

Understanding Program Diversification in Higher Education: A Comparison between Public and Private Sectors

Pedro Teixeira ^{a,b*}, Vera Rocha ^{a,b}, Ricardo Biscaia ^{a,b}, Margarida Fonseca Cardoso
^{a,c,d}

^a *CIPES, Center for Research in Higher Education Policies, Rua 1º Dezembro, 399,
4450-227 Matosinhos, Portugal*

^b *FEP – Faculty of Economics of University of Porto, Rua Dr. Roberto Frias, 4200-464
Porto, Portugal*

^c *ICBAS – Instituto de Ciências Biomédicas Abel Salazar, Largo Prof. Abel Salazar, 2 ,
4099-003 Porto, Portugal*

^d *CIIMAR - Centro Interdisciplinar de Investigação Marinha e Ambiental, Rua dos
Bragas, 289, 4050-123 Porto, Portugal*

*Corresponding author
Pedro Nuno Teixeira (pedrotx@fep.up.pt)
Faculty of Economics of University of Porto
4200-464 Porto
Portugal
Telephone: 00 351 229 398 790
Fax: 00 351 229 398 799

Understanding Program Diversification in Higher Education: A Comparison between Public and Private Sectors

Abstract:

The development of mass higher education and growing competition between higher education institutions has given increasing visibility to the issue of diversification. This paper analyses the issue of program diversification using a panel of 181 Portuguese higher education institutions over the period 1995-2007 by comparing the behavior of public and private institutions. The institutional diversity found within the Portuguese higher education system and its evolution over the recent decades provides a suitable and interesting case to perform this analysis. The results show that the legal status of institutions is a major factor regarding diversification, as private institutions are far more specialized than their public counterparts. The study also evaluates which the role of other institutional variables such as size, age, location, category, and research intensity to explain differences in the diversification behavior of higher education institutions. The results provide important insights, as competition has been thought to improve the performance of higher education institutions.

Keywords: Competition, Diversification, Specialization, Higher Education, Portugal, Public-Private Sectors

JEL Codes: I23, L2, L3

1. Introduction

Diversification of activities has been for long time one of the main topics of debate in industrial economics and management thought (see, for instance, Caves 1980; Porter 1980). In particular, many authors have examined why (certain) firms diversify their activity and what is the best environment to promote or hinder diversification, especially when this corresponds to an innovative behavior. Kamien and Schwartz (1975) and Ramanujam and Varadarajan (1989) provide two valuable in-depth surveys on the link between corporate diversification strategies and market structure. Montgomery (1994) also provides an influential discussion about why firms entail diversification strategies, paying particular attention to their motivations related to the available resources and market-power objectives.

Despite the extensive literature on corporate diversification (see also Martin, 2003), we still know little about diversification strategies in other sectors. In particular, universities and other higher education institutions are increasingly required to respond to new and complex demands from society. In the contemporary “knowledge-based economy”, Higher Education Institutions (HEIs) are expected to play an increasing significant role at the ongoing re-qualification of human resources (Rossi, 2009), being increasingly viewed by policy-makers and general public as agents of economic development and growth (Yusuf and Nabeshima, 2007).

The massification of higher education has not only created significant challenges for HEIs, leading also to an increasing policy interest. Institutions of higher education have been facing, over the most recent years, an increasingly heterogeneous student population from a socio-economic, ethnic, gender and geographical points of view (van Vught, 2009), as well as a demanding and complex financial context in which traditional modes of funding have been transformed towards a growing financial stringency with more pressures on revenue diversification (Johnstone, 2004). Accordingly, HEIs have simultaneously reasons to diversify their supply (in order to capture a wider range of student preferences and to match the potential competition from other HEIs) and to specialize in certain educational fields (mainly those attracting the majority of enrolments or demanding fewer cost burdens, in order to maximize revenues) (Duchesneau and Wihry, 2002; Glass et al., 2002).

The coexistence of such conflicting pressures towards a higher or lower diversification of HEIs' supply creates an environment about which policy-makers have been strongly concerned. Competition in higher education, mainly the one associated with the large privatization phenomena around the globe, has been supported by high political expectations, notably concerning an increase of the programmatic diversity, which implies greater choice of programs and HEIs' responsiveness to students' and labor market demands (Teixeira et al., 2012), with potentially positive impacts on HEIs' performance, autonomy and accountability (Aghion et al., 2010).

Despite the increasing relevance of these questions among the public debate and the increasing body of literature on public-private competition in education (Belfield and Levin, 2005), empirical assessments of competition in higher education systems are still limited and more focused on the US experience (Bok, 2003, Winston, 2004; Kwoka and Snyder, 2004). Studies about European higher education have been rather scarcer, possibly reflecting the more limited role of competition, private providers, and market forces.¹ However, the European landscape has been changing and the growing competition is likely to stimulate HEIs to be more proactive in seizing new markets and expanding their activities.

In this paper, we use a panel of 181 institutions from the Portuguese higher education system, observed over the period 1995-2005, to study the horizontal diversification patterns of HEIs in terms of program supply. The institutional diversity found within the Portuguese higher education system and its evolution over the recent decades provides a suitable and interesting case to perform this analysis. In particular, we intend to evaluate whether HEIs are all supplying the same fields of education or, in opposition, if they are specialized in some particular areas, paying special attention to the differences between private and public subsectors. Moreover, we assess which institutional-level characteristics potentially explain HEIs' diversification behavior and if significant differences exist between private and public institutions.

The remaining of the paper is structured as follows. Section 2 discusses the framework and formulates the hypotheses. Section 3 describes the data and the Portuguese higher education context. Section 4 presents the methodology applied to study the patterns of specialization and differentiation of public and private higher HEIs and the results

¹ For an analysis of strategic behaviour in the German higher education system see Warning (2004).

obtained. Section 5 explores the potential explanatory factors for HEIs' diversification patterns, applying linear panel data models. Section 6 concludes.

2. Competition and Program Diversification in Mass Higher Education: Theory and Hypotheses

2.1. Theoretical Background

In recent decades, higher education has experienced massive expansion worldwide. This has been visible through multiple dimensions, namely an expansion of national systems of higher education, a growing number of institutions, and a larger participation rate of the respective age cohorts (Trow, 2010). The expansion of the higher education system has often been linked with aims to increase diversification of higher education along several dimensions. One of the dimensions referred to the types of training provided. On the one hand, massification was expected to bring not only a larger student population, but also a more diverse one (Scott, 1995); on the other hand, a mass higher education sector is supposed to perform a more diverse array of roles than an elite one, with a much greater emphasis in the transmission of skills and the promotion of adaptability to social and technological changes (Trow, 2010).

The massification process has been associated with a transformation of the structure of higher education systems in which alongside traditional sectors and institutions, there was the emergence of new sectors and new types of institutions. These new types of institutions were often established with the purpose to offer more diversified types of advanced training. These increasing diversification attempts could have been justified not only by the fact that different types of programs could often be cheaper than the strategy followed by more research-oriented traditional institutions, but also on the grounds that these new programs and diversified institutions could be better suited for a student population that was expected to be more heterogeneous from a socio-economic, ethnic, gender or geographical points of view. Consequently, many countries have established a vocational sector or vocationally-oriented institutions that were expected to be more appealing to certain groups of students (Palfreyman and Tapper, 2009; Teichler 1988). The process of massification also included a more disperse geographical coverage, which was often intertwined with the aforementioned institutional diversification, that could place higher education under the reach of more peripheral

regions and that promoted a greater interaction between those new institutions and the local economic and social needs.

The structural changes in higher education were also related to the development of private institutions. Also in this case we see a combination of financial and educational concerns. The development of the private sector has been clearly seen as a possibility to continue the expansion of higher education in a way that would place far less burdens on tightening public budgets (Barr, 2004). However, the greater willingness to have a much greater presence of the private sector in higher education, even in countries where this was not traditionally the case, was justified on the grounds that those institutions could contribute to a better match between types of training supplied and demanded. Since their funding is highly reliant on tuition fees, private institutions were expected to be far responsive to diverse needs from students and employers, adopting a more entrepreneurial behavior (Shattock, 2006).

Accordingly, and drawing lessons from the corporate diversification literature, we could argue that program diversification entailed by Higher Education Institutions (HEIs), mainly in the private sector, could fit the market-power and resource-based views, both consistent with profit maximization objectives (Montgomery, 1994). Private institutions in particular need to balance the costs of a more diversified programmatic supply and the associated costs with a large number of enrolled students, having in mind the resources available and their profit-seeking behavior. Accordingly, a managerial perspective seems not to be totally unreasonable in the private subsector of higher education.

This issue of programmatic and institutional diversification has gained a greater visibility in recent years in higher education due to several regulatory changes, notably by the increasing influence of market mechanisms (Le Grand, 2007; Teixeira et al, 2004). Pressed by financial and economic pressures, many governments have tried to promote greater institutional competition. Underlying these changes, there has been the expectation that market competition could make institutions more efficient and more responsive to socio-economic needs and, in particular, the potential contribution of public-private competition can be significant regarding program diversification.

Accordingly, program diversification in higher education may be affected by a complex set of forces, some of which may promote greater diversification and others leading

towards greater homogenization. The issue of competition and diversity in higher education systems emerges as a challenge from a policy point of view, where an optimal balance between regulation and market forces must be found. In this paper, we aim at identifying the institutional-level characteristics that are associated with the diversification patterns of HEIs in terms of the programs they offer. Next section discusses the potential specificities of higher education institutions that might help to understand their diversification behavior.

2.2. Hypotheses

Several institutional-level aspects must be taken into account when analyzing the diversification profile of HEIs, at the programmatic level. One of the first specificities deserving attention is the legal status of the institution, that is, whether it is public or private. In the previous section we have already discussed that public and private HEIs follow a well-recognized different strategy, mainly due to regulatory questions related to funding. Private HEIs rely much more on tuition fees as one of the main source of revenues, which might justify their potential firm-like profit maximizing behavior. This can also make them more cautious and instill a significant risk-aversion that will undermine the expectations that private institutions could promote greater program diversification (Shattock, 2006). Actually, some studies have suggested that private HEIs tend to duplicate what their public counterparts do, especially by supplying programs in fields with strong demand and requiring low investment (Teixeira and Amaral, 2001; Wells et al., 2007). Accordingly, we expect that:

Hypothesis 1 Private HEIs are less diversified than public HEIs regarding the programs supplied, *ceteris paribus*.

Other institutional-level characteristic to bear in mind is the HEI's size in terms of the number of students enrolled. Although the literature on scale and scope effects in higher education is less than conclusive, there are indications of both effects in this sector, especially at smaller scales of production (Cohn et al., 1989; Dunder and Lewis, 1995). Institutions receiving a larger number of enrollments probably face a more heterogeneous population of students, justifying a more diversified supply. In other

words, institutions with a lower number of enrollments may be more efficient if they focus on fewer educational fields. Moreover, launching new programs can be an organizational challenge, especially for smaller institutions, since they will have to find the necessary financial and human resources to attract a sufficient and qualified group of students in areas that not necessarily master and/or have reputation within.

Hypothesis 2 Smaller HEIs (in terms of enrollments) are less diversified than larger HEIs regarding the programs supplied, *ceteris paribus*.

The category of the institution, namely if it is a university or a polytechnic institute, is also expected to impact on the programmatic diversification pattern of HEIs.

Polytechnic institutions are understood as being more vocational/professional-oriented institutions, which may justify their stronger focus on more specific educational fields. Also, their larger resource constraints (in terms of funding and share of PhD academic staff) may contribute to their larger specialization in particular areas, thus less diversified programmatic supply, compared to the university subsector.

Hypothesis 3 Vocational institutions are less diversified than universities regarding the programs supplied, *ceteris paribus*.

The maturity of the institution may also play a role, though the direction of the effect seems not to be clear-cut. Rossi (2009) has found for Italy that older institutions tend to reduce their diversification levels. On the other hand, we could also argue that younger institutions may tend to start their activity by focusing their supply in a few educational areas, diversifying the set of programs supplied over time. However, older HEIs may also have different diversification profiles according to their legal status (public or private) or category (university or polytechnic), though no clear expectation on these potential differences is definite *a priori*. As a result, we only define the hypothesis for the most general effect of HEIs' age, though we will take this factor into deep account in the empirical analysis.

Hypothesis 4 Older HEIs are more diversified than younger HEIs regarding the programs supplied, *ceteris paribus*.

Having a much stronger research orientation may also contribute to explain the programmatic diversification profile of HEIs. Research-active institutions tend to be identified mainly among university institutions, which award doctoral degrees and present larger shares of academic staff holding a PhD. Following the same arguments discussed above for the university-polytechnic case, we expect that:

Hypothesis 5 Research-active HEIs are more diversified than the other HEIs regarding the programs supplied, *ceteris paribus*.

Finally, the location can also partly explain why HEIs are more or less diversified in terms of programmatic supply. In particular, for those institutions that draw most of their students from their local area, we could expect that the pressure to diversify in order to satisfy a wider range of student preferences should be higher than those HEIs that draw their students from the entire national territory, which can afford to specialize in a narrower range of disciplines (Rossi, 2009). We proxy those “national” HEIs by distinguishing the institutions located in the country’s capital from those located in the remaining regions. Also, at least in Portugal, the purchasing power is larger in the capital, so this difference in the potential population target must be controlled for in our estimations. Based on Rossi (2009), we thus expect that:

Hypothesis 6 HEIs located in the capital are less diversified than HEIs located in the other regions of the country regarding the programs supplied, *ceteris paribus*.

In summary, overall we expect that the degree of programmatic diversification in mass higher education systems will be influenced by the intensity of institutional competition and financial pressures, the legal and regulatory possibilities for greater institutional differentiation, and the need to adapt programs to specific local needs and to accommodate a growing population of students with more varied educational, social, economical and cultural backgrounds (Rossi, 2010).

3. Data and Institutional Framework

In this study we use data on the Portuguese higher education system. The Portuguese case provides a suitable and interesting case to perform the analysis, mainly due to the institutional diversity found within the system and its evolution over the recent decades. Until the mid-seventies, the Portuguese higher education system was clearly an elite system, with a low rate of enrolment despite some attempts to increase the participation rate. The increasing pressure towards expansion was particularly channeled by the institutional diversification of the system, with the creation of new public universities and the significant expansion of the private sector and a vocational polytechnic sector (both in the public and the private sectors). Between the 1970s and the 1990s the system doubled its size each decade, moving steadily away from its original elitist character and the Portuguese system is nowadays a diversified one composed by private and public subsectors (both including universities and polytechnics).

This pattern of expansion has led to an increasing competition for students due to the reverse of demand patterns, mostly because of the demographic retrenchment. Like many of its European counterparts, Portugal has suffered a significant decline in fertility rates, with subsequent effects in educational enrolments, though, due to the late expansion of higher education, that effect only became at a later stage. Whereas until the mid-nineties there was a scarcity of places, with students competing for places in many institutions and programs, nowadays the competition is mostly between institutions, struggling to attract a sufficient number of students to fill their *numerus clausus*. The stabilization of demand has affected in particular the private sector, which seems to be the less competitive part of the whole system. This competition for students was exacerbated due to the way the system has geographically developed. Although the public system's expansion has led to the creation of public universities and vocational institutions in several medium-sized cities across the country, the development of the private sector counteracted this trend of increasing regional diversification, with private institutions concentrating in the main urban areas of Lisbon and Porto. The overall regional distribution of the higher education network remained strongly concentrated, contributing to intensify the competition between institutions, thus highlighting the potential role played by HEIs' location when explaining their diversification behavior.

Throughout the massification process, and until recently, public and private institutions were able to create most of the programs they wanted, with very few exceptions in areas such as health that remained subject to stricter regulation. The control operated by the ministry was focused on administrative details and very little on the quality or sustainability of programs. A recent trend has been the development of postgraduate programs, since demographic trends precluded any significant expansion of the undergraduate group. This was enhanced by the implementation of the Bologna process that in many cases reduced the length on the first cycle of studies and created an incentive for the development of multiple second-cycle programs. Although many observers have expressed concern about the excessive number of programs, including many institutional leaders, the cumulative effect of individual institutional behavior was a steady expansion in the number of programs.² This evolution of the Portuguese system thus presents several features that recommend a more systematic analysis of patterns of program diversification.

The dataset used to find potential explanatory factors of HEIs' patterns of programmatic diversification comprises an unbalanced panel³ of 181 Portuguese HEIs for the period 1995-2007⁴: 51 public HEIs (19 universities (including 4 military HEIs) and 32 polytechnics) and 130 private HEIs (56 universities and 74 polytechnic institutions). In order to study the diversification patterns of HEIs in terms of fields of study they have been offering over time, we need to compute a *diversification* index that summarizes into a single value the relative presence of each HEI across eight educational fields⁵: Education; Humanities and Arts, Social Sciences, Business and Law; Science; Engineering, Manufacturing and Construction; Agriculture; Health and Welfare and Services. Moreover, to identify the areas in which HEIs are more or less specialized, we also compute a *specialization* index, which measures the relative specialization of each institution in each of the 8 educational fields.

² This capacity of institutions to create most of the programmes they submitted has only changed recently, with the creation of the new accreditation and evaluation agency in 2008, which has signalled a far stricter approach to the creation of new programmes, though its effects will only be felt in the future.

³ The panel is unbalanced due to the existence of institutions that have born, closed or merged during the period. Each institution was active in the dataset, on average, for 10.8 years.

⁴ Data on graduate students by educational fields is available for the period 1995-2007. This will be the time window studied later, in our econometric analysis. Data on other indicators – academic staff, number of programs and total enrolments – are available for different periods (see section 4 for further details).

⁵ The UOE manual, available at http://www.uis.unesco.org/ev_en.php?ID=5750_201&ID2=DO_TOPIC, considers eight educational fields.

In few words, if an institution is very much diversified, this also means that it is not very much specialized, so higher levels of the diversification index mean lower levels of the specialization index over the different areas of education. On the other hand, lower levels for the diversification index will mean that the institution will be more specialized in some educational field(s). The computation of the specialization index will thus allow the identification of the areas where the relative specialization of the (set of) institution(s) is stronger.

Specific indicators are needed to compute both indexes. In order to check whether the results are sensible to the indicator used, the analysis was performed using data on four specific indicators: the total number of programs, total academic staff, total enrolled students and total degrees awarded, disaggregated by institution and the eight educational fields. Each of these indicators has advantages and drawbacks, so an analysis integrating several different indicators is richer and more robust.

4. Specialization and diversification of Portuguese HEIs

4.1. Methodology

To capture the level of diversification of each sector, the Rossi (2009) approach was followed and a “diversification index” constructed based on the inverse of Herfindhal-Hirschman index (Pepall et al., 2008, Berry, 1971):

$$D_j = 1/(\sum_i (x_{ji}/X_j)^2), \quad (1)$$

where:

(Let Z denote the total number of programs/academic staff/enrolled students/graduates)

x_{ji} = number of Z in sector j and in educational field i ;

X_j = total number of Z in sector j ;

j = legal status of the sector: {private, public};

i = educational field.

This diversification index shows how wide the range of educational fields of each sector is, so low values of D_j imply that sector j is more specialized, while higher values mean that the sector is more diversified in terms of the programmatic supply. D_j assumes values between 1 and n (the overall number of educational fields), being normalized to take values in the range $[0, 1]$ as follows:

$$ND_j = (D_j - 1) / (n - 1). \quad (2)$$

To enrich the analysis and measure in what extent each sub-sector is “specialized” in a particular educational area relative to the national average, the Revealed Comparative Advantage (RCA) index developed in international economics by Balassa (1965) was applied (Rossi, 2009). Accordingly, the specialization index of sector j in educational field i , S_{ji} , is defined as follows:

$$S_{ji} = (x_{ji}/X_j)/(x_i/X), \quad (3)$$

where besides x_{ji} and X_j already defined

x_i = number of Z in educational field i from all institutions in both sectors;

X = total number of Z of all institutions from both sectors in the country;

This index takes positive values. Values smaller than 1 mean that sector j is relatively under-specialized in educational field i , whereas values greater than 1 imply that sector j is relatively over-specialized in the area. To avoid problems associated with the sensitivity of the index to the size of sectors, S_{ji} was normalized following Brusoni and Geuna (2003) as follows:

$$NS_{ji} = (S_{ji} - 1) / (S_{ji} + 1), \quad (4)$$

Now, the index takes values in the range $[-1, 1]$ and indicates whether sector j has a higher-than-average “activity” ($NS_{ji} > 0$) or a lower-than-average “activity” ($NS_{ji} < 0$) in a particular educational field i .

4.2. Discussion of Results

Figures 1 and 2 depict the profile of enrolments in the top educational fields in both private and public subsector. For the private sector, a sharp decrease in the number of enrolments in social sciences is identified. Conversely, health sciences have becoming a more attractive field with an increasing level of enrolments. For the public sector (Figure 2) the pattern is different, as social sciences and engineering are the dominant fields and where the number of enrolments is still growing. Similarly to the private sector, the health field presents a growth in enrolments. On the other hand, Education areas have been declining over the years.

Figures 1-2 here

Figures 3 to 6 depict the evolution of the normalized diversification index for public and private sectors, according to the four indicators used⁶. We focused the analysis on the public-private dichotomy over the time. The results indicate a large public-private differentiation in terms of fields of study. Private HEIs are much less diversified and thus far more concentrated in specific educational fields, whatever the indicator used. However, the differences have been decreasing over time, probably due to the decline in enrolments in social sciences, where the private sector has always showed a relevant share (Figure 1). This reduction in the private sector is probably a result of the increase of the number of degrees in this area in the public sector.

Figures 3 - 6 here

In Table 1 we report the normalized average specialization index (NS_{ji}) for public and private HEIs throughout the eight educational fields. The results relate to the year 2006/07, as it is the most recent year with available data for all four indicators.

Insert Table 1 here

In all cases the index highlights the relative over-specialization of private HEIs in Social Sciences and Health fields, in contrast with Engineering and Hard Sciences, where they tend to be under-specialized. In contrast, the main focus of public HEIs seems to be the Hard Sciences, Engineering and Agriculture. Such differences between sectors may be

⁶ For each of the four indicators, we used data available for the widest period available. Data on programs and enrolments is available for the years 1998/99-2006/07. For graduates we have data for 1995/96-2007/08. For academic staff, we only have data for the years 2001/02-2008/09. Data on programs, enrolments and graduates include Bachelor, Master and Doctorate degrees. Data were obtained by GPEARI, the office aiming to provide the statistical and policy support to MCTES (*Ministry of Science, Technology and Higher Education*).

partly explained by differences in the average size and resources available for each group of institutions. Private HEIs are often smaller than public ones (see Section 5) and tend to have a strong focus on educational fields where the average costs and the initial investment are lower (e.g. Social Sciences) or where the private rates of return are high, as in most Health Sciences. The public-private differences suggest that the private supply tends to complement the public one by contributing to widen the students' choices, but prefers to avoid direct competition with the more prestigious and cheaper public sector. Next section offers a deeper analysis on the potential institutional-level factors that could explain the programmatic diversification differences hitherto founded.

5. Institutional-level factors of programmatic diversification of Portuguese HEIs

5.1. Methodology

In order to better understand the factors potentially determining the diversification of HEIs, multivariable regression analysis was performed where the dependent variable D_{it} corresponds to the diversification index of institution i at year t . In this section the diversification index was estimated based on data from graduated students⁷ of each HEI in each of the eight educational fields.

We use linear panel data models, and discuss the suitability of the fixed and random effects models for the data analysed and the models developed. Panel data provides more informative data and greater efficiency in the estimations, compared with only cross-section or time-series data, allowing to control for individual heterogeneity and to study the dynamics of adjustment over the time (Baltagi, 2005). Potential explanatory variables were the *Size* of the institution at time t – measured by the enrolled students

⁷ We have selected the index computed with graduated students in each educational field and subsector of HEIs as this seems to be the most suitable indicator to analyze the specialization and diversification patterns of HEIs. The other indicators present some drawbacks that we can avoid in this section. For instance, by using the number of programs data, each program has the same relative importance in the computation of the indexes, regardless the number of enrolments. The use of staff data could be misleading due to interdisciplinary and organizational issues, as we frequently find faculty from very different educational fields associated to programs of a specific area, which may disguise the actual degree of specialization of some HEIs. Analyses based on enrolments cannot control the so-called “phantom students” phenomenon i.e., the number of enrolled students that have limited engagement in lectures and examinations and that seems to be high in several public institutions. Consequently, using the results based on graduate students overcomes these potential limitations.

(represented in thousands), the *Age* of the institution and four dummy variables – the *Public* dummy (which assumes the value 1 if the HEI is public and 0 if it is private); the *University* dummy (which assumes the value 1 if the HEI is an university and 0 if it is a polytechnic institution); the *Lisbon* dummy (which assumes the value 1 if the HEI is located in the Portuguese capital and 0 otherwise) and the *RAI* dummy (which assumes the value 1 if the HEI is considered to be a Research-Active Institution and 0 otherwise). Research-active institutions correspond to HEIs that fulfill at least three out of six criteria: 1) the existence of an official research mandate; 2) the existence of research units institutionally recognized; 3) the inclusion in the R&D statistics as sign of institutionalized research activity; 4) awarding doctorates or other ISCED 6 degrees; 5) consideration of research in institutions' strategic objectives and plans and 6) regular funding for research projects either from public agencies or from private companies (EUMIDA, 2010).

Random effects (generalized least squares) panel data models were found to be preferred over fixed effects estimation, being thus used to account for the variability of repeated measures over time (within variation) of the same HEI and also to account for the variability between institutions (between variation). A previous analysis of data regarding the within and between variation of each variable allowed observing that the institutions under scrutiny were very dissimilar, not only within each subsector (university and polytechnic), but even more between subsectors. As a result, a statistical model able to account for both within and between variation, as random effects panel data models, would be the most appropriate (Greene, 2002: 295; Baltagi, 2005: 17). Accordingly, we estimated the following equation:

$$D_{it} = \alpha_i + X'_{it}\beta + \varepsilon_i + u_{it} \quad (1)$$

where α_i is the intercept term, common across the institutions included in the analysis, while X_{it} is the vector of aforementioned explanatory variables. The two remaining components correspond to a composite error term, where ε_i is the cross-section, or institution-specific, error component and u_{it} is the combined time series and cross-section error component. The error components were assumed to be not correlated with each other and not correlated across both cross-section and time series units.

5.2. Discussion of Results

Table 2 provides some descriptive statistics for the main independent variables to be used in the estimations, overall and across the several subsectors. The larger HEIs are public universities, in opposition to private polytechnics which have the lower average number of enrolments. The most mature HEIs are on average public universities, while private HEIs (both universities and polytechnics) include much younger institutions. The proportion of HEIs located in the capital is similar across the subgroups of institutions, varying between 33.3% (for all the private polytechnics in the sample) and 47.4% (for public universities). Research-active institutions are only found among universities and mostly in the set of public universities, where almost three quarters of the HEIs are RAIs. Among the private universities, less than 8% are RAIs.

Insert Table 2 here

Table 3 displays the results from Random Effects estimation. In order to check the reasonability to include each of the independent variables previously presented in a multivariable regression, we have first conducted a univariable analysis, regressing the diversification index of institution i at time t with each of the independent variables alone. This helped the identification of the variables that could be associated with diversification.

Insert Table 3 here

The first column of Table 3 provides the results for the univariable analysis including all the Portuguese HEIs. Individually, all the variables help to explain part of the variability of HEIs' programmatic diversification, though not all variables have the same explanatory power (see the overall R^2 of these univariable regressions at the bottom of the Table). Due to the dissimilar diversification pattern found between public and private subsectors in Section 4, the analysis was replicated for the two subgroups of institutions (second and third columns of Table 3). The results suggest that the explanatory power of each variable may be significantly different for public and private HEIs. In particular, we observe that, unconditionally, HEI's size⁸ and location might not

⁸ However, we must note that in this case we are evaluating the contemporaneous impact of the total enrolments upon the institution's diversification index. Actually, some institutions may take more time to adapt the supply to their students population, and this may be particularly true among private institutions, which have more resource constraints compared to their public counterparts. To check this, we have regressed, by subgroups, the HEI's diversification on different lags (1 to 5 years) of HEI's size. In both cases the results suggested that a larger population of students exerts a positive effect of the

be so relevant to explain why private HEIs are more or less diversified. However, in order to find the independent effect of each variable, on diversification a multivariable regression analysis should be performed.

The last three columns of Table 3 report the results obtained from the multivariable regressions, after removing those that were not statistically significant ($P\text{-value} > 0.05$), where the independent effect of each variable can be identified, after controlling for all the remaining HEI's specificities. Moreover, given the differences found among institutions regarding their age (Table 2), we have also included an interaction dummy – *University*Age* – in order to capture whether there is any joint effect exerted by the HEI's category and its maturity.

The multivariable regression estimated for all HEIs would corroborate all the hypotheses raised in Section 2, excepting Hypothesis 3 (about the different diversification behavior of polytechnics and universities). However, we observe a significant and positive effect of the *RAI* dummy, which is in some way capturing the effect of being a university rather than a polytechnic, given that research-active institutions in Portugal are only found in the university subsector. In particular, being a research-active institution seems to increase the diversification index by 0.08 on average, *ceteris paribus*. Being located in the capital penalizes the diversification index of HEIs by almost, on average, 0.08. Larger and older HEIs tend to be more diversified, though the effect of institution's maturity is almost negligible. Additionally, public universities are found to be considerably more diversified than private ones, clearly supporting our Hypothesis 1. This difference between private and public HEIs also strengthens the motivation to further analyze the diversification determinants for these separate groups.

The last two columns of Table 3 show the results for the two subgroups. We find support for our Hypothesis 2 in both subsectors: the larger the institutions, the higher the corresponding diversification index, keeping all the remaining variables constant. However, the effect is higher and more significant among public HEIs. No support for both Hypotheses 3 and 5 is found within each of the subgroups, as no significant difference emerges either among polytechnics and universities, or between a RAI and a

diversification index of the institution over the subsequent years, though the magnitude of the effect and the overall R^2 is always much larger within the public sector.

non-RAI. This may suggest that, when explaining why HEIs are more or less diversified in terms of their programmatic supply, institutions' legal status (private vs. public) is more important than institution's category and research-orientation. Actually, when we focus our attention on each of the subsectors, the differences previously detected for RAIs or universities vanish, which means that HEIs may have different diversification profiles not because they are universities rather than polytechnics (or because they are more research-oriented), but primarily because they are public-owned. Being located in the capital only affects (negatively and with a significant magnitude) the diversification index of public institutions, being not significant for private ones, so Hypothesis 6 only holds for the public subsector.

Regarding the effect of HEI's maturity, the results deserve some special attention, as HEI's category is found to moderate the effect of this variable. For public HEIs, a higher maturity impacts positively (though marginally) upon the diversification index of the institution if it is a polytechnic. If rather it is an university, the positive effect of institution's maturity cancels out. Among private institutions, results only allow to conclude that an increase in the institution's age by 10 years would increase the difference in the diversification index of universities and polytechnics by on average 0.026, favoring the university subsector. A summary of the conclusions can be found in Table 4.

Insert Table 4 here

In summary, we conclude that being public or privately-owned is a crucial determinant for programmatic diversity in Portuguese Higher Education. Additionally, within each of the sectors, the variables that mostly contribute to the explanation of programmatic diversity are not exactly the same. For public institutions, being larger and located out of the capital contributes to expand the diversification of HEIs' programmatic supply. Moreover, public polytechnics tend to become more diversified as they grow older. For private institutions, the conclusions are less clear and only small effects are found to arise from the dimension of enrolments and the joint effect of HEIs' category and maturity. However, we must take into account the quality of the regressions in terms of their explanatory power. For public HEIs, the estimated model is able to explain about 54% of the overall variation in HEIs' diversification index, both between institutions and over the period under scrutiny, which is very satisfactory when using panel data.

For private institutions, the explanatory power of the estimation is weaker. Actually, their private status *per se* seems to have a strong power to predict their less diversified supply, more than the specificities that the several private institutions might present.

6. Concluding Remarks

The evolution of mass higher education has led to an increasing policy interest in the development of diverse types of training since this was believed to contribute to greater efficiency of the higher education system. Over the last decades, we have seen in many European systems several policies aiming to promote greater diversity, with particular attention to the development of new types of higher education institutions and programs. Moreover, in order to stimulate greater institutional responsiveness and diversification, those policies have been accompanied by regulatory changes awarding greater financial and managerial institutional autonomy. In this study we have analyzed the issue of programmatic diversification by looking at the Portuguese higher education system, which has mirrored those aforementioned trends and evolved over the last decades through the development of an institutionally diverse and very competitive higher education sector.

Our results suggest that program diversification is affected by rather complex and even conflicting forces, especially when we compare the behavior of public and private institutions. On the one hand, we found that private institutions are more specialized than public ones in the type of programs that they offer, though over time we have observed a pattern of some convergence between both sectors in terms of the level of diversification. On the other hand, the results also indicated that the private sector has been very responsive to shifts in the demand, with special relevance to the subject-mix. Faced with a change of tide in student demand and with a decline in their major area of specialization (Social Sciences), private institutions have tried to sustain their decline by expanding in other areas and reducing their significant specialization.

The analysis indicates that although institutions seem to respond to market stimuli and competition appears to be a powerful force in stimulating institutional behavior, its effects are modulated by the peculiarities of the HE sector, namely the specificities of higher education institutions. The empirical results suggest that the major institutional

characteristic explaining the diversification of HEIs is their legal status. After distinguishing between public and private HEIs, some results emerge as well. Among public institutions, a larger size and a location out of the country capital impact positively on their diversification in terms of the programs they offer. Also, institutional maturity also potentiates program diversity, though this is only verified for polytechnics.

Within private HEIs, besides the positive effect of size, there is an important joint effect of HEI's category and maturity, as institutions' age impacts differently for universities and polytechnics (favoring the diversification of private universities). Finally, the analysis suggests that more attention should be given to the peculiarities of higher education markets and of the dynamics of institutional competition in the higher education sector.

REFERENCES

- Aghion, P., Dewatripont, M., Hoxby, C., Mas-Colell, A., Sapir, A. (2010), "The governance and performance of universities: evidence from Europe and the US", *Economic Policy*, 61, 7-59.
- Balassa, B. 1965. Trade liberalization and "revealed" comparative advantage. *Manchester School*, 33, 99-123.
- Baltagi, B. H. (2005), *Econometric Analysis of Panel Data*, 3rd edition. England: John Wiley & Sons, Ltd.
- Barr, N., 2004. *The Economics of the Welfare State*. Oxford: OUP.
- Belfield, C., Levin, H. M., 2005. *Privatizing Educational Choice - Consequences for Parents, Schools, and Public Policy*. Boulder and London, Paradigm Publishers.
- Berry, C. H., (1971) Corporate Growth and Diversification, *Journal of Law and Economics* 14 (Oct. 1971), 371-383.
- Bok, D., 2003. *Universities in the Marketplace - The Commercialization of Higher Education*. Princeton, Princeton University Press.
- Brusoni, S., Geuna, A., 2003. An international comparison of sectoral knowledge bases: persistence and integration in the pharmaceutical industry. *Res. Policy* 32, 1897-1912.

- Caves, R. E. (1980). Industrial organization, corporate strategy and structure. *Journal of Economic Literature*, XVIII, 64-92.
- Cohn, E., Rhine, S., Santos, M. (1989), "Institutions of higher education as multiproduct firms: Economies of scale and scope", *The Review of Economics and Statistics*, 71 (2), 284–290.
- Duchesneau, T. D., Wihry, D. F. (2002), "The impact of degree programmes on university expenditure", *Applied Economics*, 34, 727-739.
- Dundar, H., Lewis, D. R. (1995), "Departmental productivity in American universities: economies of scale and scope", *Economics of Education Review*, 14, 2, 119-144.
- EUMIDA (2010) Final Study Report, available at <http://ec.europa.eu/research/era/docs/en/eumida-final-report.pdf>, accessed 1st June 2011.
- Glass, J. C., McKillop, D. G., O'Rourke, G., (2002), "Evaluating the productive performance of UK universities as cost-constrained revenue maximizers: an empirical analysis", *Applied Economics*, 34, 1097-1108.
- Greene, W. H. (2002), *Econometric Analysis*, 5th edition. New Jersey: Prentice Hall.
- Johnstone, D. B. (2004), "The economics and politics of cost sharing in higher education: comparative perspectives", *Economics of Education Review*, 23, 4, 403-410.
- Kamien, M. I., Schwartz, N. M. (1975). Market structure and innovation: a survey. *Journal of Economic Literature*, 13(1), 1-37.
- Kwoka, J. E., Snyder, C. M. (2004) Dynamic Adjustment in the U.S. Higher Education Industry, 1955–1997, *Review of Industrial Organization*, 24: 355–378,
- Le Grand, J. (2007) *The Other Invisible Hand: Delivering Public Services through Choice and Competition*. Princeton University Press.
- Martin, J. (2003), "Corporate diversification and shareholder value: a survey of recent literature", *Journal of Corporate Finance*, 9, 1, 37-57.
- Montgomery, C. A. (1994), "Corporate diversification", *Journal of Economic Perspectives*, 8, 3, 163-178.
- Palfreyman, D., Tapper, T. (2009) *Structuring Mass Higher Education - The Role of Elite Institutions*. London and New York: Routledge

Pepall, L., Richards D., Norman G., 2008. *Industrial organization - Contemporary theory and empirical applications*. Malden, MA, Wiley-Blackwell.

Porter, M. E. (1980). *Competitive Strategy. Techniques for analyzing industries and competitors*. New York: The Free Press.

Ramanujam, V., Varadarajan, P. (1989). Research on corporate diversification: a synthesis. *Strategic Management Journal*, 10, 523-551.

Rossi, F., 2009. Increased competition and diversity in higher education: an empirical analysis of the Italian university system. *High. Educ. Policy* 22, 389-413.

Rossi, F. (2010). Massification, competition and organizational diversity in higher education: evidence from Italy”, *Studies in Higher Education*, 35(3), 277-300.

Scott, P. (1995) *The Meanings of Mass Higher Education*. Milton Keynes: Open University Press

Shattock, M. (2006) *Entrepreneurialism in Universities and the Knowledge Economy - Diversification and Organizational Change in European Higher Education*. Berkshire and New York: Open University Press and McGraw Hill

Teichler, U. (1988). *Changing Patterns of the Higher Education System: The Experience of Three Decades*. London: Jessica Kingsley Publishers.

Teixeira, P., Amaral, A. (2001), “Private higher education and diversity: An exploratory survey”, *Higher Education Quarterly*, 55 (4), 359–395.

Teixeira, P., Dill, D., Amaral, A., Jongbloed, B. (Eds.), 2004. *Markets in Higher Education*. Kluwer, Amsterdam.

Teixeira, P. N., Rocha, V., Biscaia, R., Cardoso, M. F. (2012), “Myths, beliefs and realities: public-private competition and program diversification in higher education”, *Journal of Economic Issues* (forthcoming).

Trow, M. (2010) *Twentieth-Century Higher Education - Elite to Mass to Universal*. Baltimore (MA): John Hopkins Press.

Van Vught, F. A. (2009). “Diversity and differentiation in higher education”. In F. A. van Vught (Ed.), *Mapping the higher education landscape—Towards a European classification of higher education* (pp. 1–16). Berlin: Springer.

Warning, S. (2004) Performance Differences in German Higher Education: Empirical Analysis of Strategic Groups, *Review of Industrial Organization*, 24: 393–408.

Wells, P. J., Sadlak J., Vlăsceanu L. (Eds), 2007. The Rising Role and Relevance of Private Higher Education in Europe. UNESCO – CEPES, Bucharest.

Winston, G. C. (2004). Differentiation among US Colleges and Universities, *Review of Industrial Organization* 24: 331–354

Yusuf, S., Nabeshima, K. (2007), *How Universities Promote Economic Growth*, Directions in Development – Human Development, The World Bank.