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Measuring International Skilled Migration: New Estimates Controlling for Age of Entry

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Non-Technical Abstract

Recent data on international skilled migration define skilled migrants according to education level independently of whether education has been acquired in the home or in the host country. In this paper we use immigrants' age of entry as a proxy for where education has been acquired. Data on age of entry are available from a subset of receiving countries which together represent more than 3/4 of total skilled immigration to the OECD. Using these data and a simple gravity model, we estimate the age-of-entry structure of skilled immigration and propose alternative brain drain measures by excluding those arrived before age 12, 18 and 22. The results for 2000 show that on average, 68% of the global brain drain is accounted for by emigration of people aged 22 or more upon arrival (78% and 87% for the 18 and 12 year old thresholds, respectively). For some countries this indeed makes a substantial difference. However, cross-country differences are globally maintained, resulting in extremely high correlation levels between corrected and uncorrected rates. Similar results are obtained for 1990.

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Abstract

Recent data on international skilled migration define skilled migrants according to education level independently of whether education has been acquired in the home or in the host country. In this paper we use immigrants' age of entry as a proxy for where education has been acquired. Data on age of entry are available from a subset of receiving countries which together represent more than 3/4 of total skilled immigration to the OECD. Using these data and a simple gravity model, we estimate the age-of-entry structure of skilled immigration and propose alternative brain drain measures by excluding those arrived before age 12, 18 and 22. The results for 2000 show that on average, 68% of the global brain drain is accounted for by emigration of people aged 22 or more upon arrival (78% and 87% for the 18 and 12 year old thresholds, respectively). For some countries this indeed makes a substantial difference. However, cross-country differences are globally maintained, resulting in extremely high correlation levels between corrected and uncorrected rates. Similar results are obtained for 1990.

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1 Introduction

Recent data sets on international skilled migration (Carrington and Detragiache, 1998, Adams, 2003, Docquier and Marfouk, 2004, 2006, Dumont and Lemaitre, 2004) define skilled immigrants as foreign-born workers with university or post-secondary training. This definition does not account for whether education has been acquired in the home or in the host country and thus leads to potential over-estimation of the intensity of the brain drain as well as to possible spurious cross-country variation in skilled emigration rates. On the basis of US survey data, Rosenzweig (2005) shows that children migration can represent an important fraction of total immigration for certain countries and suggests that only people with home-country higher education should be considered as skilled immigrants. If such information was available, this would provide a lower bound to the brain drain estimates.

In this paper we use immigrants' age of entry as a proxy for where education has been acquired. Data on age of entry are available from a subset of receiving countries which together represent more than three-quarters of total skilled immigration to the OECD. Using these data and a simple gravity model, we estimate the age-of-entry structure of skilled immigration to the other OECD countries. This allows us to propose alternative measures of the brain drain by defining skilled immigrants as those who left their home country after age 12, 18 or 22, and to do so for 1990 and 2000. The corrected skilled emigration rates, which can be seen as intermediate bounds to the brain drain estimates, are by construction lower than those computed without age-of-entry restrictions by Docquier and Marfouk (2006), which we take as our upper-bound brain drain measure.

2 Census data on age of entry

To estimate the structure of immigration by age of entry, we collected census and register data in a sample of countries where such information is available: the US 1990 and 2000 censuses, the Canadian 1991 and 2001 censuses, the French 1999 census, the Australian 1991 and 2001 censuses, the New-Zealand 1991 and 2001 censuses, the Danish 2000 register, the Greek 2001 census and the Belgian 1991 census. Together, the countries sampled represent 77% of total skilled immigration to the OECD area. The sample is representative of the OECD in that it includes countries with different demographic sizes, regional locations, development levels, and immigration policy and tradition. We thus have bilateral information on immigrants' origin, age, education level and age of entry from 12 host countries' censuses distinguishing 192 origin countries. These 2304 observations allow us to compute the proportion of immigrants arrived before a given age in the total stocks of immigrants aged 25+ estimated by Docquier and Marfouk (2006). Eliminating zeros and a few suspicious observations,

we end up with 1580 observations for each age threshold.[1]

Obviously, an approach based on Census data is not perfect. As explained by Rosenzweig (2005, p. 9), "information on entry year... is based on answers to an ambiguous question - in the US Census the question is 'When did you first come to stay?' Immigrants might answer this question by providing the date when they received a permanent immigrant visa, not the date when they first came to the US, at which time they might not have intended to or been able to stay". Only surveys based on comprehensive migration history would provide precise data about the location in which schooling was acquired. Still, the Census is the only representative data source available in many countries while survey data are not available for many countries and, when they are (e.g., the Labor Force Survey, or the ECHP (European Community Household Panel), do not provide representative cross-sectional pictures of immigrants' characteristics. The coverage can be very small for countries with few emigrants, which is typically the case of small countries. Apart from the case of surveys explicitly designed to capture immigrants's characteristics (such as the NIS in the US), extrapolating the immigration age of entry structure from national surveys can be misleading.

3 Estimating the age-of-entry structure of immigration

In order to provide estimates of the age structure of immigration for receiving countries for which information on age of entry is missing, we conduct an econometric analysis using a simple gravity model of migration. More precisely, we aim at identifying the determinants of the proportion of skilled migrants from country i to country f with tertiary education arrived before age $J = 12, 18$ and 22. These bilateral proportions are denoted by σ_{if}^J. Since the proportions of skilled migrants arrived before a given age lie between 0 and 1, it is appropriate to use a logistic transformation so that the dependent variable is defined on $(-\infty, +\infty)$. Therefore, we use $\theta_{if}^J = \ln\left[\frac{\sigma_{if}^J}{1-\sigma_{if}^J}\right]$ as dependent variable. More precisely, we estimate the following equation:

$$\theta_{if}^J = \alpha + \sum_{k=1}^{n_{if}} \beta^{kJ} X_{if}^k + \sum_{k=1}^{n_i} \gamma^k Z_i^k + \sum_{k=1}^{n_f} \lambda^{kJ} W_f^k + \epsilon_{if}^J \tag{1}$$

where X_{if}^k $(k = 1, ..., n_{if})$ is a collection of n_{if} variables capturing proximity between origin and host countries, Z_i^k $(k = 1, ..., n_i)$ are origin countries characteristics and W_f^k $(k = 1, ..., n_j)$ are host countries characteristics. These variables can affect the age

[1] Table A1 of the Supplemental Appendix gives descriptive statistics on the estimated proportions of adult immigrants arrived before age J ($J = 12, 18$ and 22). It may be seen that immigrants arrived before age 12, 18 and 22 represent on average 85.7%, 78.2% and 69.1% of total skilled immigration.

of entry structure through self-selection mechanisms as well as through out-selection mechanisms due to differences in host countries immigration policies.

Regarding the proximity variables included in X_{if}^k, we use indicators of economic, geographic and linguistic distance, and dummy variables for whether the pair of countries share a colonial link. Regarding the variables on origin countries characteristics, Z_i^k, we include democracy indicators and measures of public expenditures on primary, secondary and tertiary education. Finally, host countries characteristics, W_f^k, are apprehended through indicators of social expenditures, education expenditures, and degree of openness to immigration.

All the variables used are presented (with data sources) in the Supplemental Appendix. This appendix also describes the econometric technique and reports all estimates.[2] All coefficients are usually highly significant, robust across specifications, and affect the structure by age of entry in a very intuitive way. The proportion of younger skilled migrants decreases with economic and geographic distances and increases with colonial and linguistic links. Education expenditures favor family migration while social expenditures have the opposite effect. The higher the host country immigration rate, the higher the proportion of skilled migrants who arrived as children. Regarding origin-country characteristics, the democracy index has no significant effect, and public education expenditures are never significant at the 5-percent threshold. Finally, the coefficient on the dummy for 2000 is negative (except for $J = 12$).

Putting together the available census data on age-of-entry, which represent 77 percent of total immigration to the OECD, with the estimated structure computed from the parsimonious model for the remaining 23 percent,[3] the next section provides alternative measures of the brain drain from which skilled immigrants arrived before a given age are excluded.

4 Alternative brain drain estimates

The Docquier and Marfouk (2006) data set gives the total number of skilled emigrants from a given origin country i to host country f (denoted by M_{if}). It also gives the number of skilled residents in the home country (denoted by N_i). The skilled emigration rate is then defined as the ratio of skilled emigrants to the total number of skilled natives (residents + emigrants). Our method here consists of multiplying M_{if} by the estimated proportions of skilled migrants who left their home country after age J ($J = 12, 18, 22$). The corrected skilled emigration rates are then given by

$$m_i^J = \frac{\sum_f \pi_{if}^J M_{if}}{N_i + \sum_f \pi_{if}^J M_{if}}$$

[2] See Tables A2, A3 and A4.

[3] See column (4) in Tables A2 to A4.

where π_{if}^{J} is the proportion of skilled emigrants who left after age J according to our computations. The Docquier-Marfouk measures correspond to the special case where $J = 0$ or $\pi_{if}^{0} = 1$. We use them as an upper bound of the intensity of the brain drain. As π_{if}^{J} decreases with J, the corrected rates for $J = 12, 18, 22$ are by construction lower than m_{if}^{0}. The data is available from

http://siteresources.worldbank.org/INTRES/Resources/...
...DataSet_BDwith_age_of_entry_DocquierRapoport.xls

For the 192 sending countries in our sample, the m_{if}^{12}/m_{if}^{0} ratio ranges from 74.8 to 98.6 percent, the m_{if}^{18}/m_{if}^{0} ratio ranges from 59.4 to 97.9 percent, and the m_{if}^{22}/m_{if}^{0} ratio ranges from 48.5 to 95.0 percent. The correlations between the corrected and the uncorrected measures are extremely high. Simple regressions results of m_{if}^{J}/m_{if}^{0} give R^2 values of .9775, .9895 and .9966 respectively for $J = 22, 18, 12$. Table A5 of the Supplemental Appendix focuses on the countries most affected by the brain drain. As may be seen from this Table, controlling for age of entry does not significantly alters the rankings.

5 Concluding remarks

Recent data sets on international skilled migration define skilled migrants according to education level independently of whether education has been acquired in the home or in the host country. This leads to evaluations of the magnitude of the brain drain that must be seen as upper bound estimates as well as to possible spurious cross-country variation in skilled emigration rates. In this paper we estimate the age-of-entry structure of skilled immigration and propose alternative measures of the brain drain excluding those who left their home country before age 12, 18 or 22. The corrected rates are obviously lower than those calculated without age-of-entry restrictions. However, the correlation between corrected and uncorrected rates is extremely high and the country rankings by brain drain intensities are basically unaffected by the correction. This should mitigate concerns about children migration possibly leading to cross-sectional biases in the brain drain estimates and, consequently, about potential biases in the estimation of the growth effects of the brain drain using uncorrected data (Beine et al., 2006).

6 References

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Supplemental Appendix

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Abstract

This supplemental appendix characterizes the data sources used to control for age of entry in the skilled emigration data set. We also provide data for the most affected countries.

1 Data sources

To estimate the structure of immigration by age of entry, we use census and register data in a sample of countries where such information is available: the US 1990 and 2000 censuses, the Canadian 1991 and 2001 censuses, the French 1999 census, the Australian 1991 and 2001 censuses, the New-Zealand 1991 and 2001 censuses, the Danish 2000 register, the Greek 2001 census and the Belgian 1991 census. Together, the countries sampled represent 77 percent of total skilled immigration to the OECD area. Table A1 gives descriptive statistics on the estimated proportions of adult immigrants arrived before age J ($J = 12, 18$ and 22). The average shares vary across receiving countries. On the whole, the average shares are 85.7%, 78.2% and 69.1% for immigrants arrived before age 12, 18 or 22. They are usually higher for Belgium, Denmark and Greece. The lowest shares are observed in Australia, New Zealand and the United States. Canada and France are not far from the average distribution.

Table A1. Proportion of immigrants arrived after age J among immigrants aged 25+

Arrived after 12	Australia (2001)	Belgium (1991)	Canada (2001)	Denmark (2000)	France (1999)	Greece (2001)	New Zealand (2001)	United States (2000)	Total
Mean	*0.728*	*0.906*	*0.884*	*0.978*	*0.827*	*0.966*	*0.781*	*0.858*	*0.857*
Standard error	*0.193*	*0.112*	*0.114*	*0.041*	*0.134*	*0.080*	*0.096*	*0.094*	*0.150*
Min (Q0)	*0.217*	*0.446*	*0.400*	*0.818*	*0.424*	*0.500*	*0.198*	*0.498*	*0.217*
Quartile (Q25)	*0.581*	*0.849*	*0.834*	*0.978*	*0.777*	*0.977*	*0.703*	*0.810*	*0.800*
Median (Q50)	*0.704*	*0.946*	*0.912*	*0.994*	*0.864*	*1.000*	*0.797*	*0.875*	*0.897*
Quartile (Q75)	*0.909*	*1.000*	*0.971*	*1.000*	*0.922*	*1.000*	*0.893*	*0.923*	*0.990*
Max (Q100)	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*0.984*	*1.000*
Arrived after 18	Australia (2001)	Belgium (1991)	Canada (2001)	Denmark (2000)	France (1999)	Greece (2001)	New Zealand (2001)	United States (2000)	Total
Mean	*0.678*	*0.871*	*0.814*	*0.961*	*0.777*	*0.947*	*0.734*	*0.744*	*0.782*
Standard error	*0.196*	*0.124*	*0.143*	*0.054*	*0.160*	*0.097*	*0.090*	*0.127*	*0.200*
Min (Q0)	*0.200*	*0.382*	*0.333*	*0.676*	*0.303*	*0.500*	*0.186*	*0.387*	*0.099*
Quartile (Q25)	*0.534*	*0.799*	*0.731*	*0.943*	*0.699*	*0.948*	*0.660*	*0.670*	*0.647*
Median (Q50)	*0.645*	*0.909*	*0.840*	*0.979*	*0.816*	*0.985*	*0.749*	*0.747*	*0.829*
Quartile (Q75)	*0.833*	*0.963*	*0.917*	*1.000*	*0.899*	*1.000*	*0.839*	*0.826*	*0.956*
Max (Q100)	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*0.960*	*1.000*
Arrived after 22	Australia (2001)	Belgium (1991)	Canada (2001)	Denmark (2000)	France (1999)	Greece (2001)	New Zealand (2001)	United States (2000)	Total
Mean	*0.598*	*0.785*	*0.720*	*0.910*	*0.667*	*0.883*	*0.633*	*0.613*	*0.691*
Standard error	*0.204*	*0.151*	*0.169*	*0.085*	*0.196*	*0.136*	*0.056*	*0.143*	*0.234*
Min (Q0)	*0.179*	*0.299*	*0.217*	*0.554*	*0.137*	*0.400*	*0.135*	*0.290*	*0.036*
Quartile (Q25)	*0.459*	*0.690*	*0.608*	*0.876*	*0.559*	*0.826*	*0.500*	*0.507*	*0.527*
Median (Q50)	*0.551*	*0.797*	*0.739*	*0.928*	*0.699*	*0.924*	*0.603*	*0.619*	*0.727*
Quartile (Q75)	*0.750*	*0.906*	*0.843*	*0.968*	*0.795*	*1.000*	*0.750*	*0.725*	*0.889*
Max (Q100)	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*0.926*	*1.000*

Equation (1) is the regression model explaining the proportion of skilled migrants arrived before age J (σ_{if}^J) as a function variables capturing proximity between origin and host countries (X_{if}^k), origin countries characteristics (Z_i^k) and host countries characteristics (W_f^k).

Regarding the proximity variables included in X_{if}^k, we use:

- Economic distance, as measured by the ratio of GDP per capita. To the extent that host countries are more restrictive towards immigration from poor countries (for example, are tougher on family reunion and on granting permanent legal status due, e.g., to lower transferability of human capital), one may expect to see fewer children migrating with their parents as economic distance increases. On the other hand, it may also be the case that immigration policy is aimed primarily at asylum seekers, who tend to migrate with their family. Since asylum seekers generally originate from poor countries, the sign of this coefficient is a priori unclear. Data on GDP per capita are taken from the World Development Indicators (World Bank, 2005).

- Geographic distance, as a proxy for migration costs. This is expected to have an ambiguous impact on family migration as larger transportation costs can prevent emigration from entire families while on the other hand, geographic distance can make separation more painful and therefore provide additional incentives to migrate with relatives. The data used to evaluate geographic distance is based on population-weighted bilateral distances between host and origin countries largest cities and are taken from the CEPII data set (Clair et al., 2004).

- Colonial links. We use a dummy variable equal to 1 if the countries of origin and destination share a colonial relationship and 0 otherwise. We expect colonial links to affect negatively the proportion of skilled migrants arrived after age J. Data on colonial links are taken from the CEPII data set.

- Linguistic proximity. Linguistic proximity is likely to favor immigration with children as it will facilitate their integration into the host country education system. Hence, we also expect of a negative sign for this coefficient. Data on linguistic proximity are also taken from the CEPII data set.

Regarding the variables on origin countries characteristics, Z_i^k, we include:

- Democracy. Democracy at home can affect children migration in a number of ways: its absence is likely to provide additional incentives for migrants to emigrate with family or seek for family reunion but can also preclude family emigration. We use the POLITY IV indicator of democracy, which ranges from -10 in dictatorial regimes to +10 in fully democratic countries.[1]

[1] This indicator is available from http://www.cidcm.umd.edu/inscr/polity/

- Public education. We also include public expenditures in the source country, respectively for primary, secondary and tertiary education. The higher public education expenditures at origin, the lower the expected propensity to emigrate with children. We use the UNESCO data on public education expenditures per student as percent of the GDP per capita.

Regarding the variables on host countries characteristics, W_f^k, we include:

- Social expenditures as percent of GDP. As is well known, welfare magnets tend to raise the propensity to immigrate with children. However, receiving countries with more generous welfare systems tend to discourage family migration in an attempt to reduce the fiscal burden of immigration. We use OECD data on social expenditures.

- Total education expenditures as percent of GDP. This variable is introduced to capture the characteristics of the education system at destination. We expect this variable to favor family migration but cannot exclude a potential role for a fiscal burden argument in the same spirit as above. We use OECD data.

- Immigrants as percent of the population. This variable captures the general openness to immigration and should therefore all else equal favor children migration. We use the data computed by Docquier and Marfouk (2006).

2 Regression results

Tables A2, A3 and A4 report the OLS estimates. To correct for heteroskedasticity, we use White standard errors. To account for possible common trends in immigration policy we also add a time fixed effect for the year 2000 (the year 1990 is normalized to 0). Columns (1) to (3) compare alternative specifications with different measures of public education expenditures at origin. Column (4) gives the parsimonious specification after exclusion of the non-significant variables.

Our estimates are usual highly significant, robust across specifications, and affect the structure by age of entry in a very intuitive way. The proportion of younger skilled migrants decreases with economic and geographic distances and increases with colonial and linguistic links. Education expenditures favor family migration while social expenditures have the opposite effect. The higher the host country immigration rate, the higher the proportion of skilled migrants who arrived as children. Regarding origin-country characteristics, the democracy index has no significant effect, and public education expenditures are never significant at the 5-percent threshold. Finally, the coefficient on the dummy for 2000 is negative (except for $J = 12$).

Table A2. Explaining the proportion of skilled migrants arrived after age 12

Dependent variable, θ12	(1)	(2)	(3)	(4)
Ratio of GDP per capita	*0.267****	*0.257****	*0.236****	*0.242****
	(0.051)	*(0.051)*	*(0.058)*	*(0.042)*
Distance (in logs)	*0.219****	*0.217****	*0.210****	*0.199****
	(0.056)	*(0.055)*	*(0.055)*	*(0.053)*
Colonial link	*-2.503****	*-2.512****	*-2.501****	*-2.430****
	(0.211)	*(0.214)*	*(0.211)*	*(0.208)*
Linguistic proximity	*-0.416****	*-0.425****	*-0.438****	*-0.416****
	(0.096)	*(0.097)*	*(0.099)*	*(0.093)*
Social expenditures at dest. (in logs)	*0.569****	*0.556***	*0.542***	*0.532***
	(0.219)	*(0.220)*	*(0.221)*	*(0.213)*
Education expenditures at dest. (in logs)	*-2.343****	*-2.324****	*-2.299****	*-2.337****
	(0.274)	*(0.275)*	*(0.276)*	*(0.263)*
Immigration rate at dest.	*-0.101****	*-0.101****	*-0.101****	*-0.099****
	(0.010)	*(0.010)*	*(0.010)*	*(0.010)*
Democracy index at origin	*0.175*	*0.199*	*0.193*	-
	(0.153)	*(0.153)*	*(0.153)*	-
Public education exp. at origin - primary	*0.075*	-	-	-
	(0.076)	-	-	-
Public education exp. at origin - secondary	-	*0.085*	-	-
	-	*(0.073)*	-	-
Public education exp. at origin - tertiary	-	-	*0.045*	-
	-	-	*(0.049)*	-
Year 2000	*-0.103*	*-0.101*	*-0.101*	-
	(0.094)	*(0.093)*	*(0.094)*	-
Constant	*4.617****	*4.659****	*4.537****	*4.610****
	(1.161)	*(1.161)*	*(1.150)*	*(1.077)*
R2	*0.241*	*0.242*	*0.241*	*0.247*
Number of observations	*1542*	*1542*	*1542*	*1579*

Note: Estimation by OLS. White standard errors between parentheses.

* p-value lower than 10 percent; ** p-value lower than 5 percent; *** p-value lower than 1 percent

Table A3. Explaining the proportion of skilled migrants arrived after age 18

Dependent variable, θ18	(1)	(2)	(3)	(4)
Ratio of GDP per capita	*0.255****	*0.242****	*0.237****	*0.242****
	(0.054)	*(0.054)*	*(0.060)*	*(0.041)*
Distance (in logs)	*0.181****	*0.174****	*0.167****	*0.146****
	(0.052)	*(0.052)*	*(0.052)*	*(0.050)*
Colonial link	*-2.474****	*-2.479****	*-2.464****	*-2.408****
	(0.192)	*(0.196)*	*(0.193)*	*(0.194)*
Linguistic proximity	*-0.447****	*-0.459****	*-0.461****	*-0.459****
	(0.095)	*(0.094)*	*(0.096)*	*(0.091)*
Social expenditures at dest. (in logs)	*0.546***	*0.528***	*0.526***	*0.538***
	(0.215)	*(0.215)*	*(0.216)*	*(0.211)*
Education expenditures at dest. (in logs)	*-2.908****	*-2.880****	*-2.875****	*-2.843****
	(0.298)	*(0.298)*	*(0.298)*	*(0.285)*
Immigration rate at dest.	*-0.116****	*-0.116****	*-0.115****	*-0.109****
	(0.011)	*(0.011)*	*(0.011)*	*(0.010)*
Democracy index at origin	*0.095*	*0.134*	*0.130*	-
	(0.164)	*(0.165)*	*(0.165)*	-
Public education exp. at origin - primary	*0.132**	-	-	-
	(0.078)	-	-	-
Public education exp. at origin - secondary	-	*0.094*	-	-
	-	*(0.074)*	-	-
Public education exp. at origin - tertiary	-	-	*0.022*	-
	-	-	*(0.050)*	-
Year 2000	*-0.304****	*-0.299****	*-0.299****	*-0.265****
	(0.091)	*(0.091)*	*(0.091)*	*(0.080)*
Constant	*6.053****	*5.921****	*5.672****	*5.469****
	(1.181)	*(1.187)*	*(1.176)*	*(1.108)*
R2	*0.285*	*0.285*	*0.284*	*0.288*
Number of observations	*1526*	*1526*	*1526*	*1563*

Note: Estimation by OLS. White standard errors between parentheses.

* p-value lower than 10 percent; ** p-value lower than 5 percent; *** p-value lower than 1 percent

Table A4. Explaining the proportion of skilled migrants arrived after age 22

Dependent variable, θ22	(1)	(2)	(3)	(4)
Ratio of GDP per capita	*0.220****	*0.212****	*0.243****	*0.190****
	(0.054)	*(0.053)*	*(0.058)*	*(0.041)*
Distance (in logs)	*0.212****	*0.205****	*0.202****	*0.175****
	(0.050)	*(0.050)*	*(0.050)*	*(0.049)*
Colonial link	*-2.316****	*-2.316****	*-2.302****	*-2.265****
	(0.179)	*(0.181)*	*(0.179)*	*(0.177)*
Linguistic proximity	*-0.455****	*-0.464****	*-0.441****	*-0.467****
	(0.090)	*(0.090)*	*(0.092)*	*(0.086)*
Social expenditures at dest. (in logs)	*0.233*	*0.220*	*0.246*	-
	(0.205)	*(0.205)*	*(0.206)*	-
Education expenditures at dest. (in logs)	*-2.719****	*-2.670****	*-2.741****	*-2.666****
	(0.323)	*(0.323)*	*(0.321)*	*(0.299)*
Immigration rate at dest.	*-0.114****	*-0.114****	*-0.113****	*-0.112****
	(0.010)	*(0.010)*	*(0.010)*	*(0.008)*
Democracy index at origin	*0.221*	*0.248*	*0.251*	-
	(0.164)	*(0.166)*	*(0.165)*	-
Public education exp. at origin - primary	*0.099*	-	-	-
	(0.074)	-	-	-
Public education exp. at origin - secondary	-	*0.055*	-	-
	-	*(0.073)*	-	-
Public education exp. at origin - tertiary	-	-	*0.043*	-
	-	-	*(0.050)*	-
Year 2000	*-0.405****	*-0.402****	*-0.402****	*-0.399****
	(0.086)	*(0.086)*	*(0.086)*	*(0.080)*
Constant	*5.525****	*5.537****	*4.992****	*5.896****
	(1.197)	*(1.204)*	*(1.190)*	*(0.599)*
R2	*0.258*	*0.258*	*0.258*	*0.255*
Number of observations	*1508*	*1508*	*1508*	*1544*

Note: Estimation by OLS. White standard errors between parentheses.

* p-value lower than 10 percent; ** p-value lower than 5 percent; *** p-value lower than 1 percent

3 Most affected countries

The complete data set can be found on:

http://siteresources.worldbank.org/INTRES/Resources/...
...DataSet_BDwith_age_of_entry_DocquierRapoport.xls

Finally, Table A5 focuses on the countries most affected by the brain drain (in relative terms, or brain drain intensity). The left panel reports the results for countries with population above .25 million while the right panel reports results for countries with population above 4 million. The brain drain appears to be very strong in small countries, with emigration rates as high as 80 percent in some Pacific or Caribbean islands. Controlling for age of entry does not significantly affect the ranks, as may be seen from Table A5.

Table A5. Most affected countries - Various definitions

Population above 0.25 million				Population above 4 million							
Country	m0+	Country	m22+	Country	m0+	Country	m12+	Country	m18+	Country	m22+
Guyana	*89.0%*	*Guyana*	*81.9%*	*Haiti*	*83.6%*	*Haiti*	*82.0%*	*Haiti*	*78.3%*	*Haiti*	*73.7%*
Jamaica	*85.1%*	*Jamaica*	*74.6%*	*Sierra Leone*	*52.5%*	*Sierra Leone*	*52.1%*	*Sierra Leone*	*51.1%*	*Sierra Leone*	*48.4%*
Haiti	*83.6%*	*Haiti*	*73.7%*	*Ghana*	*46.8%*	*Ghana*	*46.0%*	*Ghana*	*44.9%*	*Mozambique*	*43.7%*
Trinidad and Tobago	*79.3%*	*Trinidad and Tobago*	*67.5%*	*Mozambique*	*45.1%*	*Mozambique*	*44.6%*	*Mozambique*	*44.4%*	*Ghana*	*42.3%*
Cape Verde	*67.4%*	*Gambia*	*60.4%*	*Kenya*	*38.4%*	*Kenya*	*37.0%*	*Kenya*	*35.7%*	*Kenya*	*33.4%*
Barbados	*63.5%*	*Cape Verde*	*55.5%*	*Laos*	*37.4%*	*Uganda*	*33.7%*	*Uganda*	*32.7%*	*Uganda*	*30.7%*
Gambia, The	*63.2%*	*Sierra Leone*	*48.4%*	*Uganda*	*35.6%*	*Somalia*	*32.2%*	*Somalia*	*31.4%*	*Somalia*	*29.9%*
Fiji	*62.2%*	*Barbados*	*47.5%*	*Angola*	*33.0%*	*Angola*	*30.6%*	*Angola*	*29.2%*	*Angola*	*26.4%*
Bahamas	*61.3%*	*Mauritius*	*45.1%*	*Somalia*	*32.6%*	*Laos*	*30.2%*	*Sri Lanka*	*26.1%*	*Sri Lanka*	*24.1%*
Malta	*57.6%*	*Fiji*	*44.5%*	*El Salvador*	*31.0%*	*El Salvador*	*28.1%*	*Laos*	*25.7%*	*Rwanda*	*23.9%*
Mauritius	*56.1%*	*Malta*	*44.1%*	*Sri Lanka*	*29.6%*	*Sri Lanka*	*27.6%*	*Rwanda*	*24.7%*	*Laos*	*21.9%*
Sierra Leone	*52.5%*	*Mozambique*	*43.7%*	*Nicaragua*	*29.6%*	*Nicaragua*	*27.3%*	*El Salvador*	*23.3%*	*Afghanistan*	*20.4%*
Suriname	*47.9%*	*Bahamas*	*42.3%*	*Hong Kong*	*28.8%*	*Rwanda*	*25.2%*	*Nicaragua*	*22.8%*	*Nicaragua*	*19.4%*
Ghana	*46.8%*	*Ghana*	*42.3%*	*Cuba*	*28.7%*	*Hong Kong*	*24.8%*	*Afghanistan*	*21.5%*	*Croatia*	*18.9%*
Mozambique	*45.1%*	*Liberia*	*37.7%*	*Papua New Guinea*	*28.5%*	*Vietnam*	*23.2%*	*Hong Kong*	*21.2%*	*El Salvador*	*18.3%*
Liberia	*45.0%*	*Suriname*	*36.7%*	*Vietnam*	*27.1%*	*Papua New Guinea*	*23.1%*	*Croatia*	*20.7%*	*Malawi*	*18.0%*
Lebanon	*38.6%*	*Kenya*	*33.4%*	*Rwanda*	*25.8%*	*Cuba*	*22.9%*	*Papua New Guinea*	*19.8%*	*Hong Kong*	*18.0%*
Kenya	*38.4%*	*Uganda*	*30.7%*	*Honduras*	*24.4%*	*Afghanistan*	*22.7%*	*Cuba*	*19.4%*	*Papua New Guinea*	*17.1%*
Laos	*37.4%*	*Somalia*	*29.9%*	*Guatemala*	*24.2%*	*Honduras*	*22.2%*	*Vietnam*	*19.0%*	*Cuba*	*17.0%*
Uganda	*35.6%*	*Eritrea*	*27.9%*	*Croatia*	*24.1%*	*Croatia*	*22.1%*	*Honduras*	*18.9%*	*Vietnam*	*15.8%*
Eritrea	*34.0%*	*Lebanon*	*27.4%*	*Afghanistan*	*23.3%*	*Guatemala*	*21.7%*	*Guatemala*	*18.4%*	*Honduras*	*15.2%*
Cyprus	*33.2%*	*Angola*	*26.4%*	*Dominican Republic*	*21.6%*	*Dominican Republic*	*19.2%*	*Malawi*	*18.2%*	*Togo*	*15.0%*
Angola	*33.0%*	*Sri Lanka*	*24.1%*	*Portugal*	*19.5%*	*Malawi*	*18.4%*	*Togo*	*16.9%*	*Zambia*	*14.5%*
Somalia	*32.6%*	*Macedonia*	*24.1%*	*Togo*	*18.7%*	*Togo*	*17.8%*	*Dominican Republic*	*15.7%*	*Slovakia*	*14.4%*
El Salvador	*31.0%*	*Rwanda*	*23.9%*	*Malawi*	*18.7%*	*Portugal*	*16.4%*	*Slovakia*	*15.4%*	*Guatemala*	*14.1%*
Sri Lanka	*29.6%*	*Ireland*	*23.3%*	*Cambodia*	*18.3%*	*Slovakia*	*15.9%*	*Zambia*	*15.1%*	*Portugal*	*13.1%*
Nicaragua	*29.6%*	*Bosnia Herzegovina*	*21.9%*	*Senegal*	*17.7%*	*Zambia*	*15.7%*	*Portugal*	*14.7%*	*Dominican Republic*	*12.8%*
Ireland	*29.5%*	*Laos*	*21.9%*	*Cameroon*	*17.2%*	*Cameroon*	*15.5%*	*Cameroon*	*14.6%*	*Senegal*	*12.5%*
Macedonia	*29.1%*	*Cyprus*	*21.3%*	*Morocco*	*17.0%*	*Senegal*	*15.5%*	*Senegal*	*14.1%*	*Serbia Montenegro*	*12.3%*
Hong Kong	*28.8%*	*Afghanistan*	*20.4%*	*Zambia*	*16.8%*	*Cambodia*	*14.8%*	*Morocco*	*13.4%*	*Cameroon*	*12.3%*

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