the most prominent - only destinations are known while foreign students in China are unknown. This is the case for quite a number of developing countries and for cases in which the number of students is lower than 1000; I assume that therefore the regional aggregation of the data is more reliable than the data for individual countries., although the estimation of stocks of highly skilled in these countries (regions) are probably slightly underestimated.

⁷ Only two out of six countries are plotted on the horizontal axis, hence between UK and China, the Philippines, India, Mexico and Germany are situated but not plotted on the X-axis.

⁸ The bilateral data at my disposal is only available for the years “around” 2000 and not always available for both destinations and origins. Future versions of this paper will address this incompleteness of the data.

⁹ http://www.oecd.org/topicstatsportal/0,2647,en_2825_495609_1_1_1_1_1,00.html

The numbers of IMS more than doubled between 1990 and 2007, this is exhibited in . This is mainly the result of a general increase in tertiary enrolment and not so much as a result of increased international orientation among students: in fact the actual share of IMS only rose marginally.¹⁰

Table 2 Origin of Internationally mobile students

Internationally mobile students (millions)			
	OECD	Non-OECD	Total
1990			1.3
2000	0.7	1.0	1.7
2007E	0.8	1.8	2.6
Average annual growth 1990-2000 (%)			2.7%
Average annual growth 2000-2007 (%) E			6.3%

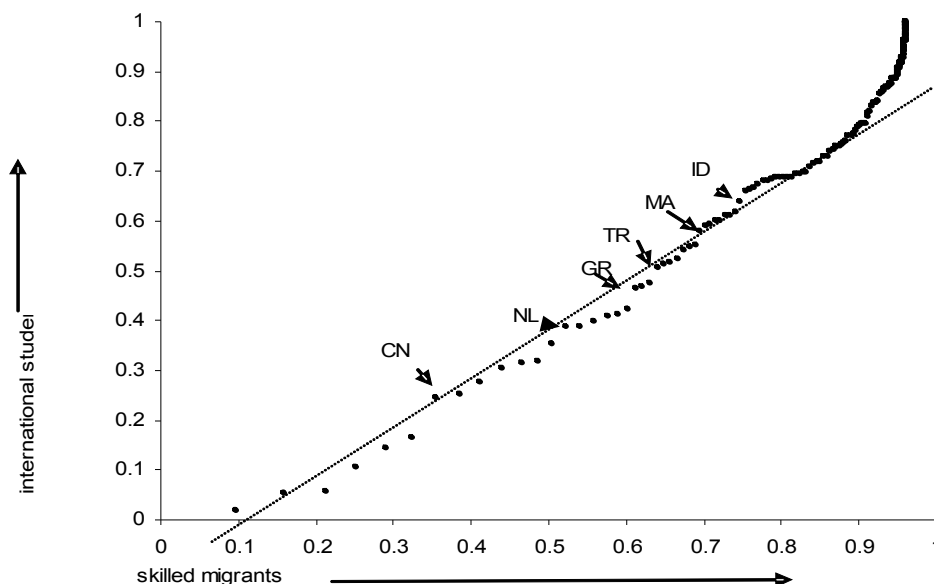
Source: UIS database, internationally mobile students
E: estimated by the author

¹⁰ Global Education Digest 2006, page 34

Highly skilled migrants vs. internationally mobile students

In this paper we test Tremblay's assertion¹¹ that the number and origin of students who went abroad are indicative for where the HSM go. An indication for a possible but yet unknown relationship between stock of HSM and stock of IMS - for each origin - is the relation between the cumulative distributions of the two. Figure 4 exhibits on the X-axis the share of highly skilled migrants ordered from the highest to the lowest shares (per country of origin) while the Y-axis represents the concomitant cumulative student's share. From this figure it is clear that with the exception of the "upper-tail" the cumulative distributions of the skilled migrants and international mobile students are highly correlated. A linear relation suggested by the dotted line describes the ratio HSM to IMS well, although not perfect. Among the countries with large HSM-shares (depicted by the dots at the left side lower corner of the figure) there are quite a number of countries with relatively large numbers of IMS compared with HSM in particular China (CN), Netherlands (NL), Greece (GR), Turkey (TR), Morocco (MA) and Indonesia (ID). This is exhibited in Figure 4 by the "discontinuities" in the relation between HSM and IMS. However the "tail" above the dotted line at the right-hand upper corner of the figure is populated with the majority of the countries that send many students but very few highly skilled migrants abroad.

Figure 4 X-Y plots of cumulative distributions of highly skilled migrants and international students (share in total of 2000, country of origin)



Based on the data two pictures of the patterns of destination and origin of HSM and IMS in five world regions can be drawn which are given in Figure 5 and Figure 6. The arrows

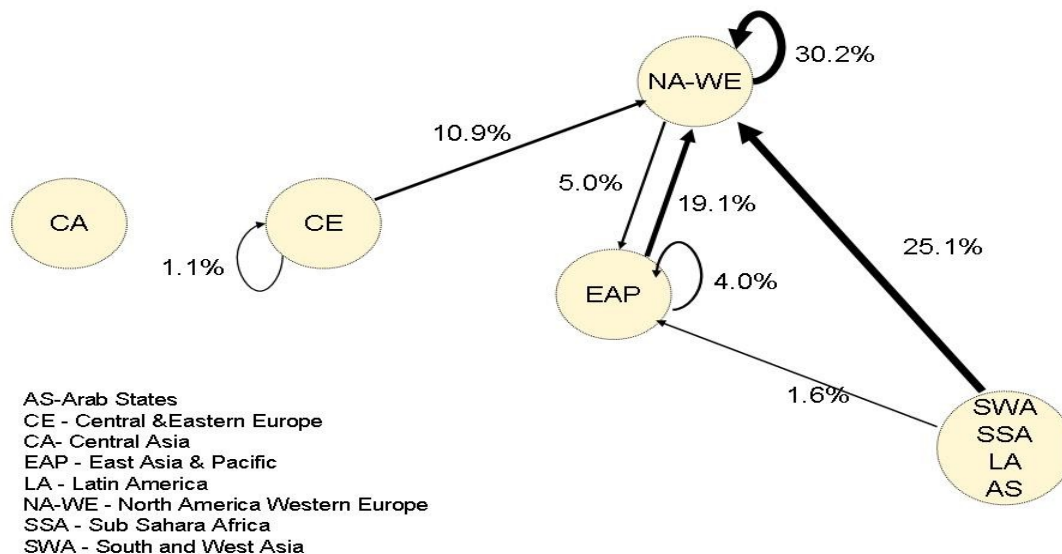
¹¹ See paragraph 3.

in these figures point from the origin towards the destination regions, while the width of the arrow represents the stocks (as accumulated past flows) as far as they account for more than 1% of the total.

These figures has to be interpreted with care: in Figure 5 the destination countries are OECD countries, while in Figure 6 the destination and origin countries are the countries having more than 1000 students abroad or at home¹².

North America and Western Europe (NA-WE) functions as the strongest magnet: most of the HSM as well as the ISM settled in this region, HSM that moved within this region account for 34.7% of the total. HSM that went to NA-WE from South West Asia (SWA), Sub Sahara Africa (SSA), Latin America and the Caribbean (LA) and the Arab States (AS) taken together make up 25.1% of the total, this is more than the HSM from East Asia and the Pacific (EAP), that make up 19.1% of the total. The stock from Central and Eastern Europe (CE) is smaller than the flow from Eastern Asia and the Pacific (EAP). Within region flows are small in Central Europe (CE) and East Asia and the Pacific (EAP) and (almost) non existent in the other regions, with the exception of North America and Western Europe (NA-WE).

**Figure 5 Highly skilled migrants in OECD destination countries in 2000
N=14.6 Million**

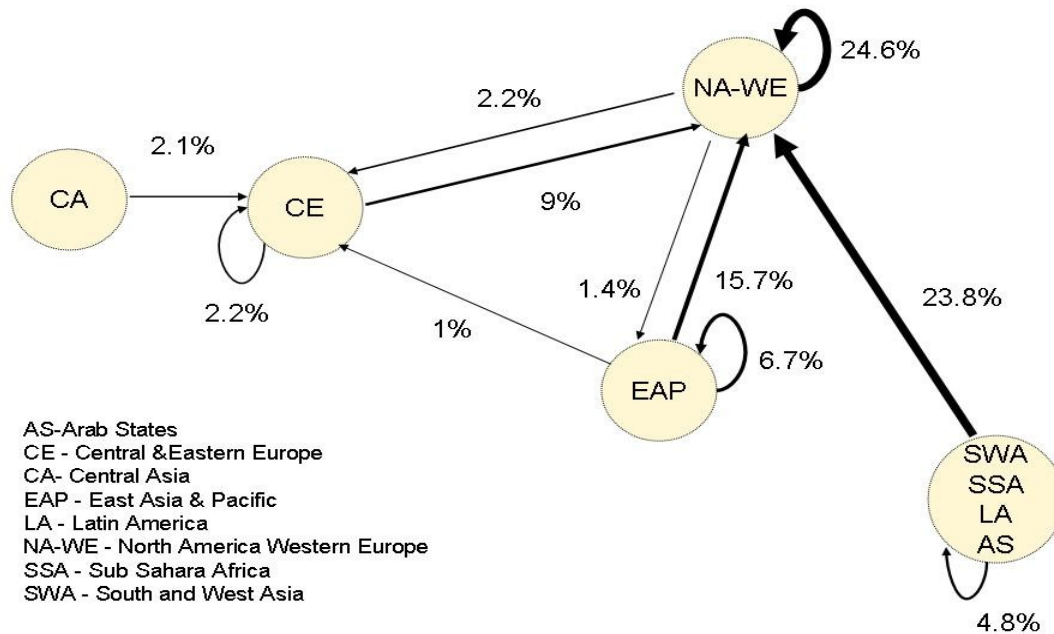


More important than the size of flows and stocks is the question if the patterns of HSM and IMS match. The data on IMS more or less confirm the pattern of the HSM, based on OECD destinations. Of course it is a rough way to compare, but the sizes of the stocks

¹² See for the selection of countries Appendix 1, this restricted set of countries has the consequence that from the 29 million HSM in the Docquier and Marfouk data, mentioned in Table 1 only 14.6 million are part of the analysis.

that came from within and towards North America and Western Europe (NA-WE) and the region that consist of African (SWA, SSA) Latin American (LA) and Arabian countries (AS) and East Asia and the Pacific (EAP) region exhibit patterns that are not very different. The interregional mobility in Central and Eastern Europe (CE), the African, Latin American and Arabian region (SWA, SSA, LA, AS) and East Asia and the Pacific (EAP) are indications of missing circuits in figure 5. Figure 6 confirms also that there is (almost) no mobility towards Central Asia (CA) in this sense this region is a bit peripheral, hence it is very unlikely that brain circulation exists. The African, Latin American and Arabian region (SWA, SSA, LA, AS) exhibits in Figure 6 modest intra regional circulation which is (by definition) lacking in Figure 5.

Figure 6 International mobile students in 2000
N=1.7 Million



Comparing both figures reveals two things: firstly the order of magnitudes from Figure 5 are also present in Figure 6, and secondly the additional information looks plausible. Additional information are the inter regional stocks of mobile students within the African, Latin American and Arabian region (SWA, SSA, LA and AS) and the circuit between Eastern Asia and the Pacific (EAP) as well as Central Asia (CA) and Central Europe (CE) and from North America and Western Europe (NA-WE).

Why and how much of the highly skilled migrate: A statistical analysis

In this paragraph we test some of the hypothesis derived from the literature in a simple linear regression model.

Basically four drivers of migration emerge from the literature¹³:

- Size of the Diaspora
- Wage gap between country of destination and origin
- Cultural proximity
- Quality of Society

The size of the Diaspora is often mentioned in the literature as an important driver of migration. The larger the Diaspora the easier (and less costly) it is to take leave for the host country in which so many compatriots already work. In the regression we use the size of the Diaspora of highly skilled people a decade ago¹⁴ (as a ratio of the population of the country of origin) together with current differences in wages culture and quality of society between the host and origin country.

Cultural proximity is another important phenomenon that impacts the choice of host country the migrant chooses. The more linkages there are between home and host country the more likely it is that the migrant chooses a host country. Language is one of these linkages other possible linkages are former colonial ties etc.

Quality of life might be improved by going abroad, earning higher wages and enjoying a better infrastructure; a countervailing power is the quality of life in the home society. If this quality is low due to lack of political stability or massive corruption the option to leave this unpredictable and unsafe context is high, while on the other hand political stability and reliable public governance might diminish the urge to leave.

The independent variable is defined as the ratio of the highly skilled from country of origin that settled in the host country and the population of the country of origin. The highly skilled that emigrated is based on census data in the host countries (stock of migrants). This presents data on Diasporas from about 195 source countries into 30 OECD destination countries. From this dataset we derive for 2000 and 1990 the stock of highly migrants in the 30 OECD countries from 195 countries of origin¹⁵. For each of the 30 OECD countries the stock of highly educated migrants (as a ratio of the population in

¹³ Of course many more variables could be chosen from the list that can be derived from the literature , however it is often very hard to find sufficient observations for many countries, especially data on entrepreneurship, information and knowledge infrastructure are hard to find for the number of countries we like to consider. This is one of the tasks ahead for revised versions of this paper.

¹⁴ Ignoring endogeneity and other possible sources of bias –like the impact of a conscious migration policy to attract the highly skilled - in the estimations, further elaborations of this research will target these issues.

¹⁵ This exercise is also possible for 1990.

the country of origin) from the 195 countries of origin has been calculated. The number of cases therefore is $30 \times 195 = 5850$ for the year 2000, for 1990 these numbers are somewhat lower.

As regressors we have chosen the following variables:

Wage level differences between the 30 OECD and the 195 countries of origin have been approximated by differences in GDP per head in purchase power parities (World Development Indicators). It turned out to be impossible to use the databases on occupational wages because of the low coverage of countries in the database on occupational wages (ILO data and/or the Freeman-Ostendorp database¹⁶).

Cultural proximity - a term coined by Straubhaar (1991) – is rooted in cultural-linguistic ties between people. This concept from the communication sciences assumes that shared linguistic and historical experiences give rise to cultural commonalities creating a sense of closeness in audiences. Specific values and historical proximities are often seen as tied to the locally spoken language. The linguistic account and the knowledge account are also closely connected: all awareness of sorts, resemblances, facts, etc., in short, all awareness of abstract entities- indeed, and all awareness even of particulars- is a linguistic affair (Sellars, 1963). Indeed cognition and language are important dimensions institutional closeness is clearly another dimension of proximity. Colonial ties are the most pronounced examples of institutional closeness of countries and being a former colony often implies linguistic proximity. These considerations led us to describe cultural linguistic proximity by means of the languages spoken in a country.

Let $l_{i,j}$ the share of people in country i that speaks language j ¹⁷, obviously $\sum_{j=1}^n l_{i,j} > 1.0$ is possible because some people speak more than one language in country i . Take as an example Belgium: 57% of the Belgian population speak Dutch, 40% French and 2% German.

Because we are focussing on the stock of tertiary educated people that migrated in 2000 from their home country (195 countries) to a host OECD (30 countries) country the above defined language matrix $L = [l_{i,j}]$, $i = 1, \dots, 195$ and $j = 1, \dots, 23$ we can calculate the proximity matrix as follows $PL = [pl_{i,k}] = [(l_{i,j}, l_{i,k}^T)]^T$ which is a (195×30) matrix and each row of this matrix describes the linguistic ties with each of the 30 OECD countries. The maximum value is 1.0 the minimum 0.0.

¹⁶ These databases contain occupational wage data for 161 occupations in over 150 countries from 1983 to 2003. The Freeman-Oostendorp occupational wage data http://www.economicswbinstitute.org/data/World_wages.zip are derived from the ILO October Inquiry database (<http://laborsta.ilo.org>, Table 01) by calibrating the data into a normalized wage rate for each occupation. The normalized wages refer to average monthly wage rates for male workers. However the coverage is countries is quite low.

¹⁷ This information is taken from <http://members.fortunecity.com/mikecolley/atlas/>

In for example Belgium we can conclude that Belgium has cultural-linguistic ties with The Netherlands, France and Germany but also with Canada, Luxembourg and Burkina Faso (and many other French speaking African countries) because of the French language spoken and with Switzerland and Austria because of the German language.

Quality of society is a composite variable describing societal quality of the home against the host country; it consists of data on institutional quality (World Bank). The bilateral differences between these indexes show the potential net impact of the push and pull factors for the countries. Quality of society is currently defined in a broad and biased sense because it is measured with six governance indicators. Governance of society is understood as a process, by which governments are selected, monitored and replaced and as a capacity to formulate effectively and implement sound policies. Governance is also characterised by indirect effects like respect of citizens and the state for the institutions that govern economic and social interaction. The indicators on quality of society are available from the work of Kaufmann, Kraay & Mastruzzi (version 2006, hereafter KKM (2006)) and are based on 250 detailed indicators from 25 different sources constructed by 18 different organisations. KKM (2006) aggregated these 250 indicators into six indicators:

- Voice and accountability (VA)
- Political Stability and absence of violence (PS)
- Government Effectiveness (GE)
- Regulatory Quality (RQ)
- Rule of Law (RL)
- Control of Corruption (CC)

The quality of society indicator has been calculated as the average of these six indicators.

The following regression equation is proposed for testing:

$$Z(HSM_{ij} / POP_j) = c + \sum_{l=1}^m \alpha_l Z(DX_{l,ij}) + \varepsilon_{ij}$$

In which:

$Z(Y)$ = z-transformed Y, these variables have the following features: $E\{Z(Y)\}=0$, $VAR\{Z(Y)\}=1.0$

HSM = highly skilled migrants, POP= Size of the population in the home country
 $DX_l = X_{li} - X_{lj}$, X_l one of the explanatory variables mentioned above, i = index for country of destination, j = index for country of origin, ε_{ij} residual assume to be drawn from $N(0, \sigma^2)$ and uncorrelated with HSM/POP.

In Table 3 the variable $F(z < 3.0)$ is a dummy variable that assumes the value of 1.0 if the size of the Diaspora from the country of origin in the host country (one of the OECD countries) is smaller than the average Diaspora +3* standard deviation.

This is the case for the large majority of observations. $L10(HSM/POP)$ is the Diaspora in the host country in 1990 from the country of origin as a ratio of the population in the country of origin in 1990.

CULTPR, DGDP/POP and DQS are cultural proximity, the differences in income per head in PPP and quality of society (which is the average of the six indicators on quality of society by KKM (2006) between the host country and the country of origin.

Table 3 Regression^A results: the highly skilled Diasporas in OECD countries

const	F(z<3.0)	L10(HSM/POP)	CULTPR	D(GDP/POP)	D(DQS)	R-square	DF
8.627 -84.441	-8.691 (-84.753)					0.551	5849
8.597 (83.990)	-8.66 (84.298)		0.034 (3.894)			0.552	5849
8.525 (77.688)	-8.583 (-77.903)		0.037 (3.784)	0.001 (0.092)		0.544	5177
8.516 (62.167)	-8.567 (-62.336)		0.040 (2.249)	0.019 (1.063)	-0.024 (-0.993)	0.544	4493
1.496 (18.421)	-1.507 (-18.452)	0.834 (119.468)				0.87	5849
1.496 (15.258)	-1.507 (-15.303)	0.856 (131.068)	-0.009 (-1.812)			0.867	5177
1.496 (17.442)	-1.507 (-17.465)	0.838 (113.036)		0.022 (4.123)		0.868	5177
1.463 (16.301)	-1.496 (-16.665)	0.835 (108.668)			0.02 (3.919)	0.87	4829
1.496 (17.062)	-1.505 (-17.066)	0.839 (110.600)		0.012 (1.443)	0.015 (1.781)	0.868	4955
1.498 (16.268)	-1.504 (-16.250)	0.839 (105.022)	-0.008 (-1.289)	0.017 (1.954)	0.012 (1.273)	0.868	4493
1.496 (17.068)	-1.505 (-17.071)	0.839 (110.402)			0.015(*) (1.791)	0.868	4955

^ASPSS version 14.0, Release 14.0.0.(5 Sep 2005) has been used to produce these regressions

(*) DDQS replaced by DRL (differences between the countries wrt rule of law)

The results in Table 3 learn that both cultural proximity and the size of the Diasporas are the most important variables that explain the size of the current Diasporas. Quality of society might also function as a significant driver of migration of the highly skilled, although with much less explanatory power. Other variables like the differences in GDP per capita are only slightly significant different from zero.

Linear regression is also applied in order to supplement the (missing) HSM observations towards non-OECD countries. The following equation describes the relation between

ISM (IS2000) and highly skilled in OECD countries (HSM2000) is used in the calculation:

$$HSM2000 = 4.733 * IMS2000 + 193093.5 * HSMGT3, R^2 = 0.626, DF = 3270,$$

(25.696) (52.362)

For HSM2000 > 0.0

This equation “predicts” the number of highly skilled migrants that migrated from the home country to the host country as 4.7 times the number of international students from the same home country in the same host country, while for large Diasporas (larger than 3 times the standard deviation of the standardised variable) this number must be increased by 193093.5.

About 100 cases can be regarded as “outliers+” (i.e. observations that deviate more than + 3 * standard deviation from the average). Most of these cases are the Diasporas in the traditional immigration countries US, UK, Australia, and Canada and in France.

- US: 22 Diasporas are present in the US from China, India, Japan, Korea, Canada, Indonesia, Thailand, Turkey, Mexico, Germany, Brazil, United Kingdom, Malaysia, Hong Kong (China), France, Pakistan, Russia, Colombia, Kenya, Saudi Arabia, Venezuela and Sweden.
- UK: 15 Diasporas are present in UK from Greece, Ireland, Germany, France, US, Malaysia, Hong Kong (China), Spain, Japan, China, Pakistan, Italy, Singapore, Norway, Sweden and India.
- Germany: 14 Diasporas from Turkey, Poland, Greece, Iran, Italy, Austria, China, Russia, France, Morocco, Spain, Korea, Croatia and Serbia & Montenegro.
- Australia: 8 Diasporas from Malaysia, Singapore, Indonesia, Honduras, China, India, UK, and New Zealand.
- France: 5 Diasporas in France from Morocco, Algeria, Tunisia, Germany and Senegal.
- Canada: 3 Diasporas from China, US and France

In conclusion it turns out that the UNESCO data on IMS can be used as a proxy to describe several missing observation especially the observations on migrants in non-OECD countries. Most of the large Diasporas are observed in the Docquier and Marfouk data, thus the main contribution of our method is that especially 10 large and quite a number of smaller Diasporas that settled in non-OECD countries are unveiled.

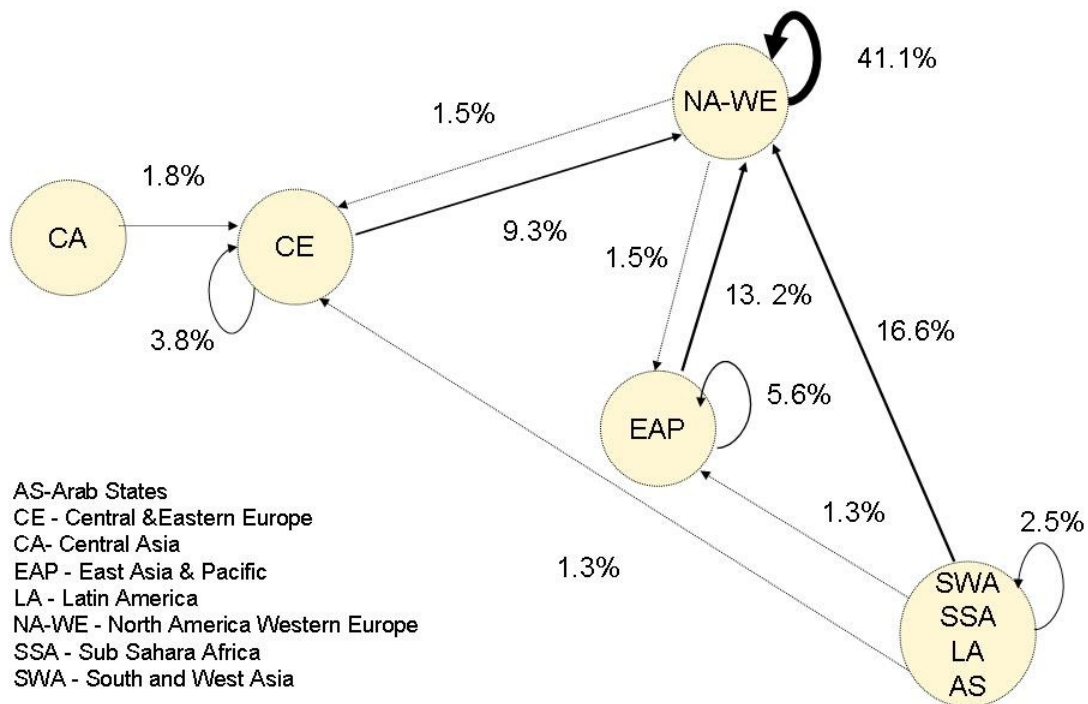
These Diasporas are present in:

- South Africa originating in Zimbabwe, Botswana, Namibia and Lesotho;
- Russia from Kazakhstan, Ukraine and Belarus;
- Ukraine, from Brunei Darussalam;
- Czechoslovakia (former) from Iran;
- Malaysia from China and India;
- Latvia from Israel;
- Romania from Moldova;

- Jordan from Palestine Autonomous Region;
- Tajikistan from Uzbekistan;
- Bulgaria from the Greek Diaspora.

Using these results and assuming that the z-transformed IMS and HSM variables have z-distribution that follows the relation exhibited in Figure 4¹⁸ we can recalculate and redraw the broad picture based on estimated numbers of HSM, this is exhibited in Figure 7.

Figure 7 Estimated Stocks of Highly Skilled Migrants, 2000, N=19.1 Million



What can be said about these results, especially the difference in the landscape between the figures 5, 6 and 7?

Firstly the global landscape that appears from Figure 6 especially with regard to the African, Latin American and Arabian region changed most prominently in Figure 7. The stock of migrants from the African, Latin American and Arabian region (SWA, SSA, LA and AS) towards North America and Western Europe (NA-WE) diminished (from 23.8% to 16.6%) and new stocks of migrants from the African, Latin American and Arabian region (SWA, SSA, LA and AS) towards Central Europe (CE) and East Asia and the Pacific (EAP), which account for more than 2.5% of the migrants, appear on the chart.

¹⁸ To be precise in figure 4 the z distributions are related according to $z(\text{ISM}) = 0.1 + z(\text{HSM})$

Secondly the inter-regional flows in North America and Western Europe (NA-WE) and Central Europe (CE) increased considerably.

In conclusion we can say that the landscape suggested in Figure 5 (based on OECD destinations only) is a biased one. Indeed the destinations as South Africa, Russia, Ukraine, Malaysia and Jordan are real existing destinations for the Highly Skilled; however these stocks are much smaller than the stocks existing in the developed world. Furthermore it turns out that Central Europe (CE) and the African, Latin American and Arabian region (SWA, SSA, LA, AS) are less peripheral in Figure 7 compared with Figure 5.

First order redistribution effects of migration of the highly skilled

Now we have estimates of migration of the highly skilled from everywhere to everywhere we can use these Diasporas to estimate “naïve” or first order redistribution effects by assigning GDP per head in the region of destination minus GDP per head in the region of origin to a highly skilled migrant. This has been done in Table 4, there it is exhibited in which region GDP gains or suffers from migration. For example that migrants from all over the world produce in North America and Western Europe (NA-WE) \$ 140.5 billion -given the differences in GDP per capita and due to outmigration it “looses” \$8.81 billion .

The last row and utmost right column of Table 4 gives these effects for all regions.

The conclusion is that all destination regions incur redistribution losses, except North America and Western Europe. The total first order redistribution effect is almost \$135 billion and is mainly produced in North America and Western Europe (NA-WE) by migrants from the other regions. Migrants from East Asia and the Pacific (EAP) are the owners of \$ 44.3 billion, while North American and Western Europe (NA-WE) migrants loose \$10.8 billion

Table 4 Differences in GDP per head in the regions of the world and the accompanying income redistribution effects

		Region of Origin								
Difference in GDP per Capita between Region Destination and Origin (*\$1000)		AS	CE	CA	EAP	LA	NA_WE	SWA	SSA	<i>Redistribution (\$ BLN)</i>
Region of Destination	Arab States (AS)	0.0	-1.2	5.2	-3.1	1.0	-20.7	4.9	4.6	-0.1
	Central and Eastern Europe (CE)	1.2	0.0	6.4	-1.9	2.2	-19.5	6.1	5.8	-2.2
	Central Asia (CA)	-5.2	-6.4	0.0	-8.4	-4.2	-25.9	-0.3	-0.6	-0.1
	East Asia and the Pacific (EAP)	3.1	1.9	8.4	0.0	4.1	-17.6	8.1	7.8	-3.0
	Latin America and the Caribbean (LA)	-1.0	-2.2	4.2	-4.1	0.0	-21.7	4.0	3.6	-0.1
	North America and Western Europe (NA_WE)	20.7	19.5	25.9	17.6	21.7	0.0	25.6	25.3	140.5
	South and West Asia (SWA)	-4.9	-6.1	0.3	-8.1	-4.0	-25.6	0.0	-0.3	-0.1
	Sub-Saharan Africa (SSA)	-4.6	-5.8	0.6	-7.8	-3.6	-25.3	0.3	0.0	0.0
<i>Redsitrbution (\$ BLN)</i>		<i>23.7</i>	<i>34.4</i>	<i>2.8</i>	<i>44.3</i>	<i>17.8</i>	<i>-10.8</i>	<i>15.4</i>	<i>7.4</i>	<i>135.0</i>

Source: Author's calculations

Conclusions and further research

Migration flows are thus mainly driven by the size of Diasporas build up in the past; migration of the highly skilled is self-reinforcing and partly based on cultural proximity as well. The message here is that the presence of large Diasporas in a globalising world can be quite effective instrument for the acquisition of activities for and the promotion in general of the country of origin.

Another factor that impact migration of the highly skilled is the difference in the quality of governance of society between country of destination and origin. The impact of more quality of society here is positive suggesting that improvement of the quality of society lowers migration of the highly skilled and very likely the acquisition of activities as well.

Knowledge spillovers from the Diaspora to the source country are observed for Chinese and Indian-born engineers in case of return migrating entrepreneurs (Saxenian, 2006, and Ley and Kobayashi, 2005). Further benefits might also consist of the possible induction of additional education among stayers. For the destination countries immigration generates first order external returns, it furthermore expands the size of the market, it introduces new interactions between workers and firms but the main impulse comes from complementarities of skilled immigrants with the capital employed in the host countries. (Borjas, 1995)

Neoclassical models describing migration of the highly skilled in general regard the gap between host and home country's development as fuel for push and pull factors. Here the Findlay-Gerschenkron-Veblen-Arrow model (Findlay, 1978) asserts that the greater the backlog off opportunities in the backward country the greater the pressure to adopt the superior techniques and catch up. Therefore migration is one effect of this backlog the other is the possibility to catch up. However our results point at the importance of the Diaspora already present in the destination country and very likely, although not investigated here the importance of migration policies.

Further research

Migration in a neoclassical model increases the labour supply in the host country evoking more production a wage reduction and a welfare gain. Due to migration the welfare gain under the assumption of constant returns to scale equals halve the increase in the labour supply multiplied by the wage rate reduction. (see e.g Freeman, 2006)

However this is not the perspective of the migrant who wants to improve her/his net present value abroad by migrating from country i to country j compared with this value at home taking into account the costs incurred and the options at the disposal of the migrant to move. It is our intention to proceed along these lines to better understand the global welfare effects of migration of the highly skilled.

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Appendix 1.

Regions and Countries included in the estimation of Highly Skilled Migrants

Arab States:

Algeria, Bahrain, Iraq, Jordan, Lebanon, Morocco, Qatar, Saudi Arabia, and Tunisia

Central Europe

Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Poland, Moldova (Republic of), Romania, Russia, Slovakia, Turkey, Ukraine

Central Asia

Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan

East Asia and the Pacific

Australia, Fiji, Hong Kong (China), Japan, Macao (China), Malaysia, New Zealand, Philippines, Korea, (South Republic of), Thailand, Viet Nam

Latin America and the Caribbean

Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Mexico, Uruguay, Venezuela

North America and Western Europe

Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Sub Sahara Africa

Cameroon, Madagascar, Mali, Namibia, Senegal, South Africa, Togo

South and West Asia

India, Iran (Islamic Republic of)

OECD Member States

Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.