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Migration Balances

Concept, Hypotheses and Discussion

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Abstract

This article describes the concept of migration balance and its usefulness before offering an initial estimate of OECD countries' migration balances. Here, movements of people are identified and then assigned a value in light of the public investments in the education that the migrants received in their countries of origin. Expatriated and impatriated education investment stocks are measured for each country. Net balances are calculated by comparing the stock of human capital in two different years, 1990 and 2000. An estimate of the stock of expatriated human capital is proposed for countries that are not members of the OECD. The implications of this new type of accounting are then discussed, with particular emphasis on developing countries. The last section discusses

the parameters of a possible mechanism to share the value added from migration.

JEL Classification: International Migration (F22) – Remittances (F24) – Foreign Aid (F35) – Open Economy Macroeconomics (F41) – Government Expenditures and Education (H52) – Educational Finance (I22) – Human Capital; Skills; Occupational Choice; Labor Productivity (J24) – Geographic Labor Mobility; Immigrant Workers (J61) – Human Resources; Human Development; Income Distribution; Migration (O15) – Trade Policy; Factor Movement Policy; Foreign Exchange Policy (O24)

Keywords: migration, human capital, brain drain, education capital, migration balance.

Foreword: Soul Trade?

Comparing the movement of people to the trade in goods or capital can shock. Let us therefore specify from the start that this article does not in any way intend to defend the idea that human beings are goods like any other; instead, it intends to understand some of the economic implications behind human migration flows.

Comparing people to goods in this way leads to an initial observation: migration is the only type of flow that is not recorded in a balanced set of accounts. When a Japanese car is exported to the United States, this commercial exchange is offset in accounting terms by a flow of payment in the opposite direction, regardless of its nature (cash in various currencies, a commercial debt, etc.). Similarly, one country's capital investment in another country gives rise to an opposite account entry, depending on the nature of the counterpart to the investment. Whether the trade flows are public or private does not change anything: national accounts record international flows. Human migration, for its part, does not generate any counterpart, either in accounting terms because it is not recorded or in financial terms because it is not estimated.

The accounting anomaly can be resolved by recording an appreciation or depreciation on a country's human capital balance sheet respectively depending on whether the country in question gains or loses an asset (here, a migrant). Obviously, this requires such a balance sheet to exist - something for which one should not give up hope even though economists' experiments have not yet resulted in including intangible human factors in official national accounts. On this subject, one can read the experimental but considerable work by Robert Eisner on the United States (Eisner, 1984), or even our attempted estimate of France's education capital (Mélonio and Timbeau, 2006) on a smaller analytic perimeter (approximately 250% of the United States' GDP in Eisner, compared to approximately 140% of France's in our estimate).

The financial anomaly follows from a different logic. In this case, one can be surprised that countries allow a resource to leave without asking for or receiving anything in exchange. This was more easily understood in a context of widespread oversupply of unskilled labor and relatively non-selective migration policies - a situation similar to the pre-1974 configuration. However, it becomes more surprising during times of increasingly selective migration policies and a scarcity of skilled migrants. The sharp rise in the percentage of skilled workers in migration phenomena, especially in North-South migration corridors (Beine, Docquier and Rapoport, 2008), can only enliven the debate on the compensation that departure countries could request from destination countries. The brain drain phenomenon is nothing new; it has already been analysed extensively - and usually denounced - since the 1970s, resulting in various economic policy proposals, the most notorious of which is the so-called "Bhagwati tax" (Bhagwati and Dellafar, 1973). The debate on compensation for migration flows, which helps justify work on estimating migration balances, will be addressed in the second section of this article.

Generally speaking, one can conclude that migration balances both provide a more complete economic picture that increases the role and value of people in economic systems, and fuel political debate on migration policies, their consistency with development policies and their possible financial implications.

Any progress in estimating the value of human capital by recording foreign contributions in the accounts also has considerable consequences for writings on the link between human capital and growth because it modifies the data on the first item. This is one of the possible uses for estimates of human capital stocks and, as such, the movement of this capital.

1. Tentative Estimation of Migration Balances

1.1 Data Source and Analysis

1.1.1 Data on Migrants' Schooling

Calculating a country's migration balance amounts to measuring migration's net annual contribution to the national stock of human capital (education capital in this article). This could theoretically be done by observing the flow of people between the country and the rest of the world using data from consulates, but these data only rarely provide details on each individual's level of schooling. One must therefore use census data. Inasmuch as censuses are not annual undertakings, migration balances can only - barring exceptions - be calculated by the difference between stocks of human capital measured after the fact, sometimes a long time later. Here, migration balances are estimated over a ten-year period and, if linear movement over the decade is assumed, annual migration balances can be deduced. This assumption is, however, unnecessary, and it seems more reasonable to take an interest in the medium-term evolutions in the countries examined here.

The work presented below relies on Frédéric Docquier and Abdeslam Marfouk's (2006) data for all estimates of the stocks of migrants from developing countries residing in OECD countries in function of the extent of their schooling. These data benefited from prior research by Carrington and Detragiache (1998). Data are available for the years 1990 and 2000, which were therefore chosen here. These data seem to us to be sufficiently homogenous. There are two limitations to the current data. The first is the difficulty estimating illegal migration flows. The impact on our results is double: under-estimation of migration flows, with a marked impact on corridors with a large illegal component; and possible additional biases due to differences in destination countries' techniques for measuring migration and their migration policies. Because the data used here is in stocks and not flows (which implies fewer reporting

problems of illegal immigrants) and because illegal migration is mostly unskilled and therefore provides little education capital, this risk may not be exaggerated here.

The age at which migrants arrive in the destination country (BDR, Beine, Docquier, Rapoport, 2007) was also included in the measurement of the migration balances discussed below. Indeed, depending on whether a migrant from country X arrives in country Y at the age of 12, 30 or 50, the loss of human capital for the country of departure will vary, with it understood that only a migrant's final degree is known, not where the degree was obtained. Age at migration is only provided for higher education graduates in the BDR data; it was therefore transposed to migrants' other levels of schooling (primary, secondary). Improving these data would make it possible to more accurately model the depreciation of migrants' education capital (see, for example, Mélonio and Timbeau, 2006, on linear or geometrical methods applied to France).

1.1.2 Data on Real Length of Schooling

Daniel Cohen and Marcelo Soto's data (Cohen and Soto, 2007) have, for their part, been used to take into account the length of school cycles and the possible termination of schooling before completion of a cycle. When these data were not available, UNESCO data on school attendance were used. This required a linear calibration as the school attendance and graduation rates provided by Cohen-Soto and by UNESCO differ considerably for the countries covered in both databases, with UNESCO being more "optimistic" in general. To avoid an over-estimation bias for countries not covered by Cohen and Soto, the data were recalibrated.

The Cohen and Soto data were used because they constitute an evolution of the Barro and Lee data (Barro and Lee, 2000). Nevertheless, the cycle completion rates

are the weak point in these data. Part of the data seems to have been reconstructed. For instance, the primary school completion rate in 1980 is identical within a thousandth, to the 1990 rate for a large number of countries, which leads one to think that one was extrapolated from the other without any particular correction. This extrapolation is questionable given that the worldwide average intra-cycle completion rate changed between the two dates. At a minimum, linear alignment with the average evolution would have been desirable. In some cases, in the Cohen-Soto and Barro-Lee data, the secondary school completion rate is equal to the primary school completion rate; this is probably the result of an assumption - a questionable assumption since, in the Cohen and Soto data, the average primary school completion rate is 61.8% and the secondary school completion rate is 54.8% for 1980, whereas these figures are respectively 61.2% and 57.4% for 1990. It would therefore be preferable to adjust the data assuming linear evolution rather than invariability over time. This correction was made when analysing our data. Finally, the completion rates for each cycle seem to have been overestimated in general: while Cohen and Soto estimate primary and secondary school completion at 71% in Senegal in 1980, these rates increase to 79.5% and 78.4% in 1990 and 2000 respectively, whereas the RESEN methodology, which relies on very in-depth country analysis, more realistically estimates these rates at 54% and 27% in 2004! Similarly, Cohen and Soto estimate the primary and secondary school completion rate at 88% in 2000, compared to the 67% and 41.4% estimates by the Pôle de Dakar in the RESEN framework.¹

It is therefore not surprising that estimates of human capital's macroeconomic yields are still imprecise, given the amount of work remaining to be done on human capital data, whether on the duration or cost of schooling, not to mention its quality.

1.1.3 Data on Education Costs

The education cost data utilised are from UNESCO. For a certain number of countries, these data are partially or totally unavailable. Out of 173 countries, education costs are partially unavailable for 30 countries and totally unavailable for 23. For countries with partially unavailable data (when the cost of one or two cycles out of the three is

not known), the average of comparable countries was utilised, calibrated to the available data. For countries for which costs are not at all known, the average of comparable countries (in terms of per capita income, geographic location and education spending) was used. We will note that, while per student spending on primary schooling is fairly constant worldwide as a percentage of per capita GDP (slightly less than 15% of per capita GDP on average), secondary schooling spending seems to increase with revenue and vary regionally. In higher education, scale-based productivity and more massive school attendance allow, on the contrary, the most advanced countries to devote a considerably smaller share of average revenue per student than the least developed countries (LDCs) (OECD countries devote amounts ranging from 40% to 50% of per capita GDP to each student every year, whereas LDCs easily spend between 120% and 150% of average national per capita revenue on each student).

The countries partially or totally lacking cost data are mainly low-income countries that are "small" in terms of migration, and they have little impact on the results discussed here. Countries with reconstructed data account for 1.7% of the total amount of expatriated human capital calculated here, and countries with partially calibrated data account for 9.3%. The three largest countries with incomplete data are China, Russia and Canada. However, even with a 10% error in the human capital production cost estimates for countries with partially unavailable data, the error for destination countries - our focus here - would only be on the order of 1%.

We also deplore the lack of data on the private cost of education, too massive an absence to allow migration balances to be calculated to include public and private costs. This leads to underestimating the value of the migration flows measured here. However, the public education investment losses sustained by States are correctly identified. One will therefore keep in mind the fact that the estimates presented in this article indicate flows of public investment physically carried by private actors, but

¹ A few misprints also seem to be present in Barro and Lee's data and in Cohen and Soto's data: the graduation rate seems to be erroneous in both sets of data for Thailand prior to 1980, where there is a break in the series; and, in Zambia, at exactly 80%, the primary and secondary schooling completion rate does not evolve from 1960 to 2000. The differences between the two data series are also very large for Mauritius and Nicaragua (Cohen and Soto indicate a secondary schooling completion rate of 100%).

do not take into account education's direct private cost and opportunity cost (that is to say, giving up earning a salary to pursue one's studies).

Finally, geopolitical changes in the 1990s have made it necessary to adjust data to avoid eliminating an overly large number of countries. The decision was made to use the year-2000 list of countries, assigning reconstructed values for the year 1990 to the countries that did not exist at that time. In this way, we have reconstituted a Slovakia 1990 by assigning it a pro rata share of Czechoslovakia 1990's stock of migrants based on the year-2000 split of immigrants between Slovakia and the Czech Republic, and assuming that this share has not changed. Among countries for which we only know departure flows, the then-USSR-member States and the Ethiopia/Eritrea duopoly were reconstructed using the same procedure. Estimates for these countries must therefore be regarded with great caution.

1.1.4 Choice of a Method to Assign Value to Migration Flows

Once migration volumes are known and the public cost of forming education capital in the countries of departure has been determined, the question becomes one of how to assign value to these migration flows. From a strictly methodological standpoint, the lack of transaction prices makes this difficult to estimate. And yet, it is indeed this "price" that should be used from the accounting standpoint,

and not production cost (if oil exporting countries valued their oil at its production cost, their trade balances would be much worse) or the value for the destination country (which is necessarily greater than the price, otherwise the trade would not happen). The decision was made to value migration flows by assigning them the cost of the schooling received in purchasing power parity (PPP) in order to give each migrant an "absolute" value, reasons of this choice are explained below.

For purchasing power parity levels, the figures in the Penn World Tables were used, also correcting for possible differences between the general price level and the price of governmental services since more than 85% of the cost of producing education capital is covered by the public sector. In other words, the flows estimated here are valued by their formation costs taking into account production cost differentials in the field of education around the world. Since salaries and prices are on average much higher in destination countries than in countries of departure, the value selected here is indeed contained within the range defined by the lower limit of the cost of forming the migrant human capital and the upper limit of its value in the destination country. Due to a lack of data, it was not possible here to make positive or negative adjustments to take into account differences in the quality of education systems that cost the same. Nevertheless, absolute spending per student is already a proxy for education quality, beyond the number of years of school attendance.

1.2 Estimated Migration Balances

Table 1: Synthesis of OECD Countries' Stocks of Expatriated and Impatriated Education Capital in 1990 and 2000

Quantities Expressed in GDP Points	Expatriated Education Capital 1990	Impatriated Education Capital 1990	Expatriated Education Capital 2000	Impatriated Education Capital 2000	Net Foreign Migration 1990	Net Foreign Migration 2000	Migration Balance 1990-2000
Australia	1.7	23.5	2.5	24.9	21.8	22.4	0.6
Austria	11.3	2.3	12.3	7.2	-9.0	-5.1	3.9
Belgium	4.2	10.1	5.3	10.7	5.9	5.4	-0.5
Canada	8.7	18.1	9.1	18.9	9.5	9.8	0.4
Czech Republic	1.4	0.3	3.1	3.7	-1.1	0.7	1.8
Denmark	10.3	2.1	11.9	2.9	-8.2	-9.0	-0.9
Finland	10.7	0.6	12.3	2.0	-10.1	-10.3	-0.2
France	2.7	3.7	3.1	4.2	1.0	1.2	0.1
Germany	5.9	2.7	6.6	4.3	-3.2	-2.4	0.9
Greece	8.6	2.5	8.7	2.2	-6.1	-6.5	-0.4
Hungary	5.3	1.3	6.0	2.5	-4.0	-3.5	0.5
Iceland	14.1	8.5	16.5	11.5	-5.6	-5.0	0.6
Ireland	24.0	10.1	24.3	15.0	-13.9	-9.3	4.6
Italy	8.2	0.6	8.2	1.0	-7.6	-7.1	0.5
Japan	0.7	0.4	0.7	0.5	-0.2	-0.3	-0.1
Korea	2.9	0.5	3.6	0.3	-2.4	-3.3	-0.9
Luxembourg	17.7	12.9	18.6	20.9	-4.7	2.3	7.1
Mexico	2.1	2.0	4.4	2.4	0.0	-2.0	-2.0
Netherlands	8.7	2.9	9.5	4.8	-5.8	-4.7	1.1
New Zealand	15.1	25.9	22.2	10.5	10.8	-11.7	-22.5
Norway	6.7	6.0	7.6	5.9	-0.7	-1.7	-1.0
Poland	3.6	1.7	5.2	2.7	-1.9	-2.4	-0.5
Portugal	12.7	0.9	12.9	0.9	-11.8	-12.0	-0.2
Slovakia	3.6	0.5	8.5	2.2	-3.1	-6.3	-3.2
Spain	2.7	3.3	2.7	3.5	0.7	0.8	0.1
Sweden	4.9	7.9	6.7	11.6	3.0	4.9	1.9
Switzerland	11.1	24.1	12.4	25.2	13.0	12.8	-0.2
Turkey	2.0	1.8	2.2	3.9	-0.2	1.7	1.9
United Kingdom	10.2	3.5	11.6	6.1	-6.7	-5.5	1.2
United States	0.7	4.2	0.8	4.5	3.5	3.6	0.2

Source: Author's calculations.

Table 1 gives the stock of expatriated education capital in percentage points of GDP for each OECD country. It is read as follows: emigrants from France to the OECD held, according to our estimates, a stock of education capital equal to 2.7 GDP points in 1990, and 3.1 GDP points in 2000. The impatriated stock (flow from the entire planet toward France) represented 3.7 GDP points in 1990 and 4.2 in 2000. France's net migration balance was positive

overall: 0.14 GDP points from 1990 to 2000, or a fairly modest net annual inflow of education capital of 0.014 GDP points, equivalent to just over 200 million dollars in 2000 (in PPP). The countries receiving the most from migration are, starting from the largest recipient: Luxembourg (+7.1 GDP points in ten years), Ireland (+4.6), Austria (+3.9), Turkey (+1.9) and Sweden (+1.9). Turkey's position may surprise, but one can note the inflow of higher education graduates

(probably with a non-negligible share of returning binationals) from Germany, Great Britain or the United States - countries where education costs are high, which was therefore a significant contribution for the country during the 1990s. The countries with a longer immigration history sometimes have very large stocks of education capital (nearly 25 GDP points for Australia and Switzerland in 2000, 21 points for Luxembourg, and even 19 points for Canada).

Some countries have, on the contrary, seen their brains and arms flee their territory: New Zealand, for instance, has lost more than two GDP points per year (this is the equivalent of one-third of the country's education spending evaporating every year!). This very large deficit can be explained by very heavy emigration to neighbouring Australia and, to a lesser extent, to the United States and Great Britain. Outside of these cases, which are extreme for the OECD, Mexico (-2.0), Korea (-0.9) and Denmark (-0.9) have all lost in the education capital shuffle to various degrees.

Analysis of Tables 2 and 3 inspires several comments. Emigration, like immigration, became more selective from 1990 to 2000 (the number of university graduates has risen in proportion to the total number of migrants). This characteristic is fairly common to OECD countries. France's stock of expatriates has changed little in number, but since the percentage of university graduates has sharply increased, the overall value of the stock has increased greatly in the absolute. One will also note the large drop in the number of expatriates whose education

levels are not known. This could create a bias if the lack of knowledge of degrees in the surveys depended on the level of study, and this bias had varied over time. It is difficult to know how this imperfection could play here and, consequently, the decision was made to allocate migrants whose levels of schooling are not known proportionately to the number of migrants whose degrees are known on a pro rata basis for 1990 and 2000. For immigration, one will note that it takes a significant number of immigrants from developing countries to offset the "losses" due to expatriation. In our model, which gives considerable space to schooling costs, this is explained by the notable difference in the cost of "producing" a graduate in a developing country versus in a developed country. Given the valuation method utilised, developed countries turn out to be France's principal suppliers of education capital (from largest to smallest: Italy, Portugal, Spain, Germany, Belgium and Switzerland). Morocco, Tunisia and Algeria are also among France's top ten suppliers of education capital (with stocks of 2.7, 1.9 and 1.8 billion dollars PPP respectively in 2000).

The methodology described above also allows one to calculate, for a large group of countries, the stock of expatriated human capital. The table below indicates the countries for which this stock changed the least during the 1990s. The countries indicated in bold type are those for which some data needed to be reconstituted and for which the values given are subject to greater error than the other countries.

Table 2. France: Evolution of the Stock of Expatriates

	Total Emigrants Having Completed Primary School at Best	Total Emigrants Having Completed Secondary School at Best	Total Emigrants with Higher Educations	Total Emigrants for whom Education is Unknown	Estimated Stock in Billion \$ PPP
1990		224 387	223 687	225 415	74 085 27.2
2000		228 714	245 912	312 494	21 693 45.3

Source: Docquier-Marfouk, Author's calculations.

Table 3. France: Evolution of the Stock of Impatriates

	Total Immigrants Having Completed Primary School at Best	Total Immigrants Having Completed Secondary School at Best	Total Immigrants with Higher Educations	Estimated Stock in Billion \$ PPP
1990	2 803 709	192 640	279 044	37.6
2000	2 756 255	325 633	591 611	62.5

Source: Docquier-Marfouk, Author's calculations.

Table 4: Low-Emigration Countries (stock of expatriated human capital in 1990 and 2000)

	Expatriate Stock/GDP, 1990	Expatriate Stock/GDP, 2000	Ten-Year Variation in Percent of GDP
Palau	29.8%	22.5%	-7.3%
Malta	31.8%	30.7%	-1.1%
Angola	3.2%	2.5%	-0.6%
Panama	4.8%	4.2%	-0.6%
Mozambique	1.0%	0.6%	-0.5%
Vanuatu	2.8%	2.5%	-0.3%
Tunisia	4.7%	4.5%	-0.2%
Brunei Darussalam	1.4%	1.2%	-0.2%
Lesotho	0.3%	0.2%	-0.1%
DRC	0.4%	0.3%	0.0%
Italy	8.2%	8.2%	0.0%
Argentina	0.6%	0.6%	0.0%

Sources: Author's calculations using data from UNESCO, Docquier-Marfouk, Beine-Docquier-Rapoport, Cohen-Soto, and the Penn World Tables.

Table 5: High-Emigration Countries (stock of expatriated human capital in 1990 and 2000)

	Expatriate Stock/GDP, 1990	Expatriate Stock/GDP, 2000	Ten-Year Variation in Percent of GDP
Mexico	2.1%	4.4%	2.4%
Iceland	14.1%	16.5%	2.5%
Estonia	2.5%	5.0%	2.5%
Bulgaria	3.1%	5.6%	2.6%
Lebanon	19.0%	21.9%	3.0%
Cape Verde	12.4%	15.9%	3.5%
Hong Kong (China), SAR	16.5%	20.1%	3.6%
Kuwait	1.2%	4.8%	3.6%
Congo	1.7%	6.6%	4.9%
Bahamas	7.3%	12.7%	5.4%
Cuba	15.0%	20.5%	5.5%
Fiji	13.0%	19.7%	6.7%
New Zealand	15.1%	22.2%	7.1%
Samoa	47.6%	54.7%	7.2%
Tonga	48.2%	55.8%	7.6%
Dominica	19.4%	27.0%	7.6%
Belize	32.0%	43.9%	11.9%
Antigua	22.2%	39.5%	17.4%
Jamaica	37.7%	57.5%	19.7%
Guyana	27.4%	50.9%	23.6%
Trinidad and Tobago	42.6%	73.5%	30.8%

Sources: Author's calculations using data from UNESCO, Docquier-Marfouk, Beine-Docquier-Rapoport, Cohen-Soto, Penn World Tables.

This group contains countries that have low rates of expatriation and/or very limited per capita investment in human capital. The small number of countries whose stock of expatriates fell is explained by the increase in the number of migrants in general, the increase in their qualifications, and the lack of depreciation assumed here for education capital. In this group of countries whose human capital expatriates itself (sometimes massively), one will note the very large proportion of island States, including States with a high degree of development, and the presence of countries that experienced conflict during the period considered. The numbers given for the very small countries should, however, be regarded with caution because the small number of their representatives in the samples surveyed in developed countries implies a high margin of error when a Labour Force Survey has been used in the destination country instead of a census. In addition, the quality of data

on education costs is frequently mediocre for these countries. This explains the number of countries indicated as being uncertain.

Finally, a last comparison of foreign direct investment and migration is revealing. Here, the proposal is made to calculate a rate of "brain openness", calculated as a rate of extroversion by the half-sum of stocks of impatriated and expatriated education capital in GDP points. Here, the results are presented as stocks and not flows. Generally speaking, one can note a trend of increasing "brain openness" between 1990 and 2000.

It should be noted that brain openness has increased in almost all countries between 1990 and 2000 in GDP points. This probably derives from both an increase in the number and value of migrants in the world. It seems pretty obvious that small countries are more open than big countries, which is a feature in line with traditional trade economics.

Table 6: Rate of “Brain Openness” in OECD Countries

Quantities Expressed in GDP Points	Rate of “Brain Openness” in 1990	Rate of “Brain Openness” in 2000
Australia	12.6	13.7
Austria	6.8	9.7
Belgium	7.1	8.0
Canada	13.4	14.0
Denmark	6.2	7.4
Finland	5.6	7.1
France	3.2	3.6
Germany	4.3	5.5
Greece	5.5	5.4
Hungary	3.3	4.2
Iceland	11.3	14.0
Ireland	17.1	19.7
Italy	4.4	4.6
Japan	0.5	0.6
Korea	1.7	1.9
Luxembourg	15.3	19.8
Mexico	2.0	3.4
Netherlands	5.8	7.1
New Zealand	20.5	16.3
Norway	6.4	6.7
Poland	2.7	4.0
Portugal	6.8	6.9
Spain	3.0	3.1
Sweden	6.4	9.1
Switzerland	17.6	18.8
Turkey	1.9	3.0
United Kingdom	6.9	8.9
United States	2.5	2.6
Average	6.8	7.9

Source: Author's calculations. Each rate is obtained by calculating the average of the rates of openness to expatriation (expatriated education capital/GDP) and to impatriation (impatriated education capital/GDP).

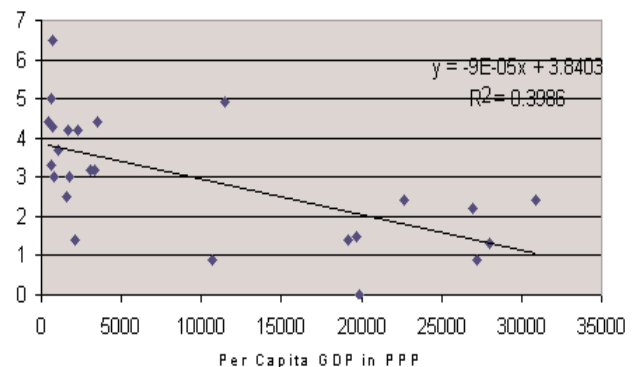
2. Economic Policy Stakes

2.1 Discussion on the Measurement of Human Capital

All of the results presented focus on public education capital and not human capital. Indeed, private spending on education and health expenditures are not taken into account here. In models that examine economic growth, most production functions are estimated by approximating human capital according to length of school attendance. Here, education spending provides a second element, one that improves accuracy according to our tests.

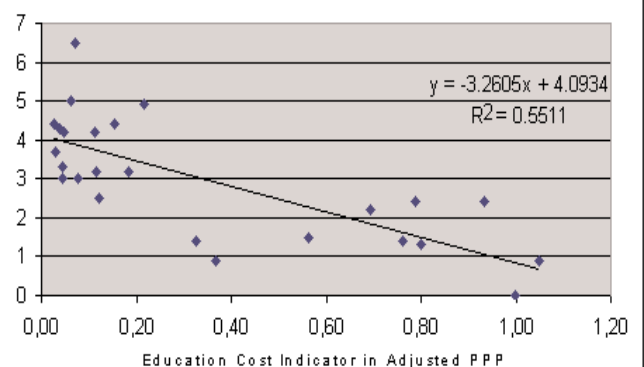
Ideally, one should approximate human capital using a real indicator measuring the active (and inactive) population's "skills", as mentioned in the article by Coulombe and Tremblay (2008). Since this type of measurement is only available in a harmonized manner for a limited number of countries, we have approximated it through education spending in PPP to public service costs for the countries considered. This method was adopted after building an indicator consisting of each country's average spending on students in primary, secondary and higher schools compared to the spending of Canada, used as the country of reference. This approach was then tested by running a regression comparing our ad hoc cost indicator to an indicator of the real quality of graduates, the skill-schooling gap developed for Canada. The skill-schooling gap indicates, at average education level, the difference in number of years that a student in a given country would need to attain the level of a Canadian student with the same school attendance. The smaller the indicator, the more an education system produces students near the Canadian level. In other words, the skill-schooling gap is inversely correlated to the quality of an education system, at least according to the partially normative referential adopted by this aggregate of the 4 tests in the International Adult Literacy and Skills Survey (writing, document comprehension, calculating, problem solving). The different regressions that we ran showed that our ad hoc indicator of education cost in PPP to public service price explains graduates' "real level of skills" better than per capita GDP, per capita GDP in PPP, education cost in absolute

Graph 1: Link Between Skills Level and Per Capita GDP



Source: Coulombe and Tremblay

Graph 2: Link Between Adjusted Education Spending in PPP and Skills



Source: Author's calculations.

value, or even education cost in PPP to price of the economy. Therefore, taking into account the cost of education seems to be useful in estimating migrants' level of "skills" at an equal level of schooling.

The last column, presented here, indicates a given country's students' additional performance given the country's spending. This column is therefore an estimate of the education system's effectiveness compared to its cost. In 1995, Portugal and Russia had the best cost/efficiency ratio, whereas Ukraine and Korea seemed to spend particularly large sums compared to their students' results.

Table 7: Links Between Education Spending and Skills

	Summary Indicator of 1995 Education Cost in PPP(1)	Skill-Schooling Gap(2)	Result Gap Compared to Average Spending (system efficiency)(1)
Canada	1.00	0	0.83
China	0.04	3.3	0.65
El Salvador	0.05	4.2	-0.27
France	0.69	2.2	-0.37
Germany	0.79	2.4	-0.88
Guyana	0.05	3	0.95
Hong Kong	0.93	2.4	-1.35
India	0.03	4.4	-0.39
Iran	0.08	3	0.84
Italy	0.76	1.4	0.20
Jamaica	0.11	4.2	-0.47
Korea	0.22	4.9	-1.51
Lebanon	0.18	3.2	0.29
Mexico	0.12	3.2	0.52
Netherlands	0.80	1.3	0.18
Pakistan	0.06	5	-1.11
Philippines	0.03	3.7	0.30
Poland	0.16	4.4	-0.81
Portugal	0.37	0.9	2.00
Romania	0.12	2.5	1.19
Russian Federation	0.33	1.4	1.63
Sri Lanka	0.04	4.3	-0.33
Ukraine	0.07	6.5	-2.64
United Kingdom	0.56	1.5	0.75
United States	1.05	0.9	-0.23

Source: (1) Author's calculations; (2) Coulombe and Tremblay.

2.2 Who Benefits from Migration?

Calculating migration balances opens more debates than it resolves. In the same way that it would be simplistic to conclude that a country suffers from its openness to trade in goods and services only because its accounts show a technical deficit, the movement of people requires, in order for the interpretation to be relevant, a higher level of analysis than a simple glance at the bottom line on the migration balance sheet. Of course, at first glance, a foreign trade deficit contributes negatively to GDP as defined in accounting terms, but this does not mean that it does not contribute positively to standard of living, employment level, productivity, or even the GDP of the

country. Following the same logic, one should not focus exclusively on “primary” economic flows, i.e. migration, but also on their numerous economic consequences, some of which can be positive in the medium term. Hence the need to refine analyses that conclude too hastily that the “brain drain” (and, incidentally, the “arm drain”) is negative in nature because the “migration” balances that we have calculated here concern skilled and unskilled workers equally even though the method of assigning value takes into account only schooling inputs and, as a result, our migration balances could easily be mistaken for “brain balances”.

When it comes to migration, a country that watches more human capital leave every year than it welcomes can, in theory, come out a “winner” from the international movement of people. Two mechanisms can be invoked: migrants’ remittances (money, technologies, social practices, etc.) can generate more ancillary activity than was lost,² and/or one could also hope that the departure country’s stock of human capital would increase because of the greater motivation among students in the country to educate themselves so as to take advantage of migration opportunities and the increased profitability of the human capital that they procure (“brain gain” hypothesis). These

two mechanisms amount to thinking that the departure of a migrant can be not a loss but a gain for the country of origin. In regard to remittances, we can, as an illustration, compare a country’s expatriated education capital to the remittances received by the departure country. One will note that this measurement, presented below, is only a very imperfect approximation of the profitability of expatriated human capital because here one divides a fraction of the private benefit of migration by a public investment that neither corresponds to migrants’ total education capital (for which there was also private spending) nor to its physical force.

Table 8: Ratio of Expatriates’ Remittances to Education Capital

	Annual Profitability of Expatriated Education Capital 1990	Annual Profitability of Expatriated Education Capital 2000
Australia	41.60%	21.99%
Austria	4.24%	7.57%
Belgium	47.03%	43.74%
Denmark	4.98%	3.60%
Finland	0.67%	2.80%
France	13.78%	21.04%
Germany	4.92%	3.84%
Greece	31.47%	22.68%
Hungary	7.94%	8.69%
Iceland	5.67%	5.66%
Ireland	3.18%	1.59%
Israel	20.96%	10.02%
Italy	5.59%	2.55%
Japan	4.95%	3.40%
Lebanon	86.89%	71.37%
Mexico	42.76%	44.11%
Netherlands	3.98%	4.32%
New Zealand	19.35%	8.69%
Senegal	285.27%	322.58%
South Africa	24.97%	29.59%
Spain	22.66%	33.42%
Sweden	1.82%	2.40%
Switzerland	4.69%	4.82%
Tunisia	104.87%	109.76%
United Kingdom	2.41%	2.46%
United States	2.82%	3.32%

Sources: World Bank, IMF, author’s calculations.

² Migrants’ remittances are included in the accounts as part of the GNP, but the consumption in the country of departure or the investment that may result from these remittances are counted in the GDP.

Let us add the usual reservations on estimated remittance amounts, which call for caution because informal remittances, not directly measured, make up a large share of the total. Nevertheless, we shall point out the following schematic elements: the more skilled emigrants a country has, the less profitable their expatriation. This is because the salary gap will be smaller since average degree level correlates to the standard of living in the country of departure. For an LDC, it is possible for an emigrant to transfer one to three times the “value” of his or her State-financed education capital every year. Indeed, an unskilled worker can earn the minimum wage in the destination country and in the first year recoup the modest education capital he or she had at the start because of a little-endowed school system.

It also appears that old emigration countries see the profitability of their education capital decline over time, probably along with ties and attachment to the country of departure. For instance, Italy and Greece have remittance revenues that are relatively low compared to their stocks of expatriated education capital. Generally speaking, it is very difficult for a high-income, high-skills country to have

expatriated education capital with gross profitability greater than the cost of public investment (approximated, for example, by the cost of debt). Germany, Denmark, Finland, Ireland, Italy, Japan, the Netherlands, Sweden, the United Kingdom, and the United States clearly receive less in remittances than it cost them to produce the human capital. This is all the more true as only education spending is identified here and not health spending, which would further decrease the overall profitability of expatriated human capital. The very considerable gains by migrants from developing countries does not mean that States themselves also come out ahead. Salaries in destination countries and remittances in departure countries are obviously received by households. Remittances make up a tax base that is very difficult to tax directly (no examples of taxes on remittance flows have been seen to date). They could possibly be taxed indirectly through a VAT tax on additional consumption provided that it is possible to administer such a tax. Generally speaking, migration therefore flows from a form of privatisation of profits and collectivisation of losses, since the State that produces education capital can but marginally recoup the fruits of its investment.

2.3 Brain Gain?

Michel Beine, Frédéric Docquier and Hillel Rapoport propose an extremely original, ambitious and complementary method to estimate the gross impact of the migration of skilled workers on the level of human capital in the country of departure (Beine, Docquier and Rapoport, 2008). Their most striking result is to show that, all things being equal elsewhere, a country’s stock of human capital may be greater with a moderate rate of emigration among skilled workers than it would be if the country kept all its resources. In this case, one would have a gross brain gain. The hypothesis of an optimal emigration rate that would have different values for different countries is therefore not impossible (roughly between 5% and 10% of higher education graduates), and would make it possible to maximise the departure country’s human capital. The losing countries would be those countries with less human capital because of an excessive migration rate among the highly educated (above 20%), and/or the countries that have a

high proportion of graduates from higher education (more than 5%). The major strength of this model is to show that skilled emigration does not necessarily contradict a priori an increase in human capital within a coherent individual conceptual framework (skilled migrants must cover the cost of their education and migration, have access to credit if they do not have funds, find higher salaries in destination countries to justify migrating, etc.).

Despite all that, it seems too optimistic to call a country a “winner” because its human capital level (here approximated by the number of people with higher education degrees or some higher education) seems higher with a 10% emigration rate than with a 0% emigration rate. In other words, does a gross brain gain necessarily imply a net brain gain? One first objection deals with the quality of the workers in question. It is entirely possible - even probable - that the average quality of migrants is different from the average quality of higher education graduates who

remain in the country. To be more explicit, it is likely that the most in-demand professions worldwide - those that have the highest salaries and best employment rates - are also the ones for which there will be the highest emigration rates. One can also think that the best students will leave more easily than other students, using the quality of their grades to obtain scholarships for example, and the average quality of skilled workers in the home country will fall as a result. Consequently, this amounts to saying that the number of higher education graduates alone is not an ideal proxy by which to measure human capital levels. The most serious objection deals with the long-term financial sustainability of a human capital exportation model. In Beine, Docquier and Rapoport's cost model, only the private cost of schooling is taken into account (for a future migrant to decide to invest in his or her education, his or her future salary must justify the investment and cover his or her initial costs, education and loans if any). However, if the State in question finances a significant portion of migrants' educations with State revenues or public debt, then the cost to the State of training not only migrants but also better quality workers will be greatly increased (compared to the counterfactual situation of zero emigration). UNESCO tracks public and private education spending in a certain number of countries (excluding opportunity costs). In the sample of 32 countries for which these data are available, public spending accounted for 84.2% of total education

spending (UNESCO data, Finance Indicators, Table 19, author's calculations). One can therefore say without exaggeration that the problem of the public cost of financing expatriates is significant and serious.

It is therefore appropriate to study the impact on growth of a higher tax rate destined to finance a permanent increase in the availability of higher education to cover emigration or even the cost in growth of additional debt that would in this way be generated. Generally speaking, it is entirely plausible to imagine that a high rate of emigration could increase the quality of a departure country's human capital by increasing education's general profitability, but could lower the profitability of expatriated human capital and in this way reduce the quality of the physical capital financed by diverting public investment from physical capital to human capital. As this diversion of public investment is only marginally chosen, there is no guarantee that it will result in a higher growth rate.

All in all, if the quality of trained skilled workers - a significant share of which are kept - can be better with a non-nil emigration rate than with zero emigration, which is already a considerable result, this does not provide any guarantees as to emigration's final economic impact because the public cost of this additional schooling is not recognised. Let us note, what is more, that writings estimating education's macroeconomic yields sidestep the question of the structure of education financing as well.

2.4 International Taxation of Education Capital Flows?

The above discussions lead one to conclude that migration flows are clearly more favourable for developing countries when emigrants are skilled but few in number (to benefit from the gross effects of brain gain), or unskilled (to benefit from migrants' remittances). This raises the question of sharing the added value of migration with States that do not meet these criteria for their education capital losses to the benefit of developed countries (and migrants).

Several arguments support the idea of transfers between countries in the opposite direction of "brain flows."

Indeed, while these transfers create wealth in destination countries (for individuals and for the State as it can tax migrants' incomes and consumption), nothing guarantees

that the government of the departure country can finance the additional formation of education capital made necessary for its economy by the departure of skilled workers. Indeed, the benefits of migration are private and it is difficult for a State to tax remittances (which are private, and a high percentage of which are informal in LDCs) or the consumption of the migrants' families that receive these remittances (because VAT only exists in a minority of LDCs). In short, in a context of public financing of education capital formation in the departure country, the benefits of migration are privatised and the losses are nationalised. If education financing was purely private, a balance could be found, with migrants themselves financing the education

that they “took” abroad. But the lack of student loan mechanisms (especially for grammar school and high school students) in nearly all developing countries makes it impossible to dream of - or dread - totally private financing of education. Thus, the brain drain does indeed weigh on public finance in departure countries when there is a small tax base and limited access to the private credit market. Consequently, to avoid departure countries under-investing in human capital, which would not benefit any country, one can conceive of a mechanism to share the value added from migration.

In the 1970s, Bhagwati and Dellafar (Bhagwati and Dellafar, 1973) took an interest in the idea of an individual tax that migrants would pay to the State that trained them when they left the country. The principal theoretical advantage of this tax is to prevent States from structurally under-investing in public education because the departure of migrants constitutes a loss for public finance. However, this tax turns out to be extremely complex to administer on the microeconomic level and has never been levied. Consequently, a certain number of developing countries regulate the departure of their graduates with yearly exit quotas, which generates considerable private losses for potential migrants retained in their countries or destination countries. Other countries conduct bilateral negotiations to obtain compensation in the form of official development assistance in the framework of migration agreements, either on allowing skilled workers to leave or repatriating unskilled labor.

Here, we propose to create a macroeconomic table to track international migration flows so as to assign them a monetary value and connect them to a mechanism by which to share the value added from migration. This mechanism is to the Bhagwati tax what virtual highway tollbooths are to traditional highway tollbooths. The point is no longer to tax each passage but to offset observed circulation flows so as to limit the interest of quota-based strategies for departure countries, or even of self-limitation strategies for host countries (some countries, in the image of the United Kingdom, are beginning to limit how many skilled people from developing countries they accept in order to attenuate the negative consequences on departure countries). The stakes of such an international sharing mechanism is to reconcile private decisions (“migrate” or

“take the highway”) with public mechanisms to finance the public good utilised (education or transportation) inasmuch as private investment produces an insufficient quantity of the public good in question.

In our view, such a mechanism should operate according to the following principles:

(i) Estimate the migration surplus, or the “value added from migration”, measured by the difference between the value of a migrant in the destination country (upper limit of assigned value) and the cost of his or her schooling in the departure country (lower limit of assigned value). Here, we only examine the issue of public surplus, that is to say the difference between the cost in PPP of producing a graduate in the destination country and this same cost in the departure country. In other words, this is the maximum amount the destination country could pay to welcome a migrant without suffering damages. The migration surplus estimates calculated here are the upper limits, and not average estimates, assuming an equal level of skills for an equal number of years of schooling in departure and destination countries, which introduces a bias overestimating bilateral migration surpluses. It may be reminded here that our balances only account for movements in education capital, that are always positive. Some may argue that immigrants also bear assimilation problems that may induce various types of drawbacks, which may be assigned a negative value. As explained before, this paper does not intend to produce a full migration balance, but solely an interstate public education balance and therefore does not treat these issues.

The method of assigning value used here relies on the estimation of education cost in PPP used earlier. Over the period examined, with a base 100 in high-income countries, the cost of educating a migrant was 5.7 in LDCs, 13.4 in lower middle income countries (LMICs), and 27.4 in upper middle income countries (UMICs), or trade value added of respectively 94.3%, 86.6% and 72.6% of flows from the standpoint of an average OECD country. Discounts for the difference in education quality between developed and developing countries could be applied, most likely ranging from 10% to 40% according to the results of the IALSS survey cited by Coulombe and Tremblay. It should be noted that using PPP values is already a form of discount, since at equivalent level of

degree, an immigrant is generally valued less than a national, due to higher production costs in destination countries in general. The whole point in adopting this PPP valuation is precisely to match as well as possible the “skills schooling gap”, that is unfortunately only available for a short list of countries.

(ii) Share this “surplus” according to States’ relative wealth in an optic of international solidarity. This decision - which is normative or arbitrary according to some points of view - was adopted here to contribute to the debate. Our simulation proposes sharing this value added in inverse proportion to revenue expressed in purchasing power parity. If one country is four times as wealthy as another, it would thus receive 20% of the trade surplus and the poorer country would receive 80%.

Given average income differentials, Low-Income Countries (LICs) should keep 94.2% of the value added from migration with high-income countries (HICs), LMICs should keep 84.8%, and UMICs should keep 72.7% (in this way, one can see that the education cost differential is extremely similar to the revenue differential). The amount of additional development aid from OECD countries would therefore equal the sum of the cost of educating the migrants welcomed and a fraction of the economic surplus created by migration. Migration between high-income countries would, by construction, be excluded from compensation mechanisms. The table below indicates, for OECD countries, the amounts that such a tax would collect per OECD country using the parameters for sharing described above.

Table 9: Proposed Migration Flow Compensation Mechanism

Quantities Expressed in GDP Points	Share of Education Capital Taken from High-Income Countries in 1990	Share of Education Capital Taken from High-Income Countries in 2000	Proposed Annual Tax in Million Dollars PPP per Year for the 1990-2000 Period	Proposed Annual Tax in Hundredths of a GDP Point	ODA in 2000 in Million Dollars	Proposed Tax/ODA (2000)
Australia	92.7%	90.7%	244	5.0	987	20.1%
Austria	85.0%	79.2%	206	9.4	440	41.4%
Belgium	92.3%	94.2%	-36	-1.4	820	-4.1%
Canada	92.5%	87.6%	680	8.3	1 744	33.8%
Denmark	90.2%	85.5%	26	1.8	1 664	1.7%
Finland	96.1%	89.7%	18	1.5	371	4.8%
France	84.5%	80.6%	304	2.1	4 105	6.6%
Germany	85.7%	79.2%	836	4.1	5 030	15.3%
Greece	91.0%	84.4%	15	1.0	226	4.8%
Ireland	100.0%	97.3%	32	3.3	234	13.7%
Italy	80.2%	72.0%	182	1.4	1 376	11.0%
Japan	93.5%	84.7%	106	0.4	13 508	1.2%
Luxembourg	100.0%	99.3%	2	1.1	123	1.8%
Netherlands	79.5%	84.5%	53	1.3	3 135	1.6%
New Zealand	95.2%	89.3%	-9	-1.1	113	-5.1%
Norway	95.5%	92.5%	21	1.4	1 264	1.8%
Portugal	35.5%	65.8%	-40	-2.3	271	-8.9%
Spain	91.2%	82.1%	227	2.9	1 195	13.9%
Sweden	91.7%	88.5%	124	5.5	1 799	7.5%
Switzerland	96.1%	93.4%	123	6.0	890	16.5%
United Kingdom	86.5%	86.4%	443	3.1	4 501	9.8%
United States	82.3%	72.2%	4 018	4.1	9 955	40.3%

Source: Author’s calculations. The quantities in the fifth column are expressed in hundredths of a GDP point; Australia would therefore pay approximately 5% of one GDP point in additional development aid.

Such a mechanism would have made it possible to collect the sum of nearly 8.3 billion dollars per year over the 1990-2000 period. How this expense is shared would obviously vary greatly according to the migration pattern in question: countries with selective emigration and countries whose immigrants come from developing countries would be the most heavily taxed. Cumulating both of these characteristics, the United States would be responsible for nearly half the total additional aid. In relation to official development assistance, this mechanism would allow for a nearly 16% rise in ODA worldwide, with strong variation across countries (United States +40%, Austria +41.4%, Canada +34%, Switzerland +16.5%, Portugal -8.9%, Belgium -4.1%).

It is clear that the proposal formulated here is normative and that sharing the value added from trade is more the result of a negotiation or a balance of power than it is the result of a normative estimate. Nevertheless, this mechanism gives one an idea of what such sharing would imply in additional development aid flows. More generally, sharing the surplus raises the question of allocating the product of this mechanism. As an initial approach, a bilateral mechanism going from the primary beneficiaries to the primary losers could be proposed, but nothing forbids one from designing a more sophisticated

allocation mechanism that grants each developing country a sum that depends, in a non-linear manner, on its emigration rate to take into account the non-linear nature of the effects of brain drain/brain gain according to emigration rate.

The second question is that of the base from which to collect this resource in developed countries. Two lines of thought are possible. One consists of collecting this resource from migrants' incomes, based on the belief that some of the benefits from migration are private. The other consists of collecting the resource from the revenues of all individuals and businesses in the destination country since migrants contribute to State revenues without schooling costs for the latter, and the cost of international solidarity could just as easily be borne by all of the population that benefits from the improved state of public finances. This method would not have the anti-redistribution effects of the first proposed solution.

Setting up a mechanism such as this would obviously be extremely complex. It would however indicate which countries collect large amounts of human capital from developing countries compared to their official development assistance. In addition, it would also encourage reflection on aid allocation mechanisms and plead for a more massive flow of aid to high-emigration countries.

Conclusion

This working paper aims to disseminate the migration balance concept and fuel the discussions inspired by the increase in migration between developed and developing countries, especially the migration of skilled workers. Nevertheless, one must view the results presented in this article with circumspection given the incomplete nature of the data on which they rely.

The migration balances presented for OECD countries do however give an order of magnitude for the size of the phenomena examined and the international movements of public investment they generate. With the exception of a

few small countries, these phenomena are still limited from the macroeconomic standpoint: very few countries see their stock of education capital change by more than 0.1 GDP point per year.

For developing countries, however, the losses from the expatriation of skilled workers can be more harmful. This pleads for the inclusion of migration balances in development assistance allocation mechanisms or even, as proposed here, in aid volumes through a compensation mechanism that targets those countries that are victims of excessive expatriation of graduates.

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