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+

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.728</td>
<td>0.906</td>
<td>0.884</td>
<td>0.978</td>
<td>0.827</td>
<td>0.966</td>
<td>0.781</td>
<td>0.858</td>
<td>0.857</td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td>0.193</td>
<td>0.112</td>
<td>0.114</td>
<td>0.041</td>
<td>0.134</td>
<td>0.080</td>
<td>0.096</td>
<td>0.094</td>
<td>0.150</td>
</tr>
<tr>
<td><strong>Min (Q0)</strong></td>
<td>0.217</td>
<td>0.446</td>
<td>0.400</td>
<td>0.818</td>
<td>0.424</td>
<td>0.500</td>
<td>0.198</td>
<td>0.498</td>
<td>0.217</td>
</tr>
<tr>
<td><strong>Quartile (Q25)</strong></td>
<td>0.581</td>
<td>0.849</td>
<td>0.834</td>
<td>0.978</td>
<td>0.777</td>
<td>0.977</td>
<td>0.703</td>
<td>0.810</td>
<td>0.800</td>
</tr>
<tr>
<td><strong>Median (Q50)</strong></td>
<td>0.704</td>
<td>0.946</td>
<td>0.912</td>
<td>0.994</td>
<td>0.864</td>
<td>1.000</td>
<td>0.797</td>
<td>0.875</td>
<td>0.897</td>
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<tr>
<td><strong>Quartile (Q75)</strong></td>
<td>0.909</td>
<td>1.000</td>
<td>0.971</td>
<td>1.000</td>
<td>0.922</td>
<td>1.000</td>
<td>0.893</td>
<td>0.923</td>
<td>0.990</td>
</tr>
<tr>
<td><strong>Max (Q100)</strong></td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>0.984</td>
<td>1.000</td>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.678</td>
<td>0.871</td>
<td>0.814</td>
<td>0.961</td>
<td>0.777</td>
<td>0.947</td>
<td>0.734</td>
<td>0.744</td>
<td>0.782</td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td>0.196</td>
<td>0.124</td>
<td>0.143</td>
<td>0.054</td>
<td>0.160</td>
<td>0.097</td>
<td>0.090</td>
<td>0.127</td>
<td>0.200</td>
</tr>
<tr>
<td><strong>Min (Q0)</strong></td>
<td>0.200</td>
<td>0.382</td>
<td>0.333</td>
<td>0.676</td>
<td>0.303</td>
<td>0.500</td>
<td>0.186</td>
<td>0.387</td>
<td>0.099</td>
</tr>
<tr>
<td><strong>Quartile (Q25)</strong></td>
<td>0.534</td>
<td>0.799</td>
<td>0.731</td>
<td>0.943</td>
<td>0.699</td>
<td>0.948</td>
<td>0.660</td>
<td>0.670</td>
<td>0.647</td>
</tr>
<tr>
<td><strong>Median (Q50)</strong></td>
<td>0.645</td>
<td>0.909</td>
<td>0.840</td>
<td>0.979</td>
<td>0.816</td>
<td>0.985</td>
<td>0.749</td>
<td>0.747</td>
<td>0.829</td>
</tr>
<tr>
<td><strong>Quartile (Q75)</strong></td>
<td>0.833</td>
<td>0.963</td>
<td>0.917</td>
<td>1.000</td>
<td>0.899</td>
<td>1.000</td>
<td>0.839</td>
<td>0.826</td>
<td>0.956</td>
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<tr>
<td><strong>Max (Q100)</strong></td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>0.960</td>
<td>1.000</td>
</tr>
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</table>

<table>
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</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.598</td>
<td>0.785</td>
<td>0.720</td>
<td>0.910</td>
<td>0.667</td>
<td>0.883</td>
<td>0.633</td>
<td>0.613</td>
<td>0.691</td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td>0.204</td>
<td>0.151</td>
<td>0.169</td>
<td>0.085</td>
<td>0.196</td>
<td>0.136</td>
<td>0.056</td>
<td>0.143</td>
<td>0.234</td>
</tr>
<tr>
<td><strong>Min (Q0)</strong></td>
<td>0.179</td>
<td>0.299</td>
<td>0.217</td>
<td>0.554</td>
<td>0.137</td>
<td>0.400</td>
<td>0.135</td>
<td>0.290</td>
<td>0.036</td>
</tr>
<tr>
<td><strong>Quartile (Q25)</strong></td>
<td>0.459</td>
<td>0.690</td>
<td>0.608</td>
<td>0.876</td>
<td>0.559</td>
<td>0.826</td>
<td>0.500</td>
<td>0.507</td>
<td>0.527</td>
</tr>
<tr>
<td><strong>Median (Q50)</strong></td>
<td>0.551</td>
<td>0.797</td>
<td>0.739</td>
<td>0.928</td>
<td>0.699</td>
<td>0.924</td>
<td>0.603</td>
<td>0.619</td>
<td>0.727</td>
</tr>
<tr>
<td><strong>Quartile (Q75)</strong></td>
<td>0.750</td>
<td>0.906</td>
<td>0.843</td>
<td>0.968</td>
<td>0.795</td>
<td>1.000</td>
<td>0.750</td>
<td>0.725</td>
<td>0.889</td>
</tr>
<tr>
<td><strong>Max (Q100)</strong></td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>0.926</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Equation (1) is the regression model explaining the proportion of skilled migrants arrived before age $J$ ($\sigma_{ij}^J$) as a function variables capturing proximity between origin and host countries ($X_{ij}^k$), origin countries characteristics ($Z_{ik}$) and host countries characteristics ($W_{jf}^k$).

Regarding the proximity variables included in $X_{ij}^k$, 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, $Z_{ik}$, 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, $W^k_j$, 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

<table>
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<tr>
<th>Dependent variable, $θ_{12}$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratio of GDP per capita</strong></td>
<td>0.267***</td>
<td>0.257***</td>
<td>0.236***</td>
<td>0.242***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.051)</td>
<td>(0.058)</td>
<td>(0.042)</td>
</tr>
<tr>
<td><strong>Distance (in logs)</strong></td>
<td>0.219***</td>
<td>0.217***</td>
<td>0.210***</td>
<td>0.199***</td>
</tr>
<tr>
<td></td>
<td>(0.056)</td>
<td>(0.055)</td>
<td>(0.055)</td>
<td>(0.053)</td>
</tr>
<tr>
<td><strong>Colonial link</strong></td>
<td>-2.503***</td>
<td>-2.512***</td>
<td>-2.501***</td>
<td>-2.430***</td>
</tr>
<tr>
<td></td>
<td>(0.211)</td>
<td>(0.214)</td>
<td>(0.211)</td>
<td>(0.208)</td>
</tr>
<tr>
<td><strong>Linguistic proximity</strong></td>
<td>-0.416***</td>
<td>-0.425***</td>
<td>-0.438***</td>
<td>-0.416***</td>
</tr>
<tr>
<td></td>
<td>(0.096)</td>
<td>(0.097)</td>
<td>(0.099)</td>
<td>(0.093)</td>
</tr>
<tr>
<td><strong>Social expenditures at dest. (in logs)</strong></td>
<td>0.569***</td>
<td>0.556**</td>
<td>0.542**</td>
<td>0.532**</td>
</tr>
<tr>
<td></td>
<td>(0.219)</td>
<td>(0.220)</td>
<td>(0.221)</td>
<td>(0.213)</td>
</tr>
<tr>
<td><strong>Education expenditures at dest. (in logs)</strong></td>
<td>-2.343***</td>
<td>-2.324***</td>
<td>-2.299***</td>
<td>-2.337***</td>
</tr>
<tr>
<td></td>
<td>(0.274)</td>
<td>(0.275)</td>
<td>(0.276)</td>
<td>(0.263)</td>
</tr>
<tr>
<td><strong>Immigration rate at dest.</strong></td>
<td>-0.101***</td>
<td>-0.101***</td>
<td>-0.101***</td>
<td>-0.099***</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.010)</td>
<td>(0.010)</td>
<td>(0.010)</td>
</tr>
<tr>
<td><strong>Democracy index at origin</strong></td>
<td>0.175</td>
<td>0.199</td>
<td>0.193</td>
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<tr>
<td></td>
<td>(0.153)</td>
<td>(0.153)</td>
<td>(0.153)</td>
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<tr>
<td>Public education exp. at origin - primary</td>
<td>0.075</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>(0.076)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public education exp. at origin - secondary</td>
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<td>0.085</td>
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<tr>
<td></td>
<td>-</td>
<td>(0.073)</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>0.045</td>
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<td></td>
<td>-</td>
<td>-</td>
<td>(0.049)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Year 2000</strong></td>
<td>-0.103</td>
<td>-0.101</td>
<td>-0.101</td>
<td>-</td>
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<tr>
<td></td>
<td>(0.094)</td>
<td>(0.093)</td>
<td>(0.094)</td>
<td>-</td>
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<tr>
<td><strong>Constant</strong></td>
<td>4.617***</td>
<td>4.659***</td>
<td>4.537***</td>
<td>4.610***</td>
</tr>
<tr>
<td></td>
<td>(1.161)</td>
<td>(1.161)</td>
<td>(1.150)</td>
<td>(1.077)</td>
</tr>
<tr>
<td><strong>R2</strong></td>
<td>0.241</td>
<td>0.242</td>
<td>0.241</td>
<td>0.247</td>
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<td><strong>Number of observations</strong></td>
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<td>1542</td>
<td>1542</td>
<td>1579</td>
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</table>

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

<table>
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<tr>
<th>Dependent variable, $\theta_{18}$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Ratio of GDP per capita</td>
<td>0.255***</td>
<td>0.242***</td>
<td>0.237***</td>
<td>0.242***</td>
</tr>
<tr>
<td></td>
<td>(0.054)</td>
<td>(0.054)</td>
<td>(0.060)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Distance (in logs)</td>
<td>0.181***</td>
<td>0.174***</td>
<td>0.167***</td>
<td>0.146***</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.052)</td>
<td>(0.052)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>Colonial link</td>
<td>-2.474***</td>
<td>-2.479***</td>
<td>-2.464***</td>
<td>-2.408***</td>
</tr>
<tr>
<td></td>
<td>(0.192)</td>
<td>(0.196)</td>
<td>(0.193)</td>
<td>(0.194)</td>
</tr>
<tr>
<td>Linguistic proximity</td>
<td>-0.447***</td>
<td>-0.459***</td>
<td>-0.461***</td>
<td>-0.459***</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.094)</td>
<td>(0.096)</td>
<td>(0.091)</td>
</tr>
<tr>
<td>Social expenditures at dest. (in logs)</td>
<td>0.546**</td>
<td>0.528**</td>
<td>0.526**</td>
<td>0.538**</td>
</tr>
<tr>
<td></td>
<td>(0.215)</td>
<td>(0.215)</td>
<td>(0.216)</td>
<td>(0.211)</td>
</tr>
<tr>
<td>Education expenditures at dest. (in logs)</td>
<td>-2.908***</td>
<td>-2.880***</td>
<td>-2.875***</td>
<td>-2.843***</td>
</tr>
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<td>(0.298)</td>
<td>(0.298)</td>
<td>(0.298)</td>
<td>(0.285)</td>
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<td>Immigration rate at dest.</td>
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<td>-0.116***</td>
<td>-0.115***</td>
<td>-0.109***</td>
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<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.010)</td>
</tr>
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<td>Democracy index at origin</td>
<td>0.095</td>
<td>0.134</td>
<td>0.130</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.164)</td>
<td>(0.165)</td>
<td>(0.165)</td>
<td>-</td>
</tr>
<tr>
<td>Public education exp. at origin - primary</td>
<td>0.132*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public education exp. at origin - secondary</td>
<td>-</td>
<td>0.094</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(0.074)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public education exp. at origin - tertiary</td>
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<td>-</td>
<td>0.022</td>
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<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(0.050)</td>
<td>-</td>
</tr>
<tr>
<td>Year 2000</td>
<td>-0.304***</td>
<td>-0.299***</td>
<td>-0.299***</td>
<td>-0.265***</td>
</tr>
<tr>
<td></td>
<td>(0.091)</td>
<td>(0.091)</td>
<td>(0.091)</td>
<td>(0.080)</td>
</tr>
<tr>
<td>Constant</td>
<td>6.053***</td>
<td>5.921***</td>
<td>5.672***</td>
<td>5.460***</td>
</tr>
<tr>
<td></td>
<td>(1.181)</td>
<td>(1.187)</td>
<td>(1.176)</td>
<td>(1.108)</td>
</tr>
<tr>
<td>R2</td>
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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

<table>
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<th>Dependent variable, $θ_{22}$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tr>
<td>Ratio of GDP per capita</td>
<td>0.220***</td>
<td>0.212***</td>
<td>0.243***</td>
<td>0.190***</td>
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<td></td>
<td>(0.054)</td>
<td>(0.053)</td>
<td>(0.058)</td>
<td>(0.041)</td>
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<tr>
<td>Distance (in logs)</td>
<td>0.212***</td>
<td>0.205***</td>
<td>0.202***</td>
<td>0.175***</td>
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<td></td>
<td>(0.050)</td>
<td>(0.050)</td>
<td>(0.050)</td>
<td>(0.049)</td>
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<td>Colonial link</td>
<td>-2.316***</td>
<td>-2.316***</td>
<td>-2.302***</td>
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<tr>
<td></td>
<td>(0.179)</td>
<td>(0.181)</td>
<td>(0.179)</td>
<td>(0.177)</td>
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<td>Linguistic proximity</td>
<td>-0.455***</td>
<td>-0.464***</td>
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<tr>
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<td>(0.090)</td>
<td>(0.090)</td>
<td>(0.092)</td>
<td>(0.086)</td>
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<td>Social expenditures at dest. (in logs)</td>
<td>0.233</td>
<td>0.220</td>
<td>0.246</td>
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<td>(0.205)</td>
<td>(0.205)</td>
<td>(0.206)</td>
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<td>Education expenditures at dest. (in logs)</td>
<td>-2.719***</td>
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<td>-2.741***</td>
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<td>(0.323)</td>
<td>(0.323)</td>
<td>(0.321)</td>
<td>(0.299)</td>
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<td>Immigration rate at dest.</td>
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<td>(0.030)</td>
<td>(0.010)</td>
<td>(0.010)</td>
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<td>Democracy index at origin</td>
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<td>(0.166)</td>
<td>(0.165)</td>
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<tr>
<td>Public education exp. at origin - primary</td>
<td>0.099</td>
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<td></td>
<td>(0.074)</td>
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<tr>
<td>Public education exp. at origin - tertiary</td>
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<tr>
<td>Year 2000</td>
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<td>-0.402***</td>
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<td>(0.086)</td>
<td>(0.086)</td>
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<td>(0.080)</td>
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<td>4.992***</td>
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<td></td>
<td>(1.197)</td>
<td>(1.204)</td>
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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

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<tr>
<th>Population above 0.25 million</th>
<th>Country</th>
<th>m0+</th>
<th>Country</th>
<th>m22+</th>
<th>Population above 4 million</th>
<th>Country</th>
<th>m12+</th>
<th>Country</th>
<th>m18+</th>
<th>Country</th>
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<td>Haiti</td>
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<td>Haiti</td>
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<td>Jamaica</td>
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<td>48.4%</td>
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<tr>
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<td>Haiti</td>
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<td>Ghana</td>
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<td>Ghana</td>
<td>44.9%</td>
<td>Mozambique</td>
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<tr>
<td>Trinidad and Tobago</td>
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<td>44.4%</td>
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4 References

