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A Gestão do Ensino Superior e o Desenvolvimento dos Países e Regiões de Língua Portuguesa: Desafios Globais, Experiências Nacionais e Respostas Institucionais

Mobilidade de estudantes ERASMUS na União Europeia: uma aplicação do método fuzzy[1,2,3]

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[3] CHAIA/UÉ: UID/EAT/00112/2013.

Resumo

As Instituições de Ensino Superior (IES) estão entre as mais relevantes instituições da União Europeia, contribuindo, entre outros, para a melhoria do conhecimento e do capital humano, para a criação e disseminação de conhecimento científico bem como para a promoção de inovação e maior desenvolvimento tecnológico. A mobilidade de estudantes e docentes entre instituições e países é um fator que promove a aproximação entre os países, entre sistemas de ensino superior e um maior conhecimento das respetivas características, necessidades e potencialidades. Desde os anos 80 que a proximidade entre os estudantes deste nível de ensino, nos países membros da União Europeia, se tem vindo a reforçar através da mobilidade de estudantes, designadamente por via do programa ERASMUS.

Num primeiro momento, este estudo pretende analisar a existência de correlações entre as características dos diferentes países de acolhimento e os fluxos de estudantes ERASMUS que se dirigem a cada país. Os dados usados neste estudo são relativos i) às características do sistema de ensino superior nos países da União Europeia, ii) fluxos de estudantes ERASMUS, iii) características económicas e sociais dos países da União Europeia. Os dados foram analisados com recurso a métodos de estatística descritiva bem como à metodologia *fuzzy* que visa conhecer as condições necessárias e suficientes relativas à atratividade dos países da União Europeia bem como dos fluxos de estudantes ERASMUS. Os resultados já obtidos permitem verificar a correspondência entre os fluxos de estudantes ERASMUS com as características sócio económicas bem como com as características do sistema de ensino superior.

Considerando os resultados obtidos, discutiremos as possibilidades bem como as vantagens/desvantagens da conceção de um programa de mobilidade semelhante ao ERASMUS no espaço da lusofonia.

Palavras-Chave: Método *Fuzzy*, Ensino Superior, ERASMUS, Mobilidade de Estudantes, Desenvolvimento Territorial

ERASMUS student mobility in the European Union: an application of the fuzzy method

Abstract

Higher education institutions are among the most important institutions of the European Union countries. These institutions contribute, inter alia, to the improvement of the academic training, the creation and dissemination of scientific knowledge and the promotion of innovation and technological development.

The mobility of students and teachers promotes a stronger liaison and cooperation between countries and higher education systems as well as a better knowledge of their characteristics, weaknesses and potentialities.

Since the 1980s, the proximity between students, at this education level, in these countries has been reinforced through mobility programs, including the ERASMUS program.

This research intends to analyse the existence of correlations between the characteristics of the different host countries and the ERASMUS student's flows that they host. The research question that underlies this study is: The size of the higher education system is related to the characteristics of the country and the attractiveness of both is proportional?

Data used in this research are relating to (i) the characteristics of higher education systems in European Union countries, ii) ERASMUS student flows, iii) economic e social characteristics of the European Union countries. The data are analysed using descriptive statistics methods and with the fuzzy methodology that aims to know the necessary and / or sufficient conditions of the attractiveness of the countries in relation to the ERASMUS students flows.

Considering the results obtained, we will discuss the possibilities and the advantages / disadvantages of designing a mobility program similar to ERASMUS in the Portuguese-speaking world.

Key-words: *Fuzzy* method, Higher education, ERASMUS, Students mobility, Territorial Development

Introduction

Higher education institutions (HEI) are among the most important institutions of the European Union countries. These institutions contribute, inter alia, to the improvement of the academic training, the creation and dissemination of scientific knowledge and the promotion of innovation and technological development. The globalization, in turn, promote relevant challenges in higher education systems, among which the increase of international exchange programs and deeply competitiveness among students at international level (Brandenburg & de Wit, 2011).

The mobility of students and teachers, among others, promotes a stronger liaison and cooperation between countries and higher education systems as well as a better knowledge of their characteristics, weaknesses and potentialities. In the European Union framework, the promotion of internationalization of higher education, held by governments and HEI, intend to establish networks through cooperation programs based on the mobility of academic staff and students. The recent literature in this field show that international cooperation in higher education has been strengthened through the creation of "double grade" programs as well as through participation in international research projects which encourages the mobility of students, teachers and researchers (Dias, 2012). Since the 1980s, the proximity between higher education students, in these countries, has been reinforced through mobility programs, including the ERASMUS program.

This research intends to analyse the existence of correlations between the characteristics of the different host countries and the ERASMUS student's flows that they host. The research question that underlies this study is: The size of the higher education system is related to the characteristics of the country and the attractiveness of both is proportional? Data used in this research are related to (i) the characteristics of higher education systems in European Union countries, ii) ERASMUS student flows, and iii) economic e social characteristics of the European Union countries. The data are analysed using descriptive statistics methods and with the fuzzy methodology that aims to verify the existence of necessary and / or sufficient conditions for the attractiveness of the countries in relation to the ERASMUS students flows. After this brief introduction, the text proceeds with a literature review section and thereafter with an explanation of the methods and data used as well as the results obtained. We conclude with some final remarks.

1. Literature Review

1.1. Higher Education in the European Union Countries

Higher education systems in the EU are among key networks in the countries and are characterized by great diversity. This diversity results from the difference of their origin as well as the underlying cultural and social values in the countries. The set of typologies in higher education in Europe can be summarized as follows (Rego, Abreu & Cachapa, 2013): small or large-scale establishments, focus on research or teaching institutions, located on campus or in the heart of cities, based on e-learning, specialized or extended, public or private; profitable or non-profit; national or international institutions; market or public service oriented. In the European Union countries, higher education is widespread and attended, in most countries, by a large proportion of young people.

Higher education system intends to answer to several challenges simultaneously: on the one hand, to the needs of economic and productive activity, through technological developments and innovation; on the other hand, through education and training, based on increased knowledge and investigation as well as the skills of individuals. In the knowledge society context, which the European Union aims to consolidate, besides teaching and research functions, HEIs should extend the access to higher education, train skilled workers with the focus on knowledge economy, business innovation, knowledge transfer and continuous development professional (Rego, Abreu & Cachapa, 2013). Beyond the challenges already identified, higher education systems intend to answer to the increase in the number of students, the diversity of teaching-learning models, the decrease in public funding and the greater importance of research and innovation, as well as stronger competition between HEIs.

Figure 1 shows the total number of students in higher education. It illustrates a part of the diversity that characterizes higher education in the European Union and which we have been talking about: the differences in size of the systems, in terms of the number of students is very large, which also reflects the differences in the countries size. In fact, access to higher education in most countries is widespread and this degree can be accessed by those who wish to do so.

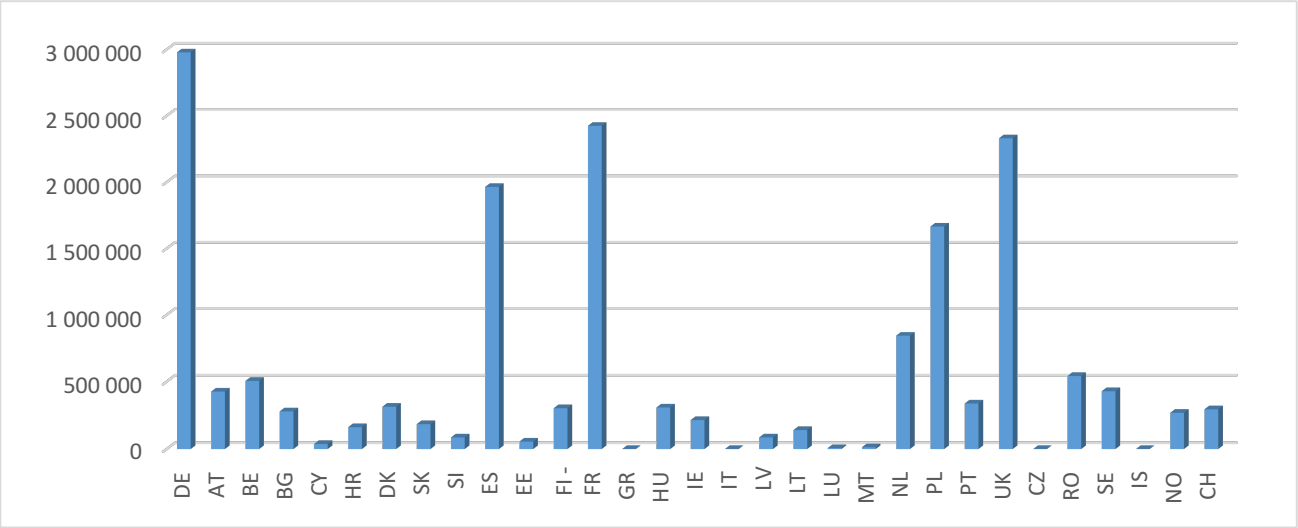

Figure 1. Number of students enrolled in Higher Education (Total, 2015)
Source: PORDATA

Besides that, the demand for higher education has been increasing, although the different countries have distinct levels of qualification of the population. This is due to factors such as the capacity to access the system, the social and individual evaluation of education benefits as well as the wage premiums associated with higher education. The current characteristics of higher education systems as well as the overall level of qualification of the population result not only from the investment that has been made in recent years but also from the countries' cultural and historic heritage as well as their geographical, social and economic characteristics.

1.2.Erasmus mobility

The ERASMUS program, created in 1987, aims to promote the mobility of higher education students, teachers and other academic staff. This program takes place mainly in the countries of the European Union. ERASMUS, through the promotion of mobility, aims to enable participants to expand their knowledge and gain new skills. It intends to promote the internationalization and the excellence of education and training in European Union, through inovation, criativity and enterpreneurship as well as to reinforce the social cohesion, equality and active citizenship, in the framework of Europe 2020 strategy objectives.

Its origin goes back to the multinational project of educational cooperation entitled Erasmus of Rotterdam,[4] created in 1987 by the French President François Mitterand and the Students Association Aegee Europe with the aim of boosting European citizenship and spreading the learning of languages and cultures. Since it's foundation, ERASMUS program had a huge evolution and is no longer intended only just for higher education students. Since 2014, ERASMUS has been designated as ERASMUS+, once actually it also covers other areas, such as personal and teaching training, internships, cooperation projects between universities, research units, enterprises, NGOs, national, regional and local authorities as well as other socioeconomic actors, in the Europe and elsewhere. Thus, the target people, in addition to students of higher education, are also students of training educational programs, youth and sports, lifelong learning, among others. The aim is to contribute to the promotion of economic growth, social cohesion and the creation of employment, while providing young people with an opportunity for professional and personal development. From ERASMUS to ERAMUS+, more than 9 million people have already benefited from this Exchange program, and is therefore considered to be the most successful EU program – an example of the positive impact of European integration and its international extent. The most popular destinations are France, Germany and Spain, with 4,000 institutions of Higher Education. In Portugal, in 1987, when the country joined the program for the first time, 25 students benefit from ERASMUS; in 2014, there were 7 thousand.

In higher education and youth domains, ERASMUS+ program supports collaborative actions also with Partner Countries. Although the countries of the program are the EU Member States, and the Associated States (such as Turkey, Norway, Iceland, Liechtenstein and former Yugoslav Republic of Macedonia), there are other partner countries within and outside Europe that can benefit from these collaborative actions. Among them, Portuguese speaking countries are included as program partners: Angola, Brazil, Cape Verde, Guinea Bissau, Equatorial Guinea, Mozambique, São Tomé and Principe and Timor and the so called Special Administrative Region of China, Macao.

[4] Humanist and Dutch theologian who, during the Renaissance, defended the idea of a unified Europe without frontiers.

2. Data and Methodology

In order to realize the main conditions that promote Erasmus demand in the several countries under study, we use fsQCA methodology. The main objective of this tool is to verify which conditions are most important to be considered necessary and/or sufficient to achieve a given outcome. This methodology therefore implies identification of the conditions and the outcome to be used. Regarding the outcome, we will use the Erasmus flows in 25 countries (see Figure 2). As for the conditions, Table 1 present the data collected from the European Commission.

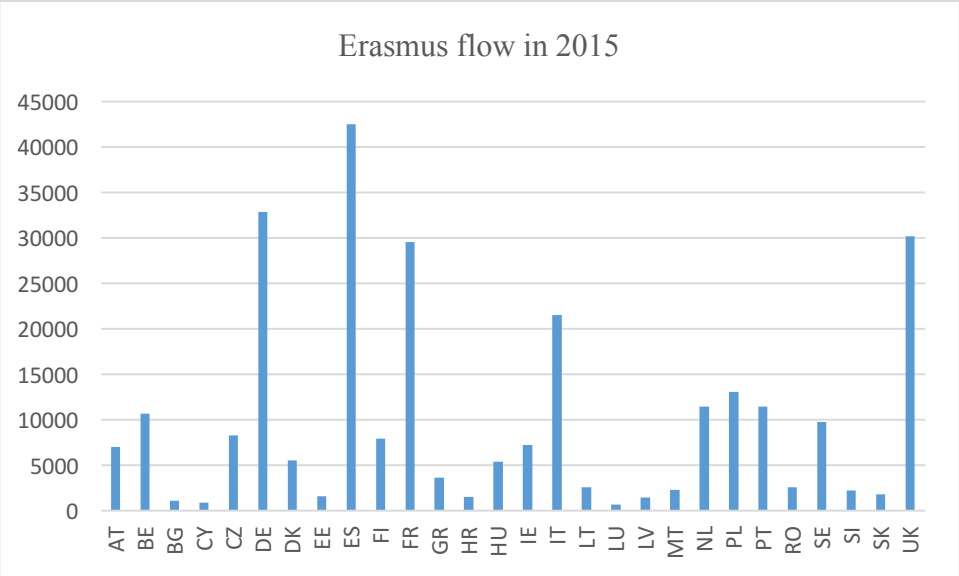

Figure 2. Erasmus Students Incoming for the 25 countries under study (2015)
Source: Data provided by National Agency ERASMUS

Table 1. Data used for the fsQCA analysis

Data	*Year*	*N. obs*
ERAMUS	2015	25
GDP PC	2015	25
Total Employment Rate	2015	25
Students in Higher Education (Total)	2015	25
Expenses in Public Education (pps)	2012	25
Hospital Beds for 100,000 inhabitants	2013	25
Population Density	2014	25
Youth Dependence Index	2014	25
Population Employed in Secondary Sector	2014	25
Population Employed in Terciary Sector	2014	25

Source: Own elaboration

The fsQCA is a qualitative methodology which, according to Vis (2012), reveals the minimum combinations for a given specific result. In fact, fsQCA is only one of the alternatives that allow comparative qualitative analysis, since it is possible to use this type of analysis with binary variables (crispy-set QCA) or with multivalued variables (multivalue QCA). For more information, see, for example, the work of Ragin (2008).

Introduced in the literature by Ragin (1987), comparative qualitative analysis has been developed ever since (see, for example, Ragin, 2008 or Wagemann & Schneider, 2010). Used mainly in social sciences, such as sociology, in recent years, it has also been used in areas such as economics or management. For example, we can find studies on countries' economic performance (Vis *et al.*, 2007), export performance (Schneider *et al.*, 2010), economic growth (Ferreira & Dionísio, 2016a), innovation (Ferreira & Dionísio, 2016b) or entrepreneurship (Khefacha & Belkacem, 2015 or Ferreira & Dionísio, 2016c).

Since the aim here is to study the conditions for better performance in a country attraction level, and not to make estimates of this attractiveness, fsQCA becomes an appropriate approach when compared with regression analysis. In fact, fsQCA does not make a pure cause-and-effect analysis but rather analyzes different combinations of conditions of a given problem (Ragin, 2008). Another important point is that this methodology is suitable for use with any type of sample size (see, for example, Vis, 2012).

It is important to note that fsQCA has the capacity to capture the existence of necessary and sufficient conditions. The necessary conditions are measured by the "consistency", which measures the degree to which each case corresponds to a theoretical set for a given solution. In other words, it is intended to know what proportion of cases is consistent with a particular result. Therefore, we use a consistency measure introduced by Ragin (2006), which attributes severe penalties to inconsistencies in results.

To analyze the sufficient conditions, the truth table algorithm (see, for example, Ragin, 2008) is used. This is an algorithm that groups central and peripheral causal conditions and can provide three different solutions: parsimonious, intermediate, and complex. The complex solution does not use simplifying hypotheses in the model, a situation that usually hinders interpretation of the results. At the opposite extreme is the parsimonious solution, which reduces the causal conditions to the smallest possible number. As for the intermediate solution, it includes certain assumptions selected by the researcher, namely the type of relationship that is expected between the conditions and the result (Ragin,

2006). In this paper, as in other studies, a combination between the intermediate and the parsimonious solution is used.

While regression analysis normally uses data directly from the source, in the fsQCA it is necessary to codify data. The basic reasoning behind the calibration is that coding of the variable in a range defines several points of the variable: the fully in point (1), the fully out point (0) and the point of "neither in nor out" (0.5). According to Ragin (2000), a fuzzy set is a continuous measure for which an investigator establishes, for each condition and for the result, a value of belonging to the set (fully in, for which the variable takes the value of 1), a non-set value (fully out, for which the variable takes the value of 0) and a crossover point (0.5). The coding process causes all conditions and the result to take values ranging from 0 to 1. This process is called calibration.

Data calibration was based on a percentile approach. According to Ragin (2008), this approach is appropriate when the data in question are continuous, as with the data for the factors. Through this approach, the fully in point corresponds to the 95th percentile, the fully out to the 5th percentile and neither in nor out to the 50th percentile. The same criterion was used for all conditions and outcomes. The current version of the fs / QCA software package (2.5) was used.

3. **Results**

As mentioned before, the main goal of this research is to evaluate the relation between the characteristics of the different host countries and the ERASMUS student's flows that they host. The research question that underlies this study is: the size of the higher education system is related to the characteristics of the country and the attractiveness of both is proportional?

Our first step is the evaluation of the necessary conditions. Results are presented in Table 2, and according to Fiss (2011) we will focus on results which level of consistency is above 0.8.

It is interesting to note that some conditions are important as necessary conditions, namely the number of students in Higher Education system, the expenses in public education and also the total population employed in secondary and terciary sectors. Results make sense and, somehow, are expected.

Table 2. Necessary conditions for attractiveness for ERASMUS

Conditions tested:	*Consistency*	*Coverage*
GDP PC	0.775	0.683
~GDP PC	0.593	0.506
Total Employment Rate	0.732	0.576
~Total Employment Rate	0.599	0.579
Students in Higher Education (Total)	**0.936**	**0.868**
~Students in Higher Education (Total)	0.499	0.407
Expenses in Public Education (pps)	**0.935**	**0.942**
~Expenses in Public Education (pps)	0.519	0.395
Hospital Beds for 100,000 inhabitants	0.660	0.513
~Hospital Beds for 100,000 inhabitants	0.614	0.602
Population Density	0.654	0.659
~Population Density	0.614	0.602
Youth Dependence Index	0.708	0.662
~Youth Dependence Index	0.588	0.476
Population Employed in Secondary Sector	**0.846**	**0.835**
~Population Employed in Secondary Sector	0.576	0.446
Population Employed in Terciary Sector	**0.881**	**0.863**
~Population Employed in Terciary Sector	0.544	0.424

Source: Own elaboration

We follow our analysis with the analysis of sufficient conditions, following the procedure proposed by Ragin & Fiss (2008) which display the intermediate solution and identify core conditions (larger symbols) and peripheral conditions (smaller symbols). Table 3 show the results for sufficient conditions for higher attractiveness for ERASMUS students.

Results about sufficient conditions reveal that the existence of important number of related conditions to higher attractiveness for ERASMUS students. In fact, there in any condition by itself that could be considered sufficient. It is necessary to joint several conditions to have a robust solution. For example, the first solution indicates that the population employed in the secondary and terciary sectors, the level of expenses in public education, the number of students in higher education and the GDP are, as an all, a sufficient condition to the increase of the Erasmus flow in a particular country. Somehow, we may believe that these results make sense, since the conditions under study are evidence of the level of development of the country, the possibility of employment and also the level of the public education.

Table 3. Sufficient conditions for higher attractiveness for ERASMUS

	raw coverage	unique coverage	consistency
Youth Dependence Index*Expenses in Public Education (pps) * Total Employment Ratet*GDP PC	0.497256	0.084523	0.982647
Pop Employed Terciary *Pop Employed Secondary *Expenses in Public Education *Students Higher Education *GDP PC	0.657519	0.062569	0.993366
Pop Employed Terciary Sector*Pop Employed Secondary Sector*Expenses in Public Education *Students Higher Education*Population Hospital Beds	0.461032	0.059276	0.933333
solution coverage: 0.801317			
solution consistency: 0.955497			

Source: Own elaboration

Final Remarks

The ERASMUS program, since 1987, involved more than 9 million people. In the Portuguese case, in the academic year 2014/2015, the Portuguese HEIs hosted more than 11 thousand students from the more than 300 thousand who travelled; in 2013/14, about 7000 Portuguese students left the respective HEIs in ERASMUS to other countries. These cooperation processes involve countries with very distinct higher education systems and that values higher education differently.

The main goal of this research is to evaluate the relation between the characteristics of the different host countries and the ERASMUS student's flows that they host. The results obtained shows de following:

- Necessary conditions for attractiveness for ERASMUS: the dimension of higher education systems as well as the public funding to the education policy and the employment market are strongly related with ERSAMUS student's attraction in the EU countries;
- Sufficient conditions for higher attractiveness for ERASMUS: All the conditions show us the strength relationship between the ERASMUS incoming flows and the

dimension of higher education system, the economic dynamic as well as the public policy in social areas. All these variables reflected, in they own way, some contribution to the improvement of competitiveness and cohesion in the EU countries.

Being known the necessary and suficiente conditions, what lessons can we draw in terms of public policy proposals? In summary, from this perspective the results obtained suggest that:

- It is necessary to invest in the quality of higher education systems;

- It is necessary to promote employment for high skill persons, specially in secondary and tertiary sectors, and,

- The necessary conditions are also sufficient, when combined with health system and economic dynamics, which reinforce the countries attractiveness.

Given that this subject has not yet been exhausted, in the future we intend i) to promote a survey and questionnaire to the Erasmus students in several European countries, in order to understand the motivations for the selection of specific destinations for the Erasmus process as well as ii) deepen the analysis of countries and higher education systems adding, for example, some more socioeconomic variables related to the external attraction of the countries (e.g., touristique demand) and international notoriety of higher edcuation systems.

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