



# University or polytechnic? A fuzzy-set approach of prospective students' choice and its implications for higher education institutions' managers<sup>☆</sup>

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## ABSTRACT

This study aims to provide a deeper knowledge of the factors behind undergraduates' choice of an higher education institution (HEI) in Portugal. Based on Chapman's model (1981), this study presents the results of a survey on the personal characteristics and institutional drivers that influence this choice. The survey results in a sample of 368 Portuguese secondary or vocational education students in their final year who intend to apply to a public HEI. To the best of the authors' knowledge, this study is the first to apply the fuzzy-set qualitative comparative analysis to this field of study. The findings indicate that the choice criteria of prospective students are the same irrespective of whether they are applying to a university or a polytechnic school. Among the criteria, job opportunities and the institution's reputation are the most important. Thus, managers should account for these criteria when seeking to increase their institution's competitive advantage.

## 1. Introduction

In the context of the competition in “global market for higher education” (Mazzarol & Soutar, 2012), this study investigates what factors influence the students' choice of a higher education institution (HEI). This topic has attracted wide interest not only from the academic community but also from the managers of educational institutions. The literature on this topic finds that this choice results from a highly complex process in which both institutional and personal factors have an influence (see, e.g., Briggs & Wilson, 2007). The factors that the literature frequently identifies are cost, location, institutional reputation, and job opportunities; but it also identifies financial conditions or the opinions of others (see, e.g., Briggs & Wilson, 2007). From the students' point of view the choice is a “highly perceived risk decision” due to the long-term implications for their lives and careers (see, e.g., Simões & Soares, 2010). The high diversity of institutions and courses increases the complexity of this choice (Price, Matzdorf, & Agahi, 2003), which the students do not always manage systematically and logically (Moogan, Baron, & Harris, 1999), or with complete information (Chapman, 1981). Being able to know which criteria shape prospective candidates' decisions allows HEI managers to focus more on

improving communication and marketing strategies, recruitment programs, international partnerships, and on diversifying the offers of degrees and courses (Maringe, 2006; Però, Soriano, Capilla, Olmos, & Hervás, 2015; Sarkane & Sloka, 2015; Teixeira, Rocha, Biscaia, & Cardoso, 2012). This is especially important in a context of intensified global competition between institutions to attract the best students in the face of funding cuts and a decrease in the number of applicants, which is due mainly to low birth rates.

The aims of the study are first, to use fuzzy-set theory to test the most relevant personal and institutional factors in these choices and second, to explore whether an underlying hierarchy exists within each set of factors. Portugal is an empirically appropriate country to study because it faces the same trends as other countries, such as competition, funding cuts, and a decrease in applications due to low birth rates and high dropout rates, particularly at the secondary school level. The need to keep up with the competition has led Portuguese HEIs to implement important changes in their governance, operations, and management (Santiago, Carvalho, Amaral, & Meek, 2006; Santiago, Carvalho, & Cardoso, 2015). However, Portugal is unique in that it also is a country where public universities and polytechnics coexist, have relatively low tuition fees, and where the former has a more prestigious reputation.

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The sociological research has identified Portugal as a society in which mixed forms of dualism coexist (Nunes, 1964). While Portugal has a younger population with education levels similar to those of the most developed countries in Europe, its older population still has very low qualifications. This situation invites reflection on the importance of education (Horta, 2010), especially the choice of courses and HEIs after secondary school.

The study is divided into six parts. After the Introduction, Part 2 presents a short characterization of the dual Portuguese higher education system, which is made up of universities and polytechnics. Part 3 reviews the factors that influence students' choice when choosing which specific HEI to attend and identifies the research gap that this study aims to respond to. The research design is described in Part 4. As the study applies fsQCA, we provide a justification for the adequacy of this method as well as its requirements and calibration. Part 5 presents and discusses the results, and Part 6 concludes the study and describes its limitations and future avenues for research.

## 2. The Portuguese higher education system

The Portuguese higher education system comprises two kinds of institutions with different characteristics: universities and polytechnics (also known as universities of applied sciences). In the public system, universities and polytechnics share some criteria with input from the government: (1) nationwide coordination of the number of applications allowed, (2) similar tuition fees, and (3) common standards for ranking students' degree preferences and their grades in secondary school and on national exams. In contrast, in the private sector each institution determines the number of available applications and the value of tuition fees.

Portugal has 14 public universities out of 54 and 15 public polytechnics out of 75 (CHEPS, 2013). The government determined this binary distinction between universities and polytechnics in the late 1980s (Education System Act, Law 46/86, 14 October) and further reinforced it during the implementation of the Bologna three-cycle system (Veiga & Amaral, 2009). The Agency for the Assessment and Accreditation of Higher Education (A3Es) initiated degree and program accreditations in 2009. But this system does not show any statistical differences between universities and polytechnics, which are measured by the percentage of nonaccredited study programs (Sin, Tavares, & Amaral, 2016). In the 2014 to 2015 academic year, Portugal had 349,658 students in the higher education system: 67% in universities and 33% in polytechnics. Of those, 83% of the students attended public institutions and 17% attended private ones (DGEEC, 2015). Some of these institutions have various campuses in different regions. Seven of the public polytechnics are in underdeveloped areas in the interior of Portugal; and the universities are mainly in cities (CHEPS, 2013).

## 3. Drivers influencing the undergraduate choice of a HEI

The process of choosing a HEI is very complex (Chapman, 1981; Moogan & Baron, 2003) and depends on several factors and multiple influences (Briggs & Wilson, 2007; Simões & Soares, 2010). Various studies tend to approach this matter based directly, or indirectly, on two sets of factors: institutional and personal. This division goes back to Chapman's seminal essay of 1981 in which the author presents a longitudinal model on students' decision-making that combines a set of personal characteristics (current and background) and external influences. The personal characteristics include socioeconomic status and the levels of educational aspiration, achievement, and aptitude. Family income is one of the most relevant aspects of the socioeconomic status because it has important influence on prospective students' choice of a HEI. Students' educational expectation levels reflect their hopes and perceptions about their future performance. The research has proven that these expectations are positively correlated with high school performance. Student's achievement depends on their aptitude and serves

as a criterion for acceptance by a HEI. Achievement also allows students to judge if a certain university is adequate for them; they tend to prefer a HEI where they can find other students with similar levels of achievement (Chapman, 1981).

External influences incorporate important persons (e.g., family, friends, and high school personnel), HEIs' characteristics (e.g., cost, financial aid, location, availability of desired courses program, and campus environment), and HEIs' efforts to communicate with students (e.g., written information, campus visits). Chapman's model considers an HEI's characteristics as fixed even if it intends to change them because those changes will take time before they affect an HEI's reputation in the eyes of prospective students. The HEI's efforts to communicate with students are more flexible, and its marketing department can use them to attract new students.

Chapman (1981) clearly points out that his model does not pretend to be exhaustive in including all possible factors that influence the choice process. Further studies either have consolidated the importance of some factors or have helped to extend Chapman's model with additional external influences such as the reputation of the institution, location, academic life, availability of courses, educational facilities, and job prospects (Drewes & Michael, 2006; Harris, 2009; Kallio, 1995; Ming, 2011; Moogan & Baron, 2003; Nurlida, Faridah, Nooraini, & Norzaidi, 2010; Peró et al., 2015; Price et al., 2003; Rochat & Demeulemeester, 2011; Ruslan, Ariffin, Islam, & Zaidi, 2014; Sia, 2013; Sojkin, Bartkowiak, & Skuza, 2012, 2015).

Despite the numerous recent studies on the topic, no consensus exists on the multiple factors that affect the students' choice of an HEI (Simões & Soares, 2010). For instance, Kallio (1995) identifies location and work-related concerns as the main factors that affect the choice of a university. Connor, Pearson, Court, and Jagger (1996) find that tuition fees as well as the location and the supply of courses are important factors. Drewes and Michael (2006) conclude that location, scholarships, and nonacademic student services expressively influence the students' choice. Briggs (2006) and Briggs and Wilson (2007) identify the HEI's reputation as being the most important decision factor for students. Further, Sojkin et al. (2015) add the importance to students of the courses offered, the cost of studies, and the accessibility of financial aid to the list of factors. More recently, Peró et al. (2015) find that in Spain, gender and the area of study influences the relative importance of many assessment factors, such as academic reputation, geographic location, and courses. In line with these perspectives, Sarkane and Sloka (2015) show that the main factors in the students' choice of HEI are household budget, university's reputation, and job opportunities. The literature also includes individual variables that seem to be related to students' choice of an HEI, such as gender, number of siblings, parents' level of education, or the family's average monthly income (Anelli & Peri, 2015; Denzler, 2011; Goodman, Hurwitz, Smith, & Fox, 2015; Paulsen, 1990). The parents' level of education is an important facet of the family's background, which has proved to influence the choice of an HEI, particularly the choice between a university or a polytechnic (Denzler, 2011). Students from more privileged family backgrounds tend to prefer universities. Likewise, students also tend to be influenced by their older siblings. As pointed out by Goodman et al. (2015), younger and older siblings' choices are very closely related. Additionally, Anelli and Peri (2015) find that the siblings' gender also affects students' HEI choice, namely which degree they decide to pursue. It is also probable that the number of siblings in families of a lower socioeconomic status can influence not only the decision to proceed with academic studies, but also the choice of a specific HEI because of the education costs.

Despite the abundant literature regarding the two main sets of factors that influence students' choice, a research gap remains regarding the possibility of a presumed hierarchical structure within each set of factors. In other words, prospective students are likely to not equally weigh each sub-factor when making their decisions. Personal and institutional factors could be subdivided into first and second order conditions, or sub-factors in terms of students' preferences. At the top of

the hierarchy, students rank the dimensions that are nonnegotiable and then the ones they value the most.

#### 4. Methods

##### 4.1. Qualitative comparative analysis

This study uses a fuzzy-set qualitative comparative analysis (fsQCA). By using this analysis, the study lines up well with “human thinking, particularly in the domains of pattern recognition, communication of information, and abstraction” (Zadeh, 1965, p. 338). Similar to the way human manages information, fuzzy-set theory can explore the configurational paths that come from multiple interdependent factors.

FsQCA provides a unique middle ground between qualitative and quantitative methods that overcomes many of their limitations (Ragin, 2008) and allows for a valid explanation of the complexity at the case level and generality across cases (Woodside & Zhang, 2013). Further, several fields in the social sciences, including political science, sociology, and management, use this method (e.g., Bell, Filatotchev, & Aguilera, 2014; Cress & Snow, 2000; Crilly, 2011; Crilly, Zollo, & Hansen, 2012; Fiss, 2011; Gilbert & Campbell, 2015; Misangyi & Acharya, 2014; Woodside & Zhang, 2013). Fuzzy sets “welcome” a certain degree of ambiguity that is present in several social science constructs. By coding the information into values between zero and one, the fuzzy set reflects the degree of membership in each class (Zadeh, 1965) and thus is consistent with the principle of fuzzy information granulation and fuzzy logic, which is central to human cognition and to decision-making (Zadeh, 1983, 1997). FsQCA allows both equifinality, which permits multiple successful solutions to emerge, and asymmetric causality, which allows the configurations that lead to a “failure” to differ from the configurations that lead to “success” (Fiss, 2007, 2011). Therefore, this type of analysis is well suited to analyze combinations of conditions (causal combinations) for a given outcome (Greckhamer, Misangyi, Elms, & Lacey, 2008). This method also avoids the limitations of regression-based techniques both computationally, due to collinearity and power issues, and in terms of interpretation (Fiss, 2011; Rihoux & Ragin, 2009). This problem is overcome by the use of set-theoretic methods that allow for parsimonious and robust causal inferences while allowing for the use of multiple causal configurations (Meyer, Tsui, & Hinings, 1993; Ragin, 2008; Smithson & Verkuilen, 2006). Consequently, the use of a fuzzy-set analysis allows for the undoing of complex structures (Basedau & Richter, 2014) and consequently for better modeling of the phenomenon under investigation. Following Woodside and Zhang (2013), this study applies the fsQCA 2.5 software ([www.fsqca.com](http://www.fsqca.com)) to test several conditional arguments related to the choice of an HEI.

##### 4.2. Data collection

The data were collected in 2016 using an online questionnaire sent to 1267 students in a nationwide database who have explicitly allowed contact by email for research purposes. All of the students were in their final year in Portuguese secondary or vocational school and intended to apply to a public HEI. The response rate was 29% that equals 368 eligible questionnaires. The questionnaire was pretested twice: first, through face-to-face interviews with a group of volunteer students to check the adequacy of the instrument; second, through an experimental collection of information from the results of the surveys of 34 students, which were not included in the same sample. This pretest obliged us to rephrase some of the sentences. Table 1 presents the summary statistics.

##### 4.3. Measures

Based on Chapman's model (1981), this study presents the results for two groups that influence students in their choice: institutional drivers (Group 1) and personal characteristics (Group 2). Group 1

**Table 1**  
Summary statistics.

	<i>co</i>	<i>al</i>	<i>rep</i>	<i>loc</i>	<i>cost</i>	<i>job</i>					
<b>Institutional drivers</b>											
Mean	3,71	2,90	3,95	3,73	3,72	4,28					
SD	0,66	0,78	0,73	0,91	0,95	0,73					
Minimum	1,00	1,00	1,00	1,00	1,00	1,00					
Maximum	5,00	5,00	5,00	5,00	5,00	5,00					
<b>Calibration values</b>											
0,95	4,80	4,25	5,00	5,00	5,00	5,00					
0,49	3,80	3,00	3,67	3,67	3,75	4,33					
0,05	2,60	1,75	2,33	2,33	2,00	3,00					
<b>Personal characteristics</b>											
Mean	0,74	17,56	0,26	0,81	0,19	12,07	2673,23	1,63	0,51		
SD	n.a.	0,67	n.a.	n.a.	n.a.	4,01	1226,98	0,83	n.a.		
Minimum	n.a.	17,00	n.a.	n.a.	n.a.	4,00	2000,00	0,00	n.a.		
Maximum	n.a.	19,00	n.a.	n.a.	n.a.	18,00	7500,00	3,00	n.a.		
<b>Calibration values</b>											
0,95	n.a.	19,00	n.a.	n.a.	n.a.	18,00	6250,00	2,00	n.a.		
0,49	n.a.	17,00	n.a.	n.a.	n.a.	12,00	2000,00	2,00	n.a.		
0,05	n.a.	17,00	n.a.	n.a.	n.a.	4,00	2000,00	0,00	n.a.		

*Cosup* is the choice of the student: university or polytechnic; *age* is the student's age; *al* is academic life; *ami* is the average monthly income; *co* is courses offered; *cost* is the total cost of studying at a HEI; *gen* is the student's gender; *job* is job opportunities; *loc* is the HEI's location; *ns* is the number of siblings; *oo* is others opinions; *ple* is parents' level of education; *ppss* is the private/public secondary school origin; *rep* is the HEI's reputation; *sas* is the student's secondary school area of study.

comprises the courses offered (*co*); academic life (*al*); HEI's reputation (*rep*); HEI's location (*loc*); the total cost of studying at a HEI (*cost*); and job opportunities (*job*). For *al*, *rep*, *loc*, *cost*, and *job*, a five-point Likert scale is used where one equals not important and five equals extremely important. For *co*, the scale is one equals not diverse and five equals highly diverse. Group 2 includes the student's age (*age*); gender (*gen*); and the private or public secondary school origin (*ppss*); parents' level of education (*ple*); the average monthly income (*ami*); the number of siblings (*ns*); and others opinions (*oo*) (parents, teachers, and/or friends in which zero equals not important and one equals important). The group also includes the student's secondary school area of study (*sas*) that following Curado, Henriques, Oliveira, and Matos (2016), is divided into *hard* sciences, such as engineering and technologies, and the natural sciences and *soft* sciences, such as health and social sciences, and arts and humanities. Within Group 1, the sample questions for employment opportunities include: “The importance given to the internships offered by the HEI”; and for the HEI's reputation: “The importance given to international rankings.” For Group 2, sample items include: “how many siblings do you have?”

##### 4.4. Calibration

Using a fsQCA requires calibrating the set membership in such a way that levels of membership represent meaningful groupings and reflect theoretical and empirical knowledge regarding the variables (Crilly et al., 2012; Ragin, 2006a, 2008). Regarding the qualitative anchors necessary to calibrate the data, the study follows the recommendations from Ragin, Drass, and Davey (2003) and Ragin (2008). Table 1 shows the three values used to calibrate each condition as well as the outcome variable.

#### 5. Results and discussion

The study tests if any of the *Cosup* antecedent conditions are a necessary condition (Rihoux & Ragin, 2009; Schneider & Wagemann,

**Table 2**  
Necessary conditions summary.

Institutional drivers			Personal characteristics		
Conditions	Consistency	Coverage	Conditions	Consistency	Coverage
<b>Outcome: <i>Cosup</i></b>					
<i>job</i>	0,575	0,756	<i>~sas</i>	0,869	0,747
<i>~al</i>	0,561	0,767	<i>~ami</i>	0,829	0,739
<i>rep</i>	0,543	0,783	<i>ppss</i>	0,800	0,741
<i>loc</i>	0,529	0,748	<i>~age</i>	0,726	0,777
<i>cost</i>	0,512	0,716	<i>~gen</i>	0,720	0,731
<i>~co</i>	0,507	0,734	<i>ns</i>	0,703	0,765
<i>co</i>	0,493	0,761	<i>ple</i>	0,582	0,806
<i>~cost</i>	0,488	0,783	<i>Oo</i>	0,509	0,741
<i>~loc</i>	0,471	0,747	<i>~oo</i>	0,491	0,754
<i>~rep</i>	0,457	0,708	<i>~ple</i>	0,418	0,678
<i>al</i>	0,439	0,724	<i>~ns</i>	0,297	0,709
<i>~job</i>	0,425	0,736	<i>gen</i>	0,280	0,794
			<i>age</i>	0,274	0,679
			<i>~ppss</i>	0,200	0,775
			<i>ami</i>	0,171	0,789
			<i>sas</i>	0,131	0,750
<b>Outcome: <i>~Cosup</i></b>					
<i>cost</i>	0,601	0,284	<i>~sas</i>	0,871	0,253
<i>~rep</i>	0,556	0,292	<i>~ami</i>	0,865	0,261
<i>job</i>	0,550	0,244	<i>ppss</i>	0,828	0,259
<i>~co</i>	0,544	0,266	<i>~gen</i>	0,785	0,269
<i>loc</i>	0,528	0,252	<i>Ns</i>	0,640	0,235
<i>~al</i>	0,504	0,233	<i>~age</i>	0,616	0,223
<i>al</i>	0,496	0,276	<i>~ple</i>	0,587	0,322
<i>~loc</i>	0,472	0,253	<i>ple</i>	0,413	0,194
<i>co</i>	0,456	0,239	<i>age</i>	0,384	0,321
<i>~job</i>	0,450	0,264	<i>~ns</i>	0,360	0,291
<i>rep</i>	0,444	0,217	<i>gen</i>	0,215	0,206
<i>~cost</i>	0,399	0,217	<i>~ppss</i>	0,172	0,225
			<i>ami</i>	0,135	0,211
			<i>sas</i>	0,129	0,250

*Cosup* is the choice of the student: university or polytechnic; *age* is the student's age; *al* is academic life; *ami* is the average monthly income; *co* is courses offered; *cost* is the total cost of studying at a HEI; *gen* is the student's gender; *job* is job opportunities; *loc* is the HEI's location; *ns* is the number of siblings; *oo* is other opinions; *ple* is parents' level of education; *ppss* is the private/public secondary school origin; *rep* is the HEI's reputation; *sas* is the student's secondary school area of study.

2010). A condition, or a combination of conditions, is called “necessary” or “almost always necessary” if the consistency score exceeds the threshold of 0.75 (Ragin, 2006b). The study also addresses the sufficient conditions (a condition or a combination of conditions are “sufficient” when they produce a given outcome) by reporting two analyses: the first one explores which personal characteristics lead to *Cosup* (model 1:  $Cosup = f\{age, gen, ppss, sas, ple, ami, ns, oo\}$ ); the second analysis identifies the institutional conditions that lead to *Cosup* (model 2:  $Cosup = f\{cost, al, loc, co, rep, job\}$ ). For the study of the absence of the outcome, the results do not meet the consistency threshold, which leads to no conclusions. This result resembles what Mas-Verdú, Ribeiro-Soriano, & Roig-Tierno, 2015 find and could well be related to problems with asymmetry (Woodside, 2013).

5.1. Analysis of the necessary conditions

Following Schneider and Wagemann (2010), and Rihoux and Ragin (2009), Table 2 presents the results of fsQCA test of the necessary conditions for the outcome *Cosup* and its absence *~Cosup* for the two groups of data. For the personal characteristics, the conditions *~sas*, *~ami*, and *ppss* exceed the threshold of 0.75 and thus are an “almost always necessary condition” for both *Cosup* and *~Cosup*. Additionally *~gen* is also an “almost always necessary condition” for *~Cosup* (Ragin, 2006a). Related to institutional characteristics there are no conditions exceeding the threshold of 0.75. These results mean that personal characteristics play a more important role when students have

to decide which HEI to apply to. Another potential explanation could be the fact that the students have a better perception of their personal characteristics than the institutional drivers.

5.2. Analysis of the sufficient conditions

The analysis of the sufficient conditions requires the construction and examination of a truth table (Mas-Verdú et al., 2015; Ragin, 2008). The categorization follows Schneider, Schulze-Bentrop, and Paunescu (2010). Table 3 presents the cutoff values the study uses as well as the number of logical casual conditions. For example, the frequency cutoff for the parsimonious solution for the personal characteristics is equal to 1.0, the consistency cutoff is equal to 0.78, and the number of rows is equal to 25. Using the recommendations of Fiss (2007), Ragin (2000, 2008), Schneider and Wagemann (2010), and Mas-Verdú et al. (2015), Table 3 presents the results for the intermediate solution for *Cosup* for both sets of data.

As Schneider and Wagemann (2010) suggest, the study presents a parsimonious solution, although the intermediate solution has the capacity to make simpler assumptions and thus match up to the theoretical expectations. The results are interpreted taking into consideration the insights from Ragin (2006a, 2008), De Meur and Rihoux (2002), and Ragin et al. (2003). The solution coverage score reflects the empirical importance of the solutions present and therefore should be as high as possible, usually above 0.25. Regarding the solutions' consistency scores, these confirm that the specific configuration of antecedents is sufficient for explaining the outcome condition (Ragin, 2009). Thus, the consistency threshold should be at least 0.75, but preferably 0.85 or higher (Ragin, 2006a, 2008, 2009; Woodside, 2013). Regarding the consistency and coverage values, the two intermediate solutions are informative given the fact that they surpass the minimum values acceptable (consistency ranges from 0.81 to 0.84; coverage ranges from 0.42 to 0.59).

Considering the institutional drivers, the intermediate solution for *Cosup* produces two configurations whereas the personnel characteristics generate ten configurations that comply with the threshold of 0.8, which Ragin (2008) recommends. Regarding the institutional characteristics, the configurations with the highest raw coverage values—the portion of all cases in the outcome covered by a single sufficient path (Ragin, 2008) given the consistency boundary (above 0.8)—are  $job^*~cost^*loc^*rep$  and  $job^*rep^*~al^*co$ . Similarly, for the personal characteristics, the configurations are  $oo^*ns^*~ami^*ple^*~sas^*ppss$  and  $oo^*ns^*~ami^*ple^*ppss^*~age$  (the \* symbol represents the logical operator AND and ~ represents the absence of the condition).

The results point to the importance of the conditions of job opportunities (*job*) and the HEI's reputation (*rep*) when considering the institutional drivers. Regarding the personal characteristics, the others opinions (*oo*), number of siblings (*ns*), the absence of average monthly income (*~ami*), the parent's level of educations (*ple*), and private or public secondary school origin (*ppss*) appear to be key conditions for decision-making.

Comparing the two selected intermediate solutions for the institutional drivers, the prospective candidates appear to swap the absence of academic life (*~al*) for the courses offered (*co*), or to swap location (*loc*) for the absence of cost (*~cost*). These findings lead to the conjecture that students have a kind of hierarchy for the institutional drivers in which the top of the pyramid consists of the first order conditions—those associated to their future professional life (job opportunities [*job*] and the HEI's reputation [*rep*]), and those that are non-negotiable. The reverse effect applies to those conditions that students do not value as much, which are second order conditions. Regarding personal characteristics, more conditions exist that influence decision-making, and all of them seem to be equally important. Thus, the perception of a hierarchy does not hold for the personal sphere. By comparing the intermediate and parsimonious solutions of both data sets, the core conditions become clear (Fiss, 2007) (e.g., *job* or *rep* for institutional drivers, and *~oo* or *ple* for personal characteristics).

**Table 3**  
Results of the intermediate and parsimonious solutions for the presence of the outcome.

Intermediate solution - institutional drivers				Intermediate solution - personal characteristics			
Model: $Cosup = f\{cost, rep, al, loc, co, job\}$				Model $Cosup = f\{age, gen, ppss, sas, ple, ami, ns, oo\}$			
Lines: 26				Lines: 41			
Consistency cutoff: 75,6%				Consistency cutoff: 75,0%			
	Raw. Cov.	Unic.Cov.	Cons.		Raw. Cov.	Unic.Cov.	Cons.
$job^* \sim cost^* loc^* rep$	0,198	0,011	0,802	$\sim oo^* ns^* ami^* ple^* \sim sas^* \sim ppss^* \sim age$	0,038	0,018	0,977
$job^* rep^* \sim al^* co$	0,251	0,034	0,801	$\sim oo^* \sim ami^* ple^* \sim ppss^* gen^* \sim age$	0,020	0,005	0,957
$\sim job^* \sim loc^* rep^* \sim al^* \sim co$	0,153	0,012	0,796	$\sim oo^* ns^* ple^* \sim sas^* gen^* \sim age$	0,067	0,007	0,922
$job^* \sim cost^* rep^* \sim co$	0,202	0,005	0,794	$oo^* ns^* \sim ami^* \sim sas^* ppss^* gen^* \sim age$	0,034	0,006	0,899
$job^* \sim cost^* loc^* \sim al^* co$	0,161	0,005	0,794	$oo^* ns^* \sim ami^* \sim ppss^* \sim gen^* \sim age$	0,050	0,025	0,856
$job^* loc^* rep^* \sim al$	0,231	0,016	0,789	$ns^* \sim ami^* \sim ple^* \sim sas^* \sim ppss^* \sim gen^* \sim age$	0,043	0,013	0,835
$\sim cost^* rep^* al^* \sim co$	0,176	0,007	0,770	$oo^* ns^* \sim ami^* ple^* \sim sas^* ppss$	0,161	0,032	0,831
$\sim job^* \sim cost^* loc^* \sim rep^* \sim al^* \sim co$	0,136	0,018	0,765	$\sim ns^* \sim ami^* ple^* \sim sas^* gen^* \sim age$	0,041	0,007	0,820
$\sim job^* \sim cost^* \sim loc^* \sim rep^* \sim al^* co$	0,133	0,014	0,756	$oo^* ns^* \sim ami^* ple^* ppss^* \sim age$	0,143	0,013	0,817
				$\sim oo^* \sim ns^* \sim ami^* ple^* gen^* \sim age$	0,041	0,011	0,810
				$\sim oo^* \sim ami^* ple^* \sim sas^* ppss^* \sim idd$	0,140	0,053	0,790
				$\sim oo^* \sim ns^* \sim ami^* \sim ple^* ppss^* \sim gen^* \sim age$	0,058	0,020	0,771
				$\sim oo^* ns^* \sim ami^* \sim ple^* \sim sas^* ppss^* gen^* age$	0,013	0,007	0,760
Solution coverage: 0.42 Solution consistency: 0.81				Solution coverage: 0.49 Solution consistency: 0.84			

  

Parsimonious solution – institutional drivers				Parsimonious solution – personal characteristics			
Model: $Cosup = f\{cost, rep, al, loc, co, job\}$				Model: $Cosup = f\{age, gen, ppss, sas, ple, ami, ns, oo\}$			
Lines: 44				Lines: 56			
Consistency cutoff: 75,6%				Consistency cutoff: 75,0%			
	Raw. Cov.	Unic.Cov.	Cons.		Raw. Cov.	Unic.Cov.	Cons.
$co^* \sim cost$	0,276	0,027	0,805	$\sim ppss^* ami^* \sim oo$	0,046	0,021	0,981
$rep^* \sim cost$	0,320	0,038	0,830	$gen^* \sim ppss^* ple^* \sim oo$	0,035	0,009	0,975
$rep^* \sim loc^* \sim job$	0,190	0,004	0,802	$gen^* \sim sas^* ple^* \sim ami$	0,111	0,007	0,871
$loc^* \sim cost^* \sim job$	0,184	0,019	0,784	$\sim age^* \sim gen^* \sim ppss^* \sim ami^* ns^* oo$	0,050	0,025	0,856
$\sim al^* rep^* loc^* job$	0,231	0,049	0,789	$ppss^* ple^* ns^* oo$	0,197	0,057	0,845
$co^* rep^* \sim loc$	0,236	0,025	0,785	$gen^* ppss^* \sim sas$	0,149	0,054	0,820
				$\sim age^* \sim gen^* \sim ppss^* \sim sas^* \sim ple$	0,047	0,015	0,818
				$\sim age^* ppss^* \sim sas^* ple^* \sim ami^* ns$	0,238	0,042	0,799
				$ppss^* \sim ami^* \sim ns^* \sim oo$	0,124	0,078	0,780
Solution coverage: 0.49 Solution consistency: 0.82				Solution coverage: 0.59 Solution consistency: 0.83			

*Cosup* is the choice of the student: university or polytechnic; *age* is the student's age; *al* is academic life; *ami* is the average monthly income; *co* is courses offered; *cost* is the total cost of studying at a HEI; *gen* is the student's gender; *job* is job opportunities; *loc* is the HEI's location; *ns* is the number of siblings; *oo* is others opinions; *ple* is parents' level of education; *ppss* is the private/public secondary school origin; *rep* is the HEI's reputation; *sas* is the student's secondary school area of study; *Cons.* is the consistency; *Raw Cov.* is the raw coverage; *Uniq.Cov.* is the unique coverage.

The findings show that job opportunities and the HEI's reputation are the most important conditions, which is in line with the literature. Further, the importance that students give to the institution's employability rate as a facilitator of future job opportunities is also important (Drewes & Michael, 2006; Harris, 2009; Ming, 2011; Nurlida et al., 2010; Peró et al., 2015; Price et al., 2003; Rochat & Demeulemeester, 2011; Ruslan et al., 2014; Sia, 2013; Sojkin et al., 2012). Combining these findings with the absence of the family's average income ( $\sim ami$ ), which appears to influence decision-making, our results confirm the studies that identify cost as being less important than other factors (e.g., Briggs & Wilson, 2007), but they do not corroborate the research that highlights proximity and the idea that students would prefer to study near home for economic reasons (e.g., Paulsen, 1990; Roszkowski & Reilly, 2005). In agreement with Denzler (2011) and Goodman et al. (2015), the results show that the number of siblings (*ns*) and the parent's level of education (*ple*) also influence the student's decision.

## 6. Conclusions

This study contributes to a deeper knowledge of the factors behind undergraduates' choice of an HEI in the specific context of the Portuguese public higher education system, which has undergone several important changes over the past 30 years (see, e.g., Horta, 2010; Teixeira et al., 2012; Santiago et al., 2015). The findings indicate the importance for HEI managers to consider criteria such as job opportunities (*job*) and reputation (*rep*) when making strategic decisions to enhance their institutions' profile. When prospective students value some conditions (*rep, job*) more, rank them at the top, or consider them nonnegotiable; then this hierarchy puts pressure on HEI managers to focus more on those factors when designing strategies for promoting their institution to prospective students. Other institutional drivers, such as academic life, location, and costs are also relevant choice factors. Vis-à-vis the importance of location (*loc*) in the intermediate solution, it is a second order condition for prospective candidates as

Portuguese HEIs have wide territorial coverage. Further, managers should also consider prospective students' personal characteristics when designing marketing strategies. For example, as the number of siblings influences students' decision, an effective strategy could be offering a discount for siblings who attend the same HEI at the same time, or part of the time, similar to some practices that already exist.

The original contribution of this study, which comes from the impossibility of testing the absence of *Cosup* (conditions that lead to the choice of a polytechnic), shows that the choice criteria of prospective students are the same irrespective of whether they are applying to a university or a polytechnic. Another contribution of the study is the presumed hierarchical structure within each set of factors, which highlights *first* and *second* order conditions. The association between public funding for teaching and research activities in the higher education sector and national economic competitiveness are incentives for scientific areas that must be linked to prospective candidates' criteria. Finally, to the best of the authors' knowledge, this study constitutes the first attempt to apply fsQCA to this subject.

Several limitations of this study warrant attention and future research. First, although the undergraduates' response rate (29%) is good, it is not representative of the whole of the prospective students applying to a HEI in the year of the survey. Second, despite the fact that this study uses mature conceptual models, some concerns might arise with regard to the suitability of the model due to the specificities of the context and time frame. Future research could possibly use testing to update and refine the model. Given the importance of the discoveries made related to the first and second order conditions, it is relevant to develop this concept further by explicitly asking students to rank the criteria used when choosing the HEI that they wish to attend. This inquiry would shed light on the relative importance of each criteria and, by doing so, would contribute to improving the rigor of the management of the HEI institutions by offering its managers success indicators. Future work could also address a longitudinal framework throughout the three years of secondary school that would thus contribute to a better understanding of the evolution of the criteria that students use when they finally apply to a HEI. Such an evolution would also be relevant when considering students after the first year at their chosen HEIs to assess whether their perceptions remain unchanged. This research line would allow HEI managers to act in a more proactive and effective way when designing communication campaigns for prospective students. In accordance with recent trends in the higher education sector in Europe, the effect of national and international programs' accreditations on applicants' preferences should be analyzed as well as the level of the HEI's internationalization.

## References

- Anelli, M., & Peri, G. (2015). Gender of siblings and choice of college major. *CESifo Economic Studies*, 61(1), 53–71.
- Basedau, M., & Richter, T. (2014). Why do some oil exporters experience civil war but others not? Investigating the conditional effects of oil. *European Science Review*, 6(4), 549–574.
- Bell, R. G., Filatotchev, I., & Aguilera, R. V. (2014). Corporate governance and investors' perceptions of foreign IPO value: An institutional perspective. *Academy of Management Journal*, 57(1), 301–320.
- Briggs, S. (2006). An exploratory study of the factors influencing undergraduate student choice: The case of higher education in Scotland. *Studies in Higher Education*, 31, 705–722.
- Briggs, S., & Wilson, A. (2007). Which university? A study of the influence of cost and information factors on Scottish undergraduate choice. *Journal of Higher Education Policy and Management*, 29(1), 57–72.
- Chapman, D. W. (1981). A model of student college choice. *Journal of Higher Education*, 52(5), 490–505.
- CHEPS – Center for Higher Education Policy Studies (2013). *Policy challenges for the Portuguese polytechnic sector a report for the Portuguese Polytechnics Coordinating Council (CCISP)*. University of Twente.
- Connor, H., Pearson, R., Court, G., & Jagger, N. (1996). University challenge: Student choices in the 21st century. *Report to the CVCP*. Brighton: The Institute for Employment Studies.
- Cress, D. M., & Snow, D. A. (2000). The outcomes of homeless mobilization: The influence of organization, disruption, political mediation, and framing. *American Journal of Sociology*, 105(4), 1063–1104.
- Crilly, D. (2011). Predicting stakeholder orientation in the multinational enterprise: Amid-range theory. *Journal of International Business Studies*, 42(5), 694–717.
- Crilly, D., Zollo, M., & Hansen, M. T. (2012). Faking it or muddling through? Understanding decoupling in response to stakeholder pressures. *Academy of Management Journal*, 55(6), 1429–1448.
- Curado, C., Henriques, P. L., Oliveira, M., & Matos, P. V. (2016). A fuzzy-set analysis of hard and soft sciences publication performance. *Journal of Business Research*, 69(11), 5348–5363.
- De Meur, G., & Rihoux, B. (2002). *L'analyse quali-quantitative comparée: Approche, techniques et applications en sciences humaines*. Louvain-la-Neuve: Bruylant-Academia.
- Denzler, S. (2011). University or polytechnic? Family background effects on the choice of higher education institution. *Swiss Journal of Sociology*, 37(1), 79–97.
- DGEEC – Direção Geral de Estatísticas de Educação e Ciência (2015). *Estatísticas de Educação 2014/2015 – Principais resultados relativos ao Ensino Superior, Ministério da Ciência, Tecnologia e Ensino Superior*.
- Drewes, T., & Michael, C. (2006). How do students choose a university? An analysis of applications to universities in Ontario, Canada. *Research in Higher Education*, 47(7), 781–800.
- Fiss, P. C. (2007). A set-theoretic approach to organizational configurations. *Academy of Management Review*, 32(4), 1180–1198.
- Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal*, 54(2), 393–420.
- Gilbert, B. A., & Campbell, J. T. (2015). The geographic origins of radical technological paradigms: A configurational study. *Research Policy*, 44(2), 311–327.
- Goodman, J., Hurwitz, M., Smith, J., & Fox, J. (2015). The relationship between siblings' college choices: Evidence from one million SAT-taking families. *Economics of Education Review*, 48, 75–85.
- Greckhamer, T., Misangyi, V. F., Elms, H., & Lacey, R. (2008). Using qualitative comparative analysis in strategic management research: An examination of industry, corporate, and business-unit effects. *Organizational Research Methods*, 11(4), 695–726.
- Harris, M. S. (2009). Message in a bottle: University advertising during bowl games. *Innovative Higher Education*, 33(5), 285–296.
- Horta, H. (2010). The role of the state in the internationalization of universities in catching-up countries: An analysis of the Portuguese higher education system. *Higher Education Policy*, 23(1), 63–81.
- Kallio, R. E. (1995). Factors influencing the college choice decisions of graduate students. *Research on Higher Education*, 36(1), 109–124.
- Maringe, F. (2006). University and course choice: Implications for positioning, recruitment and marketing. *International Journal of Educational Management*, 20(6), 466–479.
- Mas-Verdú, F., Ribeiro-Soriano, D., & Roig-Tierno, N. (2015). Firm survival: The role of incubators and business characteristics. *Journal of Business Research*, 68(4), 793–796.
- Mazzarol, T., & Soutar, G. N. (2012). Revisiting the global market for higher education. *Asia Pacific Journal of Marketing and Logistics*, 24(5), 717–737.
- Meyer, A. D., Tsui, A. S., & Hinings, C. R. (1993). Configurational approaches to organizational analysis. *Academy of Management Journal*, 36(6), 1175–1195.
- Ming, J. (2011). A model of higher education institutions choice in Malaysia: A conceptual approach. *2010 international conference on business and economic research*, 1 (pp. 142–146).
- Misangyi, V. F., & Acharya, A. G. (2014). Substitutes or complements? A configurational examination of corporate governance mechanisms. *Academy of Management Journal*, 57(6), 1681–1705.
- Moogan, Y. J., & Baron, S. (2003). An analysis of student characteristics within the student decision making process. *Journal of Further and Higher Education*, 27(3), 271–287.
- Moogan, Y. J., Baron, S., & Harris, K. (1999). Decision-making behaviour of potential higher education students. *Higher Education Quarterly*, 53(3), 211–228.
- Nunes, A. S. (1964). Portugal, sociedade dualista em evolução. *Análise Social*, 2(7/8), 407–462.
- Nurlida, I., Faridah, H., Nooraini, M., & Norzaidi, M. (2010). Determining mediating effect of information satisfaction on international students' college choice: Empirical evidence in Malaysia's university. *International Journal of Scientific Research in Education*, 3(1), 51–63.
- Paulsen, M. (1990). College choice: Understanding student enrollment behavior. *ASHE-ERIC higher education report no. 6*. Washington, D.C.: George Washington University.
- Peró, M., Soriano, P., Capilla, R., Olmos, J., & Hervás, A. (2015). Questionnaire for the assessment of factors related to university degree choice in Spanish public system: A psychometric study. *Computers in Human Behavior*, 47(C), 128–138.
- Price, I., Matzdorf, L., & Agahi, H. (2003). The impact of facilities on student choice of university. *International Journal of Educational Management*, 21(10), 212–222.
- Ragin, C. C. (2000). *Fuzzy-set social science*. Chicago: University of Chicago Press.
- Ragin, C. C. (2006a). Set relations in social research: Evaluating their consistency and coverage. *Political Analysis*, 14(3), 291–310.
- Ragin, C. C. (2006b). How to lure analytic social science out of the doldrums: Some lessons from comparative research. *International Sociology*, 21(5), 633–646.
- Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. Chicago: University of Chicago Press.
- Ragin, C. C. (2009). Qualitative comparative analysis using fuzzy sets (fsQCA). In B. Rihoux, & C. C. Ragin (Eds.). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques* (pp. 87–121). Thousand Oaks, CA: Sage Publications.
- Ragin, C. C., Drass, K. A., & Davey, S. (2003). Fuzzy-set/qualitative comparative analysis, version 2.0. [http://www.u.arizona.edu/~cragin/fsQCA/download/setup\\_fsQCA.exe](http://www.u.arizona.edu/~cragin/fsQCA/download/setup_fsQCA.exe), Accessed date: 2 March 2017.

- Rihoux, B., & Ragin, C. C. (2009). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related research*. Los Angeles: Sage.
- Rochat, D., & Demeulemeester, J. (2011). Rational choice under unequal constraints: The example of Belgian higher education. *Economics of Education Review*, 20(1), 15–26.
- Roszkowski, M. J., & Reilly, P. J. (2005). At the end of the day, I want to be close to home: Adult students' preferences for college proximity to work and home. *Journal of Marketing for Higher Education*, 15(1), 81–95.
- Ruslan, R., Ariffin, K., Islam, M., & Zaidi, N. (2014). Determinants students' selection of higher education institutions in Malaysia. *Advances in Environmental Biology*, 8(9), 406–416.
- Santiago, R., Carvalho, T., Amaral, A., & Meek, V. L. (2006). Changing patterns in the middle management of higher education institutions: The case of Portugal. *Higher Education*, 52(2), 215–250.
- Santiago, R., Carvalho, T., & Cardoso, S. (2015). Portuguese academics' perceptions of higher education institutions' governance and management: A generational perspective. *Studies in Higher Education*, 40(8), 1471–1484.
- Sarkane, G., & Sloka, B. (2015). Factors influencing the choice of higher education establishment for marketing strategies of higher education. *Economics and Business*, 27, 76–80.
- Schneider, C. Q., & Wagemann, C. (2010). Standards of good practice in qualitative comparative analysis (QCA) and fuzzy-sets. *Comparative Sociology*, 9(3), 397–418.
- Schneider, M. R., Schulze-Bentrop, C., & Paunescu, M. (2010). Mapping the institutional capital of high-tech firms: A fuzzy-set analysis of capitalist variety and export performance. *Journal of International Business Studies*, 41, 246–266.
- Sia, J. K. (2013). University choice: Implications for marketing and positioning. *Education*, 3(1), 7–14.
- Simões, C., & Soares, A. M. (2010). Applying to higher education: Information sources and choice factors. *Studies in Higher Education*, 35(4), 371–389.
- Sin, C., Tavares, O., & Amaral, A. (2016). The impact of programme accreditation on Portuguese higher education provision. *Assessment & Evaluation in Higher Education*, 1–12.
- Smithson, M., & Verkuilen, J. (2006). *Fuzzy set theory: Applications in the social sciences*. Thousand Oaks, CA: Sage Publications.
- Sojkin, B., Bartkowiak, P., & Skuza, A. (2012). Determinants of higher education choices and student satisfaction: The case of Poland. *Higher Education*, 63(5), 565–581.
- Sojkin, B., Bartkowiak, P., & Skuza, A. (2015). Changes in students' choice determinants in Poland: A comparative study of tertiary business education between 2008 and 2013. *Higher Education*, 69(2), 209–224.
- Teixeira, P. N., Rocha, V., Biscaia, R., & Cardoso, M. F. (2012). Competition and diversity in higher education: An empirical approach to specialization patterns of Portuguese institutions. *Higher Education*, 63(3), 337–352.
- Veiga, A., & Amaral, A. (2009). Survey on the implementation of the Bologna process in Portugal. *Higher Education*, 57(1), 57–69.
- Woodside, A. G. (2013). Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from asymmetric thinking in data analysis and crafting theory. *Journal of Business Research*, 66(4), 463–472.
- Woodside, A. G., & Zhang, M. (2013). Cultural diversity and marketing transactions: Are market integration, large community size, and world religions necessary for fairness in ephemeral exchanges? *Psychology and Marketing*, 30(3), 263–276.
- Zadeh, L. A. (1965). Fuzzy sets. *Information and Control*, 8(3), 338–353.
- Zadeh, L. A. (1983). The role of fuzzy logic in the management of uncertainty in expert systems. *Fuzzy Sets and Systems*, 11(1), 199–227.
- Zadeh, L. A. (1997). Toward a theory of fuzzy information granulation and its centrality in human reasoning and fuzzy logic. *Fuzzy Sets and Systems*, 90(2), 111–127.

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