

Internationalization in Tertiary Education: Intra-European Students Mobility

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Abstract

The enhanced internationalization and mobility of European students reflects an undoubtedly important aspect of human capital investment. This paper examines the internationalization of European students in tertiary education and the factors that determine the probability of a student moving to a European country other than their own. The main goals of the Bologna Process and a framework of definitions of student mobility are presented, as well as factors that may motivate and hamper this process. A linear regression model of the market shares of intra-European students and a linear regression model of the ratios of foreign incoming/outgoing students of European countries are estimated. Finally, a Classification and Regression Tree (CART) algorithm is applied in order to explain the reasoning behind the decisions of students for long-term study abroad. The paper suggests that policy measures towards increasing student mobility flows will extend economic integration of the countries involved via human capital development and are most likely to increase present and future economic flows in a tangible way.

JEL Classifications: J24, F22, I23

Key words: Educational Economics, Human Capital, Tertiary Education, Student Mobility, Foreign/International Student, Linear Regression Analysis, CART Algorithm

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I. Introduction

In the present era of globalization, which requires increased skills and knowledge, competition is higher among economies and individuals, who consider education as an investment that will, on the one hand, hedge them from unemployment and, on the other hand, broaden their present or future work profile. In contrast to a few decades ago, education needs to be characterized by globally accepted high academic standards. Skills and knowledge obtained by a graduate in one country must be accepted and recognized internationally as equivalent. Governments seeking to ensure sustainable economic and social development for their countries are taking measures to promote the adoption of internationally accepted high academic standards and to encourage the exchange and mobility of students.

Mobility is a basic ingredient of the European political and economic unification process for the creation of a unique European identity. In addition to political and sociological reasons favoring mobility, student mobility contributes directly to the process of human capital formation acquired by young people migrating abroad, which in turn may provide tangible economic effects, both in the destination country and country of the origin as stated by Agiomirgianakis (2006), Agiomirgianakis *et al.* (2004), and Agiomirgianakis and Asteriou (2001). The internationalization of higher education promoted by the related provisions and measures taken by the EU is a prominent example of policy in this direction.

The concept of an international higher education system in the EU stems from a vision of creating an attractive environment where students can study in a variety of European educational institutions, thereby creating mobility and a unique European identity. In 1999 the *Bologna reform process* committed to building a common framework that would enable students to move freely within the *European Higher Education Area* (EHEA) and to study outside their home countries while obtaining full recognition for their qualifications. The overall aim of the *Bologna reform process* is the harmonization of academic structures and the compatibility and comparability of quality assurance standards throughout Europe in conjunction with the breaking down of the existing educational borders in order to make *European Higher Education* globally competitive, especially compared with the USA (European Students' Union: *Bologna with Student Eyes*, 2009).

The means to reach this objective is the removal of several barriers hampering the mobility of students, teachers, and researchers across Europe. After thirteen years of developing the EHEA, there are still many uncertainties about the mobility of students and their real incentives and disincentives. Most of the statistical surveys performed until now have been descriptive and qualitative, and, with very few exceptions, have omitted inferential statistical analysis regarding the factors that may affect the mobility of students (Van Bouwel and Veugelers 2010).

In this paper, we examine the internationalization of higher education students, focusing only on the intra-European market. We present descriptive statistical data and a quantitative

econometric and statistical analysis in an attempt to capture and model any differences regarding the number of students sent and received and the characteristics of countries as net exporters-importers in terms of academic qualifications.

The remainder of the paper is structured as follows. Section II, presents the main goals of the *Bologna Process* and the definitions of student mobility in tertiary education in Europe. We discuss the problem of data accuracy as well as the motives and barriers that students face regarding their decision to study abroad. In Section III, intra-European internationalization descriptive data are presented considering, in the first case, study periods longer than one academic year, and, in the second case, the mobility of students in the Erasmus framework. In Section IV, a linear regression model of the dependence of mobility on quantitative variables is estimated. In Section V, a Classification and Regression Tree (CART) algorithm is used in order to explain the decisions of students for long-term study in a European Union country other than their own based on quantitative and qualitative factors. To the best of the authors' knowledge, this is the first statistical model that has the objective of estimating the probability of students moving from one European country to another while attempting to capture the reasoning behind their decision in a quantitative way. Finally, Section VI contains some concluding remarks and plausible policy implication measures that could potentially improve cooperation in the EU.

II. Students' Mobility in Europe

A. The Bologna Process and its main goals

The higher education transformation known as the *Bologna Process*¹ has already reached its fourteen year crossroad. This declaration was signed in Bologna, Italy on 19 June 1999. Today, the process unites 47 member states and "Bologna" has become a new European higher education brand, recognized in governmental policies, academic activities, and international organizations (*Bologna Follow Up Group Report 2003*²).

Mobility is one of the core elements of the Bologna Process, enabling the development of international cooperation and giving substance to the European dimension of education. It assists the process of personal development, hedges against unemployment by enhancing employability, and encourages the acceptance of diversity, tolerance, linguistic pluralism, and coexistence with other cultures. It provides an opportunity for students to experience a diverse environment where they can develop competences that offer them an added value in the labor

¹ See, e.g. <http://www.ond.vlaanderen.be/hogeronderwijs/bologna/about/>

² <http://www.ond.vlaanderen.be/hogeronderwijs/Bologna>

market. Consequently, higher education can support internationalization through understanding the place of student mobility in the global environment, even though mobility is one of the most complex processes at the individual, institutional, and societal level, as mentioned in *Promoting Mobility*, ESIB (2007). Harmonization of the Bologna Process is structured through formal declarations of European ministers and summit meetings held every two years where ministers issue their conclusions and recommendations³.

At the beginning of the implementation of the *Bologna Process* in 1999, the goal was set to promote mobility by overcoming obstacles, and this was elaborated on in 2001 by stating that all obstacles to the free movement of students, teachers, researchers, and administrative staff should be removed. In 2003 mobility was seen as the basis for establishing the EHEA, while in 2005 the ministers of education confirmed their commitment to facilitating the portability of student grants and loans. In 2007, the responsibility of individual governments to facilitate the provision of visas and residence and work permits was recognized in order to encourage a significant increase in the number of joint tertiary educational programs. Most recently, a target specifying that 20% of students graduating in the EHEA should be mobile by 2020 was introduced in 2009.

B. Data accuracy

Szarka (2003) classified student mobility into “free movers” mobility (referring to students registered at institutions under standard procedures and not through any organized program), and “organized” mobility (referring to mobility encouraged by organized educational programs). In several small size countries, many students study abroad due to the limited provision of courses in their country; Varghese (2008) mentions that those students are sometimes even more than those who choose to remain in their country.

Several descriptive statistical surveys have been carried out presenting tertiary education student mobility. These rely on two institutional data sources, namely *Eurostat* and *Eurostudent*.

Eurostat, the statistical office of the EU, has been using three databases for these surveys: the UNESCO-OECD-Eurostat data collection (UOE), the *European Union Labor Force Survey*, and the *European Union Statistics on Income and Living Conditions*. OECD (Organization for Economic Co-operation and Development) is a forum where the governments of 30 states cooperate to address the economic, social, and environmental challenges of globalization. The Commission of the European Communities also collaborates with the OECD. Its member countries gather information, develop and apply common definitions and criteria for data quality control and verification, and provide the necessary tools to interpret and report the submitted data. The definitions and methodological requirements are available on the

³ http://www.ond.vlaanderen.be/hogeronderwijs/bologna/about/how_it_works.htm

web⁴.

Eurostudent project collates comparable data on the social and economic conditions of student life in Europe. The Eurostudent III survey was carried out between 2005 and 2008 in 19 EU member states and three countries outside the EU, capturing the life of students by surveying them directly.

Lanzendorf and Teichler (2003) stated that reporting student mobility depends to a large extent on countries' immigration legislation, mobility arrangements, and data availability. The OECD allows countries to define as:

- *International students*: those who are not permanent residents of their country of study or, alternatively, those previously educated in another country (regardless of citizenship), depending on the most appropriate operational definition in their national context (OECD, 2010). Permanent or usual residence in the reporting country is defined according to national legislation. In practice, this means holding a student visa or permit, or voting in a foreign country. The country of prior education is defined as the country in which students obtained the entry-qualification, i.e. the one required to enroll in their current level of education.
- *Foreign students*: the non-citizens enrolled in a country (i.e. including some permanent residents as a result of their or their parents' immigration and therefore an overestimate of actual student mobility).

However, it is obvious that these definitions are not perfect and the "best statistics available" are far from the desired level. There is a broad range of problems regarding definitions *per se*, quality of collected data, etc. In general, statistical information systems can only produce time series during long periods and thus are meaningful over time if the data collection system is not changed according to political fashion. The major problems of current student mobility statistics according to Kelo *et al.* (2006) are the lack of comprehensive data on "mobility" and the incomplete coverage of short-term mobile students. More specifically:

- Errors occur due to administrative problems, incomplete reporting, possible manipulation of data by the individual institutions of higher education, etc.
- Data might be inaccurate regarding the reporting of tertiary educational institutions. For example, in some countries, a number of tertiary education students are not included in the official education statistics.
- National policies vary substantially regarding part-time students, distance education students, students in short programs not leading to regular diplomas and degrees, students in programs leading to sub-degree certificates and diplomas, students in adult and continuing professional education, students in preparatory courses, participants of language courses and summer schools, students in internships, "guest" students, and finally short-term mobile students.

⁴ http://circa.europa.eu/Public/irc/dsis/edtc/library?l=/public/unesco_collection

- Data quality differs by education levels, which are classified according to the revised *International Standard Classification of Education (ISCED)*⁵. In general, data quality is high for students in undergraduate programs of tertiary education and master's programs, while short and often vocational programs are less clearly structured and organized and incomplete information is provided for the number of persons preparing for advanced degrees.
- There are cases of double-counted students, e.g. in countries where students can enroll in more than one field of study or when a student is enrolled in two different programs at the same time or at two different institutions of tertiary education.
- There is a lack of data on outwards-mobile students who are not registered in most countries, thus statistics can only be produced if all countries worldwide register inwards-mobile students. In that case, the number of outwards-mobile students of a certain country is calculated by adding up all inwards-mobile students who went from this country to all the other countries.

Regarding the category of foreign students, there are additional sources of errors, and it is still unclear if they actually affect the available data:

- Cross-border educational programs might be handled inconsistently across countries.
- Foreign students could be reported incompletely/inconsistently in general statistics.
- Foreigners may not be considered as foreigners in official registers and statistics after a period of residence, study, or work, even though their nationality has not changed.
- Data on foreign students might be incomplete by sectors.
- Finally, a serious problem in this context is the undercount of short-term mobility. Practices of recording short stays abroad vary in statistics on foreign students.

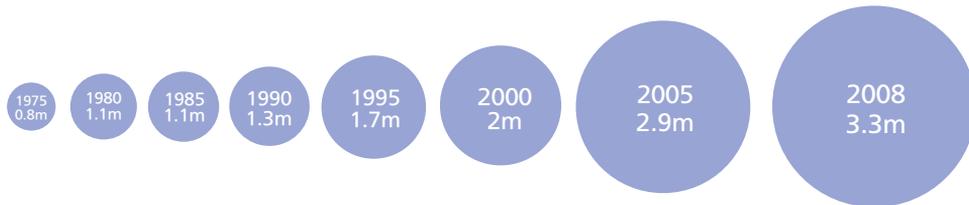
The data for foreign students are the only directly comparable data that is available now because not all countries are able to report data on international student mobility. Nevertheless, there is a need for caution in interpreting the results because of the above mentioned problems and the fact that the numbers of foreign students are accumulated based on different timescales as relevant time series are not yet available for study periods of one full academic year or more.

C. Motives and barriers for European student mobility

Over the past three decades, the number of students enrolled worldwide outside their country of citizenship has risen dramatically, from 0.8 million worldwide in 1975 to 3.3 million in 2008, a more than threefold increase as illustrated in Figure 1.

⁵ www.oecd.org/edu/eag2009

**Figure 1. Long term growth in the number of students outside their country of citizenship
(Growth in internationalisation of tertiary education 1975~2008, in millions)**



(Note) Data on foreign enrolment worldwide comes from both the OECD and the UNESCO Institute for Statistics (UIS). UIS provided the data on all countries for 1975~1995 and most of the partner countries for 2000, 2005 and 2008. The OECD provided the data on OECD countries and the other partner economies in 2000, 2005 and 2008. Both sources use similar definitions, thus making their combination possible. Missing data were imputed with the closest data reports to ensure that breaks in data coverage do not result in breaks in time series.

(Source) OECD (2010) and UNESCO Institute for Statistics.

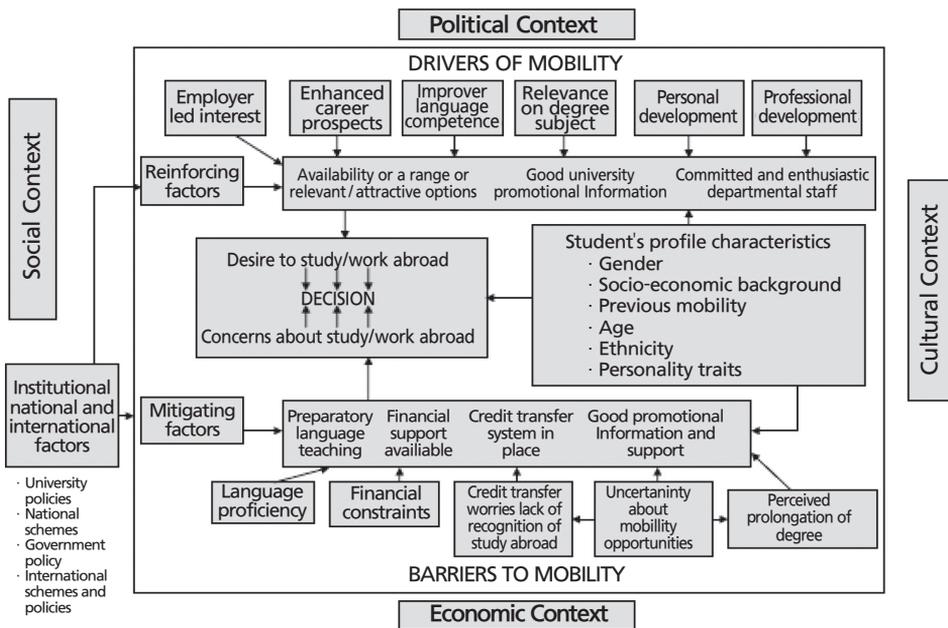
The growth of foreign student numbers in tertiary education in Europe can be attributed to several reasons:

- Globalized economies have led to a higher degree of dependency on each other.
- European unification process required harmonization of rules, means and measures that guarantee the mobility of all Europeans.
- EU countries are obliged to treat students from other EU member states as their “home students”.
- The wide utilization of new technologies has ensured faster, safer, and in some cases less expensive transportation and communication (OECD, 2010).

The results of the increasing number of mobile European students are obvious in government educational policies. For example, in several countries (e.g. Luxembourg), a study-related stay abroad (training course, internship) is mandatory before obtaining a degree in some master programs. In France, engineers are urged to spend time abroad for linguistic reasons, as an acceptable level in English is required to graduate. In Austria, students from polytechnic institutes are required to spend one semester abroad. In a further group of small size European countries, student mobility is intense.

The generic schema of the decision making process of students regarding mobility is illustrated in Figure 2:

Figure 2. Student mobility decision making process



(Source) HEFCE(2004)

From Figure 2, it can be concluded that the drivers and barriers of student mobility can be categorized into those having national-international characteristics and into those based on the personal profile features of students. The major underlying factors that either enhance or discourage students in their choice that were examined in this paper belong to the first group and they are: language, financial aspects, immigration policy/migration networks in host countries, perceived academic superiority of the institutions in the host countries (causing “brain drain” in the origin countries), and geographical-ideological-cultural affinity, as stated in Altbach and Teichler (2001), Altbach and Knight (2007), and Guruz (2008). More specifically:

Language

The language spoken and used in instruction is an essential element in the choice of a foreign country to study. Countries whose instruction language is widely spoken and read (e.g. English, French, German, and Russian) are leading destinations of foreign students in Europe. The almost universal use of English in scientific literature is unquestionable. Within the non-English speaking countries of Europe, higher education institutions provide an increasing number of classes and even full degree programs taught in English. On the other hand, lack of language proficiency is a major obstacle; therefore, the majority of higher education institutions receiving foreign/international students offer intensive courses in the language of the host country.

Financial aspects

A country with a labor market characterized by high wages and low unemployment and with universities offering access to its labor market can attract a larger number of students because of the promising prospects of higher employability and better salary profiles for students after their studies. On the other hand, tuition fees, cost of living, and insufficient support from the home country are also important factors in prospective foreign/international students' choice of country. This tends to lead to inequalities and exclusion of students who do not have additional sources of income.

Impact of immigration policy and migration networks on foreign student destinations

In recent years, several OECD countries have eased their immigration policies to encourage the temporary or permanent immigration of foreign/international students. Migration networks also play a role. For instance, Portuguese students study in France, Turkish students in Germany, etc.

Academic superiority in the host countries - brain drain in the origin countries

Key player countries in the foreign/international European student market have education organizations with a long tradition in teaching and research, high credibility for their academic standards, and implement impressive marketing strategies to target potential students. They provide studies at internationally renowned "world-class facilities" with high academic reputations and top positions in the ranking lists of European universities⁶. Verbik and Lasanowski (2007) stated that they have the capacity to provide "better" knowledge than other competitor countries, and this is a major reason why they manage to recruit more foreign/international students. On the other hand, a brain drain through mobility is mostly feared in those countries that send out more students than they receive from abroad, provided that this accounts for a critical mass of students. For example, the Central and Eastern European countries tend to suffer from a brain drain to Western Europe. Human capital theory argues that a brain drain of highly qualified persons should be prevented because it constitutes an economic factor. Within the EU, it has turned out empirically that any brain drain (often connected to vertical mobility and less to horizontal mobility) is comparatively low, while mobility of highly qualified labor has increased. Kehm (2005) in particular analyzed the fact that the smaller European countries have made efforts to prevent a brain drain while fostering international mobility.

Geographical-cultural-historical factors

Cultural considerations, geographic proximity, and similarity of education systems are important determinants of the choice of destination. Geographic considerations and similarities

⁶ e.g. <http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/europe.html> , <http://www.arwu.org/Europe2009.jsp>

in entry requirements are likely explanations of the concentration of students, for instance from Germany in Austria, from Belgium in France and the Netherlands, from France in Belgium, between Nordic countries, etc.

Concluding this section, several other factors of the first group that affect student choices that could be examined in future research are: the transparency-flexibility of programs regarding the time spent abroad, the restrictiveness of university admission policies at origin country, etc. In addition, factors of the second group include several student profile characteristics like the level of family education separation from the family or from a partner, a possible rejection from national educational systems after failure in examinations, a multiple choice selection of candidate universities in different countries, rejection from the first or second choice.

III. Intra-European Internationalization data

A. Long-term study periods

In Table 1, Foreign students in tertiary education from the 50 European sovereign states are having the 23 European OECD countries and 3 non-OECD European countries (Estonia, Russian Federation, and Slovenia) as a destination in 2008 are depicted. They are also combined by country of origin with each country's respective market share of intra-European foreign students depicted as percentage of enrolled European foreign students. The reason for examining only these 26 European destination countries is that they are the ones with available relevant data and they can be considered to host the major European educational institutions⁷. In Table 1 the symbol n is used in case the magnitude is either negligible or zero. The symbol α is used in case data is not applicable. It has to be noted here that data for Montenegro is incorporated into data for Serbia for the examined time period.

⁷ <http://www.arwu.org/Europe2009.jsp>

Table 1. Number of foreign students enrolled in tertiary education and percentages of all foreign students from Europe-wide enrolled in the examined 26 destination countries

Country of origin	Country of destination														
	OECD Countries														
	Austria	Belgium	Czech Republic	Denmark	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Luxembourg	Netherlands	
	1	2					5				6			5	
CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	CIT	
OECD countries															
Austria	a	46	24	45	39	492	6 419	32	122	15	42	181	5	248	
Belgium	117	a	7	48	28	2 763	963	22	10	1	58	197	95	2 193	
Czech Republic	622	58	a	71	42	751	2 016	10	44	13	29	181	10	143	
Denmark	104	37	5	a	48	200	492	8	5	68	21	52	4	165	
Finland	180	41	7	210	a	284	721	16	21	43	41	79	6	197	
France	517	16 650	41	236	153	a	5 784	60	63	50	448	1 013	241	822	
Germany	17 464	675	286	1 461	423	6 918	a	393	1 640	103	467	1 591	240	16 554	
Greece	300	435	151	74	58	1 926	5 627	a	166	1	52	4 537	19	670	
Hungary	1 391	103	41	166	115	584	2 212	15	a	8	21	169	12	261	
Iceland	24	5	5	1 747	21	36	89	1	62	a	6	7	1	79	
Ireland	63	56	48	44	31	392	358	2	127	3	a	35	3	125	
Italy	6 733	1 757	30	223	173	5 009	7 318	91	41	29	233	a	63	640	
Luxembourg	537	1 614	n	4	3	1 551	2 562	2	2	n	10	41	a	58	
Netherlands	204	4 056	15	237	80	652	1 544	19	13	10	62	118	8	a	
Norway	74	17	259	2 411	76	324	489	3	700	34	90	69	n	329	
Poland	1 637	494	279	817	190	3 260	13 891	114	44	31	209	1 430	17	844	
Portugal	116	770	369	56	31	2 612	1 519	9	19	n	33	130	236	282	
Slovak Republic	1 470	67	18 621	65	24	399	1 415	6	2 178	8	16	205	8	101	
Spain	473	886	24	193	122	3 905	4 692	27	50	32	187	504	24	812	
Sweden	175	62	112	1 796	532	441	612	25	331	48	71	123	1	201	
Switzerland	708	105	12	81	26	1 613	2 235	33	13	12	20	1 143	1	175	
Turkey	2 346	293	53	373	94	2 270	23 881	148	133	4	36	465	4	874	
United Kingdom	243	241	410	472	200	2 519	1 723	102	104	38	1 421	247	7	827	
Total from OECD countries	35 498	28 468	20 799	10 830	2 509	38 901	86 563	1 138	5 888	551	3 573	12 517	1 005	26 600	
Non-OECD countries															
Albania	218	108	49	20	24	437	767	5 940	11	2	7	11 787	4	56	
Andorra	n	1	n	n	n	143	1	n	n	n	n	1	n	1	
Armenia	49	87	52	18	11	482	422	154	5	n	1	40	n	24	
Azerbaijan	47	19	36	8	6	164	445	4	18	n	n	20	n	29	
Belarus	141	70	355	56	25	517	2 096	n	14	n	12	259	2	67	
Bosnia and Herzegovina	2 742	23	67	272	26	145	2 906	25	10	1	6	374	10	43	
Bulgaria	1 161	233	123	186	75	2 222	10 552	625	32	9	25	803	18	737	
Croatia	1 440	29	72	24	23	122	4 476	12	146	1	11	1 270	3	76	
Cyprus	32	18	172	3	3	242	209	14 377	307	n	14	106	n	36	
Estonia	50	17	3	220	681	128	691	8	10	10	13	51	1	65	
Georgia	143	36	54	13	6	409	2 705	182	25	n	4	74	2	32	
Gibraltar	n	n	n	n	n	n	n	n	n	n	1	n	n	n	
Holy See	n	n	n	n	n	1	1	n	n	n	n	3	n	n	
Kazakhstan	51	93	332	14	27	200	989	37	18	5	11	36	1	35	
Latvia	62	24	9	239	61	165	848	6	5	11	18	66	3	125	
Liechtenstein	163	n	n	1	n	3	25	n	n	n	2	n	1	n	
Lithuania	94	39	11	490	99	237	1 577	3	4	22	40	199	3	107	
Malta	4	a	n	2	2	17	22	n	1	1	6	55	1	7	
Moldova	100	42	79	24	11	794	794	98	37	2	8	685	1	25	
Monaco	n	1	n	n	n	306	n	n	n	n	2	8	n	n	
Romania	897	420	43	285	134	3 844	3 859	163	3 134	5	72	3 151	32	324	
Russian Federation	588	575	1 405	386	1 291	3 347	12 501	351	204	24	75	949	19	450	
San Marino	n	n	n	n	n	1	5	1	n	n	n	778	n	n	
Serbia	1 497	103	127	21	12	479	2 177	123	1 310	4	n	209	26	48	
Slovenia	653	23	20	18	17	98	606	1	31	n	8	328	5	71	
The Former Yugoslav Rep. of Macedonia	343	24	63	n	6	124	866	58	7	1	n	355	3	71	
Ukraine	707	184	907	225	115	1 307	8 787	252	1 372	6	14	737	1	220	
<i>Europe not specified</i>	25	6	4	173	n	741	603	3	11	4	10	33	n	54	
Total from non-OECD European countries	11 206	2 179	3 983	2 698	2 655	16 775	58 931	23 423	6 712	108	360	22 377	136	2 702	
Total from Europe	46 704	30 647	24 782	13 528	5 164	55 676	145 493	23 561	12 600	659	3 933	34 894	1 141	29 302	
European Market share, 2008	6.3	4.1	3.3	1.8	0.7	7.5	19.5	3.2	1.7	0.1	0.5	4.7	0.2	3.9	

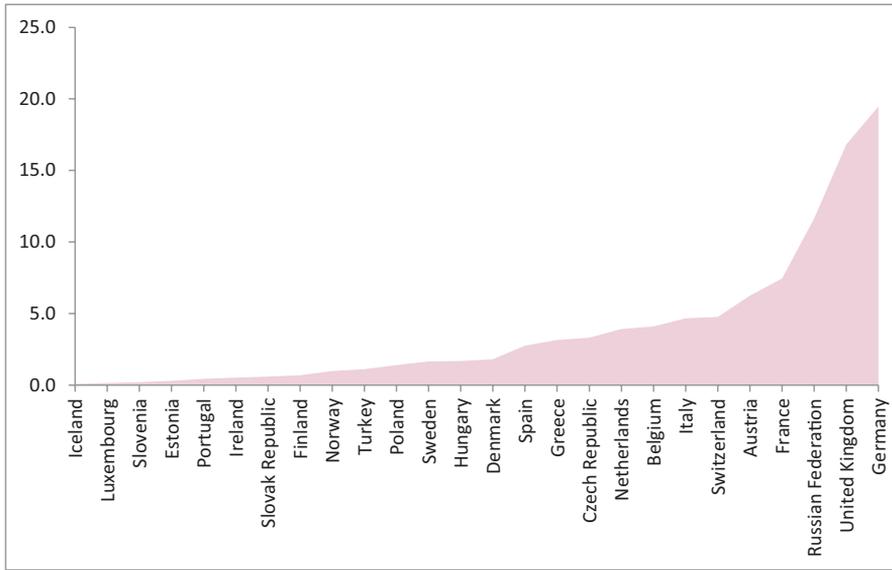
(Note) The proportion of students abroad is based only on the total of students enrolled in countries reporting data to the OECD and UNESCO Institute for Statistics.

1. Excludes tertiary-type B programmes.
2. Excludes data for social advancement education.
3. Reference year 2007.
4. Excludes private institutions.
5. Excludes advanced research programmes.
6. Excludes part-time students.

(Source) OECD (2010), authors' Calculations

These results are better illustrated in Figure 3.

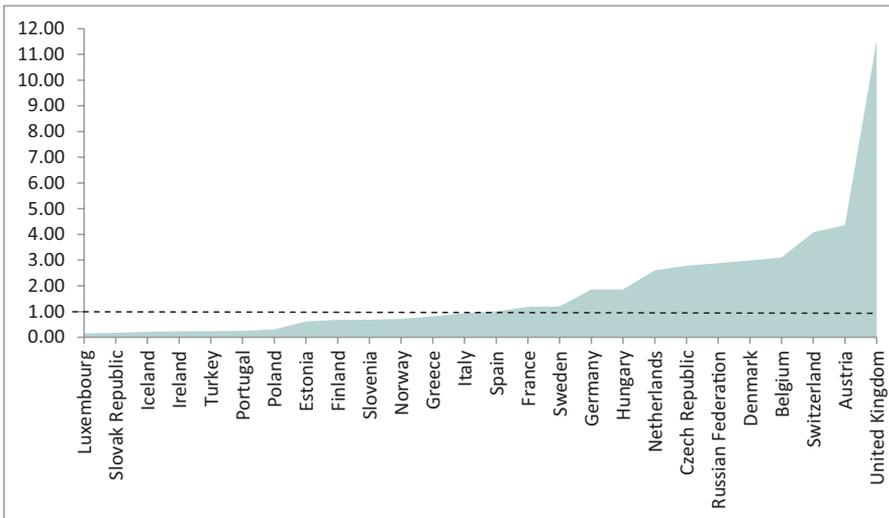
Figure 3: Incoming foreign student percentage market shares for the 26 examined European destination countries.



It can be deduced that the major European destination countries (in increasing order of intra-European market foreign student shares) are Netherlands, Belgium, Italy, Switzerland, Austria, France, Russia, the UK, and Germany, having a total share of 79.2%. Consequently, the vast majority of European students that decide to study in a European country other than their own enroll to one of these nine countries. An interesting fact is that these percentages differ significantly compared with the respective distribution of worldwide foreign students (OECD, 2010). Also, Germany is the most attractive country for European students that study abroad. On the other hand, the UK and France are much more diverse markets and attract many students from Asia, Africa, etc. Finally, it seems that the size of the country is not directly related to its foreign student market share as, for example, the UK and Germany are considerably smaller countries than Russia, but their market shares are greater.

It can be concluded, at least in terms of the intra-European market, that European countries with high foreign student market shares and high incoming mobility can be regarded as “net exporters” of academic qualifications, while the opposite is true for the remaining countries, i.e. they are “net importers” of academic qualifications. This is something that becomes more evident in Figure 4, which illustrates the incoming/outgoing student ratios for the 26 countries examined.

Figure 4. Incoming/outgoing student ratios for the 26 examined European destination countries



For the countries with a ratio greater than 1, although only inside the relatively limited European student market compared with the global market, it is obvious that they can be considered as academic qualification exporters, whereas the remaining countries can be considered as academic qualification importers. Compared with Figure 3, significant differences exist as it is evident that countries with high student market shares have comparatively lower ratios and vice versa. For example a UK student, having a high quality tertiary educational system, seems not to be very interested in studying abroad. Finally, it is quite reasonable to assume, although there is no reliable data available yet, that the majority of the remaining 24 European countries that were not considered as destinations in the previous analysis are academic qualification importers.

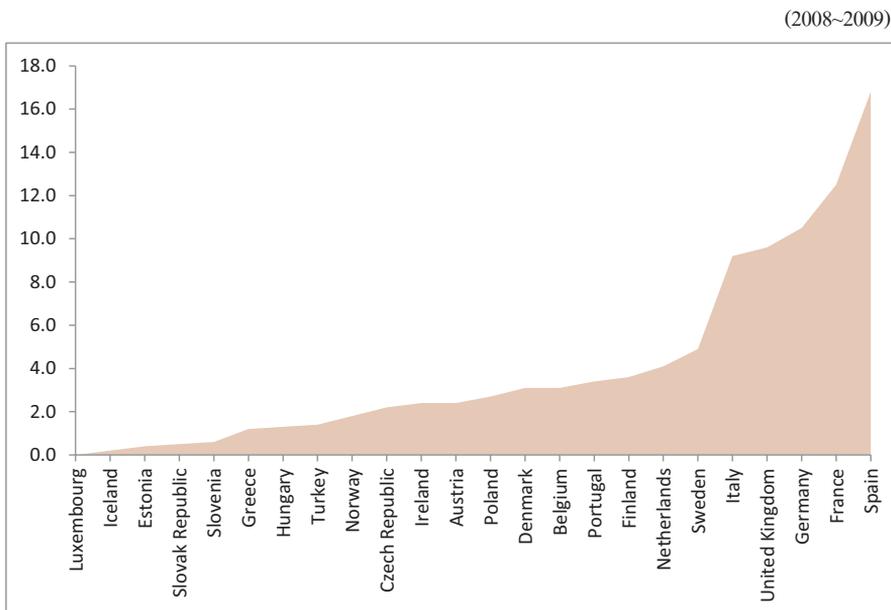
B. Erasmus student mobility

Student exchange programs are excluded theoretically from the UOE data on mobility. These programs are characterized by a relatively short duration (usually of one academic semester), and they are called “exchanges” because originally the goal was an exchange of students between different countries. No trade-off is actually required; therefore, a student is allowed to go to another country without finding a counterpart in that country to exchange with. Various European programs were created to support learning mobility across Europe. The most famous of them is probably Erasmus, often considered the European Union’s flagship mobility program.

Erasmus data do not present the volume of exchanges, i.e. the number of students, but they

do present the number of visits abroad by those participating in the related programs. In Figure 5, the percentages of incoming Erasmus students for 24 countries (the 26 countries examined in the previous section excluding Russia and Switzerland) for the academic year 2008~2009 are illustrated⁸. Comparing Figures 3 and 5, although the countries with high foreign student market shares in Europe attract many Erasmus students, significant differences exist because of the short-term nature of the program and the co-operation between the educational institutions of the host and origin countries.

Figure 5. Percentages of incoming students under the Erasmus program



IV. Statistical Analysis

The objective of the developed statistical models in this section is to estimate the percentage market shares of foreign students and the incoming/outgoing student ratios of the 26 destination European countries by modeling their correlation with some of the major factors that may affect student choice regarding the country of study. The short term mobility of students under the Erasmus program is excluded from the following analysis and left as an open research topic for the future. The main reason for this exemption is that the nature of the Erasmus program

⁸ http://ec.europa.eu/education/erasmus/doc920_en.htm

and the existing agreements between the educational institutions of host and origin countries constitute factors that affect student decision making regarding the selection of a country for study.

At this point it should be noted that our data may underestimate the number of students studying abroad. Indeed, data on international and foreign students in the UOE statistical surveys used are obtained from enrolments in destination countries. As Tremblay (2001) mentions, students are usually counted on a specific day or period of the year and this can provide an estimate of the proportion of foreign enrolments in an education system, but the actual number of individuals involved may be much higher since many students study abroad for less than a full academic year or participate in exchange programs that do not require enrolment, for example, inter-university exchange or advanced research short-term mobility. Unfortunately, there is no data regarding the exact percentage of this underestimation yet. Statistical analysis was performed using the SPSS for Windows version 17 package and a significance level of 5%.

An estimation of the percentage market shares of foreign students and the incoming/outgoing student ratios of the 26 destination European countries presented in Section III is attempted. It has to be stressed that relevant time series are not yet available regarding foreign students mobility; therefore, the following variables were selected using data from the year 2008, which were the latest available regarding foreign students (OECD, 2010):

PERC: Foreign student percentage market shares.

RATIO: Incoming/outgoing student ratios.

UNIRANK: Quality of University Ranking as a proxy of the perceived quality of the tertiary educational institution.

According to the Academic Ranking of World Universities (ARWU) at <http://www.arwu.org/Europe2009.jsp> compiled by Shanghai Jiao Tong University and now maintained by the Shanghai Rankings Consultancy, normalized values summing up to one were assigned to the 26 countries, quantifying and rating the perceived quality of tertiary educational institutions.

GDP: Gross Domestic Product per capita (in thousand euros) (www.cia.gov).

UNEMPL: Unemployment percentage rates (OECD, 2010).

COMP: Employees' compensation (in million euros) (OECD, 2010).

CPL: Logarithms of Comparative Price Levels (<http://epp.eurostat.ec.europa.eu>).

Some descriptive statistics for variables *PERC* and *RATIO* are illustrated in Table 2.

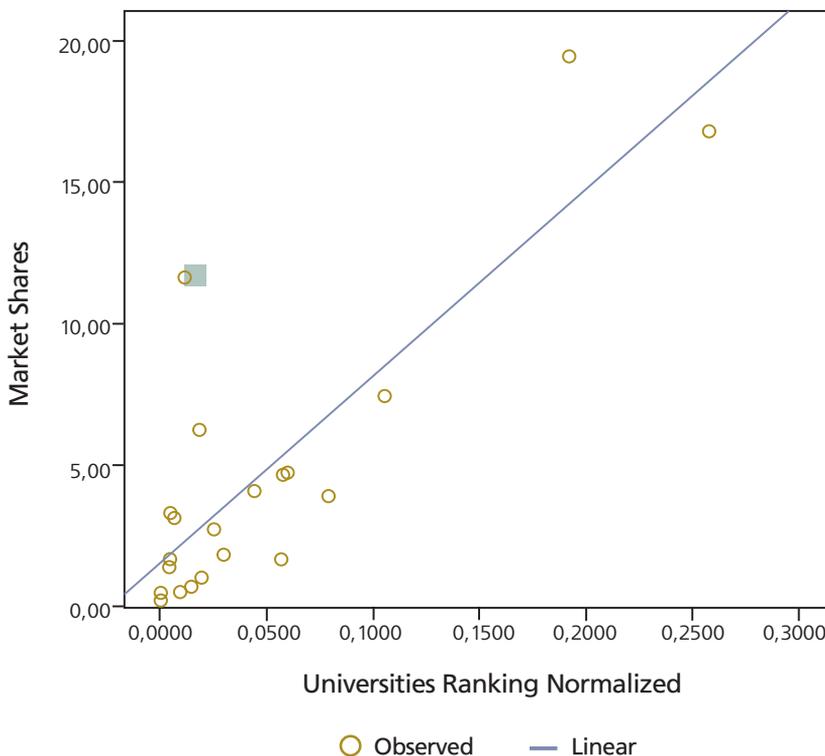
Table 2. Descriptive statistics for variables PERC and RATIO

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<i>PERC</i>	26	0.10	19.50	3.8538	5.01033	2.102	.456	4.134	.887
<i>RATIO</i>	26	0.15	11.54	1.8250	2.35009	3.048	.456	11.676	.887
Valid N (listwise)	26								

Then the continuous variables *PERC* and *RATIO* were tested to determine whether or not they follow the normal distribution by using a one-sample Kolmogorov-Smirnov non-parametric test. This test is used to compare a sample with a reference probability distribution, which in the case examined is the normal distribution. The Kolmogorov–Smirnov statistic quantifies a distance between the empirical distribution function of the sample and the cumulative normal distribution function. The null distribution of this statistic is calculated under the null hypothesis that the sample is drawn from the normal distribution (normality assumption).

For both variables the normality assumption is not violated (p -value=0.10 and 0.11, respectively). Since normality was ensured, a regression analysis was performed with *PERC*, in the first case, and *RATIO*, in the second case, as the dependent variable in order to assess their correlation with the other four independent variables, a methodology used or proposed by many researchers such as Altbach and Teichler (2001), Altbach and Knight (2007), Guruz (2008), Agiomirgianakis (2006), Agiomirgianakis *et al.* (2004), and Agiomirgianakis and Asteriou (2001). Indeed, in the first case, where the dependent variable is the percentage market share of foreign students in the destination countries, it is reasonable to assume that it is significantly correlated with the quality of the tertiary education system. This is illustrated in Figure 6.

Figure 6. Foreign student percentage market shares vs. Normalized university ranking



From Figure 6, it is obvious that, with the exception of the Russian Federation, which is depicted by the black square around the dot, a linear equation with *UNIRANK* fits *PERC* data adequately. Consequently, a linear regression model with five independent variables (*UNIRANK*, *GDP*, *UNEMPL*, *COMP* and *CPL*) was tested. The statistically significant independent variables are *UNIRANK* ($p\text{-value}=2.195 \cdot 10^{-9} < 0.05$) and *CPL* ($p\text{-value}=0.007 < 0.05$). Multicollinearity, i.e. the case where two or more independent variables in a linear regression model are highly correlated, does not exist between them and the model's $R^2=0.7958$, which indicates that the model fits *PERC* data well, explaining 79.58% of their variability. The estimated linear equation is:

$$\widehat{PERC} = 26.555 + 74.025UNIRANK - 12.881CPL \tag{1}$$

The other three variables were not statistically significant. This may be explained by students basing their decision to study abroad mostly on the academic reputation of the destination country and on the cost of living there. The negative sign in *CPL* may be explained by the decrease in the number of incoming students in a country if the cost of living in that country for a student is high, including tuition fees, rental cost, etc.

An interesting observation is that the high percentage market share of foreign students in the Russian Federation, even though the ranking score of its universities is not very high, may be explained by a number of reasons such as (a) the large number of students that it attracts from its neighboring countries and (b) historical reasons dating from the policy of the ex-Soviet Union, which create both an agglomeration effect and a language-familiarization effect. Thus, the case of the Russian Federation is something that is worth investigating further in the next section.

In the second case where the incoming/outgoing student ratio is considered as the dependent variable, the linear regression model with the five independent variables used was tested. A single statistically significant independent variable was observed, namely *UNIRANK* (with $p\text{-value}$ equal to 0.000008). The model's $R^2=0.779$, which indicates that the model fits *RATIO* data well, explaining 77.9% of their variability. The estimated linear equation is:

$$\widehat{RATIO} = 1.81 + 52.67UNIRANK \tag{2}$$

The residuals' descriptive statistics for the two models are illustrated in Table 3.

Table 3. Descriptive statistics for the residuals for the two regression models

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Unstandardized Residual - model 1	21	8.00261	-4.04000	3.96261	0E-7	.39480729	1.80923427	3.273	.130	.501	.642	.972
Unstandardized Residual - model 2	19	4.80992	-2.16098	2.64894	0E-7	.28334997	1.23509389	1.525	.310	.524	-.400	1.014
Valid N (listwise)	19											

Consequently, although a number of factors are examined in an effort to find which ones may significantly affect the flow of foreign students, one can safely conclude that the quality competitiveness of a country's tertiary education system enhances the country's market share in the foreign student educational market both by attracting students and by deterring native students from migrating abroad. Living-cost considerations are also important in attracting international students.

V. Estimating Probability of Student's Mobility

An interesting research topic is the estimation of the probability of students moving from one European country to another and attempting to discover the reasoning behind their decision. For example, describe the "profile" of Germans and French that study in Austria and Belgium, respectively, explain why Russian Federation attracts students from its neighboring former USSR countries, why Greece enrolls large number of Cypriot and Albanian students, etc. Accordingly, factors affecting student decisions that originate from their own countries, including any implications arising from the several kinds of relationships between European countries, will be incorporated in the analysis.

The developed statistical model's objective is to estimate the probability of students moving from one European country to another and attempting to discover the reasoning behind their decision in a quantitative way. The drivers and barriers of student mobility can be categorized into those that have national-international characteristics and those that are based on the personal profile features of students. The present analysis focuses on the first group, where the examined major underlying factors that either enhance or discourage students in selecting a country of study are: language, financial aspects, immigration policy/migration networks in host countries, perceived academic superiority of the institutions in the host countries, and geographical-ideological-cultural affinity. These factors were proposed by Altbach and Knight (2007) and Guruz (2008).

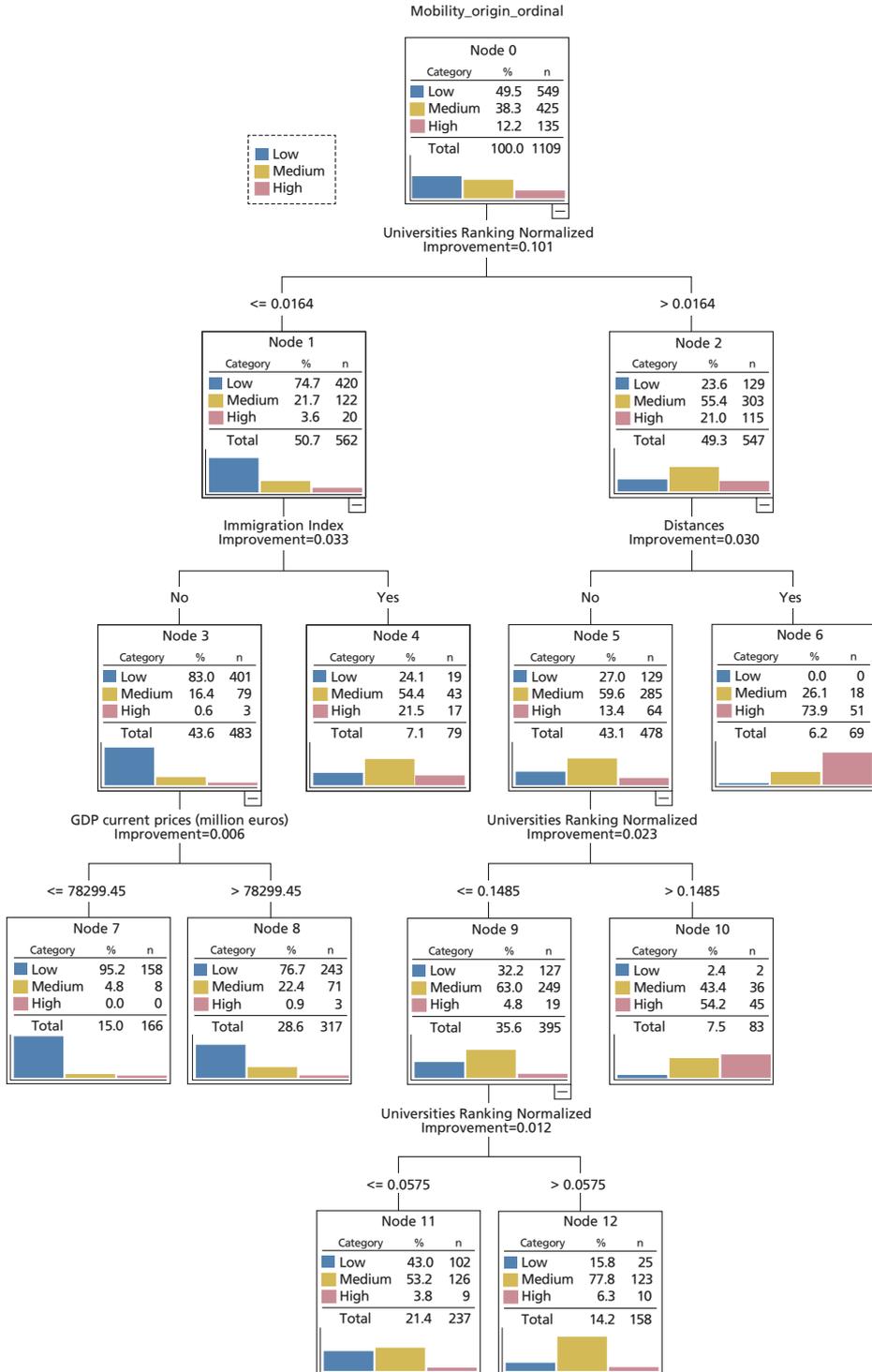
The methodology utilized was decision trees analysis and, more specifically, a univariate-

split CART (*Classification and Regression Trees*) algorithm by Breiman *et al.* (1984). For the 26 destination and the 50 origin European countries, all the possible pairs were formed and, after excluding not applicable and unavailable data, a sample of 1,109 pairs was created. Then for each case the following variables were selected:

- (1) *Mobility_origin_ordinal*: According to Table 1, the numbers of foreign students enrolled in tertiary education by country of origin were transformed to percentages, which in turn were classified into three categories of probability level, namely Low, Medium, and High, which each included approximately 50%, 40%, and 10% of the cases respectively, arranged in non-decreasing order of the percentage of students enrolled from the origin country.
- (2) *University Ranking Normalized*: The variable *UNIRANK* used in the previous regression analyses.
- (3) *GDP*: the same as in the previous analyses.
- (4) *Distances*: a binary variable indicating if two countries have common geographical borders.
- (5) *Language*: a binary variable indicating if two countries have the same official state language.
- (6) *Culture*: a binary variable indicating if two countries have significant cultural similarities according to Ronen and Shenkar (1985) and the authors' opinion.
- (7) *Immigration Index*: a binary variable indicating if there is a significant population minority (higher than 0.1% of the total population) from the origin country in the destination country (Eurostat, 2009a and 2009b).

CART algorithm was then implemented with *Mobility_origin_ordinal* as dependent variable and the remaining six items from the above list as the predictor independent variables. For all the statistical tests, a significance level of 5% was used. The resulting tree diagram is illustrated in Figure 7.

Figure 7. CART algorithm tree diagram



The tree diagram displays detailed results within each node, which are numbered. The results of the CART tree show 7 sample segments that yield different probabilities for students to move from their origin to a destination country, details for which are displayed in each of the tree's 7 terminal nodes. The largest percentage of high student mobility is obtained from segment 6, defined as pairs of countries with common geographical borders and a normalized university ranking above 0.0164. Terminal node 6 shows that there are a total of 69 pairs of countries in this segment and the percentage of high student mobility between them is 73.9%. This explains the fact that many Germans study in Austria, French in Belgium, etc. The next high student mobility segment is obtained from pairs of countries where the destination countries have very high normalized university ranking, i.e. Germany and the UK (terminal node 10), and the percentage of high student mobility to these two countries is 54.2%. Segment 4 is also worth mentioning, which contains cases where the destination countries have a tertiary educational system that is not considered of very high quality, but they have a significant population minority from the origin country (for example the Russian Federation attracts students from its neighboring former USSR countries, Greece enrolls large numbers of Cypriot and Albanian students). The percentage of high student mobility in terminal node 4 is 21.5%. The implementation of the CART algorithm classifies correctly the percentage of foreign students by country of origin in 71.1% of the cases (Table 4).

Table 4. CART algorithm- observed vs. predicted cases

	Predicted				Percent Correct
	Low	Medium	High		
Observed	Low	401	146	2	73.0
	Medium	79	292	54	68.7
	High	3	36	96	71.1
	Overall Percentage	43.6	42.7	13.7	71.1

VI. Conclusions

The political and economic importance of international student mobility and the efforts taken by the EU to increase it have resulted in an enhanced need for comprehensive, up-to-date, and reliable estimates. To satisfy this need, information about the effects of mobility and statistical data are required. While the plethora of statistical surveys published by national governments, specialized agencies, research institutes, and international organizations, such as

the OECD, UNESCO, and the EU, may give the impression that there is no shortage of quality data on foreign/international student mobility, this is a rather misleading impression because the available data are not (always) the data that is needed as stated by Kelo *et al.* (2006b). The data limitations are widely known and have been thoroughly explained and accepted by scholars and public services. In addition, there is a large requirement for inferential statistical analysis.

Tertiary education institutions play a major role in equipping students with the tools to overcome the threat of unemployment by offering academic qualifications and the opportunity for students to develop their skills and abilities; however, it must be accepted that student mobility between European countries is not balanced. Several patterns based on geographical affinity and migration networks and a flow of students towards large European countries with advanced tertiary educational systems are visible. This inequality could be attributed, to some extent, to fund shortages in some parts of Europe, but it may also result from a short-sighted vision of the dynamics of cooperation. European countries are characterized by a diversity of languages, cultures, religions, and priorities that have resulted in segmented national/ethnic markets with regard to academic qualifications. Unfortunately, this diversity has been seen to a large extent as an obstacle rather than as an advantage for achieving a European identity.

Using quantitative methodology, this paper shows that the percentage market share of foreign students of a country is positively related to the academic quality of that country's tertiary education system and negatively related to a high cost of living. Also, the ratio of incoming/outgoing students in a destination country depends positively on the academic quality of its tertiary education system. Finally, an estimation was done for the probability of students moving from one European country to another.

The aforementioned results have some clear policy implications: First, if a country aims to enhance its share in the foreign student educational market then it should significantly improve the competitiveness of its tertiary education system. Second, foreign student mobility may be affected positively in the near future because of a rapid increase of immigration and generic citizen mobility within Europe as a result of both institutional measures undertaken by the EU and the seriousness of the economic crisis that has occurred in several (mostly southern) European countries. Decisions about studying abroad have to be made in consideration of living-costs and a student's budget for education. In countries with more stable financial conditions student decisions may be less affected by high living-costs, whereas students in countries affected by the crisis may choose less expensive destinations and public rather than private institutions (OECD, 2010). Policy measures towards increasing student mobility flows will not only extend economic integration of the countries involved via human capital development, but they are also most likely to increase tangible present and future economic flows.

Provided that consistent time series regarding student mobility are available, the next research step would be to utilize more extensive data, i.e. add more years to the empirical analysis in this paper so as to form panel data, thereby increasing the efficiency of the estimators. Finally,

it has to be noted that there are several other factors that affect student choices that could be examined in future research, such as the transparency and flexibility of programs regarding the time spent abroad towards degree requirements, the restrictive university admission policies of origin countries, and government policies to facilitate transfer of credits between home and host institutions.

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Appendix. Web-pages available on 20 October 2012

<http://www.oecd.org/edu/eag2009>

<http://www.ond.vlaanderen.be/hogeronderwijs/Bologna>

http://circa.europa.eu/Public/irc/dsis/edtc/library?l=/public/unesco_collection

http://ec.europa.eu/education/erasmus/doc920_en.htm

<http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/europe.html>

<http://www.arwu.org/Europe2009.jsp>

<http://www.cia.gov>

<http://epp.eurostat.ec.europa.eu>