

The long walk to knowledge: on the determinants of higher education mobility to Europe[☆]

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Abstract

This paper investigates the determinants of demand for higher education mobility from students in low and middle-income countries to European countries over the period 2004-2013. We identify the dyadic factors associated with the relationships between home and host countries as well as monodic variables associated with “push” and “pull” factors. Used together with various linguistic relations, we emphasize the relevance of informal and formal networks in explaining resistance to student migration. The former is highlighted here by social networks made up of friends or previous students while the latter is formal partnerships that have been established among higher education institutions in home and host countries. Overall, our results show that, apart from the usual economic considerations, non-monetary factors specific to origin and destination, such as socio-demographic characteristics, individual beliefs and institutional profiles, have a significant impact on student mobility. It appears that qualitative and direct information on the de facto outcome of rules, public institutions or service delivery strongly influence HE mobility.

JEL codes: F22, F62, I23, O15, O57

Keywords: Higher education mobility, South-North mobility, multilateral resistance, network effects, language skills, institutional quality

1. Introduction

The international mobility of people has been booming globally since the early 1990s. All countries experience emigration and immigration by people looking for better opportunities to work or to study. The main reason why so many people would like to leave their home country is that they may earn much more if they move (the so-called “place premium”), with economic consequences for labor markets and economic growth both at home and in destination countries. However, there are other reasons for moving to another country besides income gains. Among them, Higher Education (HE) in a globalizing world has attracted increasing interest in the economic literature. As summarized in [OECD \(2009\)](#):

“Higher education drives and is driven by globalization. Higher education trains the highly skilled workers and contributes to the research base and capacity for innovation that determine competitiveness in the knowledge-based global economy. It facilitates international collaboration and cross-cultural exchange. Cross-border flows of ideas,

[☆]The authors wish to thank Arnaud Elie (CREAM, University of Rouen), Sylvain Lamourette (Head of International Relations Office and EU Project Manager, University of Rouen) and Jorge Santos (Department of International Cooperation, University of Porto, Portugal) for their helpful comments, precious assistance in data compilation of immigration policies, student mobility and Erasmus Mundus scholarship programmes. Any errors or omissions are the authors’ responsibility. The views expressed in this paper are solely those of the authors and should not in any way be attributed to the University of Rouen.

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students, faculty and financing, coupled with developments in information and communication technology, are changing the environment where higher education institutions function. Cooperation and competition are intensifying simultaneously under the growing influence of market forces and the emergence of new players.”(p.13)

In the light of this, globalization has led to a changed understanding of HE. In particular, developing countries need to understand and better exploit the benefits as well as mitigate the challenges that come with globalization. On the one hand, the internationalization of HE has challenged policy makers and university managers in various areas: the importance of English or foreign languages, the need for Internet and other forms of Information and Communication Technology (ICT), the emphasis on research and publications and the related concern with the ranking of universities, etc. On the other hand, cross-border or “borderless” HE has also changed student and staff behavior. The movement of persons and programs across nations has opened up new opportunities in terms of careers and salaries, skills and learning or teaching capacity. The development of mobility programs within the Erasmus scholarship scheme financed by the European Commission aptly illustrates such opportunities.

Students studying abroad are an example of legal temporary migrants, a category that has been expanding in recent decades. OECD figures show a gradual but definite increase in the percentage of HE graduates in the younger age brackets. With the increase in the number of admissions at tertiary level, the global HE landscape is changing, with competition among educational institutions in developed countries becoming ever more intense in order to attract both native-born and international students ([van der Wendet, 2015](#)).

By focusing on the demand for HE, the present paper aims to study the determinants of student mobility from developing countries to Europe. However, it adopts a new perspective on the topic; in particular, it seeks to ascertain whether non-monetary factors such as linguistic connections, networking or institutional factors and beliefs may explain the flows. From the point of view of the sending countries, individuals demand for foreign study and sort across potential destinations. A random selection in the sending country may then face “positive” selection in the destination country, that is: highly skilled people are more likely to become migrants and are randomly selected from a pool of applicants in the destination country. This enables us to address three underlying issues:

- (i) First, what are the main motivations for students from developing countries to go abroad? What are the factors in the host countries that encourage or inhibit this mobility? While the former determinants constitute the so-called “push” factors characterizing the sending countries, the latter are the “pull” factors intrinsic to the destination countries.
- (ii) Second, are there any individual or environmental characteristics that encourage mobility to one location rather than others?
- (iii) Third, does the current combination of mobility and funding flows through scholarship programs help student mobility? What will be the implications of these trends for the geography of Europe’s HE? Indeed, global competition among HE institutions (HEIs) to attract internationally mobile students raises worrying concerns about the development of global academic powerhouses that are magnets for academic talent from across the world.¹ One wonders whether the current uneven geography of academic mobility may also guide future student mobility and, through a cumulative causation, lead to even stronger concentration.

To conduct our investigation, two strands of literature in the field of international development studies are combined here.

- Firstly, we draw on the economics of immigration, which deals with the factors underlying international mobility, i.e. what determines whether people choose to move and where they decide to go. We rely here on the new economics of migration paradigm and focus on student migration as a collective decision that results from incomplete markets ([Bansak et al., 2015](#)).

¹In the OECD countries for example, more than 3/4 of mobile academics are concentrated in only 4 countries: namely, the US, Australia, the UK and Japan.

- Secondly, we consider cross-border education at tertiary level as an investment decision in human capital theory. Notably, students are individuals seeking better opportunities to get education (academic and skills) in order to increase their future earnings and employment opportunities. Theories of investment in education may then explain why international mobility at tertiary level is worthwhile.

The rest of the paper is organized as follows. Section 2 briefly describes our statistics and background. Section 3 presents the general options of our methodological approach before our empirical findings are reported in Section 4. In Section 5, the results are summarized and conclusions drawn.

2. Research framework

2.1. Targets

There are different types of immigrants, some of which overlap with each other. This is due to the diverse sources of migration. Here, we focus on immigrants who *choose* to move legally (not forced to do so) because most of the world’s migrants are voluntary migrants. These voluntary migrants choose to move for various reasons: to work, to join family members or to study. In the present paper, we are interested in educated or skilled people who are going abroad to study for a while and may return home (temporary *versus* permanent migration). These persons have permission to enter and live, albeit temporarily, in a host country. However, they may become “illegal” or “irregular” immigrants by violating the terms of their visa (for example, by overstaying a temporary visa). Thus immigration policy can affect whether people choose to become permanent migrants and do not return to their origin country. In addition, they may be eligible for public assistance programs in some host countries, enabling domestic residents to argue against immigrant entries.² For this reason, we take national borders for granted, as studies in this field usually do. In other words, barriers to mobility of people do exist and policymakers focus on the effects of migration flows (here, internationally mobile students) on their own countries and not on the global effects (Bansak et al., 2015).

The purpose of this paper is to examine what drives macro-economic flows of tertiary students from developing countries to Europe. However, by assuming that they will return to their countries of origin directly after mobility, we leave aside the underlying issue of their decision on whether or not to stay in the destination country, in other words their comparative expectations about future earnings once their studies are completed. To this end, we consider internationally mobile students coming from low and middle-income countries (all developing economies). The data computed here come from the UNESCO website on global flows of tertiary level students. Based on its annual data collection, the UNESCO Institute of Statistics (UIS) produces a range of indicators to track trends in tertiary education at the global, regional and national levels.³ Internationally mobile students are defined as those who have crossed a national or territorial border for the purpose of education and are now enrolled outside their country of origin. These data are downloaded from the UNESCO website for 89 Low and Middle-Income countries (LMIs) from which individuals went to Europe over the period 2004-2013 for the purpose of undertaking tertiary level study. The full list of host and home countries in our sample is presented in Appendix A. Descriptive statistics using the available data are displayed in Appendix B.

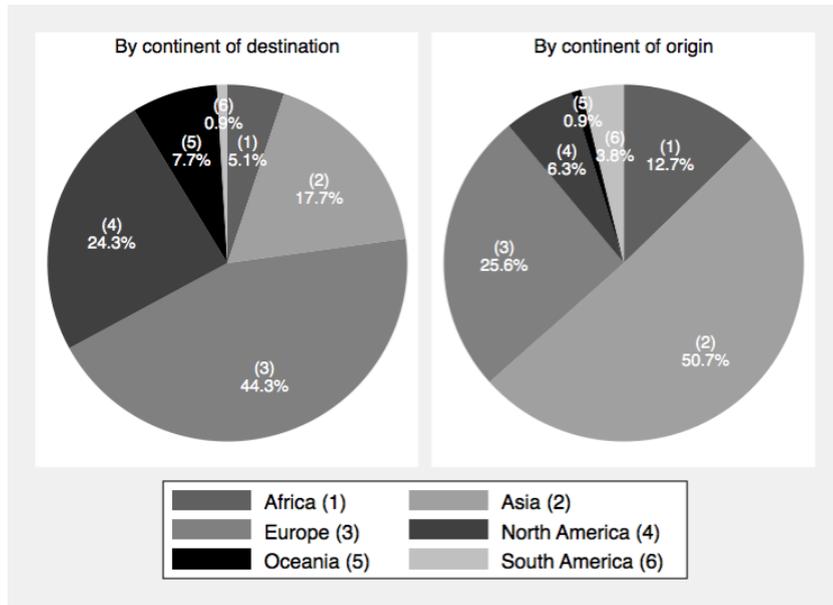
Among the various categories of migrants, internationally mobile students are the ones who have experienced a dramatic increase in recent decades. Their number doubled between 1999 and 2013. From the home perspective, 67.2% of the student outflows originate from Asia (which forms the largest group), Africa and South America (Figure 1). As a result, LMIs represent 65.4% of student outflows, which calls for a specific analysis on these countries. At destination, North

²People may oppose immigration because they believe they will compete with immigrants or will pay more in taxes as a result of immigration (taking their jobs or places in universities that would otherwise go to native-born students, receiving more in public assistance, or leading to changes in their country’s culture). Such beliefs are likely to affect how people feel about immigration, including international students, and are among the reasons why countries impose restrictions on immigration and why immigration policy generates considerable debate (Bansak et al., 2015).

³See more at: <http://www.uis.unesco.org/Education/Pages/tertiary-education.aspx#sthash.I4ezWA3x.dpuf>

America and Europe account for 68.6% of the total aggregate flows with a high concentration in a small number of countries (the US, the UK, France, Germany and Australia). As the European countries accounts for 44.3% of the total aggregate flows, one wonders if the region can become a magnet within the global competition among HEIs to attract internationally mobile students. Figure 2 shows the evolution of tertiary student flows from LMIs towards our European countries of destination over the period 1999-2013. Out of the number of LMIs counted according to the World Bank classification, our sample of 89 origin countries accounts for a high share of the outflows.

Figure 1: Distribution of inbound and outbound flows
Cumulative flows, 1999-2013



Source: UNESCO

2.2. Variables of interest

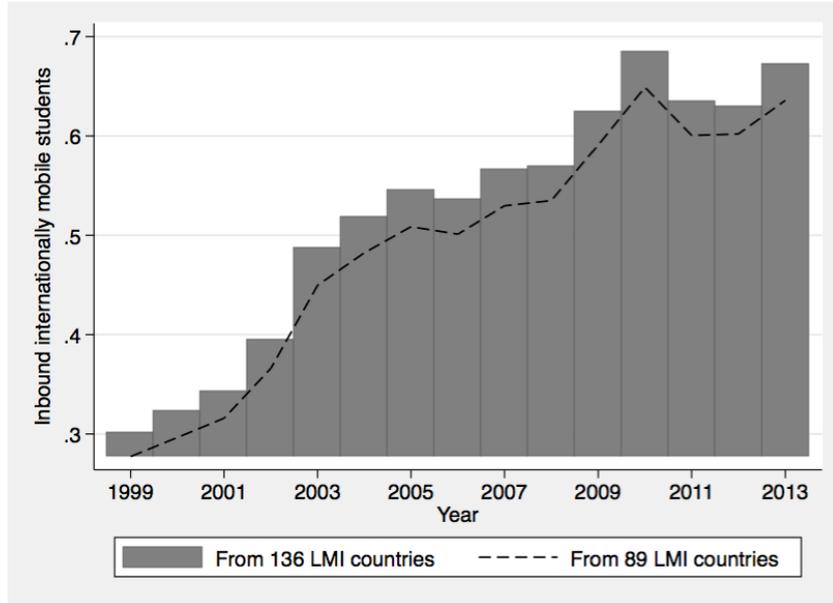
Different variables can influence the international mobility of students. We divide them into two groups: dyadic factors and monodic factors. The latter include two sub-groups: monodic home (“pull”) factors and monodic host (“push”) factors.

Dyadic factors

Moving is costly, even though the expenditure required (passport and visa, transportation, etc.) has fallen over time (Bansak et al., 2015). There are also non-monetary costs to moving which may be even higher than the monetary costs (“psychic costs”, for example). Among them, a first set of dyadic variables that are commonly used in gravity models helps to understand the factors that might explain resistance to any bilateral flow, namely bilateral distance, linguistic proximity, historical colonial links. The CEPII has made available a “square” gravity dataset for all world pairs of countries (Head et al., 2010). These dyadic factors linking home and host countries in the gravity equation are usually applied to international trade, but they can be merged with any matrix of bilateral flow (FDI, migration or other types of bilateral flows). It is assumed here, therefore, that such dyadic variables influence the cost of student mobility.

However, geographic and cultural distances are customary mobility costs that are not specific to students; rather, students must factor the additional costs of attending HE programs in different

**Figure 2: Total flows of inbound students to Europe
1999-2013, in million**



Source: UNESCO

locations into their investment decisions. In the present study, it is expected that various measures of networks as well as foreign language skills may lower the cost of migrating, especially when developing countries are considered. Consequently, such considerations are highlighted here by extending the usual dataset provided for gravity models with two other kinds of “resistance”.

Linguistic relations are considered to be an initial resistance to migration. The contribution of such relations is of particular importance in international HE mobility because language skills allow migrant students to shrink their “sunk costs”. However, it seems that the role of this variable is underestimated in the literature, since in numerous studies only one measure of language linkage is used. For example, [Beine et al. \(2014\)](#) refer only to “common official language” while [Van Bouwel and Veugelers \(2013\)](#) refer to “common spoken language” and [Vogtle and Windzio \(2016\)](#) use the “same language branch”. Unlike these authors, we refer to the four measures of language relationships which are computed by [Melitz and Toubal \(2014\)](#):

- (i) *Common official language* (COL): An official language implies that “all messages in the language are received by everyone in the country at no marginal cost, regardless what language they speak”. This variable takes two values: 1 if two countries share the same official language and 0 otherwise.
- (ii) *Common spoken language* (CSL): this is the probability that a random pair of individuals from two countries can understand each other in a given language. Since a pair of countries may share different spoken languages, CSL can be calculated as:

$$CSL = \max \alpha + (\alpha - \max \alpha)(1 - \max \alpha)$$

where $\alpha := \alpha_{ij} = \sum_{l=1}^n L_{li}L_{lj}$; L_l is the percentage of speakers of a typical language l and n is the number of spoken languages that two countries share.

- (iii) *Common native language* (CNL): this refers to the probability that a random pair of individuals from two countries speak the same native language. The measure of this variable is similar to the CSL. Hence, it follows that CSL includes CNL and is greater than CNL.
- (iv) *Language proximity* (LP): this refers to the closeness of two different native languages. [Melitz and Toubal \(2014\)](#) propose two indicators of LP: the *Ethnologue* classification of language

trees between trees, branches, and sub-branches and the Automated Similarity Judgment Program. In our study, the latter is used to capture LP.

Turning to our second resistance factor, the role of networks has been widely investigated in the economic literature. Network analysis shows how social and institutional relationships play an important role in human capital accumulation. In our specific case, we investigate whether individuals who are linked to other individuals within social or institutional networks are more prone to become mobile.

A commonly used proxy for networking is the stock of all migrants from the origin country living at destination (see for example [Beine et al., 2011, 2014](#); [Bertoli and Fernández-Huertas Moraga, 2015](#)). Those migrants are likely to provide assistance and information to students from their country of origin and therefore decrease their migration costs. However, according to the World Bank, the international migrant stock is defined as the number of people born in a country other than that in which they live, including refugees or asylum seekers. Thus it covers a broader population than our target population, allowing us to introduce two other measures of networks.

One way to proxy networking is to compute the average number of tertiary students from an origin country moving to a destination country in recent years. Social networks made up of friends or previous students are informal, but we assume that they are critical determinants in individual decisions to study overseas. The role of informal networks in international HE has been addressed in qualitative case studies from sociological perspectives (see for example [Mazzarol and Soutar, 2002](#); [Brooks and Waters, 2010](#); [Beech, 2015](#); [Pedro and Franco, 2016](#)). This approach argues that international mobility is often socially embedded and highly influenced by either friendship or kinship networks. [Beech \(2015\)](#) for example, documents that such networks may provide advice and encouragement and shared living experiences that could have a decisive influence on potential students' mobility. Our research extends these studies by using a quantitative rather than a qualitative approach. As in [Beine et al. \(2014\)](#), we assume that previous students have assimilated a wealth of information about the destination country and, through their feedback, shares their knowledge of it and thereby helped to reduce the cost of moving there.

A second proxy for network effects involves looking at the formal partnerships that have been established among HEIs in sending and destination countries. In particular, the Erasmus Mundus - Action 2 (EMA2) program, which is dedicated to the development of relations between Europe and other regions through international mobility, has become an increasingly used tool in the internationalization process. The main objectives of this program are to promote intercultural understanding and the exchange of persons and knowledge in order to develop HE teaching and learning capacity and to build the management capacity of HEIs in third countries. In fact, its primary aim is to contribute to the socio-economic development of the non-EU countries targeted by the EU external cooperation policy: we talk about “lots” of covered countries, or “eligible” partner countries. To this end, grants are awarded to students (from bachelor to post-doctorate level) and to academic and administrative staff.⁴ In order to be eligible for any EMA2 scholarship, applicants must meet a set of minimum requirements. Targets are clearly defined in terms of mobility flows (host/home institutions, cohorts), disciplines and academic offers (courses, internships) and candidacy (students, staff). Among the main questions raised by such programs is whether the underlying eligibility criteria for mobility stipulated by the EMA2 (area of study, type of mobility, language requirements, partner institutions) lower resistance to the international mobility of students.

Monodic factors

Monodic variables are a set of variables that capture home or host country specific characteristics. Various strands of the economic literature examine the factors that influence the choice of HEIs from different perspectives. While aspects of destinations are subsumed under the heading of “pull factors”, the ones that persuade individuals from sending countries to move abroad are

⁴Among the people eligible for EMA2 scholarship, it should be noted that some are very short-term migrants (e.g., one full month for academic and administrative staff). They travel to another country “to visit” for a specific period but not to live; they are not considered immigrants, even temporary ones.

classified as “push factors”. Push factors are the conditions that propel students to leave the country of origin, while pull factors are the conditions that entice students to enter one destination country rather than another. Both push and pull factors are at play in students’ decisions to move (Bansak et al., 2015). Virtually, every push factor has a corresponding pull factor, and vice-versa. However, divergent regulatory policies, as well as deep political and institutional characteristics of countries, have been shown to influence trade as modeled in the gravity framework (Shepherd, 2012). In the present study, we believe that such “behind-the-border barriers” apply to migration flows, especially when they are concerned with the international mobility of students.

In addressing this issue, a number of economic and socio-demographic conditions will be tested in order to determine how economic development influences student mobility. On the other hand, however, individual perceptions of public institutions, civil society or social cohesion in the home and host countries are of great importance in mobility decisions. The objective here is to investigate the effects of institutional factors and beliefs on a specific environment underlying mobility choice. Quality considerations, migration climate, expectations and social relations are particularly highlighted here.

From a host country point of view, a country’s ability to attract talent from around the world in a highly competitive environment allows its institutions to further strengthen its capacity and improve its rankings and reputation. Quality considerations in HE are widely addressed from this perspective (Van Bouwel and Veugelers, 2013). Similarly, many countries try to limit the number of immigrants entering their country but also to shape the characteristics of the inflow, including internationally mobile students. The policies that destination countries adopt play a central role in determining how many people study abroad and where they go.

Unfortunately, the empirical literature on international student mobility devotes much less attention to the impact of such policies on sending countries. By way of example, let us the provision of public services. According to the existing studies, an inflow of foreign-born HE students may put pressure on the education system and other publicly provided services. Keeping fiscal costs unchanged (and the resulting price of HE unchanged), this inflow increases the demand for HE and could crowd out natives from universities and the quality of education may fall in the host country. However, few (if any) studies have tried to look at the effects of such policies adopted in destination countries on the choice of location made by a student in sending countries. As in Van Bouwel and Veugelers (2013), we use different measures as quality indicators, namely the number of universities a country has in the top 100 of the Shanghai ranking and the quality of public services in HE (teaching and research). But other characteristics describing the immigration climate and access to public facilities will also be added in order to test the “attractiveness” of HEIs in the host country.

Our purpose here is also to determine how developing countries can “push” or discourage skilled individuals (students) from leaving. On the sending country side, quality considerations (teaching, research, employability) or improvements in human capital through the internationalization of HE can be taken into consideration. For example, relatively few institutions in developing countries have doctoral programs. In this case, the driving force for student mobility appears to be the lack of graduate-level educational opportunities in the home country. In our specific case, it means that HE supply is not sufficient to meet demand in the origin country: moving abroad to get a better education may be the best solution to incomplete education markets (Bansak et al., 2015)⁵. In addition, certain socio-demographic characteristics of the home countries are introduced into our study. Indeed, a “youth bulge” in the home country may increase the population of young adults, the group most likely to migrate in search of better opportunities.

The recent literature provides evidence that economic conditions (income, unemployment rate, tax burden, skills shortages) matter more in destination countries than in sending countries, implying that they are bigger pull factors than push factors (Bansak et al., 2015). However, existing studies have produced mixed results on these economic aspects. In some empirical studies, for example, GDP per capita (a proxy for development) in the home country has been found to be neg-

⁵Using micro-level data on 2,485 students from four countries (China, India, Indonesia, Taiwan), Mazzarol and Soutar (2002) claim that the *difficult to gain entry at home* and *course not available at home* appear to be the main reasons pushing these students to study abroad.

ative in explaining outflows in some empirical studies (Clark et al., 2007; Hatton and Williamson, 2005; Pedersen et al., 2008). Other studies have found positive or ambiguous effects for GDP per capita (Grogger and Hanson, 2011; Mayda, 2010). As average incomes rise, fewer people migrate because the country’s economy is faring better (negative correlation); however, this may also mean that more people can afford to migrate, thereby increasing emigration flows (positive correlation). The present study will address this issue with specific regard to flows of student migrants. More precisely, in order to treat the development level as predetermined with respect to the current outflows, we take the level of GDP per capita at the initial year (that is, 2004).

Lastly, policies or restrictions that discourage outbound students can also be viewed from the sending country side. Emigration may affect the sending country (especially when migrants are skilled) and concern about possible negative effects is the main reason why some countries impose restrictions on emigration (especially in developing ones). For some authors, however, the so-called “brain drain” is offset by a “brain gain”, whereby the sending country benefits if emigrants return after acquiring skills abroad or if the possibility of emigrating causes residents to acquire more skills as the expected return to education increases (Docquier and Sekkat, 2006). Following this line of argument, it is assumed here that international students coming in the sending country bring positive externalities in terms of knowledge, learning capacity and human capital formation.

To deal with all the monodic factors underlying institutions, beliefs or perceptions in both sending and receiving countries, we use the Institutional Profiles Database (IPD), a collaborative venture between the French Development Agency (AFD) and the Directorate General of the Treasury (DG Trésor). The IPD provides an original measure of countries’ institutional characteristics through composite indicators built from perception data⁶. These indicators are made available for academic research purposes and, more specifically, to explore the relationship between institutions and development. Other macroeconomic data were downloaded mainly from the World Bank database (World Development Indicators) and from Eurostat. Table 1 lists the variables used and their source. Some summary statistics are presented in Appendix B.

3. Methodology

3.1. Theoretical background

The present study applies the Random Utility Maximization (RUM) model of migration (Beine et al., 2011, 2016; Bertoli and Fernández-Huertas Moraga, 2013, 2015 among others) to the context of international student mobility. The main assumption underlying this research framework is the existence of multilateral resistance to migration.

Let us start with the migration decision of a student k in country $i \in O$ to country $j \in D$

$$U_{kij} = a_{ij} - c_{ij} + \epsilon_{kij} \quad (1)$$

where $i = 1, 2, \dots, O$ is a set of origin countries and $j = 1, 2, \dots, D$ is a set of destination countries. Variable a_{ij} implies a deterministic component of utility while c_{ij} includes specific costs of moving from i to j , and ϵ_{kij} is a student-specific stochastic term. It is assumed to follow an independent and identically distributed extreme value type 1 distribution (iid EVT-1).

Let p_{ij} be the probability that student k chooses country j instead of staying at home or an alternative country $l \in D$. If the deterministic component does not vary with origin country i , this probability can be expressed as in Beine et al. (2013):

$$\begin{aligned} p_{ij} &= Pr\{U_{kij} = \max_{l \in D} U_{kil}\} \\ &= \frac{e^{a_i - c_{ij}}}{\sum_{l \in D} e^{a_i - c_{il}}} \\ &= \frac{S_{ij}}{S_i} \end{aligned} \quad (2)$$

where S_{ij} represents the number of students from i moving to j , and S_i the total number of students residing in i .

⁶Source: <http://www.cepii.fr/institutions/EN/ipd.asp>

Table 1: List of variables

Variable	Definition	Source	Available years
1. Dependent variable: Internationally mobile students			
AS_{ij}	Average flows of tertiary level students from country i to country j	UNESCO	2004-2013
2. Covariates			
Dyadic factors			
Networks			
$Stocks_{ij}$	Stock of migrants from country i in country j in 2000	OECD	2000
FN_{ij}	Formal networks: Number of Erasmus Mundus partnerships between country i and country j	Authors construction	2004-2013
IN_{ij}	Informal networks: Average flows of tertiary level students from country i to country j in the previous period	UNESCO	1999-2003
Linguistic relationships			
COL_{ij}	Existence of a common official language between country i and country j	CEPII	-
CNL_{ij}	Existence of a common native language between country i and country j	CEPII	-
CSL_{ij}	Existence of a common spoken language between country i and country j	CEPII	-
LP_{ij}	Language proximity between country i and country j	CEPII	-
Other dyadic cost variables			
$Dist_{ij}$	Distance from the capital of country i to that of country j	CEPII	-
$Col45_{ij}$	Existence of a colonial link after 1945 between country i and country j	CEPII	-
Monodic factors			
Push factors (home countries)			
<i>Economic and socio-demographic factors</i>			
$GDPcap_i$	GDP per capita in 2004	World DataBank	2004
Yu_i	Unemployment, youth total (% of total labor force ages 15-24)	ILO database	2004-2013
$Enrol_i$	Enrollments in tertiary education	World DataBank	2004-2013
AS_i	Internationally mobile students coming from the host countries aggregate	UNESCO	2004-2013
<i>Political environment and institutional factors</i>			
$Conflicts_i$	Internal conflicts	IPD - CEPII	2012
$Tensions_i$	Internal tensions caused by neighboring countries	IPD - CEPII	2012
$Freedleav_i$	Freedom to leave the country	IPD - CEPII	2012
$Integration_i$	International/regional integration	IPD - CEPII	2012
<i>Quality of HE</i>			
$HEqual_i$	Quality of public higher education and research services	IPD - CEPII	2012
$HEadapt_i$	Adaptation of the higher education system to business needs	IPD - CEPII	2012
<i>Beliefs of young people</i>			
$Prospects_i$	Prospects for young people	IPD - CEPII	2012
$Irregular_i$	Irregularities in obtaining university	IPD - CEPII	2012
$Merit_i$	Importance of merit to upward social mobility	IPD - CEPII	2012
$Relucthire_i$	Reluctance of firms to hire university graduates	IPD - CEPII	2012

continued next page

Table 1: List of variables (continued)

Variable	Definition	Source	Available years
Pull factors (host countries)			
<i>Economic and socio-demographic factors</i>			
PLI_j	Price Level Index, actual individual consumption, by using purchasing power parity (PPP)	Eurostat	2004-2013
$Enrol_j$	Enrollments in tertiary education	World DataBank	2004-2013
$Genderratio_j$	Female / male ratio of enrollments in higher education	UNESCO	2004-2013
<i>Quality of HE</i>			
$HEqual_j$	Quality of public higher education and research services	IPD - CEPII	2012
$Ranking_j$	Number of universities in ShangHai Top100	ARWU	2004-2013
$HEadapt_j$	Adaptation of the higher education system to business needs	IPD - CEPII	2012
<i>Socio-economic environment</i>			
$Healthqual_j$	Quality of public services (provided by the public sector) in relation to basic healthcare	IPD - CEPII	2012
$Migrants_j$	Total stock of migrants, % of population	World DataBank	2010

Hence, if we take the ratio between the number of students moving from i to j and that of stayers, it can be given by:

$$\frac{S_{ij}}{S_{ii}} = \frac{e^{a_j - c_{ij}}}{e^{a_i}} \quad (3)$$

from where the number of students moving abroad can be expressed as:

$$S_{ij} = \frac{e^{a_j - c_{ij}}}{e^{a_i}} S_{ii} \quad (4)$$

where a_j can be considered as the specific attractiveness of destination country j or *pull factors*. On the other hand, a_i captures the specific characteristics of the home country i pushing students to study abroad or *push factors*.

3.2. Econometric strategy

Based on Equation (4), we first consider a benchmark model where the average number of students from country i studying in country j can be expressed in log as:

$$AS_{ij} = \alpha + \alpha_i + \alpha_j + \beta_1 \cdot Dist_{ij} + \beta_2 \cdot Col45_{ij} + \beta_3 \cdot N_{ij} + \beta_4 \cdot l_{ij} + \epsilon_{ij} \quad (5)$$

Recall that c_{ij} captures the variable costs depending on dyadic factors between origin country i and host country j . Besides physical distance ($Dist_{ij}$) and colonial link ($Col45_{ij}$), we add here two other kinds of dyadic factors: networks (N_{ij}) and shared language (l_{ij}). All specific characteristics of the home and host countries are captured by α_i and α_j respectively, while ϵ_{ij} is an error term.

The main purpose of Equation (5) is to focus the multilateral resistance terms. More precisely, we attempt different measures of network and of linguistic relationship between the home and the host countries. This specification includes country dummies to control for origin-specific and destination-specific factors. The inclusion of dummies makes the estimates consistent with the aforementioned RUM model (Ortega and Peri, 2013; Bertoli and Fernández-Huertas Moraga, 2015).

However, to capture both push and pull factors, we need to replace the origin and destination dummies in distinctive specifications. We first investigate the role of push factors and Regression (5) can be rewritten as:

$$AS_{ij} = \alpha + \alpha_j + \beta_1 \cdot Dist_{ij} + \beta_2 \cdot Col45_{ij} + \beta_3 \cdot N_{ij} + \beta_4 \cdot l_{ij} + \gamma_i \cdot \Omega_i + \epsilon_{ij} \quad (6)$$

where α_i is replaced by different push factors Ω_i and α_j is retained in order to capture specific fixed effects of the host country j . These push factors can be divided into four groups

- (i) economic and socio-demographic factors
- (ii) political environment and institutional factors
- (iii) quality of HE
- (iv) beliefs of young people

Second, we examine how the attractiveness of the host country (pull factors) affects international mobility in HE by using the following equation:

$$AS_{ij} = \alpha + \alpha_i + \beta_1.Dist_{ij} + \beta_2.Col45_{ij} + \beta_3.N_{ij} + \beta_4.l_{ij} + \gamma_j.\Omega_j + \epsilon_{ij} \quad (7)$$

where all specific fixed effects of the sending country i are captured by α_i while Ω_j includes different pull factors.

In a last step, both push and pull factors are combined to shed light on the interactions between specific determinants of attractiveness and exit. We rely on the following equation:

$$AS_{ij} = \alpha + \beta_1.Dist_{ij} + \beta_2.Col45_{ij} + \beta_3.N_{ij} + \beta_4.l_{ij} + \gamma_i.\Omega_i + \gamma_j.\Omega_j + \epsilon_{ij} \quad (8)$$

Equations (5) to (8) can be estimated by the OLS method. However, owing to the presence of zero flows (representing 14% of our sample), covariates can be correlated with the error terms, which makes the OLS model inconsistent. To deal with this concern, the two-stage method *à la* Heckman as in Beine et al. (2011) and the Poisson Pseudo-Maximum Likelihood Estimator (PPML) as in Beine et al. (2014) may be relevant. In this research, we rely on the PPML estimator developed by Silva and Tenreiro (2006). This method enables us to deal with two problems associated with the log-linearization of observed flows: (i) the existence of heteroskedasticity, which leads to inconsistent estimates and (ii) the presence of zero values which induces a selection bias. The two-stage method *à la* Heckman takes the latter into account but not the correlation with the error term in presence of heteroskedasticity.

Throughout the estimation process, the dependent variable is the average flow of migrant students from country i to country j over the period 2004 to 2013. We do not estimate either the pool or annual data, for two reasons. First, according to Beine et al. (2014), some dyadic factors such as linguistic and colonial links or Euclidean distance are constant overtime and can be included in bilateral specific effects in pooling data. Second, estimating annual migrant students separately may not control for sudden shocks and thus lead to biased estimated coefficients.

4. Main findings

4.1. Role of dyadic factors

This subsection investigates the role of dyadic factors in determining international student mobility, keeping dummies for the fixed effects of home and host countries. In addition to the mobility costs commonly used in gravity empirics, two other kinds of dyadic resistance are explored in this purpose.

Role of networks

Based on Equation (5), we expect to find evidence on the impacts of three kinds of networking on outflows of students: (i) *average migrant students in the past* considered as “informal networks” (denoted here IN_{ij}), (ii) *average numbers of EMA2 partnerships* between home and host countries as a proxy for “formal networks” (denoted here FN_{ij}), and (iii) *stock of migrants in 2000*, used as a general measure of network effects in numerous empirical studies. The associated estimates are shown in Table 2. Each measure of networking is examined separately in alternative models from 1 to 3 and it is assumed for the moment that linguistic links are proxied by *Common Official Language* (COL).

Table 2 shows that networks have robust and positive effects: whatever the measure under consideration, networks influence student mobility. This is consistent with predictions, especially when they concern developing countries. Pedersen et al. (2008), for example, found that networks matter the most for immigrants coming from poor origin countries.

Table 2: Determinants of HE mobility: role of networks

Dependent variable	Model 1 <i>AS_{ij}</i>	Model 2 <i>AS_{ij}</i>	Model 3 <i>AS_{ij}</i>
Network			
<i>Stock_{ij}</i> (in log)	0.238*** (0.041)		
<i>IN_{ij}</i> (in log)		0.805*** (0.028)	
<i>FN_{ij}</i> (in log)			0.469** (0.150)
<i>Dist_{ij}</i> (in log)	-1.691*** (0.277)	-0.653*** (0.169)	-2.163*** (0.296)
<i>Col45_{ij}</i>	0.905*** (0.199)	-0.015 (0.091)	1.035*** (0.203)
Linguistic link			
<i>COL_{ij}</i>	1.428*** (0.210)	0.504*** (0.096)	1.684*** (0.190)
Origin fixed effects	Yes	Yes	Yes
Destination fixed effects	Yes	Yes	Yes
Number of origin countries	89	89	89
Number of destination countries	30	30	30
Observations	2,670	2,670	2,670
R-squared	0.907	0.987	0.886
Pseudo log-likelihood	-146486	-45593	-165841

Clustered and Robust standard errors in parentheses. Significant: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$

Specification 1 introduces the same dyadic factors as in [Beine et al. \(2014\)](#). Compared to their findings, the elasticity of *Stock of migrants* is found to be lower while that of other dyadic factors is higher in our study. One possible reason is that our sample only contains students from LMIs while [Beine et al. \(2014\)](#) consider both students from developing and developed countries. Consequently, “resistance” to migration is stronger in our country sample. However, we find that the contribution of networking is divergent. *Stock of migrants* appears to have the smallest impact, with an elasticity of 0.238 (Model 1), whereas informal networks have the highest effect. From a qualitative point of view, including this variable in the estimator produces very high R-squared values (about 99%) while ignoring it reduces the model’s explanatory level (i.e. 91% in Specification 1 and 89% in Specification 3). Surprisingly, formal networks captured by the number of Erasmus Mundus partnerships between home and host countries are less important than the informal ones.

These divergent impacts of networking can be explained as follows. On the one hand, in deciding whether or not to study abroad, potential migrant students may first look for feedback from former migrant students and then seek out information, firstly from formal networks (i.e. HEIs) and finally from immigrants in the destination country. Such feedback may include decisive information on education quality, integration and administrative facilities, quality of life, etc which helps to reduce the “sunk costs” for potential migrant students. On the other hand, it is possible that the contribution of formal networks is partly included in other variables such as colonial link or COL, for which the associated coefficient is much higher in Model 3. Hence, it seems that two countries sharing either the same official language or a common history also have a high number of partnerships.

As expected, the results on *Distance* are in line with theoretical predictions (see for example [Rodriguez Gonzalez et al., 2011](#); [Beine et al., 2014](#); [Appelt et al., 2015](#)). However, as with post-colonial links, the associated coefficient is lower in informal student networks. In fact, [Grogger and Hanson \(2011\)](#) talk about the “great circle” of distance to describe how the effects of network and physical distance interact with each other. When the coefficients associated with each variable are aggregated, this “great circle” in informal networking lowers the cost of migrating and stimulates student mobility ($0.805 - 0.653 = 0.152$ in Model 2) while it still discourages outflows in the two other networks (respectively -1.453 and -1.694 in Models 1 and 3).

Other dyadic factors were investigated in order to proxy commercial links between countries: regional trade agreements, preferential treatment of imports coming from former colonies or some specific developing countries. The results appear to be insignificant in explaining student mobility. Thus in order to keep our empirical investigation manageable and to shorten our tables, we leave them aside.

According to Table 2, sharing the same official language increases the number of internationally mobile students by at least 65.5%.⁷ However, using common language as a sole measure might underestimate this effect.⁸ As Bertoli and Fernández-Huertas Moraga (2013, 2015) note, potential migrants face multilateral resistance and in our case linguistic skills are likely to be an important factor. Hence, in order to cast a fresher eye on the role of linguistic relations, different indicators will be taken into account in what follows.

Role of linguistic skills

We explore here four indicators of linguistic relationships (COL, CSL, CNL, and LP) as shown in Melitz and Toubal (2014). Estimation results using Equation (5) and relying on the PPML method are reported in Table 3. Since *Stock of migrants* is less important, only *Average migrant students in the previous period* and *Average number of EM partnerships* are retained subsequently in order to explore the resistance of informal versus formal networks. From columns (1) to (4), informal networks are the variable used, while in the last four columns this variable is replaced by formal networks. For both types of network, each indicator of linguistic relationship is considered separately: COL in Model 1, CSL in Model 2 and CNL in Model 3. In Model 4, the three indicators are gathered together before language proximity is introduced in Model 5. This distinction allows us to disentangle common or shared languages from linguistic proximity (see Adserà and Pytliková, 2015).

Whatever the related network, *COL*, *CSL* and *CNL* are all significant at the 0.1% level when they are individually controlled for. However, *CNL* and *CSL* appear to have a stronger impact on student mobility flows. In informal networks for example, sharing *CSL* (*CNL*) with an European host country increases the number of students moving from the related sending country by 232% (249%) and when these variables are all introduced into the estimation (Column 4), only *CSL* remains significant. Similar results are produced when *LP* is introduced. Since neither *COL* nor *CNL* is significant, their role is probably absorbed by *CSL*, which suggests that facility of communication is more influential than ethnicity and mutual trust in HE migration. All in all, these findings support our aforementioned intuition that using *COL* alone may underestimate the role of linguistic skills.

When formal networks are considered separately, the coefficients of common language are at least three times higher than those associated with informal networks. It is possible that European countries use the EMA2 program to apply indirect “qualitative” selection criteria (i.e. immigration policies) to skilled migrants. Coniglio and Kondoh (2015), for example, argue that the EU uses restrictive requirements in language skills to limit the number of immigrants from non-EU countries. It follows that only students with sufficient linguistic levels are selected by EMA2 partners in the sending and the destination countries, enabling linguistic resistance to become stronger in formal networks than in informal ones. When all linguistic indicators are gathered together, *CSL* remains the most important indicator.

Interestingly, the coefficients of *Distance* and *Colonial link* associated with formal networks are found to be much higher than those related to informal networks. Historical ties are highly significant in formal networks and this may also reflect an immigration policy based on preference granted to students from former colonies. These findings tend to support the intuitions mentioned above. On the one hand, the small contribution of institutional networks may possibly be absorbed by colonial and linguistic relations. On the other hand, feedback from former migrant students is so important that distance is less costly and colonial links become insignificant in informal networks.

⁷The coefficient of COL is the lowest in Specification 2. The associated impact is computed by: $\exp(0.504) - 1 = 0.655$, that is 65.5%.

⁸In the case of bilateral trade, using a sole linguistic relationship only explains one fifth of the total impact (Melitz and Toubal, 2014).

Table 3: Determinants of HE mobility: the role of linguistic relationships

Dependent variable	Informal Network					Formal Network				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
	AS_{ij}									
Network										
IN_{ij} (in log)	0.805*** (0.028)	0.774*** (0.029)	0.806*** (0.027)	0.774*** (0.029)	0.766*** (0.029)	0.469** (0.150)	0.253+ (0.137)	0.379** (0.140)	0.268+ (0.141)	0.249+ (0.134)
FN_{ij} (in log)	-0.653*** (0.169)	-0.653*** (0.151)	-0.709*** (0.154)	-0.677*** (0.154)	-0.683*** (0.155)	-2.163*** (0.296)	-2.145*** (0.319)	-2.235*** (0.309)	-2.125*** (0.318)	-2.023*** (0.322)
$Dist_{ij}$ (in log)	-0.015 (0.091)	0.145 (0.093)	0.242* (0.100)	0.110 (0.093)	0.141 (0.094)	1.035*** (0.203)	1.306*** (0.161)	1.878*** (0.160)	1.175*** (0.193)	1.268*** (0.197)
Linguistic link										
COL_{ij}	0.504*** (0.096)			0.119 (0.116)	0.122 (0.116)	1.684*** (0.190)			0.254 (0.240)	0.294 (0.239)
CSL_{ij}		1.196*** (0.169)		0.904* (0.367)	0.802* (0.381)		3.959*** (0.266)		3.995*** (0.566)	3.324*** (0.563)
CNL_{ij}			1.251*** (0.170)	0.224 (0.361)	0.570 (0.415)			3.897*** (0.363)	-0.624 (0.722)	0.971 (0.782)
LP_{ij}					0.086* (0.041)					0.424*** (0.073)
Origin fixed effects	Yes									
Destination fixed effects	Yes									
Numbers of origin country	89	89	89	89	89	89	89	89	89	89
Numbers of destination country	30	30	30	30	30	30	30	30	30	30
Observations	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670
R-squared	0.987	0.987	0.988	0.987	0.987	0.886	0.904	0.893	0.903	0.910
Pseudo log-likelihood	-45593	-44200	-45347	-44104	-43853	-165841	-146362	-167481	-145693	-138847

Clustered and Robust standard errors in parentheses. Significant: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Discussion

Our findings indicate that social interactions through networking matter and that linguistic links (which are other ties connecting individuals) also matter and may even hide selective entry criteria. In summary, *CSL* appears to be the most important linguistic resistance to international mobility in HE while the most important network effect comes from informal interactions.

Our analysis of the role of dyadic factors makes two important contributions to the literature. Firstly, we show how important it is to consider different linguistic indicators (Melitz and Toubal, 2014; Adserà and Pytliková, 2015). Using only one of them can lead to an underestimated value and thus to inconsistent interpretation.

The second important contribution is the inclusion of different measures of networking. Most studies on the topic consider only *Stock of migrants* (Beine et al., 2011, 2014; Bertoli and Fernández-Huertas Moraga, 2013 among others). In our paper however, once other indicators of networking are controlled for, the role of *Stock of migrants* actually becomes insignificant⁹. First, information coming from former migrant students is likely to be more relevant than that supplied by countrymen (from stock of migrants in the destination country) or formal partnerships. In a certain sense, our results seem to be consistent with Beine et al. (2014), who also show a higher impact of skilled migrants on the flow of international students compared to general ones.

Second, the small contribution of *Stock of migrants* and *Institutional partnerships* can be partly absorbed by other covariates such as *Colonial link* or *common languages*. In addition, our finding on the role of formal networks (captured here by the *Number of EM partnerships* between EU and non-EU countries) is consistent with that in Shields (2013), who underlines the positive impact of international governmental organization membership on the international student mobility.

4.2. The role of monodic factors

The aforementioned analysis does not control for country characteristics. However, taking into account country-specific factors is important in terms of policy implications. On the home side, it helps us to understand why students do not wish to pursue their studies at home. On the host side, it will suggest some policy-relevant outcomes in terms of attractiveness. To tackle these issues in what follows, *CSL* alone is used to measure linguistic resistance and *Average migrant students in the previous period* is estimated separately in order to shed light on the impact of country-specific factors on informal networks as opposed to aggregated networks.

4.2.1. Push factors

Table 4 reports the role of monodic push factors in HE mobility. Estimates use the PPML method based on Equation (7). Both formal and informal networks are included in the first estimations. *Economic and socio-demographic factors* are explored in Model 1 and then institutional profiles provided by the IPD will be introduced to highlight qualitative aspects in Model 2. In Model 3, informal networks are considered separately from a comparative perspective.

The empirical results from Model 1 are evidence of a qualitatively strong impact of economic and socio-demographic factors in sending countries. Consistent with theoretical predictions, the initial level of *GDP per capita*, which is an indicator of their development level, appears to be negative and statistically significant at the 0.1% level. The associated sign suggests that a substitution effect prevails: as the home country gets richer, students will prefer to stay at home and the number moving abroad will decrease. Conversely, poorer countries tend to have higher student outflows because educational opportunities are more limited there. As noted in Section 2, the impact of this factor is shown to be contradictory in determining emigration. In the case of Asian students moving to the UK, a positive impact has been found by (Naidoo, 2007). In contrast, Vogtle and Windzio (2016) show no evidence of student mobility from poor to richer countries. In our paper, a negative impact of *GDP per capita* on student mobility to Europe means that it is not necessarily a push factor.

⁹Estimated results are available upon request.

Table 4: Determinants of HE mobility: the role of home monodic factors

Dependent variable	Informal & formal networks		Informal network
	Model 1 AS_{ij}	Model 2 AS_{ij}	Model 3 AS_{ij}
Dyadic factors			
<i>Network (in log)</i>			
IN_{ij}	0.843*** (0.024)	0.831*** (0.024)	0.848*** (0.024)
FN_{ij}	0.107** (0.040)	0.112** (0.037)	
$Dist_{ij}$ (in log)	-0.184*** (0.051)	-0.138* (0.056)	-0.151** (0.052)
$Col45_{ij}$	-0.018 (0.096)	0.004 (0.089)	-0.008 (0.091)
CSL_{ij}	0.511** (0.179)	0.626*** (0.170)	0.581*** (0.158)
Monodic Push factors			
<i>Economic and socio-demographic factors</i>			
$GDPcap_i$ (in log)	-0.165*** (0.046)	-0.188*** (0.047)	-0.165*** (0.048)
Yu_i	-0.016*** (0.004)	-0.010* (0.004)	-0.007+ (0.004)
$Enrol_i$ (in log)	0.197*** (0.029)	0.208*** (0.032)	0.239*** (0.027)
AS_i	-0.033** (0.013)	-0.022 (0.014)	-0.035** (0.013)
<i>Political environment and institutional factors</i>			
$Conflicts_i$		-0.118** (0.040)	-0.083* (0.041)
$Tensions_i$		-0.029 (0.029)	-0.032 (0.026)
$Freedleav_i$		-0.048 (0.074)	-0.087 (0.074)
$Integration_i$		0.030 (0.043)	0.038 (0.039)
<i>Quality of HE</i>			
$HEqual_i$		0.081+ (0.041)	0.069+ (0.041)
$HEadapt_i$		-0.079 (0.049)	-0.048 (0.049)
<i>Students' beliefs</i>			
$Prospects_i$		0.081+ (0.042)	0.091* (0.041)
$Irregular_i$		0.154*** (0.037)	0.157*** (0.036)
$Merit_i$		0.094* (0.041)	0.112** (0.042)
$Relucthire_i$		0.001 (0.032)	-0.033 (0.030)
Constant	4.495*** (0.595)	3.688*** (0.833)	3.627*** (0.778)
Origin fixed effects	No	No	No
Destination fixed effects	Yes	Yes	Yes
Number of origin countries	81	79	79
Number of destination countries	30	30	30
Observations	2,430	2,370	2,370
R-squared	0.964	0.971	0.972
Pseudo log-likelihood	-65098	-59488	-61162

Clustered and Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Note: The number of observations declines due to missing data on institutional indicators (Gambia and Kyrgyz Republic) and enrollments (Gabon, Libya, Haiti, Nicaragua, Sierra Leone, Somalia, Turkmenistan and Zambia)

Surprisingly, a high unemployment rate among young people hinders international mobility. In contrast to the first economic variable, this result suggests an income or subsistence effect in mobility decisions. Young individuals affected by unemployment are more likely to migrate as the probability of finding a job at home decreases. However, this push factor matters more for some groups of migrants than others: especially for work-based migrants. For young students, however, opportunities to get a better education may be restricted because they do not have sufficient resources to finance their study abroad. Alternatively, the opportunity cost of education is higher. In sum, unemployment describes a joint effect of income and investment prospects: young individuals will have to look for a job first. In this sense, the decision to invest in human capital will be abandoned.

As expected, *Enrollment in tertiary education* is found to be statistically significant at the 0.1% level and the associated coefficient is positive: an increase of 10% in the number of enrolled students in the home country leads to a growth of 2% in outflows. Hence, the number of enrollments in tertiary education underlies a home cohort or “market size” effect in international mobility; i.e. the potential capacity to send students abroad to improve their human capital. Conversely, the number of *Internationally mobile students coming from host countries* negatively affects the outflow of students, although the impact is low both qualitatively and quantitatively. This variable may provide evidence of a *circular effect* in bilateral flows of students: a higher number of incoming students improves learning capacity in the sending country, discouraging domestic students from moving abroad. According to [Docquier and Sekkat \(2006\)](#)), the presence of network effects with temporary mobility creates a capacity for brain exchange or “brain circulation”. From a “brain gain” perspective, entries of students from abroad (here, from Europe) enhance the human capital of all students at origin.

When the subgroup of institutional factors and perceptions in the home countries are added to Model 2, the estimated coefficients associated with economic factors remain robust but the circular effect becomes insignificant. Unemployment becomes less significant for two reasons. First, the decision to invest in education abroad overwhelms the income constraint when other factors are taken into consideration. Second, this investment decision may be partly supported by scholarships offered in formal partnerships. Turning first to the set of political institutions, security and order, *Internal conflicts* are found to be negative and statistically significant at 5%. It is likely that the more a home country experiences intensive internal conflicts, the more it closes its boundaries and prevents any emigration. In addition, since *Internal tensions caused by neighboring countries*, *Freedom to leave the country*, and *International/regional integration* appear to have insignificant impacts, it is possible that *Internal conflicts* are the most important institutional factor describing the political environment and that it absorbs the impacts of the three other variables. Obviously, when the former is removed from the estimation, *Freedom to leave the country* turns out to become significant while the impacts of the other two variables remain insignificant.¹⁰

Moving on to the role of *Quality considerations*, it appears that none of the variables is significant at the 5% level, either because they do not influence education decisions or because their impacts are absorbed by other factors. In fact, whether or not to move abroad is a decision made in response to sequential arbitrage, where the quality dimension seems to be considered after the economic, social and political aspects. In addition, we explore the role of individual beliefs in the home country. *Reluctance of firms to hire university graduates* is insignificant while the other three variables are shown to affect outflows positively. In countries where *Irregularities in obtaining university degrees* (fraud, purchases of diplomas) are high, students believe that HEIs are corrupted and are driven to move abroad. Likewise, if the *Merit to upward social mobility* is considered important, students will be more motivated to study abroad. In other words, beliefs or individual perceptions of the prevalence of corruption and the fairness of public institutions may push students into becoming internationally mobile.

In Model 3, informal networks are investigated separately. The results diverge somewhat from those produced by Model 2. Looking first at the dyadic factors, the role of *Distance* increases in informal networks, while the coefficient associated with language skill decreases. The reason is that the choice of location is constrained by the EMA2 programs, whereas informal networks

¹⁰Estimate results are available upon request.

allow students to move independently and to choose freely where to go. Hence it is likely that institutional partnerships based on EMA2 programs help to reduce distance in HE mobility, but at the expense of stricter language requirements.

When we look at push factors in the specific case of informal networks, the circular effect becomes significant. In other words, hosting international students in the origin country, be it within the framework of formal partnerships or not, encourages students to stay. Besides that, the impacts of *Students beliefs* are also dependent on the associated networking. Compared to Model 2, *Prospect of young people* is found to have a significant positive impact on informal networks. It implies that the more young people are outwardly oriented, the more they want to pursue their studies abroad. It is possible that, in a country where young people are open to the rest of the world, they simply seek out the simplest way to study overseas. In contrast, applying for EMA2 programs requires stricter conditions that undermine their motivation to study abroad.

4.2.2. Pull factors

By capturing the role of destination-specific characteristics, Table 5 depicts the monodic pull factors associated with fixed home effects. Based on the PPML method formalized by Equation (??), we conduct the same empirical exercise. Models 1 and 2 include both formal and informal networks in investigating economic and socio-demographic variables and then institutional aspects. In Model 3, we consider only informal networks with all the monodic pull factors.

Compared with previous tables, dyadic factors have a different effect at destination. On the one hand, *Post colonial link* here has a positive and significant effect at 1%. Whereas historical relations do not affect student exit from the home perspective, they strongly affect the choice of host country. On the other hand, formal networks have no significant effect. This means that the different EMA2 partnerships essentially encourage students from LMIs to study abroad without determining where they will go. Thus the expansion of partnership programs by a particular host country does not necessarily increase the number of incoming students, while historical relationships are levers for international mobility.

Comparing models 1 and 2 highlights the extent to which institutional factors in host countries can influence student inflows. When these variables are added, both the R-squared and the constant increase. In Model 1, the constant is significant only at 5%, suggesting that there is a slight bias due to omitted variables; in Model 2, it becomes significant at the 0.1% level. These two results confirm the idea that institutional factors in the host countries are good predictors of students inflows.

Regarding educational costs, we choose to measure them by a variable other than enrollment fees at destination. There are two reasons for this. Firstly, data on fees paid by mobile students vary across EU countries and are not available (Beine et al., 2014). Secondly, EMA2 programs allow students to be exempted from fees at destination. Against this background, we consider that students incur costs other than direct educational costs. Thus, through the use of purchasing power parity (PPP), the *Price Level Index* can proxy for actual consumption expenses in host countries by using. Since it measures extra costs that are embodied in educational costs, we expect this variable to have a negative effect on student flows. Surprisingly, the variable has a significant but positive effect when only economic and size factors are taken into account (Model 1). Conversely, it becomes insignificant and negative when institutional factors are considered (Model 2). One possible reason is that the *Price Level Index* captures the quality and standard of living in the host country: quality of the living environment, good amenities or institutions (public administration or services, health, transport, etc.). When the model does not include such considerations, the *Price Level Index* captures all these effects. Since students are more sensitive to the quality dimension in host countries, then the variable is significant and positive in Model 1. In contrast, when quality considerations are included in Model 2, the Price Level Index is no longer a proxy for “host” quality but only gives students an idea of their likely consumption. Thus the associated coefficient becomes negative but insignificant, suggesting that institutional quality in host countries determines student flows more strongly than living costs.

With regard to socio-demographic variables, the *Enrollments* variable has a highly significant and positive effect: the higher the number of enrolled students at destination, the larger the

Table 5: Determinants of HE mobility: the role of host monodic factors

Dependent variable	Informal & formal networks		Informal network
	Model 1 AS_{ij}	Model 2 AS_{ij}	Model 3 AS_{ij}
Dyadic factors			
<i>Network (in log)</i>			
IN_{ij}	0.778*** (0.042)	0.777*** (0.033)	0.782*** (0.033)
FN_{ij}	0.008 (0.057)	0.063 (0.057)	
$Dist_{ij}$ (in log)	-0.928*** (0.194)	-0.807*** (0.166)	-0.814*** (0.171)
$Col45_{ij}$	0.427** (0.133)	0.310** (0.114)	0.311** (0.115)
CSL_{ij}	0.590*** (0.150)	0.639*** (0.130)	0.668*** (0.133)
Monodic Pull factors			
<i>Economic and socio-demographic factors</i>			
PLI_j (in log)	0.758*** (0.197)	-0.301 (0.268)	-0.290 (0.273)
$Enrol_j$ (in log)	0.343*** (0.072)	0.251*** (0.067)	0.286*** (0.064)
$Genderratio_j$	0.988*** (0.247)	1.326*** (0.244)	1.333*** (0.245)
<i>Quality of HE</i>			
$HEqual_j$		0.293** (0.089)	0.272** (0.086)
$HEadapt_j$		-0.486*** (0.102)	-0.478*** (0.103)
$Ranking_j$		0.250** (0.093)	0.222* (0.096)
<i>Socio-economic environment</i>			
$Healthqual_j$		0.384*** (0.093)	0.396*** (0.095)
$Migrants_j$		0.032** (0.011)	0.032** (0.011)
Constant	3.880* (1.834)	5.836*** (1.678)	5.836*** (1.717)
Origin fixed effects	Yes	Yes	Yes
Destination fixed effects	No	No	No
Numbers of origin countries	89	89	89
Numbers of destination countries	30	30	30
Observations	2,670	2,670	2,670
R-squared	0.968	0.980	0.980
Pseudo log-likelihood	-63947	-56590	-56767

Clustered and Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

number of student inflows. Our finding provides two pieces of information on international student mobility. Firstly, from the point of view of host countries, a positive sign means that country size is a determining factor in the capacity to absorb student inflows from abroad. The larger the host country, the bigger the tertiary education system will be and the more students it can receive. Secondly, from the point of view of internationally mobile students, the size of the host capacity determines location choices, with the positive effects of student agglomeration outweighing the negative effects of congestion. Like informal networks, a concentration of students benefits new entrants by facilitating access to information and reducing the indirect costs of mobility. Moreover, student “clustering” favors the development of facilities and infrastructure close to universities (transportation, restaurants, housing, culture, leisure, etc.). Such advantages seem to influence destination choices.

Similarly, *Female / male ratio* allows us to consider gender aspects. The coefficient has a positive and significant effect: the more host universities are feminized, the more students coming from LMIs will be attracted. This positive role of gender can influence the destination choices of female students from home countries.

In addition to the quality dimension already highlighted on the push side, university ranking is here added on the pull side. Such rankings are well known to students who have to choose among destination countries. The *Quality of public HE services* and the *Number of universities in the Shanghai Top100* both provide information on quality. The first variable is an indicator of the intrinsic quality of HEIs, while the second measures the role of extrinsic quality, i.e. reputational effects transmitted by the various international rankings, of which the Shanghai ranking is undoubtedly the best known. These two variables are positive and significant at 1%, implying that students from LMIs are more sensitive to the quality dimension in host countries than at home. On the other hand, the *Adaptation of HE to business needs* variable has a significant but negative effect on student inflows. This may be related to their expectations of acquiring specific knowledge. Since internationally mobile students are not destined to stay in the host country to work after graduation, it is not surprising that they do not consider the HE programs that are adapted to local characteristics. On the contrary, they choose theoretical and technical courses whose contents are easily exported to their home countries.

Comparison between Models 2 and 3 makes it possible to understand the pull factors influencing the specific inflows of students through informal networks, or conversely, the relevant outcomes of formal partnerships. The only change occurs in the *Number of universities in the Shanghai Top 100*, whose significance increases from the 5% level (Model 3) to the 1% level (Model 2). Given that more and more institutions are joining formal networks such as the EMA2 programs, reputational effects are becoming a major concern in the internationalization of HE. There are two reasons for this. Firstly, the reputation resulting from this type of ranking allows students to prioritize the different formal networks at their disposal. Secondly, since formal networks are levers of reputation, countries that previously enjoyed high visibility among students are now being forced to reinforce the impact of rankings in order to retain their reputational advantages.

Finally, the socio-economic environment is taken into account. The *Quality of basic public healthcare services* provides information on the public facilities and social insurance available to migrant students. We find that this variable has a significant and positive effect: students are likely to move to countries with relatively good public facilities. While this suggests a controversial “welfare magnet” hypothesis in the economics of immigration (i.e. migrants are attracted to destinations based on the generosity of public assistance programs), our investigation with alternative variables shows that it is not true for internationally mobile students (no significance for the share of GDP devoted to public assistance programs, public expenditures). Another reason may explain this positive relationship: this variable acts as a pull factor because it allows students to reduce uncertainty about their prospects abroad. The project of studying overseas is uncertain and risky, and individuals engaging in education investment must take into consideration the probability that the mobility project could fail. Therefore, the existence of good amenities in the destination country may constitute a hedge against risks.

Immigration policies in host countries inevitably influence the entry of migrants into European countries. Thus the *Total stock of migrants* provides information on attitudes towards immigration in destination countries. It has a different meaning to that in [Beine et al. \(2014\)](#), where migrants are considered through a dyadic variable as a form of network. Here, we consider the total stock

of migrants, regardless of the country of origin, expressed in relation to the population in the host countries. Consequently, this variable’s positive sign and significance at 1% indicate the existence of a “welcoming land” effect. This positively affects international student flows in two ways. Firstly, a high percentage of migrants suggests the existence of facilities for migrants and generous policies towards immigrants, both in terms of administrative constraints and of acceptance of migrants by the rest of the population. Secondly, a favorable migration climate increases the benefits provided by migrants’ networks while at the same time reducing the costs of mobility (Beine et al., 2011, 2014; Bertoli and Fernández-Huertas Moraga, 2013). The fact that different specifications of networking (Model 3) are not affected by the *Total stock of migrants* variable suggests that this is the first effect that prevails in our model. Like *Enrollments*, the *Total stock of migrants* captures the host country’s capacity to absorb migrants, including international students. The more host countries are able to accommodate migrants, the more they attract students.

4.3. Combined push and pull factors

We now analyze the complete model by removing the country dummies on both sides. Interactions between push and pull factors will enable us to determine the demand from developing countries for HE mobility to Europe. The results are reported in Table 6.

Looking at the dyadic factors, the elasticity of informal network remains high even when the role of factors that are origin and destination-specific is captured. Furthermore, *Post-colonial link* becomes insignificant in comparison to Table 5. In other words, historical ties (and shared language) do not explain (or are less explanatory of) student inflows when the home dummies are removed. At first glance, many countries test students’ abilities, in particular linguistic skills, prior to entry. For example, this is the case for all countries in the Erasmus Mundus program as well as for students applying for tertiary enrollment in France through Campus France. However, it is less significant when other considerations at home and in the destination country are taken into account.

Moving to the country-specific factors, previous results are significantly reinforced, albeit with some exceptions. Firstly, economic and socio-demographic factors both at home and in the destination country affect HE mobility significantly. While *GDP per capita* at the origin is still significant but at a lower level, the circular effect becomes significant at 5% level when both formal and informal networks are taken into account. On the host side, extra costs (proxied by the price index) become significant, suggesting that international students are less likely to move to areas with a high cost of living. Interestingly, the elasticity of gender is reinforced while the host capacity effect shows the opposite, whether we consider informal networks alone or formal and informal networks together. Enrollments in tertiary education on both sides clearly reflects a “youth bulge” (or cohort effect) in developing source countries that matches a size or capacity effect in European host countries.

Secondly, qualitative information on political institutions, social cohesion and quality still matter, and even gains in importance. In sending countries for example, *Irregularities in obtaining university degrees* pushes students even harder to becoming internationally mobile. In receiving countries, both indicators of quality and socio-economic environment show greater elasticity, whatever the specification of networking. Interestingly, university ranking becomes less significant in explaining HE mobility compared to Table 5. On the other hand, the quality of public HE and basic healthcare services appears to be an important pull factor in our sample of European countries: the availability and quality of public services affect whether people move to those countries. Finally, the elasticity of the *Stock of migrants* is also higher in the complete model, whatever the type of network under consideration. This pull factor is highly significant in influencing student inflows: it provides a signal to potential migrants about relative conditions in a destination and, through a cumulative causation effect, some of the most immigrant-intensive countries turn out to become well-known immigrant destinations, including for internationally mobile students.

Discussion

This complete model enables us to answer the three research questions that were addressed in the Introduction. Factors that are origin-specific help us to understand the main reasons why

Table 6: Determinants of HE mobility: complete model

Dependent variable	Informal & formal networks		Informal network
	Model 1 AS_{ij}	Model 2 AS_{ij}	Model 3 AS_{ij}
Dyadic factors			
<i>Network (in log)</i>			
IN_{ij}	0.826*** (0.037)	0.817*** (0.026)	0.833*** (0.026)
FN_{ij}	0.052 (0.049)	0.086* (0.037)	
$Dist_{ij}$ (in log)	-0.216** (0.069)	-0.201** (0.064)	-0.206*** (0.062)
$Col45_{ij}$	0.147 (0.146)	0.128 (0.102)	0.121 (0.103)
CSL_{ij}	0.086 (0.187)	0.325* (0.159)	0.289+ (0.155)
Monodic Push factors			
<i>Economic and socio-demographic factors</i>			
$GDPcap_i$ (in log)	-0.106+ (0.059)	-0.136** (0.051)	-0.118* (0.053)
Yu_i	-0.015** (0.005)	-0.011* (0.005)	-0.009+ (0.005)
$Enrol_i$ (in log)	0.224*** (0.039)	0.220*** (0.032)	0.242*** (0.027)
AS_i	-0.041* (0.016)	-0.030* (0.014)	-0.040** (0.014)
<i>Political environment and institutional factors</i>			
$Conflicts_i$		-0.135** (0.049)	-0.108* (0.051)
$Tensions_i$		-0.042 (0.031)	-0.046 (0.029)
$Freedleav_i$		-0.051 (0.079)	-0.083 (0.082)
$Integration_i$		0.003 (0.042)	0.007 (0.040)
<i>Quality of HE</i>			
$HEqual_i$		0.061 (0.045)	0.050 (0.045)
$HEadapt_i$		-0.057 (0.053)	-0.034 (0.053)
<i>Students' beliefs</i>			
$Prospects_i$		0.084+ (0.045)	0.088+ (0.045)
$Irregular_i$		0.161*** (0.038)	0.164*** (0.038)
$Merit_i$		0.111* (0.045)	0.127** (0.046)
$Relucthire_i$		-0.000 (0.036)	-0.027 (0.035)
Monodic Pull factors			
<i>Economic and socio-demographic factors</i>			
PLI_j	0.297 (0.192)	-0.908*** (0.266)	-0.886** (0.271)
$Enrol_j$ (in log)	0.258*** (0.068)	0.199*** (0.058)	0.242*** (0.058)
$Genderratio_j$	1.454*** (0.251)	1.742*** (0.252)	1.792*** (0.264)

continued next page

Table 6: Determinants of higher education mobility: complete model (continued)

Dependent variable	Informal & formal networks		Informal network
	Model 1 <i>AS_{ij}</i>	Model 2 <i>AS_{ij}</i>	Model 3 <i>AS_{ij}</i>
<i>Quality of HE</i>			
<i>HEqual_j</i>		0.432*** (0.084)	0.382*** (0.083)
<i>HEadapt_j</i>		-0.604*** (0.129)	-0.601*** (0.128)
<i>Ranking_j</i>		0.255* (0.112)	0.204+ (0.115)
<i>Socio-economic environment</i>			
<i>Healthqual_j</i>		0.428*** (0.091)	0.459*** (0.091)
<i>Migrants_j</i>		0.047*** (0.011)	0.047*** (0.012)
Constant	1.372 (1.101)	7.196*** (1.561)	7.318*** (1.498)
Origin fixed effects	No	No	No
Destination fixed effects	No	No	No
Numbers of origin country	81	79	79
Numbers of destination country	30	30	30
Observations	2,430	2,370	2,370
R-squared	0.935	0.966	0.967
Pseudo log-likelihood	-96482	-75967	-77044

Clustered and Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

students from developing countries decide to go abroad. Additionally, factors that are destination-specific enable us to understand what might pull or attract internationally mobile students to European countries, thereby shedding light on the attractiveness of particular host countries.

Firstly, moving is costly and not everyone is able to afford to study abroad. Any student who decides to attend an HE program abroad will incur significant costs over and above the enrollment fees charged by the host institution. Dyadic factors have highlighted the mobility costs associated with geographic or cultural and linguistic distance, but the economic variables of LMI and European countries reinforce this main idea. Only individuals who can save or have enough income will be able to move abroad for a while; the poorest students may not be able to do this, even though they have the most to gain by doing so. In the light of this, networks are important in reducing migration costs because they pass on information and feedback about how to move and where to go.

Living costs, measured here by the *Price Level Index*, are extra costs that may offset high direct educational costs; on the other hand, however, they may also signal better conditions in the host country. If students are guided only by economic considerations, our empirical investigation shows that good and attractive amenities (good urban transport, public administration, housing, life environment) that lie behind a price index have a positive influence on international mobility. Advanced countries within the EU aptly illustrate this positive relationship (UK, Germany, France among them). However, this latter aspect is offset by other considerations, allowing us to argue that non-monetary variables are of greater importance in determining a country's attractiveness.

Secondly, from the Southern perspective, the capacity of HEIs to host internationally mobile students is an influencing factor, as is gender equity. It is particularly relevant for developing countries where, in the face of supply shortages in HE, the demographic pressure (a "youth bulge" with high numbers of enrolled students) could be solved in the short term by outflows of tertiary level students. In turn, the circular flow of students may help to build learning capacity in the origin country, thereby helping to encourage students to stay at home.

Thirdly, in line with [Van Bouwel and Veugeliers \(2013\)](#), our study finds that internationally

mobile students are more sensitive to the quality dimension in host countries, but specifically in the reputational perspective to education. Indeed, high-quality institutions with good services and “prestige” will attract students. In contrast, the extent to which HE is adapted to business needs in the host country is not an attracting factor. This finding supports the investment perspective of HE: students from LMI countries are not influenced by the employability aspect of host country HE programs, but only by the learning opportunities they offer (imperfect skill transferability).

Lastly, the immigration climate, as well as good amenities (availability and quality of healthcare or other public services), are positive pull factors for internationally mobile students. This result may support the notion that migration is the result of “cumulative causation”, from which certain controversial policy recommendations might flow. On the one hand, people who oppose immigration may find arguments here to support the imposition of restrictions on entries. On the other hand, it might be argued that our targets here are immigrants who are skilled people staying to study for a while and that therefore they do not have any permanent influence on the host countries. In fact, EU member states already have relatively strict policies on immigration by non-EU citizens. Thus transnational cooperation based on institutional partnership is one way to control for admission policies, i.e. immigration policies. Moreover, our paper finds strong evidence of network effects in migration, particularly for informal or social ties that assist students outflows. However, migration incentives become endogenous once network effects are introduced (Docquier and Sekkat, 2006). These legal, temporary migrants are only one group of immigrants and further restrictions on their entry may even generate a counter-productive effect. Indeed, restrictive immigration policies, by raising quality and availability in public HE services, make this pull factor even stronger (the destination country becomes more attractive), thereby strengthening the effect of networks in determining student inflows. Unfortunately, gravity models relying on the RUM model do not capture these cumulative effects.

5. Conclusion and remarks

Migration is a feature of the ongoing globalization process, but the profile of migrant populations varies considerably depending on the source of the migration. In this paper, we have analyzed the determinants of demand for HE mobility to Europe from students from developing countries over the period 2004-2013. The main finding of existing studies on the topic is that student mobility is governed by geographic and cultural distances, as emphasized in standard gravity empirics. However, our study highlights other factors that influence the choice of HE from different perspectives: either in multilateral resistance to migration or in country-specific factors.

In contrast to existing studies, our empirical investigation attempts to better understand multilateral resistance by highlighting two aspects. First, the literature on foreign language skills mainly uses a single measure of linguistic relationship. However, this measure may not reflect the diverse sources of linguistic influence on student mobility. Similarly, most studies on the topic consider networking either by using total migrant stocks from the origin country living in the destination country or member states of Bologna Process. Our study attempts to fill the gap by comparing different measures of networks which are of growing interest in developing countries: on the one hand, informal networks constituted on the basis of friendship and social interactions with former students and, on the other hand, formal partnerships between HEIs. In this context, the Erasmus Mundus program (EMA2) is one among many instruments dedicated to controlling or selecting immigrants. This explains the rapid development of these programs and why they have gradually become the only way for students to enter the destination country.

Our findings on dyadic resistance to migration show a positive impact from linguistic relations and network effects, which lower mobility costs when a student has to consider enrollment abroad. Particularly, *CSL* is the most important linguistic resistance to student mobility. This result can be interpreted in two ways: as a reflection, firstly, of language skill levels in origin countries and, secondly, of restrictive admission conditions for candidates in host countries and, more precisely, of the selection that takes place before students move.

On the other hand, we have shown that the elasticity of informal networks appears to be high, meaning that feedback from former migrant students turns out to make an important contribution to reducing multilateral resistance to student mobility. We consider that formal networks will assume increasing importance in the distribution of student inflows as they constitute an immigration

policy in which only international students with some education or linguistic skills are eligible for admission to HEIs. This is why the variable is sensitive to linguistic variables or *Colonial link*, which are themselves at the heart of immigration policy. As expected, *Distance* and *Colonial link* have significant effects, although they are weaker than those usually accepted in the economic literature.

By focusing on the role of different monodic home factors in HE mobility, we make an important contribution to the literature. Overall, both institutional and economic factors appear to be important push factors in our sample of developing countries. Most existing studies address the role of access to educational opportunities at home to control for the possibility that students are forced to seek HE overseas. In our paper, such educational opportunities are captured at macroeconomic level by income at home, the number of *Internationally mobile students coming from host countries* and *Enrollments in tertiary education*. Moreover, we have also investigated other institutional factors and students' beliefs. In addition to the cohort effect, it appears that unfavorable perceptions of university degrees or difficulty in gaining merit at home push students into becoming mobile. In other words, qualitative and direct information on the “de facto” outcome of rules, public institutions or service delivery strongly influence HE mobility.

Factors that are destination-specific enable us to understand what might pull or attract internationally mobile students to European countries and, therefore, suggest some policy implications in terms of attractiveness. Our results show that students are guided by economic considerations such as living costs. However, the latter aspect is offset by other considerations, allowing us to argue that non-monetary variables are of greater importance in determining a country's attractiveness. Assuming that the number of enrollments in HE is a proxy for the host capacity, we found that this is a pull factor. Gender aspects also explain student inflows from developing countries, as well as the quality of public HE and basic healthcare services. Attractive amenities appear to be an important pull factor in our sample of European countries: the availability and quality of public services affect whether people move there.

The stock of migrants is a good predictor of student inflows (and immigration flows in general), and on this basis some studies talk of the “cumulative causation of migration”. Besides describing a network effect, it provides potential migrants with signals about facilities for migrants and the living environment in destination countries. In the face of such cumulative causation, European countries may become sensitive to the ongoing debate on immigration restrictions.

Against this background, our research perspectives are twofold:

Firstly, in order to get a comparative approach with such mobility from the South to the North, the same empirical investigation could be conducted in a “North-North” perspective. For example, it seems relatively easy for a European student to study in another European country; however, it might be more difficult to enroll in a same program in the USA, or in the UK. In the face of global competition, the ability of a country to attract talent from around the world enhances local human capital; however, discrimination among student migrants or reduction in the number of student visas (when immigration policies are coupled with quality selective criteria) may raise moral doubts and financial concerns (if student mobility is seen as a way to finance local education).

Secondly, it is also important to compare the experiences of student populations in different categories. Data on candidates for scholarship that are available from different EMA2 programs allow us to determine factors that are specific to institutions or individuals at the bachelor, master or doctorate levels in various areas of study. Our current results such as linguistic gaps, learning capacities or economic and environmental impacts could be potentially examined across categories in order to gain insight at the microeconomic level. The underlying debates on attractiveness, human capital formation and immigration will be essential to drafting policies in areas such as HE.

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Appendix A. Countries sample

Appendix A.1. Host countries

In the sample		Out of the sample
EU27 countries		Luxembourg
Austria	Italy	
Belgium	Latvia	
Bulgaria	Lithuania	
Croatia	Malta	
Cyprus	Netherlands	
Czech Republic	Poland	
Denmark	Portugal	
Estonia	Romania	
Finland	Slovakia	
France	Slovenia	
Germany	Spain	
Greece	Sweden	
Hungary	United Kingdom	
Ireland		
EU+ countries		
Iceland	Switzerland	
Norway		
30 countries		1 country

Appendix A.2. Home countries

According to the World Bank classification, Low- and Middle-Income countries (LMIs) are those in which 2013 GNI per capita was \$12,745 or less.

Out of the 136 LMIs counted, data on bilateral flows of tertiary level students are missing for 47 countries.

In the sample		Out of the sample
Afghanistan	Kenya	American Samoa
Albania	Kyrgyzstan	Belize
Algeria	Lao P. Dem. Rep.	Bhutan
Angola	Lebanon	Botswana
Argentina	Liberia	Cabo Verde
Armenia	Libya	Comoros
Azerbaijan	Madagascar	Djibouti
Bangladesh	Malaysia	Dominica
Belarus	Mali	Eritrea
Benin	Mauritania	Ethiopia
Bolivia, Plu. State of	Mauritius	Fiji
Bosnia and Herzegovina	Mexico	Grenada
Brazil	Morocco	Guinea-Bissau
Burkina Faso	Mozambique	Guyana
Burundi	Nepal	Kiribati
Cambodia	Nicaragua	Korea, Dem. People's Rep.
Cameroon	Niger	Kosovo
Central African Rep.	Nigeria	Lesotho
Chad	Pakistan	Macedonia
China	Panama	Malawi
Colombia	Paraguay	Maldives
Congo, Dem Rep.	Peru	Marshall Islands
Congo, Rep.	Philippines	Micronesia, Fed. Sts.
Costa Rica	Rwanda	Moldovia
Côte d'Ivoire	Senegal	Mongolia
Cuba	Sierra Leone	Montenegro
Dominican Rep.	Somalia	Myanmar
Ecuador	South Africa	Namibia
Egypt	Sri Lanka	Palau
El Salvador	Sudan	Papua New Guinea
Gabon	Syrian Arab Rep.	Salomon Islands
Gambia	Tanzania	Samoa
Georgia	Thailand	Sao Tome and Principe
Ghana	Togo	Serbia
Guatemala	Tunisie	Seychelles
Guinea	Turkey	South Sudan
Haiti	Turkmenistan	St. Lucia
Honduras	Uganda	St. Vincent and the Grenad.
India	Ukraine	Suriname
Indonesia	Uzbekistan	Swaziland
Iran, Islamic Rep. of	Venezuela	Tajikistan
Iraq	Viet Nam	Timor-Leste
Jamaica	Zambia	Tonga
Jordan	Zimbabwe	Tuvalu
Kazakhstan		Vanuatu
		West Bank and Gaza
		Yemen
89 countries		47 countries

Appendix B. Summary statics

Variable	Type	Mean	Std. Dev.	Min.	Max.	N
1. Dependent variable: Internationally mobile students						
AS_{ij}	Continuous	215.652	1665.297	0	57324.199	2670
2. Covariates						
Dyadic factors						
Networks						
$Stocks_{ij}$	Continuous	5993.318	51290.478	0	2008979	2670
FN_{ij}	Continuous	1.795	3.926	0	35.143	2670
IN_{ij}	Continuous	129.011	961.37	0	26820.6	2670
Linguistic relationships						
COL_{ij}	Dummy	0.053	0.224	0	1	2670
CSL_{ij}	Dummy	0.082	0.158	0	1	2670
CNL_{ij}	Continuous	0.007	0.069	0	0.99	2670
LP_{ij}	Continuous	0.701	1.158	0	5.838	2670
Other dyadic cost variables						
$Dist_{ij}$	Continuous	6224.798	2881.676	169.526	12971.297	2670
$Col45_{ij}$	Dummy	0.018	0.134	0	1	2670
Monodic factors						
Push factors (home countries)						
$GDPcap_i$	Continuous	4921.384	4114.831	449.396	20397.965	2670
Yu_i	Continuous	16.469	11.816	0.700	56.4	2670
$Enrol_i$	Continuous	1.274	3.713	0.004	27.242	2430
AS_i	Continuous	90.529	403.674	0	3544.6	2670
$Conflicts_i$	Discrete ordered	1.931	0.868	0	3	2610
$Tensions_i$	Discrete ordered	2.287	1.193	0	4	2610
$Freedleav_i$	Discrete ordered	1.747	0.485	0	2	2610
$Integration_i$	Discrete ordered	2.471	0.957	0	4	2610
$HEqual_i$	Discrete ordered	2.034	0.940	0	4	2610
$HEadapt_i$	Discrete ordered	1.609	0.863	0	4	2610
$Prospects_i$	Discrete ordered	2.54	0.92	0	4	2610
$Irregular_i$	Discrete ordered	2.241	1.017	0	4	2610
$Merit_i$	Discrete ordered	1.851	0.865	0	4	2610
$Relucthire_i$	Discrete ordered	1.287	0.982	0	3	2610
Push factors (home countries)						
PLI_j	Continuous	92.903	30.564	41.95	152.38	2670
$Enrol_j$	Continuous	0.662	0.783	0.01	2.489	2670
$Genderratio_j$	Continuous	1.34	0.215	0.923	1.835	2670
$HEqual_j$	Discrete ordered	3.533	0.618	2	4	2670
$Ranking1_j$	Continuous	1.09	2.217	0	10.5	2670
$HEadapt_j$	Discrete ordered	2.767	0.883	1	4	2670
$Healthqual_j$	Discrete ordered	3.233	0.955	1	4	2670
$Migrants_j$	Continuous	10.327	5.63	0.768	26.501	2670