

The Determinants of Education-Job Matching for Portuguese Graduates

Factores determinantes da adecuación entre formación e emprego dos licenciados portugueses

Daniela Olo^{1,a} , Leonida Correia^{1,b} , Conceição Rego^{2,c} , João Rebelo^{1,d} 

¹ Centre for Transdisciplinary Development Studies (CETRAD), University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal

² Center for Advanced Studies and Training in Management and Economics (CEFAGE), University of Évora, Évora, Portugal

✉ adanielaolo@utad.pt

✉ blcorreia@utad.pt

✉ cmcpr@uevora.pt

✉ djrebelo@utad.pt

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Abstract

This paper deals with the determinants of education-job match for higher-education graduates, using a logistic regression model to identify explanatory variables related to sociodemographic, academic trajectory and institutional characteristics. The empirical analysis is based on an anonymous online questionnaire administered to a sample of graduates, from 2014 to 2019, in Portuguese institutions, of which about five hundred observations were made. Although the boundaries between universities and polytechnics are less obvious today, there are still some differences between the two higher-education subsystems regarding education-job match. The main ones are related to the field of study, gender, and the need to move away from home to study and work. Factors that improve the probability of education-job matching, common to both subsystems, were also found, such as having i) studied 'social sciences, commerce, and law' and 'engineering, manufacturing and construction', ii) attained good final grades, and iii) participated in extracurricular activities involving complementary training.

Keywords: Employability; Graduates; Higher Education; Education-Job Matching Determinants.

Resumo

Este traballo aborda os determinantes da inserción laboral dos graduados en educación superior, utilizando un modelo de regresión loxística para identificar variables explicativas relacionadas con características socio-demográficas, de traxectoria académica e institucionais. A análise empírica baséase nun cuestionario anónimo en liña aplicado a un conxunto de graduados, de 2014 a 2019, en institucións portuguesas. Analizáronse arredor de cincocentas observacións. Aínda que os límites entre as universidades e as escolas politécnicas son menos obvios hoxe en día, aínda existen algunhas diferenzas entre os dous subsistemas de educación superior con respecto á adecuación do emprego á educación. As principais diferenzas están relacionadas co campo de estudo, o xénero e a necesidade de desprazarse a un distrito diferente do domicilio familiar para estudar e traballar. Tamén se atopan factores que melloran a probabilidade de adecuación educación-emprego, comúns a ambos os subsistemas, como son i) ter estudado "ciencias sociais, comercio e dereito" e "enxeñería, fabricación e construción", ii) obtido boas notas finais, e iii) ter participado en actividades extracurriculares de formación complementaria.

Palabras chave: Empregabilidade; Graduados; Educación superior; Determinantes do traballo-educación.

JEL: I23; J21; J23.

1. Introduction

Increasing levels of education have been a notable trend in all Western countries in the last few decades (Quintano et al., 2008; Reinhold & Thomsen, 2017). Portugal is no exception, registering a large increase in the number of graduates; however, this improvement in academic qualifications has gone at a faster pace than that of the number of job opportunities available.

The world has been hit by two huge global crises in the last decade, with devastating effects on employment (Bell & Blanchflower, 2020; Meylahn, 2020; Ornellas et al., 2019), which means that an increase in qualified labour supply coincides with a decrease in demand, leading to rising unemployment rates, even for graduates. Portugal was particularly affected by the global financial crisis, which spread to the European Union after 2008. The Portuguese economy experienced a strong recession, with a significant reduction in the employment rate at a national and regional level (Correia & Alves, 2017) and a substantial rise in unemployment, especially among young people (Correia & Martins, 2019). In 2010, when Portugal was still suffering the effects of the 2008 crisis, the general unemployment rate was 10.8% and youth unemployment was 22.8%. This peaked in 2013, with general unemployment standing at 17.1%, the youth unemployment rate at 38.3% and the unemployment rate for graduates at 12.7%. As the crisis faded, these indicators improved, settling at 6.6% for general unemployment, 18.3% for youth unemployment and 5.3% for graduate unemployment in 2019. These rates rose slightly again due to the covid-19 pandemic, and in 2020 reached 7.0% for general unemployment, 22.5% for youth unemployment and 5.8% for graduate unemployment.

Researchers are becoming more and more interested in studying what variables can explain the transition of graduates to the labour market. Higher education institutions (HEIs) have also felt pressured to focus on improving the employability of their graduates due to increased competition. Whereas HEIs often just consider the employability of their graduates based on whether or not they are employed, our study aims to go further by focusing on what variables can explain how a graduate attains an education-job match. Following Frenkel and Leck (2017), we have defined the concept of education-job match as a situation of consistency between the skills required of employees at work and those acquired from their qualifications. The difficulties related to graduate unemployment have highlighted the need to identify which factors explain graduate education-job matching, so as to support more effective employment policies for what is referred to as qualified work.

Most studies have focused on the effect of personal variables on graduate education-job match (e.g., Erdsiek, 2016; Kler, 2006; Van den Berg & Gorter, 1997), and some more recent studies have added contextual variables to their explanatory models (e.g., Frenkel & Leck, 2017; Iammarino & Marinelli, 2015; Krabel & Flöther, 2014), but there is a gap in the literature regarding what effect institutional factors have. This paper aims to fill this gap, and is the first study, to the best of our knowledge, to account for institutional characteristics affecting graduate education-job match. In order to identify the factors that affect education-job matching, explanatory variables related to institutional characteristics have been chosen as the main (decision) explanatory variables. Those connected to individual sociodemographic characteristics and the academic trajectory of graduates have also been considered, and have been included as control variables.

This paper seeks to answer the following research question: “Which factors contribute to education-job matching for Portuguese higher education graduates?” A quantitative study was performed using a logit regression model based on a survey of graduates from a university and a polytechnic institute in the northern region who had been awarded their degrees between

2014 and 2019. The data was collected from an anonymous online questionnaire. We obtained 694 eligible answers, of which 246 made up graduates who were not working and 448 corresponded to those who were. The latter group was the object of analysis in this study.

The remainder of the paper is structured as follows: section 2 reviews the relevant literature; section 3 includes the method, the data, the specification of the variables, and the results of the study; section 4 concludes the paper, where the main ideas are highlighted.

2. Literature Review

Higher education is important to the social and economic success of individuals, and for society, as it creates expectations of greater economic productivity, higher incomes and holistic development (McLendon & Perna, 2014; Tomlinson, 2007). The increasing number of higher education students equates to the expectations of obtaining a degree (Figueiredo et al., 2017). Their goal is to improve their employability (Gen et al., 2013; Sánchez Sellero, 2013), but mainly to make a successful education-job match (Olo et al., 2022a). Indeed, the return on their expensive investment in higher education is reached when they are well-matched to the labour market (Boudarbat & Montmarquette, 2018; Iammarino & Marinelli, 2015; Sianesi & Reenen, 2003; Somers et al., 2019).

Some studies have considered the education-job (mis)match, but many have only related these mechanisms to specific factors such as earnings, work satisfaction, and productivity (Di Pietro & Urwin, 2006; Green & Zhu, 2010; Ju & Li, 2019; Lee & Sabharwal, 2016; Quintano et al., 2008; Robst, 2007). Other studies (e.g., Boudarbat & Chernoff, 2012; Davia et al., 2017; Diem, 2015; Diem & Wolter, 2014; Ermini et al., 2017; Pirciog et al., 2010; Sgobbi & Suleman, 2013; Somers et al., 2019) have analysed factors determining the education-job (mis)match, considering a set of variables that can be grouped into three main categories of determinants; in their systematic review of the literature on the mismatch between employment and field of education, Somers et al. (2019) called these categories (1) individual-related determinants, (2) labour-market-related determinants, and (3) education-related determinants. Cardoso et al. (2014) and McQuaid and Lindsay (2005) gave descriptions of the determinants of employability which attributed a similar significance to them, and were as follows: (1) individual determinants, related to personal and family factors; (2) contextual determinants, associated with labour-market dynamics, macroeconomic trends, working conditions and company recruitment policies; (3) institutional determinants, related to the probability an institution has of increasing its graduates' employability based on its reputation, the prestige of the training it provides, and its capacity to cooperate with professional entities and the labour market.

Since the definitions are the same, we will use those proposed by Cardoso et al. (2014) and McQuaid and Lindsay (2005) in our study, because they seem to be more comprehensive. We have also followed Berntson (2008), whose suggestion states that the individual determinants can be divided into sociodemographic determinants and academic trajectory determinants.

The individual and contextual determinants have been further developed by other authors, as can be seen in Table 1 and Table 2 below. Although, in theory, some authors (e.g., Cardoso et al., 2014; Diem & Wolter, 2014; Domański et al., 2012) have mentioned that the institutional determinants, that is, the factors related to the main characteristics of HEIs, are those which affect graduate education-job (mis)matches, no studies have developed these empirically as an integral part of their explanatory models.

Table 1. Individual Determinants

Determinants	Studies and results
Sociodemographic: Age, gender, marital status and ethnicity	McQuaid and Lindsay (2005) founded that the sociodemographic factors should be considered because they can affect the motivation or the ability of individuals to undertake certain types of activity and to behave in certain ways. Kler (2006) and Van den Berg and Gorter (1997) founded evidence that individual characteristics play a significant role in the education-job matching process.
Academic trajectory: Field of study, year degree completed, final grade, participation in extracurricular activities, international academic mobility and internships	Field of study Garcia-Espejo and Ibanez (2006) , Grayson (2004) , Heijke et al. (2003) , Robst (2007) and Wolbers (2003) noted that graduates from occupation-specific programmes have a much higher probability of making a successful education-job match than those coming from more general programmes. Buonanno and Pozzoli (2009) , Frenkel and Leck (2017) and Galego and Caleiro (2011) discovered that graduates in health, engineering, business studies and law are more likely to obtain a job in their educational field.
	Final grade Finch et al. (2013) and Verhaest and Omeij (2010) learnt that achieving good grades throughout school increases the likelihood of a successful education-job match in recent graduates. This was corroborated by the results of studies by Galego and Caleiro (2011) , Garcia-Espejo and Ibanez (2006) and Grayson (2004) .
	Extracurricular activities Rubin et al. (2002) founded that extracurricular activities are initiatives that develop interpersonal and social skills outside the formal academic environment. Sin et al. (2016) and Thompson et al. (2013) mentioned that these activities include volunteering, participation in student/religious/cultural associations, and the undertaking of sport. Thompson et al. (2013) achieved that these activities act as a complement to academic performance, providing practical experience and improving the management and organisational skills of individuals, and, in certain cases, can compensate for lower final grades. Merino (2007) and Olo et al. (2022b) have seen evidence that, in general, graduates who participate in these activities achieve a better education-job match, because employers recognise the skills acquired in extracurricular activities as being transferable to the labour market.
	Internships Chen et al. (2018) , Pereira et al. (2020) and Silva et al. (2016) noticed that programmes which include internships significantly improve graduate employability, because such training offer students a more effective learning environment than traditional classrooms.

Source: Own elaboration based on literature

Table 2. Contextual Determinants

Empirical Studies	Results
Frenkel and Leck (2017) studied the role of spatial characteristics in education-job matching in Israel, including regional aspects such as the mean wage, the number of jobs in the high-technology service sector and the number of patent cooperation treaties.	Due to the weakness of the advanced labour markets in peripheral areas, many graduates leave the periphery and migrate to the core where they have a better chance of finding jobs that match their qualifications and skills.
Kraabel and Flöther (2014) studied the mobility of German graduates when entering the labour market after completing their degrees, including variables such as the proportion of employees with higher education in the workforce, the regional wage level and the regional gross value added.	The characteristics of a region are key determinants of graduate regional mobility when entering the labour market.

Source: Own elaboration based on literature

In the context of Portugal, it seems wise to introduce institutional variables to the explanatory models for graduate education-job match, due to the nature of the higher education system. According to the Portuguese Education Act (Law no. 46/86), higher education in the country is organised as a binary system composed of university and polytechnic education. The

difference between the two systems is related to their separate objectives. While university education is guided from the perspective of promoting research and knowledge creation and aims to ensure sound scientific and cultural preparation, polytechnic education, while also considering and knowledge creation important, is more focused on applied research, with a more practical and professional outcome. This allows us to establish the hypothesis for this study: *We expect to find differences between the education-job matching determinants of university and polytechnic graduates due to the distinct objectives of each of these subsystems in Portuguese higher education.*

Research has been conducted into the binary system in Portugal, but there has been nothing documented with regard to graduate education-job match. For example, [Teixeira et al. \(2012\)](#) empirically examined the question of the differences in the syllabuses offered in the university and polytechnic subsectors. They concluded that universities and polytechnics can still be relatively easy to distinguish regarding their types of specialisations, although the level of difference seems to have decreased over the last few years. [Teixeira et al. \(2014\)](#) studied revenue diversification in public higher education by comparing the university and polytechnic subsectors and found that institutional characteristics in the development of binary systems are important determinants of the ability of higher education institutions to earn income from tuition fees and other non-public sources. [Henriques et al. \(2018\)](#) explored the determinants involved in a student choosing between a university or a polytechnic when enrolling in higher education and concluded that job opportunities and the institution's reputation are the most important criteria. They also concluded that regardless of whether a student is applying to a university or a polytechnic school, these criteria are the same.

This issue has also been studied in other countries. For example, [Bacon et al. \(1979\)](#) examined and compared the attitudes of employers to British university and polytechnic graduates. They found that the majority of employers think that universities produce better students, both academically and intellectually. On the other hand, [Ramsden \(1983\)](#) looked into differences in the perceptions of students for courses at British universities and polytechnics and discovered that the university students experienced somewhat poorer teaching and that the polytechnic students were more interested in gaining qualifications for employment, perceiving their courses as playing a fundamental part to achieve this goal. [Xia et al. \(2012\)](#) analysed the correspondence between higher education and the demand of the labour market in terms of financial returns at Finnish universities and polytechnics. They concluded that graduates from the former ear, on average, more than those from the latter.

3. Method, data, variables and results

3.1 Method

To answer the research question and using the literature review as support, we developed a model enabling us to predict the impact of explanatory variables on the probability of attaining an education-job match for Portuguese higher education graduates. The **dependent variable** was the graduate education-job match. This variable was dichotomous and indicated whether a match existed between the field of study and the type of work being undertaken. Given the qualitative nature (0 or 1) of the dependent variable, the use of a logistic regression model was recommended. This was in accordance with the method used by [Frenkel and Leck \(2017\)](#) and [Garcia-Espejo and Ibanez \(2006\)](#).

The independent variables related to the hypothesis of this study, being decision variables, include the institutional characteristics of the Portuguese binary higher education system, or university and polytechnic education.

The group nominated as control variables included sociodemographic determinants such as gender, age and mobility for work (commuting to a different district to work), as well as academic trajectory factors, such as the final grade, the year of completing the degree, mobility for studies (travelling to a different district to study), the field of study (education; arts and humanities; social sciences, commerce, and law; natural sciences, mathematics and statistics; engineering, manufacturing and construction; agriculture; health and welfare; and services) and participation in a set of extracurricular activities (international mobility, participation in associations, volunteering, complementary training, internships).

Thus, we estimated the function as follows:

$$Y = F(X) + \epsilon \quad (1)$$

where Y was a binary dependent variable that took the value 1 or 0, X was the matrix of explanatory variables and ϵ was the unobserved component or statistical error.

In probabilistic terms, we used the following equation:

$$\text{Prob}(Y = 1|X) = F(X, \beta) \text{ and } \text{Prob}(Y = 0|X) = (1 - F(X, \beta)) \quad (2)$$

Where β were the parameters to be estimated and X were the explanatory variables. Assuming that $F(X)$ undertook the logistic cumulative distribution function, we calculated it as follows:

$$P_i(Y_i|X_i) = \frac{1}{1 + e^{-X_i\beta}} \quad (3)$$

where $i = 1$ if there was a probability of the education-job match being attained and $i = 0$ otherwise.

3.2 Data and variables

The sample consists of the graduates of a university and a polytechnic institute, both located in the northern region of Portugal, who obtained their degrees between 2014 and 2019. The location was chosen because it is the most populated region of Portugal and it has the highest employed population, comprising 35% of the employed population of Portugal. This is also the Portuguese region with the second highest number of graduates, comprising 33% of the country's total. The HEIs considered were randomly chosen, and only those who returned an acceptable number of responses were used to further develop the research.

The data was collected from June 2020 to October 2020 with an online questionnaire, which was pretested twice for good adjustment to the model. This was done firstly by face-to-face interviews with a group of volunteer graduates to check the adequacy of the instrument, followed by an experimental collection of information from the results of graduate surveys from an university not included in the sample.

The questionnaires were divided into three major groups of questions, one of which asked about personal information, including personal and family characteristics of graduates. Another group covered academic training, with a set of questions about the academic trajectory

of graduates. The final group enquired about how graduates integrated into the labour market, as well as their opinions.

The HEIs sent questionnaires by email to their own graduates due to data protection regulations. The questionnaire was also posted on social networks with an access link. This method of disseminating the questionnaires prevents us from finding out exactly how many questionnaires were sent out.

We obtained 694 eligible answers, of which 246 corresponded to graduates who were not working and 448 to those who were, the latter group of which was the object of analysis in this study. To analyse the data collected, according to the research question and hypothesis formulated, and in addition to the statistical descriptive analysis, a logistic regression model was estimated, using the variables described below.

The dependent variable was dichotomous and indicated whether there was a match between the field of study and the type of employment obtained. We could have had a different dependent variable, such as employability, motivated by the growing interest of researchers in understanding how graduates' transition to the labour market. However, this variable would have only considered whether graduates were employed or not. We wanted to go further and study the education-job match of graduates, that is, the adjustment between the skills required to work and the knowledge acquired from their qualifications. Supported in the literature (e.g., [Frenkel & Leck, 2017](#); [Garcia-Espejo & Ibanez, 2006](#)), we believe that this is the most appropriate approach for a match between graduates' training and their job roles to be identified.

According to [Hartog \(2000\)](#), there are three approaches for measuring an education-job match: (1) job analysis, which is based on an 'objective' evaluation by professional job analysts; this approach is conceptually better, but its measurement is generally not easy to obtain; (2) realised matches, based on the observed educational achievement of workers in each occupation; this method may result in biases for the overeducated and the undereducated; and (3) workers' self-assessments, where they subjectively assess their own education-job matches. The author noted that the third approach is considered the most traditional way to measure overeducation.

Our study is based on a subjective assessment that used the workers' self-assessment approach to graduates, who responded to the following higher education survey based around the question: 'How related is your job to your field of study?' The graduates were asked to rate their answers on a five-point Likert scale, running from 1 to 5 points, 1 meaning "not related" and 5 being "completely related". This was then converted into a binary variable that was used as a dependent variable in a logistic regression model, grouping scores of 1 and 2 as mismatches (0) and 4 and 5 as matches (1). A score of 3 was the neutral point of the scale, which we considered to represent a match (1). Other studies have also used this subjective assessment of workers (e.g., [Boudarbat & Chernoff, 2012](#); [Frenkel & Leck, 2017](#); [Green & McIntosh, 2007](#); [Iammarino & Marinelli, 2015](#)).

We broke down the potential determinants of a match into two general categories according to the independent variables ([Table 3](#)), decision variables and control variables.

Table 3. Characterisation of independent variables

	Variable	Variable Type	Codification
Decision Variables			
Institutional determinants	Higher education institution	Dummy	0 = University; 1 = Polytechnic institute
Control Variables			
Sociodemographic determinants	Gender	Dummy	0 = Male; 1 = Female
	Age	Continuous	1 = 20-25 years old; 2 = 26-30 years old; 3 = 31-35 years old; 4 = 36-40 years old; 5 = 41-45 years old; 6 = > 45 years old
	Mobility for work	Dummy	0 = no move (if the graduate's district of residence is the same as the district where <i>n</i> (he/she) is working); 1 = move (if the graduate's district of residence is different from the district where <i>n</i> (he/she) is working)
Academic trajectory determinants	Final grade	Continuous	10-20
	Year degree completed	Continuous	2014-2019
	Mobility to study	Dummy	0 = no move (if the graduate's district of residence is the same as the district where <i>n</i> (he/she) studied) and 1 = move (if the graduate's district of residence is different from the district where <i>n</i> (he/she) studied)
	Field of study	Dummy	1 = education; 2 = arts and humanities; 3 = social sciences, commerce and law; 4 = natural sciences, mathematics and statistics; 5 = engineering, manufacturing and construction; 6 = agriculture; 7 = health and welfare; 8 = services
	Participation in extracurricular activities:		
	International mobility	Dummy	0 = No; 1 = Yes
	Participation in associations	Dummy	0 = No; 1 = Yes
	Volunteering	Dummy	0 = No; 1 = Yes
	Complementary training	Dummy	0 = No; 1 = Yes
	Internship	Dummy	0 = No; 1 = Yes

Source: Own elaboration

Table 4 presents the descriptive statistics for key variables, divided into graduates whose job matches the field of study and those whose job does not.

Table 4. Descriptive statistics

		Global sample		Job matched the field of study		Job did not match the field of study	
		Freq.	%	Freq.	%	Freq.	%
Gender	Male	191	42.6	141	50.2	50	29.9
	Female	257	57.4	140	49.8	117	70.1
Age	20 – 25	129	28.8	71	25.3	58	34.7
	26 – 30	168	37.5	112	39.9	56	33.5
	31 – 35	42	9.4	28	10.0	14	8.4
	36 – 40	56	12.5	37	13.2	19	11.4
	41 – 45	39	8.7	27	9.6	12	7.2
	> 45	14	3.1	6	2.1	8	4.8
Mobility for work	No	186	41.5	108	38.4	78	46.7
	Yes	262	58.5	173	61.6	89	53.3

		Global sample		Job matched the field of study		Job did not match the field of study	
		Freq.	%	Freq.	%	Freq.	%
Final grade	11	2	0.4	1	0.4	1	0.6
	12	29	6.5	13	4.6	16	9.6
	13	70	15.6	39	13.9	31	18.6
	14	129	28.8	75	26.7	54	32.3
	15	120	26.8	77	27.4	43	25.7
	16	71	15.8	53	18.9	18	10.8
	17	23	5.1	19	6.8	4	2.4
	18	4	0.9	4	1.4	0	0
Year degree completed	2014	50	11.2	27	9.6	23	13.8
	2015	76	17.0	54	19.2	22	13.2
	2016	109	24.3	69	24.6	40	24.0
	2017	116	25.9	67	23.8	49	29.3
	2018	61	13.6	44	15.7	17	10.2
	2019	36	8.0	20	7.1	16	9.6
Field of study	Education	57	12.7	18	6.4	39	23.4
	Arts and humanities	19	4.2	3	1.1	16	9.6
	Social science, business studies and law	157	35.0	126	44.8	31	18.6
	Natural science, maths, statistics	35	7.8	29	10.3	6	3.6
	Engineering, manuf. and construction	46	10.3	42	14.9	4	2.4
	Agriculture	48	10.7	20	7.1	28	16.8
	Health and welfare	41	9.2	25	8.9	16	9.6
	Services	45	10.0	18	6.4	27	16.2
Extracurricular activities:							
International mobilit.	No	392	87.5	243	86.5	149	89.2
	Yes	56	12.5	38	13.5	18	10.8
Participation in association.	No	381	85.0	242	86.1	139	83.2
	Yes	67	15.0	39	13.9	28	16.8
Volunteerin.	No	353	78.8	235	83.6	118	70.7
	Yes	95	21.2	46	16.4	49	29.3
Complementary trainin.	No	239	53.3	132	47.0	107	64.1
	Yes	209	46.7	149	53.0	60	35.9
Internshi.	No	78	17.4	40	14.2	38	22.8
	Yes	370	82.6	241	85.8	129	77.2
Mobility to study	No	161	35.9	93	33.1	68	40.7
	Yes	287	64.1	188	66.9	99	59.3
HEI of study	University	241	53.8	153	54.4	88	52.7
	Polytechnic institute	207	46.2	128	45.6	79	47.3
Total		448	100.0	281	100.0	167	100.0

Source: Own elaboration based on the results of questionnaires

The evidence from the descriptive data shows that a high percentage of graduates (62.7%) described their job as closely related to their field of study, which means that most of them were applying the knowledge they acquired in higher education to their professions.

The data also shows that more women than men had jobs that did not match their fields of study. Age seemed to have a similar effect in both cases, in terms of informants whose jobs matched their qualifications and those who did not have a match, most of whom belonged to the 20-25 and 26-30 age ranges, predominant for both groups. A similar situation occurred for the final grade and the year the degree was completed, where both types of graduates had the same characteristics for these indicators, most of them being rewarded 14 or 15 points and finishing it in 2016 or 2017.

The fields of study related to “social science, business studies and law”, “engineering, manufacturing and construction” and “natural science, mathematics and statistics” comprised the highest percentage of graduates attaining an education-job match.

Only the frequency of complementary training and the participation in internship programs seemed to favour education-job matching, since a large proportion of the respondents stated that they had participated in them, mainly graduates who affirmed that their jobs matched their respective fields of study.

The data illustrates that more than half (about 60%) of those who needed both mobility for work (i.e., working in a district that was different from their home address) and mobility for study (i.e., having studied in a district that was different from their home address) had a successful education-job match.

Finally, there were differences regarding the type of HEI, with 54% of university graduates and 46% of polytechnic graduates considering that they had a successful education-job match. We have attempted to identify whether there is significant evidence for these differences, via a more robust analysis.¹

3.3 Results and discussion

To assess whether there were structural differences in the logistic regression between the university and polytechnic subsystems, we started by estimating an unrestricted model that, in addition to the explanatory variables, included a dummy variable ($D = 1$ if graduate n studied at a polytechnic and $D = 0$ if graduate n studied at a university) with additive and multiplicative methods, doubling the number of parameters estimated. A likelihood ratio test (LR) was then applied. Chi-square = 53.92 (with 18 degrees of freedom) allowed us to conclude with a 1% significance level that there were structural differences between the two subsystems.

Table 5 includes the results of the global sample for each higher education subsystem. Based on McFadden's R-squared, the likelihood ratio test and the number of 'correctly predicted' cases, the results show that the estimates seemed to fit well with the data collected. As can be seen, there was a significant LR, so we rejected H_0 , i.e., the restricted model (Model 1), leading to a need to estimate and analyse separate models for university (Model 1.A) and polytechnic (Model 1.B) graduates.

The results from Models 1.A and 1.B appear to confirm the hypothesis of this study, namely that due to the different objectives of each of the subsystems in Portuguese higher education, there were differences in the determinants, which affected the probability of attaining an

¹ As explanatory variables may be related to each other, we analysed the correlation matrix. We found that there were no strong and significant correlations, meaning that there were no collinearity issues. The results are available upon request.

education-job match for university and polytechnic graduates. Therefore, although the boundaries between universities and polytechnics are less obvious today (Queiró, 2017), both often offering similar programmes (Ferreira et al., 2008), the results may imply that the differences between the two higher education subsystems are still noted in the education-job matches of their graduates.

Table 5. Model estimation results (*logit*, dependent variable: education-job match)

Model fit summary	Model 1		Model 1.A		Model 1.B	
	Global model		University graduates		Polytechnic graduates	
Number of observations	448		241		207	
Log-likelihood	-208.33		-107.69		-73.68	
McFadden's R-squared	0.296		0.319		0.465	
Likelihood ratio test: Chi-square(18)	175.07***		100.95***		127.90***	
Number of 'correctly predicted' cases	79.2%		78.4%		85.0%	
Parameter	Estimate	SE	Estimate	SE	Estimate	SE
Constant	-8.73941***	1.47559	-11.1631***	2.25194	-12.3642***	3.17086
Gender (Ref: 0 = Male)	-0.773628***	0.263839	-0.876642**	0.369127	-0.291184	0.448201
Ag.	-0.12086	0.11622	-0.094461	0.171013	0.114654	0.261683
Mobility for work (Ref: 0 = No)	0.0122358	0.265848	-0.728215*	0.420686	0.695036*	0.420641
Final grade	0.610249***	0.104653	0.749018***	0.160555	0.838463***	0.22967
Year degree was completed	-0.0554804	0.0937015	-0.238341	0.148738	0.114399	0.203192
Mobility for study (Ref: 0 = No)	0.233538	0.264434	1.04158**	0.417487	-0.227667	0.436228
Field of study (Education)	-0.854192*	0.452048	-0.151753	0.724595	-2.87477***	0.879604
Field of study (Arts/Humanities)	-2.03282**	0.824812	-1.77956	1.14931	-2.85864**	1.34493
Field of study (Social science)	1.92259***	0.380815	1.91021***	0.637708	3.17559***	0.819049
Field of study (Natural science)	1.83244***	0.602676	3.27861***	1.18737	0.803773	0.786716
Field of study (Engineering)	2.88764***	0.673105	2.79519***	0.931301	3.80592***	1.00737
Field of study (Agriculture)	-0.486919	0.442653	0.170865	0.696353	-1.18295*	0.671496
Field of study (Health)	0.81704*	0.488439	1.98864**	0.783967	-0.839396	0.842136
International mobility (Ref: 0 = No)	0.21557	0.358074	1.00535	0.744084	-0.721539	0.658212
Participation in associations (Ref: 0 = No)	-0.191973	0.332164	0.0048145	0.58271	-0.00800658	0.53163
Volunteering (Ref: 0 = No)	-0.359731	0.300069	-0.375604	0.515945	-1.07874**	0.523992
Complementary training (Ref: 0 = No)	0.581142**	0.258542	0.668171*	0.376745	0.879334*	0.526182
Internship (Ref: 0 = No)	0.403291	0.348416	0.529566	0.461584	0.037985	0.575309

Source: Own elaboration based on the results of questionnaires

***, ** and * denote significance at the 1%, 5% and 10% levels of significance, respectively; SE means Standard Error

Among the control variables, gender determined the education-job match only in the university subsystem. This variable was negative and significantly related to the dependent variable for these graduates, which means that women were less likely to be education-job matched than men. This was corroborated in the literature, since Berntson (2008), McQuaid and Lindsay (2005) and Wilton (2008) found that men have access to better options in the labour market and are, therefore, seen as more “employable”. There is no consensus about this, however, as other studies have shown that there are no significant differences between recent male and female graduates (García-Espejo & Ibáñez, 2006; Green & McIntosh, 2007; Mavromaras et al., 2009; Menon, et al., 2012) and studies with recent Portuguese graduates have also shown that gender is not a determinant of their employability (Galego & Caleiro,

2011; Sin et al., 2016). These latest findings are similar to the results obtained for polytechnic graduates, where gender is not a significant variable.

The variable age was not significant enough to explain the education-job match of graduates from either of the higher education subsystems, contradicting the findings of Galego and Caleiro (2011) for a Portuguese university, which showed that younger graduates seemed to be in a disadvantageous position compared to more mature graduates upon entering the labour market.

Mobility for work was significant in the education-job match of graduates for both subsystems, but in opposite directions. On the one hand, the effect was negative for university graduates who had to travel to a different district for work, with a lower probability of an education-job match. The observations of Pereira (2007) can shed some light on this result to some extent, since he studied geographic mobility in Portugal using the distance of displacement as the reference domain, concluding that this mechanism was not an effective way of adjusting the labour market. On the other hand, for polytechnic graduates, commuting to a different district for work positively affected their probability of an education-job match. This may be due to the polytechnic considered in our study not being located in a metropolitan area and, as explained by Frenkel and Leck (2017), graduates from peripheral areas often have to migrate to core regions for a better chance of finding jobs matching their qualifications and skills.

The results for final grades were consistent with other studies which have shown that good grades increase the likelihood of an education-job match for graduates (Finch et al., 2013; Galego & Caleiro, 2011; Garcia-Espejo & Ibanez, 2006; Grayson, 2004; Verhaest & Omey, 2010). The relationship between this variable and the probability of this kind of match was positive and significant for both university and polytechnic graduates. The literature also shows that these results essentially make sense for recent graduates transitioning to the labour market because as individuals acquire professional experience, other sources of information are considered by employers and the final grade loses its effect in determining the probability of obtaining a job (Menon et al., 2012).

The year a degree was completed was not significant in the education-job match of graduates in either of the higher education subsystems. We introduced a trend with this variable in order to identify whether the probability of attaining such a match could change over time. This parameter was not significant, implying that it did not happen.

Mobility for study only affected the probability of an education-job match for university graduates, where it had a positive and significant impact. This result may be associated with the fact that employers believe that mobility allows more skilled individuals to cope with different organisational contexts and that it improves their performance at work (Sin et al., 2017). In general, when the literature mentions the benefits of mobility, it refers to international mobility programmes during academic studies. However, in order to explain the results of our study, we have established a parallel with this type of mobility and suggested that travelling to a different district to study develops the personality characteristics of graduates such as flexibility and adaptability in new environments and lower risk aversion, as well as interpersonal skills like autonomy, the ability to solve problems, organisation and coordination, in the same way that international mobility does (Konevas & Duoba, 2007), all of which are valued by employers in the labour market. For polytechnic graduates, this is not a significant parameter.

The fields of "social science, commerce and law", "engineering, manufacturing and construction" and "health and well-being" affected education-job matching in the university subsystem, as several other studies have found as well (Buonanno & Pozzoli, 2009; Frenkel & Leck, 2017; Galego & Caleiro, 2011). The results show that other fields also positively affected

the dependent variable, such as “health and well-being” and “natural science, mathematics and statistics”. The result for the latter field was attested to by the OECD data, which demonstrates that one of the main fields where Portuguese graduates were employed was in “natural science, mathematics and statistics”. In the polytechnic subsystem, only graduates in the fields of “social science, commerce and law” and “engineering, manufacturing and construction” were more likely to have an education-job match, with these variables showing a positive effect on the dependent variable. Graduates in the fields of “education”, “arts and humanities” and “agriculture” had a lower likelihood of an education-job match, since these variables had a negative sign and were statistically significant. We do not believe that the main reason for this stemmed from the inability of polytechnic graduates from these fields of study to integrate successfully into the labour market and find matching jobs, but rather that it was due to the differences between academic institutions, where polytechnic institutes, according to the Education Law (Law No. 46/86), have a more practical and professional nature while “arts and humanities” is more closely related to university studies, meaning that it is more academic and scientific in nature than what is offered at polytechnics.

Participation in extracurricular activities, which is considered in general by employers as a way to develop individual skills (Roulin & Bangerter, 2013), was expected to have a positive effect on education-job matching. However, the results show that it was only partially true, for both the university and the polytechnic subsystems. Out of the five extracurricular activities considered in the model, only the frequency of complementary training had a significant positive effect on the dependent variable. This result is backed up by the literature in the sense that it confirms the importance of developing soft skills from complementary training, in addition to the hard skills covered in curricular plans (Suleman, 2016; Suleman & Laranjeiro, 2018). Other extracurricular activities, namely, international mobility, participation in associations and participation in internships, did not have a significant effect on education-job matching. Volunteering was negatively related to the education-job match in the polytechnic subsystem; that is, graduates who participated in volunteer programs were less likely to find a job connected to their field of study. This may have been because some employers believed that strong involvement in extracurricular activities could compromise academic performance (Rubin et al., 2002) and lead to less professional commitment (Roulin & Bangerter, 2013), thus potentially harming education-job matching.

4. Conclusion

This study has examined the role of personal attributes and institutional characteristics in education-job matching graduates from two higher education institutions in the northern region of Portugal, who were awarded their degrees from 2014 to 2019. The results of logistic regression models have revealed that although the boundaries between universities and polytechnics are less obvious today, there are some differences between the two higher education subsystems concerning the education-job matches of their graduates, leading to a need to create and analyse separate models for them.

Overall, the findings suggest that male university graduates who had studied in the fields of “social science, commerce and law”, “engineering, manufacturing and construction”, “natural science, mathematics and statistics” or “health and welfare” and who had obtained reasonable or high final grades, had an advantage in terms of the probability of attaining an education-job match. The likelihood of an education-job match was also better for graduates who had participated in extracurricular activities involving complementary training, showing an active demand for soft skills as a complement to the hard skills taught in the curricula. Finally, those

who had travelled to a different district to study had better prospects as well. In the polytechnic subsystem, graduates who had studied in the fields of “social science, commerce and law” or “engineering, manufacturing and construction” and who had been awarded reasonable or high final grades had the edge over their competitors too. The probability of education-job matches was greater for graduates who had participated in extracurricular activities including complementary training, as well as for those who had travelled to a different district for work.

Due to the differences between the university and polytechnic subsystems concerning the education-job matches of their graduates, the policymakers and managers of HEIs should consider the particularities of each subsystem when defining measures for higher education. The public policy strategy to improve the education-job match should be designed to enhance the employability of graduates in their respective areas of study, regardless of the higher education subsystem from which they come or gender. Additionally, policymakers and HEI managers should be aware that the orientation towards degrees and training plans positively contributes to education-job matching and that the availability of dynamic labour market information systems reduces information gaps for students entering higher education.

Currently, graduates face a great deal of uncertainty related to major societal challenges and those arising from the volatility of the job market, as well as the change in the skills profiles required by companies. Therefore, with study plans which allow for geographical and international mobility to be integrated, HEIs should promote the improvement of formal skills (hard skills) and personal and social skills (soft skills). At a time when graduates who complete their studies may, in the future, pursue a professional activity that does not yet exist, HEIs are responsible for ensuring adequate preparation, namely scientific and technical skills, to practice certain professions by, for example, improving the teaching of scientific knowledge and critical thinking as well as the ability to adapt to new and different circumstances. Furthermore, complementary training should be promoted via lifelong learning among other methods and conditions to improve the education-job match for women should be encouraged, since men were seen to be at a significant advantage. In this case, policy proposals should shake up the labour market and, more broadly, for social organization, work-life balance should be fairer towards women.

As described throughout this paper, the topic of education-job matching is dynamic and complex. To achieve a higher robustness of the results, it would require data over a long period provided by the main stakeholders (HEIs, graduates and employers). Therefore, knowing that this research constitutes an incremental approach, the interest in this issue opens the door to wider avenues of research, by, for example (i) replicating the methodology used in this study with a larger sample of polytechnic and university HEIs, (ii) strengthening the quantitative analysis with qualitative information collected from surveys of other stakeholders and documents produced by the evaluation agency, namely external evaluation reports on HEIs and degrees and (iii) applying panel data econometric techniques to samples collecting data in HEIs over time.

Author Contributions

Conceptualization: DO, LC and CR; Methodology: DO and JR; Software: DO; Validation: DO, LC, CR and JR; Formal Analysis: DO and LC; Data Curation: DO; Writing – DO and LC; Writing – Review & Editing: DO, LC and CR. All authors have read and agreed to the published version of the manuscript.

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