

The Gravity of High-Skilled Migration Policies

Abstract

Combining unique annual bilateral high-skilled immigration labor flow data for 10 OECD destinations between 2000 and 2012, with new databases comprising both unilateral and bilateral policy instruments, we present the first judicious cross-country assessment of policies aimed to attract and select high-skilled workers. Points-based systems are much more effective in attracting and selecting high-skilled migrants than requiring a job offer, labor market tests and shortage-lists. Offers of permanent residency, while attracting the highly skilled, overall reduce the human capital content of labor flows since they prove more attractive to non-high-skilled workers. Bilateral recognition of diploma and social security agreements foster greater flows of high-skilled workers and improve the skill selectivity of immigrant flows. Conversely, double taxation agreements deter high-skilled migrants, although they do not alter overall skill selectivity. Our results are robust to a variety of empirical specifications that account for destination-specific amenities, multilateral resistance to migration and the endogeneity of immigration policies.

Keywords: High-skilled immigration, human capital, immigration policy

JEL classification: F22, J61

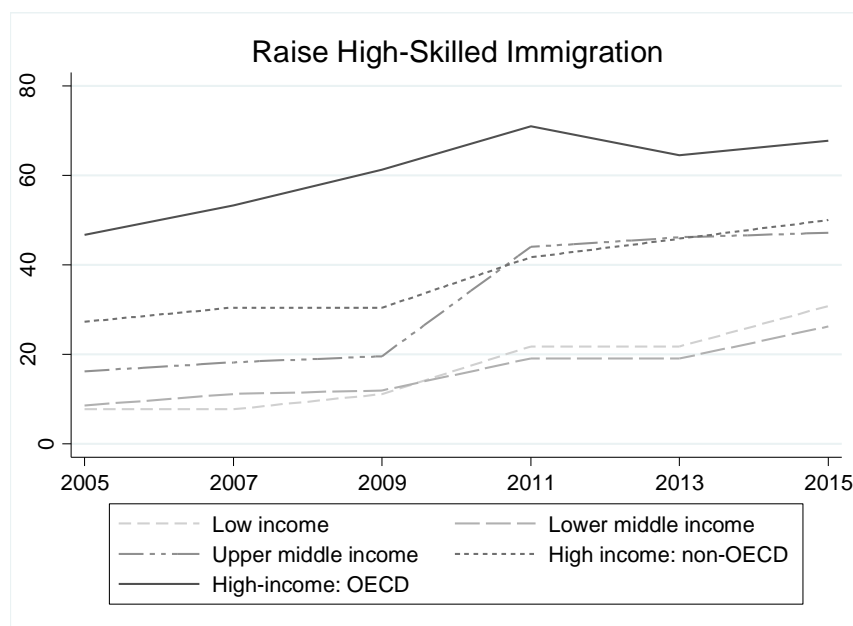
Introduction

If Europe really wants to have a knowledge based economy, if it wants to play a leading role in innovation and research, if it wants to be competitive in the global economy, it needs to do much more to attract the smartest and the brightest.

Cecilia Malmström, European Union Commissioner (2012)¹

Policy makers worldwide, cognizant of the pivotal role human capital plays in the economic development of receiving nations, increasingly vie to attract “the best and brightest” (Kapur and McHale 2005) in the “global competition to attract high-skilled migrants” (Boeri et al. 2012). At the center of this contest are the countries of the OECD, which have historically attracted the largest proportion of high-skilled migrants (Artuç et al. 2014), arguably in part due to the domestic supply of skills falling short of domestic demand (Papademetriou and Sumption 2013). Because high-skilled migrants are motivated to move internationally by myriad factors however, the efficacy of nation states’ high-skill immigration policies remains highly contested. The lack of existing evidence is largely due to the paucity of adequate data. This paper contributes to the literature by testing the efficacy of high-skilled migration policies in a cross-country setting for the first time.

Figure 1. Government Policy Objectives on High-Skilled Migration (% countries)



Source: Data from UN World Population Policies 2013³⁵ (<http://esa.un.org/PopPolicy>).

Note: OECD = Organisation for Economic Co-operation and Development.

As shown in figure 1, ever more countries are engaging in the intense global competition to attract internationally mobile human capital. By 2015⁵³, approximately 44⁴⁰ percent of the 172 United Nations member states declared an explicit interest in increasing high-skilled migration. Highly developed destinations are at the vanguard of this global trend, with two-thirds of OECD nations having implemented, or being in the process of implementing, policies specifically aiming to attract high-skilled migrants. The desirability of high-skilled immigrant workers, and thus the reason for the proliferation of policies aimed at attracting the highly skilled, has been well documented. Examples include spurring technological progress (Kerr and Lincoln 2010), raising productivity (Peri et al 2015)

¹ http://europa.eu/rapid/press-release_SPEECH-12-312_en.htm?locale=fr.

and fostering economic growth (Boubtane et al 2014). These changing policy objectives have been accompanied by a large rise in high skilled migration. Between the last two census rounds, in 2000/01 and 2010/11, OECD countries witnessed an unprecedented 70 percent rise in the number of tertiary-educated migrants to 35 million (Arslan et al. 2014).

Despite the concurrent rise in the number of high-skilled immigrants worldwide and the proliferation of high-skilled immigration policies, the degree to which high-skilled immigration policies have been effective remains contested (Bhagwati and Hanson 2009). Doornik et al (2009) argue that attracting high-skilled migrants will likely depend upon broader economic and social factors. Papademetriou, et al (2008) coined the term “immigration package” to describe the overall basket of factors that feature in high-skilled migrants’ calculus when deciding where to move.

This paper examines the degree to which skill-selective migration policies are effective in increasing the inflow and selection of high-skilled labor immigrants, having accounted for a raft of economic and noneconomic factors. The empirical (pseudo-gravity) model is derived from, and consistent with, an underlying micro-founded Random Utility Model (RUM) and is arguably the richest to date in terms of the model being well-specified. It also accounts for recent innovations in the empirical literature, namely a high proportion of zeroes in the dependent variable and Multilateral Resistance to Migration.

The paper contributes to the literature on the determinants of international migration by examining the efficacy of high skilled migration policies in a cross-country setting for the first time. Existing cross-country studies instead evaluate the effects of entire immigration regimes on *aggregate* bilateral migration flows (Mayda 2010; Ortega and Peri 2013; Czaika and de Haas 2016) or else focus upon particular migration categories such as asylum seekers (Vogler and Rotte 2000; Holzer et al 2000; Hatton 2005, 2009; Thielemann 2006) or irregular migrants (Czaika and Hobolth 2016).

Our analysis combines three new data collections: a unique data set of bilateral migration flows harmonized by skill level, a novel data base of unilateral high-skilled immigration policies and a third data set pertaining to other elements of the ‘immigration package’ that includes bilateral migration policies.

The key result of the paper is that supply side policies, for example Points Based Systems (PBS), are much more effective in attracting and selecting high-skilled migrants in comparison with demand-led policies including job offer systems, labor market test and shortage-lists. The provision of post-entry rights, as captured in the model by the offer of permanent residency, is effective in attracting high-skilled migrants, but overall is found to reduce the human capital content of labor flows.

Section 2 briefly sketches our theoretical approach. Section 3 discusses a number of pertinent empirical considerations. Section 4 details our data. Section 5 presents the baseline results, a series of robustness checks and the results on the skill selectivity of immigrant flows. Finally we conclude.

Theoretical Framework

Sjaastad’s (1962) canonical paper laid the foundation for the modern approach to theorise migration in economics, casting potential migrants as rational maximizers of human capital investments who weigh up the attractiveness of potential destinations by comparing their associated costs and benefits. The micro-founded pseudo-gravity model of international migration has since become the theoretical workhorse on which migrants’ location decisions are based. The theoretical foundations of this paper, derived from a random utility model, are therefore largely off-the-shelf and have been detailed elsewhere (see Grogger and Hanson 2011; Beine et al 2011; Boeri et al. 2012; Ortega and Peri 2013;

Beine et al 2013; Beine and Salomone 2013; Bertoli and Moraga 2013; Bertoli et al 2013; Beine et al 2014; Beine and Parsons 2015; Bertoli and Moraga 2015). In particular, the analysis denotes scale and selection equations (see, for example, Grogger and Hanson 2011; Beine et al 2011; Boeri et al. 2012; Ortega and Peri 2013).

Our *scale* equation is used to estimate *total* high-skilled migration flows:

$$\ln n_{odt}^{HIGH} = \beta_1(\ln W_{dt}^{HIGH}) + \beta_2(\ln A_{dt}) - \beta_3(\ln E_{dt}) - \beta_4(P_{dt}) - \beta_5(X_{od}) - \beta_6(\ln M_{odt}) - \beta_7(P_{odt}) + \delta_{ot} + \varepsilon_{odt}^{HIGH} . \quad (1)$$

Our *selection* equation, the *share* of high skilled in total migration is rather:

$$\ln(n_{odt}^{HIGH} / \sum_z n_{odt}^z) = \beta_1(\ln W_{dt}^{HIGH} - \ln W_{dt}^{AVERAGE}) + \beta_2(\ln A_{dt}) - \beta_3(\ln E_{dt}) - \beta_4(P_{dt}) - \beta_5(X_{od}) - \beta_6(\ln M_{odt}) - \beta_7(P_{odt}) + \delta_{ot} + \varepsilon_{odt} . \quad (2)$$

Where z refers to skilled persons ($z = \text{high (H), low(L)}$). o, d, t subscripts refer to origins, destinations and time respectively. W signifies wages and A refers to countries' amenities. Migration costs are broadly conceived as comprising time-varying economic factors at destination E_{dt} , which include the prevailing unemployment rate and the total population; time-varying destination-specific migration policies P_{dt} ; time-invariant bilateral factors X_{od} that include geographical factors, physical distance between origins and destinations, and whether country pairs share a common border; as well as cultural factors, common languages, or a colonial heritage; time-varying migrant networks M_{odt} . Time-varying bilateral and multilateral policies are represented by P_{odt} . ∂ is the error term, while origin-time fixed effects, δ_{ot} , are included to control for wages at origin in addition to the proportion of natives that remain at home, both of which are unobservable in the data.

Empirical Considerations

Empirical research has operationalized migration policies in two ways. The first approach constructs policy indices that measure the restrictiveness of immigration systems (Mayda 2010; Boeri et al. 2012; Ortega and Peri 2013). Typically a value of zero is assigned to the index for a particular country in period zero. This value is increased or decreased by one should a policy in a particular year be deemed to be more or less restrictive. This approach can be used to assess how within variation in the intensity of migration policies affect migration to a specific country, what may be termed the intensive margin.²

The second approach, which we adopt in this paper, is to use a binary variable that equals unity should a particular policy be in force in a specific year, or zero if the policy is absent. This approach is advantageous in that variations both within and across countries can potentially be exploited, while policies can also be examined in combination. We therefore measure the average effect of a policy being in place or not, what may be termed the extensive margin.

Given that policies can be implemented to varying degrees (along the intensive margin), we adopt a particular methodology such that we code countries as having a particular policy in place or not based upon the same criteria, in each case coded for the high skilled migration channel that is most relevant

² We thank an anonymous referee for this suggestion.

in terms of the volume of high skilled migration it admits (see below). Given our research design, our approach necessarily glosses over some details in countries policies, the inevitable trade-off between sacrificing some specificity and external validity.³

While in theory we can exploit both the between and within variation in our data, in practice we rely most heavily on the between variation given that we observe few policy changes in our data over the period, thereby precluding a more detailed examination of the intensive margin. In terms of statistical identification, we assume that high skilled migration policies are essentially random having controlled for a panoply of other potential determinants as suggested by the existing literature; in addition to batteries of fixed effects along a number of dimensions. We believe the existence of any remaining omitted variables to be unlikely. This approach is somewhat inevitable given the cross-country nature of the study, since no instruments will likely be available unlike in single country cases, nor is it feasible to exploit quasi-experimental designs (see for example Kato & Sparber 2011 and Shih 2015). To this end, we pay particular attention to obtaining data of the highest quality on which to base our analysis, which is a particular strength of the current work.

Given our empirical approach, the estimation of equation (1) evokes a number of empirical considerations. In their seminal paper, Santos Silva and Tenreyro (2006) show, in the presence of zeroes in the dependent variable, when the variance of the error term is a function of the independent variables that the expected value of the error term will also depend on the value of the regressors. In addition, in the presence of many zeroes, as in this data set—8,168 zeroes out of the maximum 23,920 observations—the Gauss Markov homoscedasticity assumption will be violated, resulting in biased and inconsistent ordinary least squares estimates. We follow Santos Silva and Tenreyro (2006) who propose the use of the pseudo-Poisson maximum likelihood (PPML) estimator that instead results in consistent and unbiased estimates in the presence of heteroscedasticity.

Bertoli and Moraga (2015) argue that the derivation of equation (1) is dependent upon the assumptions that (1) the utility derived from each destination varies neither across origins *nor* individuals and (2) the stochastic component of utility is i.i.d. and conforms to an EVT-1 distribution. Two key implications result. The first is that the scale of migration from country o to country d crucially depends upon the utility associated with all other possible destinations. Bertoli and Moraga (2013) coined the term “Multilateral Resistance to Migration” (MRM). A failure to account for MRM constitutes an omitted variable bias. A number of alternatives have been proposed to deal with this potential omission (Anderson and van Wincoop (2003), Feenstra (2004), Head et al (2010), Bertoli and Moraga (2013). The present paper adopts an alternative approach as suggested by Baier and Bergstrand (2009) to approximate the MRM terms, as first applied to the migration literature by Gröschl (2012).⁴

The second implication is that for the model to be consistent with the underlying RUM, one which does not violate the Independence of Irrelevant Alternatives (IIA) assumption, a set of origin-time dummies must be used to control for the population at origin, which in turn implies that the expected value of the

³ An important ongoing innovation in this regard is the IMPALA project (Beine et al 2015), which uses lawyers, experts on the texts of migration legislation to code dummy variables for destination countries.

⁴ Following Gröschl (2012), the MRM terms are calculated as:

$$MRDIST_{odt} = \left[\left(\sum_{k=1}^C \theta_{kt} \ln Dist_{ok} \right) + \left(\sum_{m=1}^C \theta_{mt} \ln Dist_{md} \right) - \left(\sum_{k=1}^C \sum_{m=1}^C \theta_{kt} \theta_{mt} \ln Dist_{km} \right) \right]$$

$$MRADJ_{odt} = \left[\left(\sum_{k=1}^C \theta_{kt} Adj_{ok} \right) + \left(\sum_{m=1}^C \theta_{mt} Adj_{md} \right) - \left(\sum_{k=1}^C \sum_{m=1}^C \theta_{kt} \theta_{mt} Adj_{km} \right) \right].$$

θ refers to a country's share of population as a fraction of the world population: N_{kt}/N and N_{mt}/N . Dist stands for our measure of bilateral distances while Adj is a binary variable equal to one if two countries in a pair border one another.

gross migration flow conditional on the independent variables (as well as the dummies) is independent across all individuals in the data set. It is important to note that the imposition of these fixed effects also controls for credit constraints, the omission of which will likely lead to alternative results (Belot and Hatton 2012).

Data

To be able to compare high skilled migration policies across countries, new data on bilateral migration flows disaggregated by skill and measures of migration policies specifically targeting high-skilled migrants are required. Given the contested nature of the efficacy of these policies, a full battery of other potential determinants must also be considered.

High-Skilled Migration Flows

Migration flow data disaggregated by skill level are some of the most seldom recorded and most difficult to collate of any migration statistics on a comparable cross-country basis. The data collection underpinning the current analysis took over two years to complete and proved particularly expensive. For the sake of brevity, interested readers are referred to Czaika and Parsons (2016) for a more complete overview of the data collection.

Given the heterogeneity in destination countries' recording mechanisms, the migration flow data disaggregated by skill are derived from a variety of sources including: administrative data files (Australia, Canada, Israel, New Zealand, the United States), work or residence permits (Switzerland, the United Kingdom), population and employment registers (Norway, Sweden), and employment visas (the Republic of Korea). Given our focus on comparing migration policies across countries, significant efforts were required to collate data at the greatest level of detail possible and subsequently to harmonise the data to the greatest extent possible, so as to facilitate meaningful comparisons across countries and over time. Immigration flow data by occupation pertaining to incoming economic migrants, entering destination country labor markets are recorded. We therefore drop any unemployed individuals. High skilled migrants' dependents will not be captured in our data unless they too are recorded as entering destination countries labor markets. This focus upon migrants entering destination countries for employment purposes is important; these are the individuals that the policies - the efficacy of which is being tested in this paper - are attempting to attract.

The raw data obtained were harmonized to the greatest degree possible. First, the flow data pertain to labor migrants arriving from abroad as opposed to those individuals that change their status in the destination country. Second, with the exception of Israel,⁵ all the data refer to immigrants' nationality as opposed to their country of birth or country of last previous residence, which is important because migration costs are determined, at least in part, by nationality (Beine et al 2014). Third, the data refer to long-term or permanent migrants, those staying for 12 months or more.⁶ Finally, because countries use differing nomenclatures when recording individuals' occupations (Parsons et al. 2014), these data were collected at the lowest possible level of disaggregation to ensure that they could be suitably harmonized to a broad notion of human capital.

⁵ The majority of immigrants that arrived in Israel during the period (74 percent) comprised individuals from the countries of the former Soviet Union, which is recorded as a single entity in the data set. This no doubt reduces any discrepancies between the two series.

⁶ The single exception to this is our inclusion of H1-B visa data for the United States.

Importantly we adopt two measures of skill. The first, that we refer to as high-skilled includes all those in the first three major groups of the International Standard Classification of Occupations (ISCO) 2008: (1) managers, senior officials, and legislators; (2) professionals; and (3) technicians and associate professionals. The second, which refers to those of all other skill levels, which for the sake of simplicity we refer to as low skilled, instead comprises those in all other ISCO 2008 categories. Students, entrepreneurs, investors and business visitors are all dropped from the dataset, the former since our focus is on destination country labour markets, the remainder since the period of stay and precise occupations of those individuals remain unclear. It is important to note, given the great variation in detail in the data obtained, it was not possible to meaningfully aggregate the raw data up into alternative skill classifications (see Czaika and Parsons 2016). Our data capture, on average, more than 700,000 skilled migrants per year from 185 origins that reside in 10 OECD destinations, according to our harmonized definition, with the greatest number in 2007, when more than 830,000 were recorded in total.⁷

High-Skilled Migration Policies

Labor immigration systems may be broadly termed as ‘demand’ or ‘supply’ driven (Chaloff and Lemaitre 2009). Demand-driven systems require labor migrants to have obtained a job offer before gaining entry to the domestic labor market and employers typically take a leading role in the recruitment process. Most European systems as well as the U.S. labor immigration system are, at least in part, employer driven. The job offer requirement is in effect a general test about a foreign worker’s employability in the domestic labor market. Such requirements are effective in selecting migrant workers that are immediately employable, but skilled migrants that do not fill an immediate shortage in the domestic labor market might be deterred.

In supply-driven systems, highly qualified migrants can apply for work permits without job offers, although a job offer may still grant preferential access. Qualifications, age, work experience, language skills, and previous wages are usually assessed on an individual basis through PBS, whereby applicants are selected independently of prevailing labor market conditions. Canada and Australia pioneered these skill-selective immigration systems, which aim to attract high-skilled migrants in large numbers. Despite any potential downside regarding the immediate employability of workers admitted through a PBS, supply-driven systems are often seen as relatively effective in attracting high-skilled migrants (Facchini and Lodigiani 2014). In fact, Boeri et al. (2012) argue that it is *only* such supply-driven systems that can meaningfully attract and capitalize upon human capital over the longer term.

Whether a country has implemented an employer-driven (demand) system, an immigrant-driven (supply) system, or a mixture, depends upon policy makers’ priorities when addressing long-term deficiencies in human capital compared with short-term labor market shortages. In practice, despite countries leaning toward a demand- or supply-side orientation, immigration policies tend to comprise a mixture of elements, both demand and supply (Parsons et al 2014), termed “hybrid systems” (Papademetriou et al. 2008). For example, Australia and Canada have recently begun to combine their PBS with shortage lists that constitute demand elements.

To capture immigration policy *systems*, this paper chooses ~~six~~^{nine} separate policy elements that collectively capture many of the key differences between destination countries’ policy stances.

⁷ It is important to emphasize that although this number is somewhat artificially inflated because of the inclusion of H1-B visa data for the United States, which are based on I-94 admissions data (Czaika and Parsons 2016), the results remain robust to their inclusion and exclusion.

These instruments reflect three broader policy categories comprising of skill-selective admission policies (shortage lists, job offer requirements, labour market tests, points-based systems), post-entry policy instruments (permanency rights, financial incentive schemes), and bilateral labour agreements specifying double taxation, diploma recognition and social security including pension portability.⁸ It is unlikely that a single policy instrument makes a particular destination country more or less attractive for high-skilled migrants, but rather a combination of immigration policies. ~~The six policy elements are job offer, PBS, labor market test, shortage list, offers of permanent residency and financial incentives.~~

Labor immigration systems can generally be distinguished by the criteria as to whether or not labor migrants are required to have a job offer before entering the country and accessing the domestic labor market. Most European, but also the US labor immigration system are, at least partially, employer-driven meaning that an employer must sponsor a foreign worker in order to qualify for a temporary or permanent work permit. The job offer requirement is a general test about a foreign worker's employability in the domestic labour market, however, despite being effective in selecting migrant workers that are immediately employable, the job offer requirement may rather distract skilled migrants who do not fill an immediate shortage in the domestic labour market. Besides a job offer requirement, most European immigration systems require work permit requests to be approved after a labor market test, which is a ~~Labor market tests are~~ case-by-case assessments of whether an "equivalent" domestic worker is currently available to fill an advertised position. Labor market tests avoid the recruitment of unemployable migrants and those that might reduce the employability of native workers. To lower the bureaucratic burden of labor market tests, particularly if it is obvious that entire occupations cannot be filled locally, countries have developed shortage lists of occupations that are exempt from labor market tests. This instrument assesses labour market shortages on an occupation-by-occupation basis in contrast to the individual approach of a labour market test. Depending on the number and types of shortage occupations, shortage lists can facilitate the entire recruitment process but only for those occupations for which shortages have been identified.⁹ Immigration systems in which highly qualified migrants can apply for a work permit *without* an actual job offer in hand, applicants are selected through a points-based system assessing prior qualifications, age, sometimes work experience, language skills or prior wages on an individual basis.

High-skilled migrants are also hypothesized to be strongly attracted by prospects of permanent residency. Even though most admitted migrants usually start on (renewable) temporary work permits, ~~T~~today most OECD destinations offer a "road to permanency" after a migrant lives and works in the country for a number of years. ~~Migrants who are not granted these permanency rights at arrival but have to start on a temporary visa, are also very often constrained in changing the employer who has sponsored the work permit.~~ Financial incentives, including tax exemptions and other economic incentives also predominantly target high-skilled migrants.¹⁰

⁸ See Czaika and Parsons (2016) for a more detailed description on the evolution and diffusion of these policy instruments across Western immigration destinations since 2000.

⁹ The accuracy of the underlying shortage analysis in identifying and assessing labour market needs has often been criticised (for instance, Sumption 2013). Therefore, the effect of a shortage list on the overall number of high-skilled immigrants is rather ambiguous, even more so when shortage lists also include occupations that require lower skill levels.

¹⁰ Given the heterogeneity of high skilled migration policies across countries, methodologically we adopt a set of statements against which a zero or one can be assigned to ensure consistency when coding our policy variables. Our data is always coded for the most attractive and most relevant HSM policies (in terms of volumes). Thus, while glossing over some detail, we primarily aim to capture the existence of some major policy instruments of

Our analysis also includes bilateral treaties that relate to social security, double taxation (and tax evasion), and the recognition of diplomas, all of which aim to facilitate the admission and transition of high-skilled employees. Social security agreements regulate the equality in treatment between signatories regarding payments abroad, including old age pension, pension portability, disability support, parenting payment for widowed persons and unemployment benefits. Double-taxation agreements prevent the double taxation of income, capital, and inheritances that are increasingly important for attracting highly mobile skilled workers who may hold multiple residences, including in their home country. These agreements also seek to reduce fiscal evasion. Bilateral agreements that recognize the credentials of migrants' overseas aim to foster migrants' integration into host country labor markets —by ensuring that qualifications of migrants are of equivalence to domestic degree programmes. Most countries have implemented procedures for an institutionalised assessment and recognition of diplomas and credentials.

To isolate the effect of ~~unilateral~~ immigration policies, it is necessary to control for treaties that facilitate the freedom of movement of people. This paper constructs a single variable that is both bilateral and time varying, thereby capturing whether the two members of a country pair in a particular year are signatories to a freedom-of-movement agreement. The agreements captured include the Schengen agreement, the freedom of movement afforded to member states of the European Union and the European Free Trade Association, the de facto right of abode between Australia and New Zealand, and the Common Travel Area comprising Ireland, the United Kingdom, the Isle of Man, Jersey, and Guernsey. Each unilateral (bilateral) policy variable is coded one should a particular policy instrument be in place for a particular country (pair) in a given year.

Amenities and “Gravity” Variables

Total unemployment and high skilled wage data are taken from the OECD.^{11,12} High-skilled wages are calculated as average annual wages multiplied by the ratio of the 9th decile to the 5th decile. Total population data are taken from the International Database of the U.S. Census Bureau.¹³ Our dyadic control for immigrant networks is taken from the OECD DIOC,¹⁴ which provides statistics for the numbers of immigrants residing in each of the OECD countries in 2000, 2005, and 2010. Flows from 2000–04 are equated with the 2000 migration network, as captured by the bilateral stock of migrants in 2000, flows from 2005–09 with the 2005 stock, and flows from 2010–12 with the 2010 stock. Contiguity, common language, distance and the sharing of a colonial heritage are all taken from the CEPII database (see Head et al 2010).

skill-selective immigration systems. For example, for a labor market test, the guiding statement is simply “Is there a mechanism in place to attempt to ensure the position cannot be filled by domestic workers?” The remaining statements can be found in appendix table A.2. Nevertheless, since destination countries typically implement numerous policies that often relate to more than one class of migrant (Czaika and de Haas 2013), a series of coding assumptions was adhered to, in order to ensure that the data are comparable both across countries and over time. These assumptions can also be found in appendix table A.2.

¹¹ <https://data.oecd.org/unemp/unemployment-rate.htm> (OECD Data Unemployment)

¹² <https://data.oecd.org/earnwage/average-wages.htm> (OECD Data Earnings and Wages)

¹³ <http://www.census.gov/population/international/data/idb/informationGateway.php>. (US Census Bureau, International Database)

¹⁴ <http://www.oecd.org/els/mig/dioc.htm> (OECD Database on Immigrants in OECD and non-OECD Countries: DIOC)

A number of amenity variables are included that aim to capture the relative attractiveness of the 10 OECD destinations. Our *Net-of-tax* measure captures differences in tax rates across countries. This measure is calculated by subjecting a fixed annual salary of \$150,000 (in purchasing power parity terms) to the differing tax schedules as provided by the OECD.¹⁵ *Ceteris Paribus*, it is believed that lower taxes increase the relative attractiveness of particular destinations for high-income earners.¹⁶ The appeal of global cities, in which high-skilled migrants no doubt agglomerate, is proxied by the prevailing UN salary country multipliers in each year.¹⁷ These multipliers are calculated based on the cost of living in major cities in each of the OECD destinations and reflect, among other things, the variety of goods high-skilled migrants are able to consume and the urban amenities available to them. A quality-of-education variable is included by way of the Programme for International Student Assessment (PISA) scores, as provided by the OECD.¹⁸ It is hypothesized that high-skilled workers value the provision of education for their children. Finally, the level of technological development that high-skilled migrants are hypothesized to favour, is proxied by the density of mobile phone use (Information and Communications Technology [ICT] coverage), measured as the number of mobile or cellular phone subscriptions per 100 inhabitants. These data are taken from the United Nations.¹⁹ Descriptive statistics on all variables are reported in the appendix (table A.4.)

Baseline Results

Table 1 reports the baseline results from estimating equation (1). Model (1) reports estimates of the economic and standard gravity in addition to the freedom-of-movement dummy variables. Models (2) and (3) additionally consider bilateral and unilateral policies, respectively; while model (4) estimates all our core variables. All regressions reported in table 1 include a full set of origin-time fixed effects to ensure the theoretical consistency of the empirical estimates.

Across the first four models, our estimates are remarkably stable. Even though all 10 destination countries are highly developed, an increase in high-skilled wages of 10 percent is associated with an increase in high-skilled immigration flows of between 6 and 11 percent. High-skilled migrants include in their calculus prevailing unemployment rates and are deterred from moving to areas with fewer job opportunities. Migration networks foster high-skilled migration flows. A 10 percent increase in the size of the bilateral migrant community is associated with an increase in high-skilled flows of more than 1 percent along the same migrant corridor. Other migration-cost-reducing factors captured by cultural, linguistic, geographical, and political proximity are all statistically significant and in the expected direction. Shared common border, language, colonial heritage, and freedom of movement between origin and destination all have a positive influence on high-skilled flows. Increasing geographical distance, however, a proxy for migration costs, naturally reduces high-skilled worker flows.

Models (2) and (4) include three major types of bilateral agreements that have been suggested as shaping the dynamic of high-skilled migration. Bilateral agreements aimed at recognizing foreign qualifications are associated with an increase in the number of high-skilled migrants by 30 to 60 percent. Evidence on bilateral agreements that regulate social security concerns are less robust, although we find mild evidence of a positive association in our full model. The net effect of the two countervailing forces

¹⁵ <http://www.oecd.org/tax/tax-policy/tax-database.htm> (OECD Tax Database)

¹⁶ The results do not change when alternative annual salaries of \$150,000, \$200,000, and \$250,000 are considered.

¹⁷ These were calculated from data available from <http://icsc.un.org/secretariat/cold.asp?include=par> (United Nations International Civil Service Commission, Post Adjustment Reports).

¹⁸ <http://www.oecd.org/pisa/>. (OECD, PISA)

¹⁹ <http://data.un.org/Default.aspx>. (UN Data).

underpinning the expected sign of the double-taxation-agreements variable interestingly is negative. This suggests that high-skilled individuals care more about avoiding tax than they care about only being taxed once as provided for in such agreements.

Table 1. Drivers of High-Skilled Migration Flows (scale equation)

		(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML
<i>Destination controls</i>	High-skilled wages (log)	1.069*** (0.119)	1.066*** (0.120)	0.751*** (0.123)	0.749*** (0.124)	0.657*** (0.128)
	Unemployment (log)	-0.719*** (0.113)	-0.695*** (0.117)	-0.533*** (0.148)	-0.482*** (0.145)	-0.445*** (0.150)
	Population (destination, log)	1.544*** (0.127)	1.519*** (0.132)	1.083*** (0.174)	0.976*** (0.172)	0.912*** (0.181)
	Network size (log)	0.130*** (0.0107)	0.119*** (0.0104)	0.141*** (0.0112)	0.128*** (0.0105)	0.125*** (0.0115)
<i>Dyadic controls</i>	Contiguity	0.577*** (0.122)	0.648*** (0.124)	0.317*** (0.0979)	0.420*** (0.0972)	0.456*** (0.0977)
	Common language	0.950*** (0.0914)	0.953*** (0.0962)	0.878*** (0.0729)	0.846*** (0.0762)	0.850*** (0.0796)
	Distance (log)	-0.0812 (0.0545)	-0.117** (0.0545)	-0.0958** (0.0464)	-0.111** (0.0443)	-0.138*** (0.0463)
	Colonial heritage	0.324*** (0.0572)	0.305*** (0.0623)	0.300*** (0.0612)	0.216*** (0.0637)	0.183** (0.0797)
	Freedom of movement	1.139*** (0.135)	1.017*** (0.136)	0.719*** (0.120)	0.552*** (0.115)	0.494*** (0.116)
	Diploma recognition		0.305*** (0.0896)		0.631*** (0.100)	0.599*** (0.0978)
	Social security		-0.0369 (0.0628)		0.121** (0.0603)	0.117* (0.0596)
	Double taxation		-0.299*** (0.0487)		-0.375*** (0.0480)	-0.343*** (0.0473)
<i>Bilateral agreements</i>	Permanency			1.062*** (0.156)	1.075*** (0.152)	1.193*** (0.159)
	Financial incentive			0.0801 (0.0967)	0.0358 (0.0932)	-0.192* (0.115)
	Job offer			-1.854*** (0.175)	-1.896*** (0.166)	-1.893*** (0.172)
	Labor market test			0.169 (0.164)	0.143 (0.159)	0.113 (0.158)
	Shortage list			-0.641*** (0.0778)	-0.699*** (0.0813)	-0.649*** (0.0977)
	Points-based system (PBS)			1.492*** (0.124)	1.382*** (0.117)	
	PBS (United Kingdom)					1.299*** (0.122)
	PBS (Canada)					0.959*** (0.192)
	PBS (Australia)					1.530*** (0.183)
	PBS (New Zealand)					1.507*** (0.195)
	Origin × Time fixed effects	yes	yes	yes	yes	yes
	Number of observations	20,240	20,240	20,240	20,240	20,240
	R²	0.961	0.962	0.969	0.971	0.971

Note: Dependent variable is the total number of high skilled individuals born in origin country o , living in destination country d at time t as given in equation (4). Standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. PPML = pseudo-Poisson maximum likelihood.

Turning to our main policy variables of interest, two of the three demand-driven instruments, the need to obtain a job offer and shortage lists, significantly deter the absolute inflow of high-skilled migrants. Countries requiring a job offer recruit almost half as many high-skilled migrants. Labor market tests, however, have no influence on high-skilled migration flows in the baseline models. Shortage lists, which are even more rigid in preselecting high-skilled migrants, seem to represent an additional barrier for recruiting high-skilled migrants in large numbers.

Our main result is that PBS appear to represent the most effective policy for attracting high-skilled migrants. Major PBS countries (Australia, Canada, New Zealand, the United Kingdom) attract, on average, one-and-a-half times the number of high-skilled migrants when compared with countries that adopt alternative policy tools. As opposed to the other policy measures, PBS across the destination countries might well operate differently. To address this concern, model (5) includes separate PBS-country dummy variables; the results from which suggest that PBS in Australia and New Zealand are the most effective.

The provision of permanency rights is also an important incentive for high-skilled migrants. Countries providing a road to permanency attract, on average, double the number of high-skilled migrants in comparison to those that do not. Permanency rights, even if permanent settlement is not the prime intention of the migrant at entry, increase the option value of staying longer in the host country and expand future opportunities. Financial incentives such as tax breaks are another attempt to attract international talent. The results from our baseline model suggest that such schemes have no effect however.

Robustness Checks

Table 2 reports a series of robustness tests of the core model specification. Model (1) in table 2 includes two MRM terms that, although both significant, do not alter the other estimates significantly, except for financial incentive schemes, which become statistically significant at the 10 percent level. The estimates for these terms (negative for the distance measure and positive for the adjacency measure) are omitted for the sake of brevity. Model (2) includes dyad fixed effects to address concerns that an omitted variable, for example, cultural distance, might be driving the results. They adequately control for such an omission since, as shown by the pioneering work of Geert Hofstede (Hofstede 1980; Hofstede et al 2010), cultural distances change extremely slowly over time. Although the addition of dyad fixed effects improves the goodness of fit, several of the other estimates become smaller in size; the social security variable is no longer significant and the labor market test variable becomes negative and significant. Nevertheless, the key findings remain intact.

Another particular concern (as shown in appendix table A.3) is that the policy variables fail to capture many policy *changes* over the period 2002–12, meaning that the estimation needs to rely quite heavily on the between variation across countries. We cannot impose a set of destination fixed effects therefore, which might lead to fears of an omitted (destination country) variable bias. To address such concerns, model (3) in table 2 is equivalent to the core model that includes both origin-time and destination-time fixed effects. The difference between the R^2 in model (3) in table 2 and the R^2 from the core model (4) in table 1 is only 0.1 percent however, which provides confidence that an omitted variable is not responsible for driving the results.

Model (4) in table 2 extends the core model with the inclusion of five additional variables that proxy for the role of economic and social amenities that have traditionally been viewed as determining the relative attractiveness of potential destinations (Tiebout 1956; Gosnell and Abrams 2011). All of the variables are included simultaneously, without causing any significant changes in the other variables of interest. The coefficients on the amenity variables are largely as expected. The ICT coverage variable used to capture the degree to which a location is culturally and technologically avant-garde, since it has been argued that a rising creative class (Florida 2002) is attracted to such places. A 10 percent increase in ICT coverage is associated with a nearly 9 percent increase in the inflow of high-skilled workers.

The net-of-tax variable proxies the attractiveness of national tax schemes and is shown, rather unsurprisingly, to significantly attract large numbers of foreign high-skilled workers. Whereas the

importance of global cities for attracting international talent is well established (for example, Sassen 2011), rising living costs, including property prices and rents, are major disincentives to moving to those cities. The coefficient on the global city living-cost variable is insignificant and negative, however, which suggests that the cornucopia of urban amenities and available product varieties compensates for relatively high living costs.

The estimates of the coefficient on the educational sector, as measured by global PISA scores, is significantly negative. In other words, the results would suggest that high-skilled workers locate to those destinations that fare relatively poorly in education. This result can be attributed to the fact that Korea, which performs best overall on the PISA, plays host to the fewest high-skilled migrants in the sample, whereas the United States, which performs worst overall on the PISA, plays host to the greatest number of migrants. It is also likely that high-skilled migrant workers are able to place their children in private schools, so concerns about average PISA scores across the country might not be taken into consideration when they are deciding where to move.

Finally, a measure of life expectancy is included in the estimation as a proxy for the overall quality of living conditions (including health services provision), in addition to other factors that affect longevity. The coefficient on this measure is insignificant, which might suggest that high-skilled migrants care more about the provision of good health care, for example, privately, as opposed to average health outcomes across the country. The imposition of the amenity measures does not alter any of the results that concern economic or policy variables. Moreover, the R^2 of model (4) in table 2 is identical to that of the core model (4) in table 1, suggesting that in the empirical framework, amenities, that is, noneconomic factors, seem to play little role in determining the destination choices of high-skilled migrants.

Table 2. Drivers of High-Skilled Migration Flows: Robustness Tests

		(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML	(6) GMM-sys
<i>Destination controls</i>	High-skilled wages (log)	0.830*** (0.129)	0.0986*** (0.0324)		0.639*** (0.117)	3.900*** (0.288)	0.208** (0.032)
	Unemployment (log)	−0.406*** (0.155)	−0.164** (0.0639)		−0.366** (0.159)	−0.887*** (0.206)	−0.654** (0.071)
	Population (destination, log)	0.914*** (0.182)	2.561*** (0.166)		0.941*** (0.190)	1.019*** (0.217)	1.110** (0.075)
<i>Dyadic controls</i>	Network size (log)	0.142*** (0.0122)	0.0162*** (0.00455)	0.136*** (0.00992)	0.127*** (0.0102)	0.101*** (0.00849)	0.092** (0.008)
	Contiguity	0.488*** (0.103)		0.157* (0.0916)	0.427*** (0.0964)	0.169 (0.111)	−0.735* (0.334)
	Common language	0.822*** (0.0786)		0.606*** (0.0712)	0.826*** (0.0773)	0.714*** (0.0816)	0.387** (0.078)
	Distance (log)	−0.142*** (0.0448)		−0.186*** (0.0428)	−0.118*** (0.0455)	−0.200*** (0.0539)	−0.175** (0.064)
	Colonial heritage	0.186** (0.0734)		0.251*** (0.0935)	0.165** (0.0787)	0.302*** (0.0841)	0.074 (0.195)
	Freedom of movement	0.402*** (0.119)	0.413*** (0.125)	0.497*** (0.117)	0.475*** (0.119)	0.380*** (0.139)	−0.142 (0.190)
<i>Bilateral agreements</i>	Diploma recognition	0.619*** (0.100)	0.453*** (0.0506)	0.727*** (0.102)	0.667*** (0.0993)	0.695*** (0.101)	3.479** (0.571)
	Social security	0.131** (0.0565)	−0.0356 (0.0695)	0.194*** (0.0579)	0.109* (0.0570)	0.158** (0.0714)	−2.760** (0.602)
	Double taxation	−0.375*** (0.0468)	−0.209*** (0.0379)	−0.332*** (0.0459)	−0.364*** (0.0466)	−0.269*** (0.0549)	−0.071 (0.289)
<i>Unilateral policies</i>	Permanency	1.024*** (0.147)	0.297*** (0.0914)		1.344*** (0.156)	1.395*** (0.243)	0.485** (0.046)
	Financial incentive	0.196* (0.111)	0.248*** (0.0478)		0.229** (0.0960)	−0.00905 (0.142)	−0.114* (0.051)
	Job offer	−1.797*** (0.173)	−2.096** (0.828)		−2.110*** (0.255)	−1.420*** (0.192)	−0.069 (0.115)
	Labor market test	0.169 (0.156)	−0.210*** (0.0565)		−0.0862 (0.184)	0.172 (0.115)	0.617** (0.058)
	Shortage list	−0.657*** (0.0803)	−0.0633* (0.0330)		−0.361*** (0.0789)	−0.333*** (0.0862)	−0.265** (0.054)
	Points-based system	1.499*** (0.119)	2.063** (0.833)		1.977*** (0.220)	1.192*** (0.174)	0.789** (0.131)
<i>Amenities</i>	ICT coverage				0.886*** (0.187)		
	Net-of-tax				2.350*** (0.492)		
	Global city living costs				−0.0590 (0.0451)		
	Schooling quality				−7.467*** (2.381)		
	Life expectancy				−5.710 (3.756)		
	MRM terms	yes	no	no	no	no	no
	Origin × Time FE	yes	yes	yes	yes	yes	no
	Destination × Time FE	no	no	yes	no	no	no
	Origin + Time FE	no	no	no	no	no	yes
	Dyad FE	no	yes	no	no	no	no
	Number of observations	20,130	20,240	20,240	20,240	11,040	18,400
	R²	0.972	0.997	0.972	0.971	0.971	0.779

Note: Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. System dynamic generalized method of moments model (6) includes AR(1): 0.170*** (standard error = 0.027). Arellano-Bond test for AR(2) in first differences fails to reject null of no autocorrelation in errors (p = 0.092). AR = Arellano-Bond; FE = fixed effects; GMM = generalized method of moments; MRM = multilateral resistance to migration; PPML = pseudo-Poisson maximum likelihood.

Model (5) in table 2 is estimated to address concerns that the results might be driven, at least in part, by the fact that the overarching data set is not perfectly balanced. Model (5) is therefore estimated on a reduced, although balanced, panel of dyad-year observations for the period 2003 to 2008. Again, the main results remain unchanged. Finally, model (6) in table 2 is estimated with an Arrelano-Bond dynamic panel estimator (Roodman 2006) to insulate our results from potentially endogeneity in the policy variables otherwise not accounted for, especially reverse causality. In addition to internal lags and first difference instruments, unionization in the destination country's labor force is included as another external instrument.²⁰ Unfortunately, given the large number of variables included in the system-GMM estimation, it is not possible to include a full set of origin-time fixed effects, but separate origin and time fixed effects are included, a modification that might drive some of the differences in the results. Nevertheless, the major policy results based on the estimates on permanency, PBS, and shortage lists remain intact, although the coefficients on these variables become significantly smaller.²¹

The Skill Composition of International Migration Flows

Even if particular skill-selecting and -attracting policies are associated with larger inflows of high-skilled migrants, the overall effect on the *composition* of total labor migration flows—operationalised as the share of high-skilled in the total labor inflow—remains uncertain.

This overall effect might in part result from our definition of high-skilled migration (ISCO classification categories 1 to 3). At least some skill-selective policies do not solely target these occupations and may similarly apply and encourage workers of lower skill levels. Shortage lists, for example, often include occupations that are not highly skilled according to this definition. Labor market tests and job offer requirements are policy instruments that may be argued to be *a priori* skill neutral, although their application largely depends upon underlying labor market demand and labor shortages. Given that such shortages are generally more prevalent in high-skilled occupations however, we may still expect that even these demand-driven policies somehow have stronger effects on high-skilled labor inflows.

Whether these skill-selective policies are effective in altering the composition of labor inflows in favor of the highly skilled remains an empirical question. Table 3 reports estimates of the proportion of high-skilled migrants in total labor migration flows (see equation (2)). Since this share is bounded between 0 and 1, the effects of the explanatory variables tend to be nonlinear, while the variances tend to decrease when the mean approaches the limits. We therefore estimate a zero-one inflated beta-fit model with slightly modified zero-one boundaries (Smithson and Verkuilen 2006). Model (1) in table 4 reports the baseline, model (2) includes the set of bilateral policy variables, model (3) adds the unilateral policy variables. Model (4) simultaneously runs Seemingly Unrelated Regressions (SUR) on high-skilled migration (4a) and on non-high-skilled migration (4b) to control for the cross-correlation in the error terms between the two groups of workers to ensure that the greatest number of observations are maintained in the data.²²

²⁰ Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners (see https://stats.oecd.org/Index.aspx?DataSetCode=UN_DEN). (Trade Union Density - OECD.Stat)

²¹ As a test of reverse causality we ran additional logit panel regressions of respective policy changes on HS migration flows. Based on these tests (which are available from the authors on request) we can conclude that we find only very limited evidence for a reverse causality of HS migration inflows on the likelihood of a policy change in the expected direction. These results in combination with the respective GMM result make us confident that these policy estimates are largely consistent and do not suffer from an endogeneity bias.

²² When calculating the shares of the high skilled in the total (models 1–3), regressions cannot be run if the total number of high skilled is equal to zero because these observations are dropped from the estimation.

A rising skill premium, as captured by the difference between the measure of high-skilled wages and the prevailing median salary in a particular year, significantly alters the composition of labor flows in favor of high-skilled immigrants. While the wage gap between the 90th percentile and the mean wage was about 45 percent in 2000, it increased to more than 63 percent in 2012 across these 10 OECD destination countries. Thus, a rising skill premium shifts the skill composition of labor inflows toward higher skilled, as predicted by the Roy model (Borjas 1987).

Models (1) - (3) in table 3 provide evidence that high-skilled foreign workers are more sensitive to business cycle fluctuations, such that higher unemployment at destination reduces the skill selectivity of incoming migrants. It is interesting, however, that the SUR estimates show that although high-skilled migrants are significantly deterred by high unemployment, there exists a negative correlation between their lesser skilled counterparts and destination unemployment levels. Migrant networks play a more important role in facilitating migration for lower-skilled workers, a result consistent with Beine et al (2011). This is unsurprising given that migrant networks are purported to reduce migration costs that are relatively higher for lower-skilled workers. The existence of migrant networks may therefore alter the selection of migrants over time (see McKenzie and Rapoport 2010).

The beta-fit regressions show that flows between contiguous country pairs tend to encourage fewer high-skilled workers, since low-skilled workers are more sensitive to migration costs and may take advantage of migrating to neighboring countries. Country pairs with freedom of movement also encourage larger shares of non-high-skilled workers, thereby leading to a more negative selection on skills. The results from the beta-fit regressions also suggest that longer distances between two countries increase the skill selectivity of the migration flow, which again would suggest, as the SUR estimates show, that non-high-skilled workers are more sensitive to increases in migration costs. Somewhat surprisingly, the regressions show that migration between countries that share a colonial heritage tend to be more skill selective and the SUR regressions show that this effect might be driven by a large deterrent effect for non-high-skilled workers. Similarly, the estimated coefficient on language in the beta-fit regressions indicates that common language reduces the selection on skills and the SUR regressions suggest this is because a common language spurs the movement of non-high-skilled more than their high-skilled counterparts.²³

²³ However, the SUR regressions show there is no significant difference of the effect of common language on skill selectivity.

Table 3. High-Skilled vs. Non-High-Skilled Migration Flow Composition (selection equation)

		(1) Beta	(2) Beta	(3) Beta	(4a) SUR	(4b) SUR
<i>Destination controls</i>	High-skilled wage premium (log)	1.019***	1.003***	0.946***		
		(0.049)	(0.049)	(0.057)		
	High-skilled wages (log)				0.617***	
					(0.029)	
	Non-high-skilled wages (log)					0.223***
						(0.038)
	Unemployment (log)	-0.746***	-0.754***	-0.684***	-0.728***	0.194***
		(0.037)	(0.037)	(0.044)	(0.040)	(0.049)
<i>Dyadic controls</i>	Population (destination, log)	0.870***	0.879***	0.922***	1.198***	-0.083*
		(0.040)	(0.040)	(0.047)	(0.041)	(0.050)
	Network size (log)	-0.046***	-0.050***	-0.045***	0.153***	0.229***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	Contiguity	-0.261***	-0.268***	-0.265***	-0.176**	0.079
		(0.093)	(0.094)	(0.092)	(0.087)	(0.107)
	Common language	-0.183***	-0.164***	-0.045*	0.492***	0.530***
		(0.024)	(0.025)	(0.025)	(0.026)	(0.032)
	Distance (log)	0.004	0.010	0.074***	-0.143***	-0.187***
		(0.017)	(0.017)	(0.018)	(0.015)	(0.018)
<i>Bilateral Agreements</i>	Colonial heritage	1.371***	1.350***	1.321***	-0.097**	-1.545***
		(0.050)	(0.051)	(0.052)	(0.041)	(0.050)
	Freedom of movement	-0.027	-0.102*	-0.235***	0.470***	1.180***
		(0.055)	(0.056)	(0.055)	(0.045)	(0.055)
	Diploma recognition		0.190***	0.204***	1.050***	0.820***
<i>Unilateral Policies</i>			(0.028)	(0.028)	(0.037)	(0.046)
	Social security		0.036	0.082**	-0.097***	-0.111**
			(0.033)	(0.032)	(0.037)	(0.045)
	Double taxation		-0.012	-0.009	0.144***	0.287***
			(0.022)	(0.022)	(0.025)	(0.031)
	Permanency			-0.345***	0.860***	1.015***
				(0.040)	(0.029)	(0.037)
	Financial incentive			0.575***	-0.114***	-0.550***
				(0.031)	(0.023)	(0.029)
	Job offer			0.155**	-0.582***	-0.351***
				(0.069)	(0.046)	(0.056)
	Labor market test			0.239***	0.328***	0.027
				(0.037)	(0.028)	(0.035)
	Shortage list			-0.389***	-0.488***	0.078**
				(0.032)	(0.026)	(0.032)
	Points-based system			0.238***	0.805***	0.198***
				(0.061)	(0.043)	(0.053)
	Origin × Time FE	yes	yes	yes	yes	yes
Number of observations		14,352	14,352	14,352	20,240	20,240
R^{2a}		0.115	0.125	0.121	0.82	0.73

Note: Standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.01. FE = fixed effects; SUR = seemingly unrelated regressions.

a. R^2 for beta regressions are calculated as the squared correlation coefficient between the actual and fitted values.

With regards migration policies, PBS again prove most effective in improving the incoming distribution of skills at destination. PBS assess skill profiles and filter labor migrants according to perceived long-term skill requirements and therefore are effective instruments, not only for recruiting relatively large numbers of high-skilled migrants, but also for shifting the skill composition in favor of the high skilled.

The beta-fit regression in model (3) suggests (albeit weakly) that requiring a job offer at entry, increases the skill selectivity of incoming workers. The corresponding SUR results, based on the full sample suggest the opposite, that job offer systems deter both sets of workers, the high-skilled worst of all, the overall effect of which would be to reduce the incoming selectivity on skills. Labor market tests are shown to increase the share of high-skilled relative to lower-skilled migrants. The SUR regressions suggest this result is due to a positive effect exerted on the high-skilled flow. This finding may indicate that countries that implement labor market tests might be more successful at filling lower-skilled positions domestically, meaning that the overall skill composition of the incoming flow increases. The imposition of shortage lists, however, significantly reduces the overall selection on skills because they deter high-skilled more than low-skilled migrants. This instrument is therefore not effective in attracting highly qualified migrants since the lists often comprise occupations that are not classified as highly skilled.

The beta-fit regressions show that permanency rights reduce the overall skill selectivity of immigrant flows. The SUR results indicate that although permanency rights provide positive incentives for both high- and otherwise-skilled workers, the effect on the latter is larger, such that the overall effect is negative. Both skill groups somewhat counterintuitively seem to be deterred by financial incentive schemes. Although tax breaks and allowances are expected to be relevant in the decision of high-income earners to migrate, robust empirical support for this presumption is not found. Finally, turning to the measures of bilateral agreements, recognition of diplomas, and social security agreements, both seem to be effective in increasing the skill composition of migrant flows, while no overall effect of international double taxation agreements is seen.

Conclusion

High-skilled migration policies are *en vogue*, in large part because of increasing demand from various businesses that lobby governments for political support in filling labor market shortages with foreign workers. The phenomenon of business-driven labor migration policies is not new, as demonstrated by the guest worker programs of the 1950s and 1960s. The main difference, though, is that employers increasingly demand skill sets that often require tertiary education or other highly qualified expertise, skills that cannot be fully met by domestic labor. Governments have decided to respond to these demands by implementing various types of skill-specific and skill-selective immigration regimes that facilitate the international recruitment of desired workers.

Recent policy developments demonstrate, however, an increasing hybridization of skill-selective immigration systems. Demand-driven policies coexist with supply-driven elements in an attempt to balance the conflicting aims of numbers versus employability. The main result of the paper is that supply-led systems, that is, points-based systems, increase both the absolute numbers of high-skilled migrants and the skill composition of international labor flows. Conversely, demand-driven systems, which are usually based upon the principle of job contingency and that are often supplemented by case-by-case (labor market test) or occupation-by-occupation (shortage lists) assessments of labor market needs, are shown to have little, and potentially even a negative, effect. This general conclusion needs to be clarified however, since the aims of these policy tools differ. Points-based systems, like those pioneered by Canada and Australia, were initially introduced with the idea that “there can never be enough of a good thing” and implemented as population policies with the aim of achieving the large-scale immigration of skilled workers. Other countries’ immigration policies, for example, those largely used across Europe, have been founded on the notion of integrating migrants both economically and socially, that prioritize labor market *outcomes* over the *numbers* of migrants actually recruited.

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Appendix

Appendix Table A.1. List of Countries and Economies

<p>Origin (185)</p> <p>Afghanistan; Albania; Algeria; Andorra; Angola; Anguilla; Antigua and Barbuda; Argentina; Australia; Austria; The Bahamas; Bahrain; Bangladesh; Barbados; Belgium; Belize; Benin; Bermuda; Bhutan; Bolivia; Botswana; Brazil; British Virgin Islands; Brunei Darussalam; Bulgaria; Burkina Faso; Burundi; Cambodia; Cameroon; Canada; Cape Verde; Cayman Islands; Central African Republic; Chad; Chile; China; Colombia; Comoros; Republic of Congo; Cook Islands; Costa Rica; Côte d'Ivoire; Cuba; Cyprus; Czechoslovakia; Democratic Republic of Congo; Denmark; Djibouti; Dominica; Dominican Republic; Ecuador; the Arab Republic of Egypt; El Salvador; Equatorial Guinea; Eritrea; Ethiopia; Falkland Islands; Federated States of Micronesia; Fiji; Finland; France; Gabon; The Gambia; Germany; Ghana; Gibraltar; Greece; Grenada; Guatemala; Guinea; Guinea Bissau; Guyana; Haiti; Honduras; Hong Kong SAR, China; Hungary; Iceland; India; Indonesia; the Islamic Republic of Iran; Iraq; Israel; Italy; Jamaica; Japan; Jordan; Kenya; Kiribati; the Republic of Korea; Kuwait; the Lao People's Democratic Republic; Lebanon; Lesotho; Liberia; Libya; Luxembourg; Macau SAR, China; Madagascar; Malawi; Malaysia; Maldives; Mali; Malta; Marshall Islands; Mauritania; Mauritius; Mexico; Mongolia; Montserrat; Morocco; Mozambique; Myanmar; Namibia; Nauru; Nepal; the Netherlands; Netherlands Antilles; New Zealand; Nicaragua; Niger; Nigeria; Niue; the Democratic Republic of Korea; Norway; Oman; Pakistan; Palau; Panama; Papua New Guinea; Paraguay; Peru; the Philippines; Poland; Portugal; Puerto Rico; Qatar; Ireland; Romania; Rwanda; Saint Helena; Saint Kitts and Nevis; Saint Lucia; Saint Vincent and the Grenadines; San Marino; São Tomé and Príncipe; Saudi Arabia; Senegal; Seychelles; Sierra Leone; Singapore; Solomon Islands; Somalia; South Africa; Spain; Sri Lanka; Sudan; Suriname; Swaziland; Sweden; Switzerland; the Syrian Arab Republic; Taiwan, China; Tanzania; Thailand; Timor Leste; Togo; Tonga; Trinidad and Tobago; Tunisia; Turkey; Turks and Caicos Islands; Tuvalu; Uganda; the United Arab Emirates; the United Kingdom; the United States; Uruguay; USSR; Vanuatu; República Bolivariana de Venezuela; Vietnam; the Republic of Yemen; Yugoslavia; Zambia; Zimbabwe</p>
<p>Destination (10)</p> <p>Australia, Canada, Israel, the Republic of Korea, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, the United States</p>

Appendix Table A.2.

<i>High-Skilled Migration Policy Database, Definitions of Variables</i>
<ul style="list-style-type: none"> • Labor Market Test: Is there a mechanism in place to attempt to ensure the position cannot be filled by domestic workers? • Shortage List: Is there a list of in-demand or otherwise valued occupations that is somehow incorporated into the selection process for high-skilled migrants? • Points-Based System: Is there a selection system that grants applicants points for particular attributes and allows entry to all those over a particular threshold? • Job offer contingency: Is it possible to enter the country as a high-skilled migrant without first having a job offer? • Permanency rights (Immediate or with delay?): Are high-skilled migrants privileged in getting permanent residence or citizenship? If so, is this because there are permanent-stay entry categories that are immediately accessible, or is it because they are privileged in broader applications for permanent residence once they have met the general requirements? • Financial Incentives: Are there special financial arrangements (such as tax exemptions, or allowances) pertaining to high-skilled migrants?
<i>High-Skilled Migration Policy Database, Assumptions Made When Coding</i>
<p><i>Data will always be coded for the highest level of specificity:</i> The scope of this project was to research policies most relevant to high-skilled migrants rather than the impact of policies in general. Thus, for each indicator, the data and the resulting score are based on the policy most relevant to high-skilled migrants. If broader provisions (that is, those applying to a wider pool of migrants) may favor high-skilled migrants, but specific provisions favor them to a greater extent, the specific provision will be recorded and coded rather than the broader one. If broader provisions have effects that are relevant to high-skilled migrants but apply equally to others, they will not be coded as positive. For example, if the permanency rights of high-skilled migrants are simply through broad permanent resident routes, a policy for high-skilled migrants will not be considered to exist.</p> <p><i>Data will always be for the most attractive and relevant (in terms of volume) HSM policies:</i> As above, if more than one route of entry for high-skilled migrants entails significant numbers, the “most relevant” route will be the one coded for. If this route is eliminated but others remain, the coding will pertain to the next most appealing, and so on. Similarly, if more-appealing routes are newly introduced, coding will prioritize them over the previously existing routes. This means that the coding at any one time may not relate to a single route of entry; instead, the coding may reflect the most appealing route of entry. The above assumption is not made if it has been decided to focus upon a specific route of entry to fit with the data.</p> <p><i>Continuity is assumed on the basis of highly similar conditions and legal continuity:</i> If the conditions for high-skilled entry at two times are highly similar (and, when possible, if they can be shown to be the artefact of the same law), it will be assumed that the conditions in the intervening period between the times are also the same. Most notably, this risks missing new laws that were introduced and then revoked in the intervening period, as well as some bureaucratic reforms that may more subtly alter the entry regime.</p> <p><i>More detailed sources are privileged:</i> If different sources report conflicting information, and the conflict cannot be resolved by seeking an additional, authoritative source, the source that provides greater detail will be used.</p>

Appendix Table A.3. High-Skilled Migration Policies across 10 Western Destinations, 2000-12

	Labor market test	Shortage list	Points-based system	Job offer contingent	Immediate permanency rights	Financial incentives		Labor market test	Shortage list	Points-based system	Contingent on job offer	Immediate permanency rights	Financial incentives
Australia							Korea						
2012							2012						
2011							2011						
2010							2010						
2009							2009						
2008							2008						
2007							2007						
2006							2006						
2005							2005						
2004							2004						
2003							2003						
2002							2002						
2001							2001						
2000							2000						
Canada							Norway						
2012							2012						
2011							2011						
2010							2010						
2009							2009						
2008							2008						
2007							2007						
2006							2006						
2005							2005						
2004							2004						
2003							2003						
2002							2002						
2001							2001						
2000							2000						
Switzerland							New Zealand						
2012							2012						
2011							2011						
2010							2010						
2009							2009						
2008							2008						
2007							2007						
2006							2006						
2005							2005						
2004							2004						
2003							2003						
2002							2002						
2001							2001						
2000							2000						

United Kingdom							Sweden						
2012							2012						
2011							2011						
2010							2010						
2009							2009						
2008							2008						
2007							2007						
2006							2006						
2005							2005						
2004							2004						
2003							2003						
2002							2002						
2001							2001						
2000							2000						
Israel							United States						
2012							2012						
2011							2011						
2010							2010						
2009							2009						
2008							2008						
2007							2007						
2006							2006						
2005							2005						
2004							2004						
2003							2003						
2002							2002						
2001							2001						
2000							2000						

Note: Light grey = policy does not exist; dark grey = policy implemented.

Appendix Table A.4. Descriptive statistics

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>Bilateral Migration Flows</i>					
High-skilled Migrants	21,712	427.499	3988.527	0	176722
Non High-skilled Migrants	21,712	347.573	1898.019	0	43012
<i>Destination controls</i>					
High-skilled wages	22,080	82790.530	65924.9	46029	770581
Unemployment	23,920	1482.401	2898.607	58	14827
Population (destination)	23,920	5.16e+07	8.94e+07	3164550	3.14e+08
<i>Dyadic controls</i>					
Network size	23,920	30617.620	260435.8	0	1.19e+07
Distance	23,920	8869.417	4482.842	115	19648
Contiguity	23,920	0.010	0.098	0	1
Common language	23,920	0.261	0.439	0	1
Colonial heritage	23,920	0.053	0.223	0	1
Freedom of movement	23,920	0.063	0.243	0	1
<i>Bilateral agreements</i>					
Diploma recognition	23,920	0.168	0.374	0	1
Social security	23,920	0.083	0.276	0	1
Double taxation	23,920	0.249	0.432	0	1
<i>Unilateral policies</i>					
Permanency	23,920	0.846	0.361	0	1
Financial incentive	23,920	0.554	0.497	0	1
Job offer	23,920	0.469	0.499	0	1
Labor market test	23,920	0.462	0.499	0	1
Shortage list	23,920	0.462	0.499	0	1
Points-based system	23,920	0.385	0.487	0	1
<i>Amenities</i>					
ICT coverage	23,920	4.482	0.315	3.383	4.915
Net-of-tax	23,920	11.607	0.119	11.352	11.844
Global city living costs	23,920	3.606	0.962	0	4.698
Schooling quality	23,920	6.229	0.050	6.098	6.297
Life expectancy	22,080	4.393	0.019	4.342	4.456