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Brain drain and institutions of governance: Educational attainment of immigrants to the US 1988–1998

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ABSTRACT

We investigate the impact of home country institutions on the skill level of immigrants to the United States over 1988–1998. Specifically, we explore the hypothesis that institutions are multidimensional and that the different dimensions have conflicting impacts on the migration of skilled labor. Using an exploratory factor analysis on fifteen institutional variables, we identify the following dimensions of institutional character: credibility, transparency, democracy, and the security of civil society. We find that credibility and transparency increase the magnitude of brain drain, security reduces it, and democracy has no significant impact.

1. Introduction

The migration of tertiary skilled labor or *brain drain* has come to be a central theme in the ongoing debate on globalization, and the last decade has seen the emergence of a significant body of research on the causes and consequences of the phenomenon. This paper contributes to the literature by investigating the impact of political institutions in the countries of origin on the skill levels of legal immigrants to the United States over the period 1988 to 1998. We emphasize the multidimensionality of political institutions and provide evidence that the various aspects of institutional structure have

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differing impacts on the migration of skilled labor. Our results show that the credibility and transparency of governance both increase the magnitude of brain drain, political stability reduces it, and democracy has no significant impact.

Our paper bears on three distinct areas of inquiry. First, in looking at institutional determinants of skilled migration, it contributes to the literature that investigates the causes of brain drain. Second, given that the outflow of skilled labor has serious consequences for any economy, it studies a relatively unexplored channel whereby institutions influence the economic prospects of a nation. Lastly, it contributes to the literature that looks at the impact of sociopolitical instability on economic performance.

The onset of globalization has seen a rejuvenation of interest in the brain drain, as summarized in the review by Commander et al. (2004). As noted by Borjas (1994) and Hatton and Williamson (2005) among others, key determinants of brain drain include factors proposed in the more general literature on immigrant selection; namely, the wage differential between the source and the destination countries; poverty, inequality, and demographics in the source country; and dimensions of cultural similarity and geographical proximity between the source and the destination countries. To this list, our paper adds another key factor, namely, the institutional character in the source country, with the cautionary note that the different dimensions of institutional structure differ in their impacts on the incentive to migrate.

There is a lack of consensus regarding the consequences of brain drain. Studies such as Bhagwati and Rodriguez (1975), Fan and Stark (2007b), and Docquier and Rapoport (2009) argue that brain drain is unambiguously detrimental to the source country. However, an emerging literature contends that skilled migration is typically accompanied by a *brain gain* for the country of origin for several reasons: first, as noted by Beine et al. (2008a), migration prospects raise the expected returns to investing in human capital. Further, Kugler and Rapoport (2007) find evidence that highly skilled immigrant networks promote foreign direct investment and Lodigiani (2008) finds that they facilitate the diffusion of technology. In addition, Li and McHale (2006) argue that skilled diasporas facilitate the adoption of institutional reforms. Fan and Stark (2007a) synthesize these results by arguing that brain drain may indeed be detrimental for the source country in the short run, although these costs may be offset by long-run benefits. Our paper contributes to the debate by pointing out the need for a more nuanced assessment of brain drain: the magnitude of brain drain and, hence, its impact on the source country depends critically on the existing institutional structure, and different aspects of institutional structure have differing impacts on the migration of skilled labor.

The literature on institutional determinants of economic development comprises a distinct field of study and it is beyond the scope of this paper to attempt any review of the existing state of research. Referring the reader to a survey such as Lin and Nugent (1995) for an idea of the classic contributions we provide a brief idea of the literature that investigates the consequences of political instability on economic outcomes, particularly economic growth.

A major impetus to this literature was provided by the seminal contributions of Easterly and Levine (1997) and Rodrik (1999) that investigated the *growth tragedy* of Africa and the *growth collapse* in South America and the Middle East, and attributed these phenomena to social conflict. From this, a more general literature has emerged that investigates the effect of inequality on economic growth via its role in fostering conflict. Benabou (1996) identifies two types of studies in this area: the first, represented by Alesina and Perotti (1996), Perotti (1996), and Sala-i-Martin (1997), constructs *indices of sociopolitical instability*, while the second, represented by Keefer and Knack (2002) and Pääkkönen (2010) among others, uses *indices of insecure property rights*. An implication of our study is that these two types of indicators may in fact have differing impacts on economic outcomes, in our case, the migration of skilled labor.

Given the correlation between available institutional variables, most existing studies on the institutional determinants of economic outcomes either include the variables separately in regressions, as in Easterly and Levine (1997) and Grogan and Moers (2001), or construct uni-dimensional indices of institutional structure from the available indicators, as in Alesina and Perotti (1996) and Perotti (1996). The first method is limited by the fact that the estimates may fail to capture the true impact of an institutional variable due to omitted variables bias, whereas the second ignores the argument that institutions may have multiple dimensions. Highlighting this second argument, Langbein and Knack (2010) undertake a confirmatory factor analysis of the World Bank's *World Governance Indicators* (WGI) to determine if these six measures are causally related to single latent variable good governance, but are unable to confirm this hypothesis.

Notably, Ghate et al. (2003) and Jong-A-Pin (2009) explicitly account for the multidimensionality of institutional quality and political instability and document differing impacts of the various dimensions on the rate of growth. While methodologically similar to Jong-A-Pin (2009), our study embraces a more general idea of institutional structure, of which stability is one aspect. The *WGI* project undertaken by Kaufmann et al. (2008) is also similar to our approach, except that a significant portion of the indicators used in the construction of their indices are not available for a portion of our sample period, and the way in which the factor analysis was conducted left the indicators highly correlated, which could lead to multicollinearity, as noted by Hooper et al. (2009).

Few studies have undertaken an analysis of the impact of institutional quality and stability on migration. Among them, Agbola and Acupan (2010) find that political stability may actually *decrease* emigration in the case of the Philippines. Also, a contribution closely related to our own is Beine et al. (2008b), who use the WGI to find that the adverse effects of brain drain are particularly acute for small states and states with high levels of political instability. However, they find a counterintuitive positive relationship between government effectiveness and skilled emigration, which they explain to be a consequence of collinearity. Our analysis, based on a wider sample of countries, a longer sample period, explicit panel data analysis, and a finer conception of institutional structure, offers more coherent results on the issue of institutions.

Combining these areas of the literature, we investigate the separate impacts of institutional quality and institutional stability on the magnitude of the brain drain. By *institutional quality*, we refer to the efficiency and transparency of the organs of governance, such as the quality of bureaucracy, lack of corruption, and property rights. *Institutional stability*, on the other hand, refers to factors that constitute threats to the continuity of the political environment, such as conflict. We explore the hypothesis that these different aspects of institutional structure have conflicting impacts on the educational attainment of immigrants.

In trying to distinguish between the quality and stability aspects of institutional structure, we are constrained by the fact that any prior classification of available institutional variables into indicators of quality and stability is innately problematic. For example, the variable called *regime durability*, provided by the Polity IV Project, purports to capture the *stability* of political institutions measured by the years since the last change in government. However, a regime may be durable precisely because it ensures a high quality of public institutions. Without further investigation, it is difficult to classify durability as an unambiguous measure of stability. As we show in Section 4, there is reason to believe that it really captures the government's ability to deliver a high quality of public services, and hence enjoy greater legitimacy.

In view of such problems, we perform an exploratory factor analysis on fifteen institutional variables commonly used in the literature. From this, we identify four aspects of institutional character: (1) *credibility of the government*; (2) *transparency of government operations*; (3) *democracy*; and (4) *security of civil society*. Of these, the first three are taken to stand for the quality of existing institutions, while the last is taken to capture the stability. High institutional quality, as captured by the credibility and transparency of government, is seen to increase the educational attainment of immigrants to the United States over the sample period, while high stability is seen to reduce it. Democracy is not found to have a robust impact.

The next section describes our variables and data sources. Section 3 presents a preliminary exploration of our data and underlines the need for a more nuanced analysis of institutional variables. Section 4 reports the results of our factor analysis and Section 5 uses the principal factors identified in the previous section to conduct a more rigorous analysis of the data. This section presents and interprets our major findings and performs a number of robustness checks on our results. The last section concludes the paper by providing a brief summary of our analysis and indicating directions for further research.

2. Empirical model and description of data

We explore the hypothesis that the two characteristics of political institutions in a country, namely quality and stability, may have conflicting impacts on the educational attainment of migrants. Political instability reduces the expected future returns to educational investment. Hence, an individual who has invested in education will have a greater incentive to migrate if the political climate is unstable than if it is stable. To appreciate this, consider a country free of conflict comprised of two skill types

(skilled and unskilled), each of whom has a different extent to which she is tied to the source country. Now suppose conflict breaks out and the marginal returns to skill domestically fall. If this is the case, then all individuals are likely to have a stronger incentive to migrate, but a comparatively higher proportion of skilled individuals will be induced to break their family and other ties to the home region and undertake migration.

The quality of political institutions may, however, impact the selection of migrants differently. To appreciate this, consider a pair of countries with a given differential in institutional quality. If this differential is large, then the marginal benefit of migration from the country with poor institutions is large across the skill distribution. Hence, both skilled and unskilled workers have an incentive to migrate. By contrast, if the country of origin has a relatively high quality of political institutions, the marginal benefit from migration is relatively lower. Thus, for a given cost of migrating, highly skilled workers have a greater incentive to migrate. This analysis leads to the following hypotheses:

1. Immigrants from countries with greater political stability tend to be less skilled on the average than immigrants from countries with more stable governments;
2. Immigrants from countries with higher institutional quality will tend to be more skilled than immigrants from countries with lower institutional quality.

We test the impact of institutions on the brain drain using data on immigrants to the United States over the period 1988–1998. The choice of this period allows us to avoid structural changes due to the two major immigration legislations in the United States, namely the Immigration Reform and Control Act (ICRA) of 1986 and the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996, which was not implemented until 1998.

We employ the following fixed effects model to test our hypotheses:

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + u_i + \varepsilon_{it} \tag{1}$$

As dependent variables, Y_{it}, we consider the *skill intensity* of immigrants as well as the total number of immigrants from country i in year t. X_{it} is the vector of controls (including information about the immigrants from each country of origin, its GDP, and educational attainment of its population); Z_{it} is the vector of indices capturing the quality and stability of governance; u_i is the fixed effect error term; and ε_{it} is the idiosyncratic error.

Given the relationship between the institutions and both per capita GDP and average years of education reported by Mauro (1995), Alesina and Perotti (1996), Perotti (1996), and Knack and Keefer (1995) among others, our preliminary investigation of the data implements a two stage procedure to account for endogeneity. First, we estimate per capita GDP and average educational attainment using per capita energy consumption and life expectancy in the source countries as instruments. Then, we estimate the fixed effects model in (1) with skill intensity as dependent variable and the predicted values of per capita GDP and average years of education.[1]

2.1. Measuring the education of new immigrants

Data on new immigrants to the United States over the sample period 1988–1998 come from the *Immigrants Admitted to the United States Series* published by Immigration and Naturalization Service (INS). This report includes the following characteristics for each immigrant: year of admission; visa class; countries of birth, last residence, and quota charge; age; occupation; marital status; gender; intended state and city of residence in the United States; labor certification status; and whether the case constitutes new admission or an adjustment in visa status for a non-immigrant foreign national already in the United States.[2]

[1] We <fn0005>obtain the same results when per capita GDP and average years of education are included directly as a control variable.

[2] The complete dataset covers the period 1972–2000 and is available at the Inter-University Consortium for Political and Social Research (ICPSR) website. See Polgreen and Simpson (2006) for a detailed description.

There are two potential problems with the INS dataset. First, it does not include information on illegal immigrants, leading to measurement error in the dependent variable. In fact, nearly all of the databases on immigrants suffer from this limitation. However, while measurement error in the dependent variable is likely to affect the standard errors, it does not necessarily bias the estimates of the coefficients. To obtain robust standard errors, we use a bootstrap method with a stratified sampling method by country of origin. Secondly, the INS data does not report the educational attainment of immigrants directly, so we must consider an alternative measure of skill for our dependent variable. To do this, we construct a *discrete measure of skill for each immigrant* skill based on their occupation. Then, we measure the *skill intensity of immigrants from each country* as the proportion of immigrants who are seeking employment in high-skill occupations. We briefly outline this technique below.

Our methodology for calculating the skill intensity of the immigrants from each country is a three-step process based on methodologies proposed by Topel (1994) and Polgreen and Simpson (2006). First, following Polgreen and Simpson (2006), we use regression coefficients for the educational attainment of US-born citizens to construct a measure of the predicted years of education of immigrants in each reported occupation *k*, based on the characteristics reported in the INS dataset.[3] While this measure of education may not be precise as a cardinal measure of education, it gives a fairly precise ordinal ranking of immigrants' skills, which is all we need to construct our skill variable. Second, following Topel (1994), the predicted measure of educational attainment is averaged by occupation to obtain an ordinal ranking of the skill for each occupation. Then, immigrants are identified as *high-skill* if their occupation falls in the top tertile of occupations, *semi-skill* if their occupation falls in the middle tertile and *low-skill* if their occupation falls in the bottom tertile. Finally, we calculate *skill intensity* for each *country* in each *year* as the fraction of all immigrants from that country who were identified as *high-skill*.

It should be mentioned that the predicted measure of immigrant education proposed by Polgreen and Simpson (2006) has its own limitations. First, the predicted variable only captures the occupational skills for immigrants who report an occupation, which excludes children, retirees, students, homemakers, the unemployed, or immigrants who have not reported an occupation. However, they document that numbers of immigrants from these categories have been relatively stable over the period in question, so any bias introduced by their omission is also stable. Second, immigrants are less likely to be matched into their primary occupation than natives due to licensing and other barriers to entry, as documented by Chiswick et al. (2008). Further, as shown by Mattoo et al. (2008), this mismatching may vary across countries of origin. However, while such mismatching may indeed affect the wages of immigrants after they arrive, it does not necessarily affect their educational attainment when they decided to leave. Last, the use of constructed variables such as our measure of immigrant education may be subject to measurement error in our dependent variable. This is less of a problem for us, since we are primarily concerned with the ordinal ranking of skill based on occupation. We address this issue by using a bootstrap method to calculate the standard errors of our coefficients.[4]

Despite the caveats outlined above, we feel that the INS dataset is of greater use for the purpose of this study than the existing alternatives, which include the *Current Population Survey* (CPS), the *Census of Foreign-Born Population*, the New Immigrant Survey (NIS) from the U.S. Census Bureau, and the OECD immigration databases compiled by Docquier and Marfouk (2006) and Brücker and Defoort (2006), among others. Although using these data may help to overcome some of the problems described above, these datasets are based on *stocks* of immigrants at a point in time rather than the *flows* of immigrants during a given year. For this reason, they do not provide information about the characteristics of immigrants *at the time of their migration* and do not answer our basic question of how the institutional structure of a country influences the skill composition of migrants from that country in that year.

[3] Using data on the US population from the *Current Population Survey* (CPS), Polgreen and Simpson (2006) estimate the following equation for each occupation *k*:

$$ed_{jk} = \beta_{0k} + \beta_{1k} age_{jk} + \beta_{2k}\, gender_{jk} + \beta_{3k} married_{jk} + e_{jk}.$$

Then, they apply the estimated coefficients of these regressions to the immigrants in the INS dataset to obtain their predicted education levels.

[4] We replicated our bootstrap 100 times using stratified random sampling, where the strata were defined as the different countries of origin. This way, we also address the problem of heteroskedasticity across different countries' immigrants.

Table 1
Summary statistics.

Variable	Source	Mean	Std. Dev.	Min	Max
Skill intensity	INS	0.678	0.175	0.115	0.937
Total immigrants (1000)	INS	2296.757	4587.371	100	40,740
High-skill immigrants (1000)	INS	615.499	1941.087	0	20,771
Semi-skill immigrants (1000)	INS	715.704	2756.614	0	34,598
Low-skill immigrants (1000)	INS	965.555	3624.067	0	40,740
New immigrants (proportion of total)	INS	0.570	0.191	0.083	0.967
Employment visas (proportion of total)	INS	0.190	0.171	0	0.713
GDP per capita (2000 constant $1000)	WDI	7.513	9.047	0.103	36.792
Average education (Years)	Barro & Lee	6.237	2.637	1.15	11.82
Population (1,000,000)	WDI	45.200	115.000	0.673	982.00
Government Stability	ICRG	6.765	2.051	0	12
Internal conflict	ICRG	8.924	2.985	0	12
External conflict	ICRG	10.342	2.067	0	12
Ethnic tensions	ICRG	4.256	1.572	0	6
Durability	Polity IV	26.210	30.697	0	150
Political fractionalization	DPI	0.568	0.263	0	1
Political polarization	DPI	0.735	0.872	0	2
(Non-)corruption index	DPI	3.674	1.379	0	6
Bureaucratic quality	ICRG	2.431	1.229	0	4
Investment profile	ICRG	6.109	1.781	0	12
Democratic accountability	ICRG	4.096	1.424	0	6
Polity index	Polity IV	5.101	5.969	−10	10
Executive index of electoral competition	DPI	6.274	1.612	1	7
Legislative index of electoral competition	DPI	6.495	1.316	1	7
Government checks	DPI	3.417	2.010	1	18
Observations		705			

2.2. Controls and institutional variables

The first set of controls comes from the INS series and includes (1) the proportion of "new entrant" visas awarded to immigrants from each country; (2) the proportion of a country's immigrants receiving employment visas; (3) the total number of immigrants from each country of origin; (4) year; and (5) region. The new entrant variable helps control for the fact that many high-skilled immigrants who eventually receive work visas have already entered under a temporary "non-immigrant" student visa and received their education in the US. The proportions of immigrants receiving employment visas control for how binding the quota restrictions are.[5] Combined, these two visa variables help to control for some of the variance in occupational mismatching documented by Mattoo et al. (2008).

The second set of controls used in our model consists of *source country characteristics*. For each country, we consider (6) population and (7) per capita GDP from the World Development Indicators, and (8) average years of education from Barro and Lee (2001). As shown in Table 1, the mean of the population variable taken over the sample is approximately 45.2 million people with a standard deviation of about 115 million. GDP per capita has a mean of about $7500, and a standard deviation of about $9000. Lastly, the mean of the education variable over the sample period is approximately 6.2 years, and it has a standard deviation of 2.6 years.

Information on institutional characteristics comes from the Polity IV Project,[6] the International Country Risk Guide (ICRG),[7] and the Database of Political Institutions (DPI) compiled by Beck et al. (2001).[8] Of the variables in the polity dataset, we select the (9) *Polity IV Index*, which quantifies the extent to which a country's system is democratic as opposed to autocratic, and (10) *Regime Durability*,

[5] Classification 29.

[6] A complete description of the variables and methodology for the polity database can be found at: http://www.systemicpeace.org/inscr/p4manualv2007.pdf.

[7] See http://www.prsgroup.com/ICRG_Methodology.aspx for a complete description of the ICRG variables and the methodology used to construct them.

[8] See Beck et al. (2001) for a description of the methodology behind the DPI variable construction.

calculated as the number of years since the last regime change. Next, we include the following indices from the ICRG: (11) the *corruption index*[9]; (12) the *index of bureaucratic quality*; (13) the *investment profile index*, which captures the enforcement of contractual agreements and expropriation risk; (14) the *democratic accountability index*; (15) the *government stability index*, which assesses "the government's ability to carry out its declared programs and ... stay in office"; (16) the *index of internal conflict*[10]; (17) the *index of external conflict*[11]; and (18) the *index of ethnic tensions*, which inversely measures the latent social conflict in a country on the lines of race and ethnicity.[12] Finally, we include three variables from the DPI: (19–20) *the legislative and executive indices of electoral competitiveness*; and (21) *checks*, which counts the number of checks of power in the government; (22) *political fractionalization*, which measures the dispersion of parties in the legislature; and (23) *political polarization*, which measures the distance between the executive and the legislature on the 'Left-Center-Right' scale.

As a practical concern, it is difficult to account for multiple dimensions of institutional quality in the same empirical model due to the fact that the institutional variables tend to be highly correlated (see Table 2). Thus, Section 3 begins our analysis by introducing each element of institutional character into our model separately to get a preliminary picture of the extent to which institutions differ in determining the education of immigrants. Once we have an idea of the importance of the individual indices, we perform a factor analysis to isolate four dimensions of institutions in Section 4 and test their impacts on the immigrant selection in Section 5.

3. A preliminary exploration of the data

As is clear from the correlation matrix presented in Table 2, the individual components of institutional structure are highly correlated with each other. Hence, we include these variables individually in our regression equations. The results of this preliminary investigation are presented in Tables 3 and 4. Consistent with our first hypothesis, Table 3 shows that the *internal conflict*, *external conflict*, and *ethnic tension* variables all decrease the skill intensity of immigrants, and are all significant at the 1% level.[13] Next, the *durability of a regime* is seen to have a significant positive impact on skill intensity at the 1% level. At first sight, this variable would appear to relate to stability, and therefore be expected to have a negative impact on selection. However, a regime may be durable precisely because it ensures the security of property rights, provides public goods and services efficiently, and thereby allows no scope for the formation of grievance that would lead to regime change. Alternatively, as argued by Collier and Hoeffler (2004), political instability may be motivated more by *greed* than *grievance*, and therefore a high quality of governance reduces the incentive and opportunity for predatory behavior. Hence, regime durability may, in fact, relate more to the institutional quality than stability. The factor analysis that we will discuss in section four confirms this argument.

Reinforcing this argument, the *government stability index* also has a positive impact on skill intensity at the 1% level of significance. As with durability, this index may appear to be an indicator of stability and have a negative predicted sign. Note, however, that the index measures the ability of a government to implement declared policies based on popular approval and unity within the government. In light of this definition, it may be more accurate to think of it as capturing the government's credibility, which in turn is a measure of institutional quality. Thus, it is reasonable to conclude that the government stability index relates more to institutional quality than stability. Once again, the factor analysis discussed in Section 4 validates this argument.

[9] This variable actually measures the *non*-corruptness of the political system, with higher scores representing greater transparency.

[10] There are other measures of political instability, most of which are highly correlated with each other. See Jong-A-Pin (2009) for a detailed discussion of the different measures of political instability used in the economic literature.

[11] Other measures of conflict include the Political Instability Taskforce and the Uppsala Conflict Data Program, which focus on civil wars. We have used the ICRG measure because it captures different forms of external conflict.

[12] As with the corruption index, variables (16) through (18) measure *more favorable* conditions and thus capture the *absence* of conflict or tension, with higher scores representing greater stability.

[13] Recall that these variables inversely measure the concepts indicated by their titles and thus the negative sign does in fact confirm the hypothesis that political stability lessens the extent of the brain drain, whereas instability magnifies it.

Table 2
Correlation matrix of explanatory variables.

	New	Employment	Population	GDP p.c.	Ave. Educ.	Gov. Stab.	Int. Conf.	Ext. Conf.	Eth. Ten.	Durability	Pol. Frac.	Pol. Polariz.	Non-corrupt	Bur. Qual.	Inv. Prof.	Dem. Acct.	Polity	EIEC	LIEC
New Imm. Employment visa	−0.292																		
Population	0.064	0.090																	
GDP p.c.	−0.087	0.242	0.003																
Ave. Educ.	0.051	0.262	−0.030	0.736															
Gov. Stab.	−0.006	0.237	−0.031	0.289	0.305														
Int. conflict	−0.085	0.299	−0.032	0.524	0.598	0.481													
Ext. conflict	−0.0321	0.362	−0.023	0.384	0.489	0.365	0.674												
Eth. Ten.	0.037	0.155	−0.128	0.443	0.488	0.382	0.697	0.548											
Durability	−0.046	0.129	0.147	0.665	0.535	0.2111	0.320	0.179	0.225										
Pol. Frac.	0.192	0.181	0.079	0.343	0.459	0.218	0.349	0.365	0.287	0.187									
Pol. Polariz.	0.030	0.187	−0.049	0.456	0.430	0.177	0.308	0.342	0.259	0.213	0.563								
Non-corrupt	−0.092	0.243	−0.062	0.671	0.677	0.328	0.609	0.459	0.512	0.499	0.327	0.366							
Bur. Qual.	−0.060	0.295	0.113	0.708	0.659	0.371	0.591	0.418	0.403	0.530	0.349	0.365	0.762						
Inv. Prof.	0.076	0.148	0.012	0.367	0.388	0.706	0.477	0.372	0.365	0.265	0.241	0.260	0.373	0.457					
Dem. Acct.	−0.009	0.232	0.058	0.649	0.677	0.336	0.629	0.546	0.475	0.514	0.501	0.489	0.717	0.705	0.445				
Polity	0.115	0.202	0.099	0.466	0.585	0.391	0.422	0.457	0.410	0.297	0.638	0.515	0.491	0.443	0.302	0.681			
EIEC	0.146	0.173	0.066	0.291	0.418	0.205	0.369	0.375	0.320	0.208	0.702	0.408	0.346	0.352	0.319	0.545	0.706		
LIEC	0.211	0.153	0.087	0.253	0.406	0.255	0.412	0.391	0.338	0.210	0.734	0.375	0.322	0.314	0.322	0.502	0.609	0.836	
Checks	0.095	0.191	0.271	0.344	0.361	0.142	0.350	0.335	0.229	0.211	0.637	0.576	0.318	0.399	0.220	0.524	0.582	0.585	0.519

Highlighted cells represent values 3 of the correlation coefficient that are greater than 0.3 in absolute value.

Table 3
Impacts of observed institutional variables on the skill of immigrants to the US with country fixed effects (dependent variable: skill intensity).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Skill intensity$_{t-1}$	0.339***	0.331***	0.310***	0.327***	0.323***	0.326***	0.321***
	(0.0388)	(0.0380)	(0.0375)	(0.0376)	(0.0383)	(0.0389)	(0.0388)
Year	0.00114	0.00471***	0.00479**	0.00423**	0.00283	0.00318	0.00294
	(0.00221)	(0.00178)	(0.00198)	(0.00172)	(0.00197)	(0.00206)	(0.00194)
New immigrants	0.181***	0.173***	0.182***	0.183***	0.189***	0.187***	0.186***
	(0.0137)	(0.0142)	(0.0133)	(0.0135)	(0.0142)	(0.0141)	(0.0140)
Employment visas	0.155***	0.150***	0.160***	0.152***	0.153***	0.148***	0.145***
	(0.0164)	(0.0162)	(0.0162)	(0.0162)	(0.0165)	(0.0156)	(0.0158)
GDP per capita	−0.0125**	−0.0148**	−0.0144**	−0.0139**	−0.0154**	−0.0127**	−0.0120**
	(0.00555)	(0.00638)	(0.00599)	(0.00614)	(0.00655)	(0.00553)	(0.00557)
Average education	0.0115	0.0128	0.0114	0.0128	0.0145	0.0131	0.0117
	(0.0213)	(0.0219)	(0.0216)	(0.0213)	(0.0212)	(0.0211)	(0.0208)
Total immigrants	−0.00322*	−0.00371***	−0.00346**	−0.00412**	−0.00394***	−0.00390**	−0.00389***
	(0.00134)	(0.00142)	(0.00140)	(0.00145)	(0.00141)	(0.00137)	(0.00137)
Population	−0.00083***	−0.00057**	−0.00075***	−0.00065*	−0.00078***	−0.00073**	−0.00071***
	(0.00027)	(0.00027)	(0.00026)	(0.00026)	(0.00027)	(0.00027)	(0.00027)
Government stability	0.00405***						
	(0.00151)						
Internal conflict		−0.00537***					
		(0.00184)					
External conflict			−0.00757***				
			(0.00150)				
Ethnic tensions				−0.0107***			
				(0.00349)			
Durability					0.00102***		
					(0.000379)		
Political Fract.						−0.00474	
						(0.0132)	
Political polarization							0.00724**
							(0.00325)
Constant	−1.921	−8.951***	−9.062**	−7.993**	−5.270	−5.953	−5.471
	(4.292)	(3.457)	(3.834)	(3.341)	(3.815)	(3.987)	(3.762)
Observations	659	659	659	659	659	659	659
Countries	73	73	73	73	73	73	73
ρ	0.941	0.949	0.953	0.946	0.944	0.942	0.940
$\rho(u_i, \mathrm{Xb})$	−0.470	−0.555	−0.588	−0.521	−0.514	−0.486	−0.451
σ_u	0.190	0.206	0.212	0.200	0.198	0.194	0.189

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Skill intensity$_{t-1}$	0.323***	0.325***	0.325***	0.333***	0.327***	0.329***	0.330***	0.322***
	(0.0388)	(0.0390)	(0.0385)	(0.0390)	(0.0392)	(0.0395)	(0.0416)	(0.0383)
Year	0.00303	0.00309	0.00307	0.00195	0.00347*	0.00359*	0.00342*	0.00301
	(0.00194)	(0.00202)	(0.00194)	(0.00200)	(0.00193)	(0.00192)	(0.00193)	(0.00197)
New immigrants	0.183***	0.186***	0.186***	0.180***	0.187***	0.187***	0.187***	0.185***
	(0.0142)	(0.0140)	(0.0145)	(0.0138)	(0.0141)	(0.0137)	(0.0138)	(0.0140)
Employment visas	0.153***	0.147***	0.147***	0.157***	0.147***	0.146***	0.146***	0.146***
	(0.0166)	(0.0156)	(0.0158)	(0.0155)	(0.0161)	(0.0159)	(0.0161)	(0.0157)
GDP per capita	−0.0129**	−0.0122**	−0.0121**	−0.0113**	−0.0139**	−0.0135**	−0.0132**	−0.0114**
	(0.00590)	(0.00552)	(0.00569)	(0.00552)	(0.00615)	(0.00631)	(0.00650)	(0.00537)
Ave. education	0.0126	0.0127	0.0127	0.00947	0.0149	0.0127	0.0131	0.0120
	(0.0213)	(0.0213)	(0.0211)	(0.0211)	(0.0223)	(0.0214)	(0.0219)	(0.0209)
Total immigrants	−0.00398**	−0.00388**	−0.00386**	−0.00323**	−0.00389**	−0.00387**	−0.00389**	−0.00378***
	(0.00138)	(0.00138)	(0.00140)	(0.00131)	(0.00137)	(0.00139)	(0.00140)	(0.00135)
Population	−0.00069**	−0.00072**	−0.00072**	−0.00069**	−0.00074**	−0.00075**	−0.00074**	−0.00081***
	(0.000265)	(0.000275)	(0.000272)	(0.000268)	(0.000271)	(0.000280)	(0.000280)	(0.000302)
Non-corruption	−0.00578							
	(0.00403)							

Table 3 (*Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democratic accountability		1.41e−05						
		(0.00268)						
Bureaucratic quality			0.000578					
			(0.00610)					
Investment profile				0.00443***				
				(0.00137)				
Polity index					−0.00183			
					(0.00132)			
Exec. index of Elec. Comp.						−0.00271		
						(0.00283)		
Leg. Index of Elec. Comp.							−0.00203	
							(0.00294)	
Government checks								0.00151
								(0.00149)
Constant	−5.629	−5.772	−5.730	−3.527	−6.529*	−6.756*	−6.422*	−5.610
	(3.762)	(3.912)	(3.765)	(3.884)	(3.740)	(3.725)	(3.735)	(3.816)
Observations	659	659	659	659	659	659	659	659
Countries	73	73	73	73	73	73	73	73
ρ	0.944	0.940	0.940	0.938	0.946	0.945	0.944	0.941
$\rho(u_i, \text{Xb})$	−0.506	−0.465	−0.460	−0.417	−0.538	−0.528	−0.512	−0.472
σ_u	0.197	0.190	0.190	0.184	0.202	0.200	0.197	0.191

Standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$

Of the two measures of fragmentation within the government, the *political polarization index* is positively significant at the 5% level, while the *political fractionalization index* turns out to be insignificant at any level. The polarization index captures the presence of ideological differences within the incumbent government. Since differences in political ideology may potentially lead to instability, the positive sign on this variable is exactly what our hypothesis would lead us to expect. The insignificance of the fractionalization index is not particularly problematic. The fractionalization index uses information on the difference in party affiliations within the ruling government to capture the degree to which a country is governed by a coalition of small parties. Insofar as coalitions are expected to be less stable than single party governments, greater fractionalization in the legislature may be expected to contribute to greater instability and hence improve the selection of immigrants. However, mere differences in party affiliation are a far coarser measure of instability than more serious differences in ideology that underlie the polarization index. As such, the predicted sign of this variable is less clear.

The *investment profile index* is seen to have a positive impact on skill intensity at the 1% level. Recall that this index captures the government's ability to provide a favorable environment for private enterprise and so it reflects the quality of institutions that affect domestic investment and FDI. As such, our second hypothesis would lead us to expect a positive impact of this variable on the selection of migrants. This is consistent with existing evidence, which reports a dynamic complementarity between FDI and skilled migration. As argued by Kugler and Rapoport (2007), Docquier and Lodigiani (2010) and Beine et al. (2011), not only do skilled migrants act as a source of information for investment opportunities in their countries of origin, they also help develop trade networks between their home and host countries.

Turning briefly to the results for the total number of immigrants reported in Table 4, we see that only three of the fifteen variables turn up as having a significant impact on migration flows.

Table 4
Impacts of observed institutional variables on the number of immigrants to the US with country fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: number of immigrants							
Number of immigrants$_{t-1}$	0.143	0.147	0.146	0.140	0.145	0.147	0.147
	(0.163)	(0.173)	(0.173)	(0.175)	(0.175)	(0.173)	(0.174)
Year	57.74	−145.4	−150.9	−110.3	−133.8	−134.1	−133.0
	(53.50)	(88.75)	(92.87)	(79.46)	(92.22)	(91.79)	(91.01)
New immigrants	−491.9	−522.8	−556.9	−670.5	−601.7	−647.3	−632.4
	(518.7)	(643.5)	(574.8)	(558.5)	(564.2)	(558.5)	(562.8)
Employment visas	−591.5	214.2	113.8	330.5	301.9	228.4	217.6
	(479.3)	(546.1)	(530.4)	(569.3)	(598.0)	(522.9)	(528.4)
GDP per capita	−0.226*	−0.295	−0.292	−0.353	−0.349	−0.304	−0.317
	(0.129)	(0.219)	(0.210)	(0.223)	(0.245)	(0.208)	(0.209)
Average education	−1.001	779.1	791.8	791.9	801.9	771.1	772.9
	(133.8)	(918.1)	(911.9)	(911.1)	(940.2)	(907.2)	(917.4)
Population	0.0101	0.000960	0.00249	0.00389	0.00185	0.002.41	0.00248
	(0.0193)	(0.0188)	(0.0187)	(0.0194)	(0.0192)	(0.0192)	(0.0192)
Government stability	−236.2***						
	(64.17)						
Internal conflict		46.04					
		(70.21)					
External conflict			90.41				
			(59.21)				
Ethnic tensions				−191.5			
				(131.4)			
Durability					9.424		
					(15.26)		
Political Fract.						124.4	
						(344.1)	
Political polarization							69.11
							(102.5)
Constant	−109,744	289,064*	299,313*	220,701	266,437	266,929	264,981
	(105,393)	(172,505)	(180,544)	(154,487)	(179,327)	(178,525)	(177,021)
Observations	659	659	659	659	659	659	659
Countries	73	73	73	73	73	73	73
ρ	0.843	0.829	0.825	0.838	0.834	0.827	0.829
$\rho(u_i, \text{Xb})$	−0.186	−0.00829	0.0159	−0.157	−0.0958	−0.0148	−0.0398
σ_u	4245	4176	4123	4282	4246	4150	4171

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: skill intensity								
Skill intensity$_{t-1}$	0.148	0.145	0.146	0.128	0.146	0.148	0.150	0.144
	(0.172)	(0.174)	(0.171)	(0.173)	(0.173)	(0.173)	(0.173)	(0.174)
Year	−133.7	−120.1	−109.8	−77.16	−132.8	−142.6	−143.8	−126.1
	(90.28)	(87.59)	(84.82)	(94.88)	(87.00)	(91.48)	(93.82)	(90.98)
New immigrants	−767.7	−676.5	−869.2	−402.6	−629.6	−664.0	−668.3	−573.0
	(591.0)	(557.1)	(594.3)	(537.9)	(568.2)	(549.5)	(539.2)	(565.7)
Employment visas	470.2	249.4	328.3	−235.2	248.6	256.5	255.7	324.4
	(601.6)	(542.8)	(545.7)	(614.1)	(545.2)	(544.5)	(544.2)	(536.1)
GDP per capita	−349*	−331	−346*	−353*	−314	−288	−277	−360*
	(210)	(207)	(209)	(211)	(225)	(218)	(227)	(212)
Ave. education	771.3	772.1	764.6	929.4	775.9	779.7	761.8	816.9
	(902.6)	(909.1)	(906.1)	(906.3)	(945.4)	(920.2)	(916.7)	(913.4)
Population	0.00366	0.00326	0.00164	0.00191	0.00237	0.00283	0.00298	0.00678
	(0.0191)	(0.0195)	(0.0192)	(0.0197)	(0.0193)	(0.0193)	(0.0192)	(0.0184)
Non-corruption	−250.9							
	(152.8)							
Democratic accountability		−110.8						
		(93.94)						

Table 4 (*Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bureaucratic quality			−502.3*					
			(266.0)					
Investment profile				−198.7***				
				(62.55)				
Polity index					6.039			
					(43.73)			
Exec. index of Elec. Comp.						58.69		
						(54.05)		
Leg. index of Elec. Comp.							71.56	
							(76.00)	
Government checks								−79.82
								(82.61)
Constant	267,460	239,752	220,397	154,181	264,472	283,524	285,668	251,359
	(176,019)	(170,314)	(164,952)	(184,708)	(169,150)	(177,884)	(182,456)	(176,977)
Observations	659	659	659	659	659	659	659	659
Countries	73	73	73	73	73	73	73	73
ρ	0.836	0.832	0.846	0.843	0.828	0.823	0.821	0.832
$\rho(u_i, \text{Xb})$	−0.154	−0.0944	−0.214	−0.164	−0.0365	0.0274	0.0555	−0.145
σ_u	4259	4214	4375	4339	4169	4106	4080	4213

Standard errors in parentheses.
* $p < 0.1$.
*** $p < 0.01$

Government stability, investment profile, and bureaucratic quality in the country of origin all significantly reduce the flow of immigrants to the US during our sample period. This confirms the general hypothesis that both institutional quality and institutional stability can be expected to lessen the flow of migrants in general; even though they may have differing relative impacts on skilled versus unskilled workers, as shown previously in Table 3.

The statistical insignificance of the other indicators of institutional quality and stability in these regressions could simply be due to the fact that including the variables individually introduces an omitted variable bias in our estimates. In fact, once we account for this by including principal factors of the institutional variables, we see quite a different picture emerging.

4. Multi-dimensionality of institutional structure

In view of the conceptual and statistical problems associated with measuring the impact of institutional variables individually on the education of immigrants, it may help to get a more general sense of the overall impact of institutional structure. Following Alesina et al. (1996), Perotti (1996), Knack and Keefer (1995), Jong-A-Pin (2009) and others, we therefore try to identify combinations of variables that explain some aspect of institutions and can be interpreted more broadly than a single institutional variable.

One simple method for doing this is to perform a principle component analysis on the institutional variables and interpret the first component as *institutions*. This is the essence of what Alesina and Perotti (1996), Perotti (1996), and Keefer and Knack (1997) do in the context of investigating the influence of institutional quality on economic growth.[14] Alternatively, following Alesina et al. (1996), one could construct a unidimensional index of institutional quality by using logit analysis. However,

[14] The first two papers investigate the impact of income inequality on economic growth via its role in fomenting social discontent. As such, they focus on constructing indices of sociopolitical instability rather than general institutional structure. Keefer and Knack (1997), on the other hand, consider more general measures of institutions.

as argued by Jong-A-Pin (2009) in the context of measuring the impact of political instability, institutions have multiple dimensions, and it is our hypothesis that these dimensions may have different impacts on immigrant selection. Hence, a unidimensional index would fail to capture the true impact of institutional structure. This raises the question as to why we do not construct two separate indices for institutional quality and stability. The problem is that this would require a prior classification of available variables into ones that capture stability and ones that stand for quality. Having undertaken such a task in our preliminary exploration of the data, we are convinced that many of the available variables are not clear-cut measures of one dimension of institutional character as opposed to another.

An alternative to principle component analysis, used by Jong-A-Pin (2009), among others, is *factor analysis*. Factor analysis is related to principle component analysis, but while principle component analysis aims to extract the *maximum* source of variation in the variables possible, factor analysis only seeks to capture the *common* sources of variation among the variables. Also, whereas in principle component analysis the components are linear combinations of the observed variables, in factor analysis the observed variables are linear combinations of the constructed factors. These features allow us to interpret the predicted factors and attach conceptual meaning to them. Principle component analysis does not lend itself as well to such interpretation. As a result, factor analysis proves more useful in our investigation.

The factor loadings from our factor analysis of the fifteen institutional variables are reported in Table 5. These loadings come from a maximum likelihood exploratory factor analysis using an oblimin rotation method.[15] From these results, we are able to interpret four important common factors underlying the observed institutional variables: democracy, security, transparency, and credibility. To help see where these interpretations come from, we have highlighted cells in Table 5 representing variables whose loading weight for that factor is greater than 0.5.

For the *democracy* factor, the variables that carry factor loadings greater than 0.5 are: the executive index of electoral competitiveness (0.880); the legislative index of electoral competitiveness (0.870); political fractionalization (0.845); the polity index (0.837); democratic accountability (0.704); and political polarization (0.587). With the exception of polarization, each of these is a measure of the extent to which a country's political leaders are determined by free and fair elections as opposed to being determined by dictate. In the case of polarization, countries that have divided governments are less likely to be autocratic (or, countries that are autocratic are extremely likely to not be divided).

For *security*, the variables with factor loadings greater than 0.5 are: internal conflict (0.781); ethnic tensions (0.677); and external conflict (0.612). Of these, internal conflict and ethnic tensions are likely to be the most correlated with the internal stability of the institutions of a country, since they capture the effects of conflict and tensions occurring within a country's borders. In the case of external conflict, countries might be engaged in external conflict for a wide variety of reasons. For example, during our sample period the United States was involved with conflicts in Bosnia, Kuwait, and Somalia, although this did not seem to have a substantial impact on the quality or stability of the United States' institutions.

The variables with high weights in the *transparency* factor are: bureaucratic quality (0.6069); corruption (0.5696); and regime durability (0.5204). The first two are clearly related to the transparency and efficiency of the government and its bureaucracy, and these variables factor somewhat highly into the construction of the democracy and security factors as well. While playing less of a role, political durability may be regarded as a reflection of the institutional transparency of a country in the sense that the duration of the government is a function of its perceived legitimacy, which in turn is directly impacted by the absence of corruption and waste.

Finally, *credibility* is determined by: government stability (0.670) and investment profile (0.638). The investment profile index relates to government credibility in enforcing contracts and protecting

[15] There are two types of rotation methods: orthogonal and oblique. Orthogonal rotations minimize correlation among the constructed factors, whereas oblique rotations (of which oblimin is the most common) lend themselves better to interpretation. As shown in Table 7, correlation is not much of a problem. We also constrained the model to return four factors. Relaxing this assumption, it returned seven factors, the first four of which had a similar interpretation as described here, and the last three did not have more than one variable that stood out.

Table 5
Rotated factor loadings for institutional variables.

Variable	Democracy	Security	Transparency	Credibility	Uniqueness
Government stability	0.1536	0.316	0.0059	0.6696	0.4281
Investment profile	0.2723	0.3056	0.1806	0.6379	0.393
Internal conflict	0.2895	0.7809	0.188	0.1823	0.2378
External conflict	0.3867	0.6122	0.0466	0.048	0.4712
Corruption	0.4012	0.3936	0.5696	−0.0351	0.3585
Ethnic TENSIONS	0.2556	0.6765	0.0885	0.1239	0.4539
Bureaucratic quality	0.397	0.3553	0.6069	0.168	0.3196
Democratic accountability	0.7037	0.2735	0.4363	0.0437	0.2377
Polity	0.8371	0.1232	0.1539	−0.0699	0.2556
Political durability	0.1144	0.1595	0.5204	0.0956	0.6815
Legislative electoral competition	0.8703	0.0469	−0.1161	0.0742	0.2215
Executive electoral competition	0.8801	0.0451	−0.0506	0.0326	0.2197
Political fractionalization	0.8453	0.0201	−0.0283	0.0635	0.2803
Political polarization	0.5869	0.075	0.2421	0.0235	0.5907
Government checks	0.087	0.0785	−0.0533	−0.0142	0.9832

Highlighted cells represent variables with a factor loadings greater than 0.5 in absolute value. These variables are used to interpret what each factor represents. Principle factor method has been used to calculate the factor loadings, and the rotation method is oblimin.

property rights. The government stability index shows how credible the announced policies are expected to be and how secure those policies are against radical shifts within the government. Together, they combine to proxy for the overall credibility of the government.

Table 6 presents descriptive statistics for these principle factor variables, and Table 7 reports the correlation matrix between these variables and the other variables in the model. Table 7 shows that there is very little collinearity among the institutional principle factors. Table 8 gives an idea of how countries in our sample rank with respect to the four institutional principal components. Note that Israel, for example, ranks second with respect to the extent of democracy, but comes in at number 56 with respect to the security of property rights; and not surprisingly, given the experience of political

Table 6
Descriptive statistics for institutional principle factors.

Variable	Mean	Std. Dev.	Min	Max
Democracy	5.56E−10	0.962	−2.057	1.201
Security	−2.45E−10	0.859	−3.225	1.629
Transparency	−4.21E−10	0.830	−2.559	2.423
Credibility	5.45E−10	0.780	−2.251	2.031

Table 7
Correlation matrix for institutional principle factor variables.

	Democracy	Security	Transparency	Credibility
Total immigrants	0.129	0.007	−0.131	−0.086
High-skill immigrants	0.093	−0.028	0.011	−0.060
Semi-skill immigrants	0.070	0.053	−0.063	−0.061
Low-skill immigrants	0.063	−0.016	−0.128	−0.033
Skill intensity	0.034	0.226	0.409	0.159
New immigrants	0.177	−0.108	−0.150	0.061
Employment visas	0.204	0.279	0.150	0.086
Population	0.089	−0.106	0.068	0.016
GDP p.c.	0.407	0.434	0.681	0.118
Average education	0.539	0.502	0.535	0.092
Democracy		0.211	0.108	0.035
Security			0.217	0.137
Transparency				0.053

Highlighted cells represent values for which the correlation coefficient is greater than 0.3 in absolute value.

Table 8
Selected rankings of countries by institutional principle factor.

	Democracy	Security	Transparency	Property rights
Top five				
1	Belgium	Singapore	United States	Morocco
2	Israel	Hungary	Switzerland	Saudi Arabia
3	Denmark	Finland	Canada	Singapore
4	Netherlands	Denmark	New Zealand	Taiwan
5	Norway	Oman	Sweden	Qatar
First quartile				
29	Australia	Australia	Saudi Arabia	South Africa
30	United States	Syria	India	Senegal
Middle five				
56	Mexico	Namibia	Burkina Faso	Israel
57	Romania	Brazil	Nigeria	Malawi
58	Bulgaria	Congo	Botswana	Sri Lanka
59	Guyana	Malawi	Colombia	Finland
60	Namibia	Iran	Serbia & Montenegrc	Slovakia
Third quartile				
85	Indonesia	Cyprus	Indonesia	Argentina
86	Ghana	Indonesia	Malawi	Colombia
Bottom five				
110	UAE	Congo, DR	Bangladesh	Romania
111	Oman	Israel	Mali	Sierra Leone
112	Bahrain	Iraq	Panama	Nicaragua
113	Saudi Arabia	Sudan	Haiti	Liberia
114	Qatar	Sri Lanka	Paraguay	Haiti

turmoil in that part of the world, at number 111 out of 114 with respect to political stability. All this points to the validity of distinguishing between multiple dimensions of institutional character and provides at least preliminary justification for our hypothesis that these dimensions may differ in their impact on the educational attainment of immigrants. The results from our empirical model with the institutional principle factors are reported in the next section.

5. Results and robustness

Our final analysis again implements a two stage procedure, where we first instrument for per capita GDP by per capita energy consumption in the source countries, and subsequently estimate a fixed effects model with the principal factors obtained in Section 4 as our explanatory variables. The results of this exercise are reported in column (1) of Table 9. The principal factor reflecting the *security of civil society* is seen to have a significantly negative impact on the skill intensity of immigrants. To see why the coefficient on the security factor is negative, recall that this factor reflects the *absence* of external conflict, internal conflict, and ethnic tension in the country of origin. As hypothesized, an increase in sociopolitical stability would reduce the incentive for skilled migration, and this is precisely what we observe. On the average, a one standard deviation increase in the security factor is seen to reduce the fraction of highly skilled immigrants by a factor of approximately 0.02.

Also in line with our hypothesis, an increase in the *transparency of government operations* is seen to have a positive and significant impact on the skill intensity of immigrants. Recall that a high value of the transparency factor reflects a high level of bureaucratic quality, a low level of corruption, and a greater perception of legitimacy of the government by virtue of its ability to deliver public services. In other words, a high value of the transparency factor reflects a high quality of existing institutions. As per our hypothesis, this should predict a higher skill intensity of immigrants, since workers at the upper tail of the indigenous skill distribution would have a greater incentive to migrate relative to workers at the lower tail, which is precisely what we observe. A one standard deviation increase in transparency is seen to increase the fraction of highly skilled immigrants by a factor of about 0.011.

The second factor reflecting institutional quality is the *credibility of the government*, as determined by its ability to prevent delays in payments receivable, ensure a low level of expropriation risk, and,

Table 9
Impacts of constructed institutional factors on the skill intensity and numbers of immigrants from each skill group.

	(1) Skill intensity	(2) Total immigrants	(3) High-skill immigrants	(4) Semi-skill immigrants	(5) Low-skill immigrants
Skill intensity$_{t-1}$	0.344***				
	(0.0380)				
Number of immigrants$_{t-1}$		0.128			
		(0.168)			
High-skilled immigrants$_{t-1}$			−0.218		
			(0.204)		
Semi-skilled immigrants$_{t-1}$				−0.00275	
				(0.207)	
Low-skilled immigrants$_{t-1}$					−0.0424
					(0.170)
Year	0.00344	−68.60	28.86	−63.80	9.368
	(0.00203)	(102.5)	(70.07)	(129.6)	(133.4)
New immigrants	0.168***	−498.8	−176.5	2422***	−2343***
	(0.0133)	(589.5)	(359.2)	(756.1)	(794.9)
Employment visas	0.169***	−378.2	24.37	667.8	−494.4
	(0.0164)	(692.0)	(669.5)	(963.8)	(1068)
GDP per capita	−0.0158**	−0.260	0.237	0.168	−0.473
	(0.00663)	(0.228)	(0.207)	(0.296)	(0.316)
Ave. education	0.00930	860.0	−616.3	115.2	885.9
	(0.0213)	(884.0)	(695.9)	(1156)	(1156)
Total immigrants	−0.00236		0.0647	0.388	0.558**
	(0.00138)		(0.0756)	(0.220)	(0.229)
Population	−0.000632**	0.00565	−0.0704**	−0.00308	0.0716***
	(0.000263)	(1.92e−05)	(0.0282)	(0.0108)	(0.0262)
Democracy	−0.00304	−13.69	352.9	−25.99	−303.8
	(0.00773)	(163.1)	(227.0)	(278.8)	(302.0)
Security	−0.0216***	−14.97	294.7	268.6	−604.8**
	(0.00576)	(204.6)	(212.4)	(253.9)	(275.9)
Transparency	0.0135**	−509.1**	−144.0	−137.8	315.4
	(0.00585)	(252.8)	(231.8)	(322.9)	(318.8)
Property rights	0.0157***	−603.3***	−77.43	−20.05	146.9
	(0.00417)	(196.3)	(168.9)	(235.7)	(278.9)
Constant	−6.435	135,478	−51,783	123,620	−22,517
	(3.951)	(200,175)	(136,085)	(253,513)	(261,181)
Observations	659	659	659	659	659
Countries	73	73	73	73	73
ρ	0.954	0.826	0.970	0.380	0.918
$\rho(u_i, \mathrm{Xb})$	−0.573	0.00604	−0.991	−0.709	−0.958
σ_u	0.209	4077	8878	3071	9041

Standard errors in parentheses.
** $p<0.05$.
*** $p<0.01$

equally importantly, ensure the continuity of government policies, particularly towards private investment and FDI. A high value of the credibility factor, therefore, reflects a more favorable political climate for private enterprise and may thus be expected to correlate with a high average return to skill investment.[16] Hence, if a worker has an incentive to migrate, it is more likely that he or she is from the upper tail of the indigenous skill distribution. As such, we would expect the credibility factor to have a positive impact on the skill intensity of immigrants, and this is exactly what we observe in Table 9: a one standard deviation increase in the credibility factor increases the fraction of skilled immigrants by a factor of 0.012. While the credibility and transparency factors appear to have approximately equal impacts on skill intensity for a one standard deviation change, the impact of the security factor is

[16] This is in addition to the dynamic complementarity between FDI and skilled migration, mentioned in Section 3.

considerably greater in magnitude. This raises the question as to whether institutional stability is more important in determining the magnitude of brain drain than institutional quality.

Interestingly, the *democracy* factor turns out to be insignificant at any acceptable level. Democratic governments are typically less repressive and more responsive to popular concerns. As such, they may be regarded as creating lower incentives for the construction of grievance, which may act as a key motive for skilled migration (Docquier and Rapoport, 2003). At first sight, therefore, the level of democracy may be expected to have a negative impact on skilled workers' incentives to migrate. On the other hand, if the existence of democracy is taken to correlate with a higher quality of institutions, we may expect a positive impact on the selection of migrants for reasons explained earlier. Theoretically, therefore, it is not clear what the sign on this factor should be. In fact, the only consensus that seems to be emerging regarding the impact of democracy on economic performance is that it is not the character of a regime as a democracy but the quality of public institutions and policies associated with it that have an impact. For example, two democracies may differ significantly in economic performance if one closes itself to trade and FDI and the other does not. In addition, the extent of democratization may itself depend on other factors, such as the level of ethnic diversity in an economy (Akdede, 2010).

It might also be natural to ask whether the differences in the various dimensions of institutional character increase or decrease the total number of immigrants. For example, in the case of security, the estimated negative impact of greater stability on the selection of immigrants in our sample might arise because greater security increases the flow of low-skill emigrants and decreases the flow of high-skill emigrants from that country, or vice versa. Alternatively, stability might decrease the flow of both types of emigrants, but decrease the flow of high-skilled immigrants by a greater percentage. For the legal immigrants to the US in our sample, the answer is not clear. Greater security does significantly decrease the flow of low-skill immigrants, and appears to decrease the overall flow of immigrants, but not significantly affect the total flow of immigrants, nor does it significantly affect the flows of high- and semi-skilled immigrants.

However, as we might expect, transparency and credibility do in fact decrease the overall flow of legal immigrants from the countries in our sample, especially for those in the high- and semi-skilled groups. Transparency and credibility actually increased the total flow of low-skilled emigrants for our sample, but this result is not statistically significant. As with selection, democracy does not appear to play any significant role in the total number of immigrants.

We have also conducted a number of robustness checks on our results. First, we have checked the sensitivity of our results to whether we include all four dimensions of institutional quality or introduce them individually. Though we do not report these results here, the results of this robustness check are not just similar in terms of significance, but the magnitudes turn out to be nearly identical.[17]

We have earlier defended our decision to instrument for per capita GDP in the countries of origin. It may, however, be asked if this procedure affects our results to any degree. To address this issue, we include per capita GDP directly as a control variable in our fixed effects model. While these results are not included in the paper, the security factor remains negatively significant at the 1% level, the credibility factor retains its positive impact at the 1% level, and democracy remains insignificant at any level. The only difference is in the significance of the transparency factor, which now has a positive impact at the 5% level instead of at the 1% level.

Lastly, as an alternative to the fixed effect model employed in our analysis, we implement a feasible generalized least square model (FGLS) with skill intensity as dependent variable. While the results of this exercise are not included in the paper, it appears to confirm our general findings, both when we instrument for GDP and when we do not: security, credibility, and transparency retain their respective impacts at the 1% level, while democracy stays insignificant at any acceptable level of significance.[18]

6. Conclusion

This paper uses data on legal immigrants to the United States to investigate the role of institutions in determining the magnitude of brain drain. Specifically, it explores the hypothesis that institutions

[17] Additional tables with these results are available on request.
[18] Available on request.

have multiple dimensions which may have conflicting impacts on the migration of skilled labor. Using an exploratory factor analysis on fifteen institutional variables commonly used in the literature, we are able to identify the following aspects of institutional character: (1) credibility of the government; (2) transparency of government operations; (3) democracy; and (4) the security of civil society. Of these, the first three pertain to the quality of existing institutions, while the last pertains to stability. In line with our hypothesis, high institutional quality, as captured by the credibility and transparency of government, is seen to increase the magnitude of brain drain, while high stability was seen to reduce it. Interestingly, democracy is not seen to have a robust impact on the migration of skilled labor.

We conjecture that the quality and stability dimensions of institutional character have conflicting impacts on the magnitude of brain drain because they influence the incentive to migrate differently. Political stability reduces the expected domestic returns to human capital investment. Having made this investment, therefore, individuals have less incentive to migrate from a country with a stable political environment than one experiencing political turmoil. Hence, greater stability reduces the magnitude of brain drain. By contrast, higher institutional quality in a country provides high-skilled workers with a greater incentive to migrate than the low-skilled. Hence, higher institutional quality in the country of origin increases the magnitude of brain drain.

In addressing the multidimensionality of institutional structure, this paper provides a more nuanced analysis of the institutional determinants of brain drain. Further, our results have an interesting policy implication: institutional reform and investment in educational infrastructure are viewed as necessary preconditions for sustained economic growth. If a small developing economy fails to take these steps, it is unlikely that it will be able to grow. If, however, it pursues needed liberalization programs, improves the quality of governance, and increases access to education, it risks losing its investment to migration. If brain drain is detrimental to growth, this confronts a developing economy with a policy conundrum. However, recent research on brain drain suggests that it is not necessarily detrimental in the long run, since highly skilled diasporas provide greater incentives for skill investment in the country of origin, send remittances, create networks that stimulate trade and inflows of FDI, and may even act as agents for needed institutional reform. If this is indeed the case, then liberalization programs should be pursued without regard to their impact on emigration decisions.

Lastly, while this paper contributes towards a better understanding of the causes of brain drain, much remains unresolved on the topic, even with respect to the role of institutions. An immediate question in this regard is whether the different dimensions of institutional structure have similar impacts on the migration of male and female labor? The question is particularly important in light of recent findings by Docquier et al. (2009) that the emigration rate of skilled women tends to be higher on the average than that of skilled men. A second set of questions relates specifically to the stability dimension: there is reason to believe that political instability may itself be multidimensional (Jong-A-Pin, 2009). In this case, it may well be asked if different forms of instability differ in their impacts on skilled migration. Specifically, does ethnic conflict differ in its consequences on brain drain from other forms of conflict? There is an emerging literature in political science which finds that ethnic conflict tends to last longer, is more resistant to third party intervention, and exhibits a greater intensity of violence than other forms of conflict. As such, it may well differ in its impact on migration from other forms of conflict. Finally, as new and better datasets emerge documenting the *bilateral* flows of migrants to OECD *and* non-OECD countries, there will be opportunities for new research on the selection of destination countries by immigrants. These and other questions will be important areas for exploration in subsequent research on institutions and the migration of skilled labor.

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