The impact of polytechnic institutes on local economy

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Abstract

Higher education institutions and, particularly, polytechnic institutes in Portugal are, generally speaking, recognised as key stakeholders in regional development.

However, due to the economic recession of recent years and the consequent budget constraints, higher education institutions, now more than ever, need to demonstrate the social and cultural impact of their activities within their communities and, also, their contribution to its economic development. Thus, the aim of this paper is to estimate the economic impact of a group of polytechnic institutes located in regions with diverse socioeconomic realities, by using a common methodology. This common framework enables a comparative study and a better identification of the variables that differentiate the realities of the different regions, the respective polytechnics and their impacts.

Introduction

In 2012, following a study on the economic impact of the Polytechnic Institute of Bragança (Fernandes, 2009; Fernandes *et al.*, 2013), similar studies were carried out at other Institutes, with the support of the Portuguese Polytechnics Coordinating Council (CCISP). The aim was to assess how the different Institutes impact their respective regions, according to a common methodology, which would therefore allow a comparison between such diverse realities. It should be noted that the aim is not to produce a ranking of

polytechnic institutes, but to understand how their impact may be different, depending on their respective region and on the characteristics of each Institute in terms of student population. For that matter, and given the difficulties of carrying out a comprehensive and simultaneous study of all polytechnic institutes, seven Institutes were selected (see Figure 1): three located in coastal regions (Viana do Castelo, Leiria and Setúbal) and four in inner regions (Bragança, Viseu, Castelo Branco and Portalegre). These Institutes cover diverse regional realities, from costal, industrialised areas to less-developed rural regions, detached from great urban centres, as well as areas that are geographically classified as coastal but whose main sphere of influence evidences indicators typically found in inner regions. In this first phase, Institutes located in large cities were intentionally not considered, as their assessment poses methodological difficulties, namely due to the proximity to university institutions within the same cities.

Thus, the aim of this work is to assess and understand how the presence of a polytechnic institute in a given region contributes towards its social and economic development and, furthermore, to understand the impact of such institutions in different regional contexts, namely, in terms of population size, age structure, literacy, purchasing power, economic activity and geographic location.

The remainder of this paper is organised as follows: Section 2 presents a brief description of the evolution of the Portuguese higher education system over the last four decades, relating this with the importance of measuring the socio-economic impact of higher education institutions. Section 3 focuses on the Portuguese polytechnic subsystem, providing some data on the seven polytechnics analysed in this study, as well as on the regions where they are located. Section 4 presents the economic impact model used to assess the influence of these polytechnics. Section 5 describes the methodology adopted to implement the economic impact model described in the previous section. Section 6 presents the main findings of this study. Section 7 discusses these findings and compares them with those obtained in other studies. Finally,

section 8 presents the main conclusions of this paper and provides insights for future research work.

The evolution of the higher education system and economic impact studies

The Portuguese higher education system has experienced severe changes over the last four decades. In 1974, when dictatorship took its last breath and the current democratic regime was established, there were only three public universities, with approximately 86,000 students. In 2006/07 there were, in the public sector, 16 universities (seven of which integrated polytechnic schools in areas such as accounting and nursing), 15 polytechnic institutes and 5 non-integrated, specialised polytechnic schools (offering courses in areas such as nursing, tourism and maritime activities) (Agência de Avaliação e Acreditação do Ensino Superior (A3ES), 2012), in a total of 121 Higher education institutions with, approximately, 360,000 students and 37,000 teachers (Organisation for Economic Co-operation and Development (OECD), 2008). In 2012, the number of students reached 390,000 and it should be noted that 80% of them were in the public higher education system (OECD, 2012; Center for Higher Education Policy Studies (CHEPS), 2013; Instituto Nacional de Estatística (INE), 2012). The strong growth in access to higher education between 1974 and 2000, at a rate of 6% per year, was accompanied by the creation of Higher education institutions all over the country. It is particularly relevant that, while the University subsystem is mostly distributed along the Portuguese coastal region, the polytechnic subsystem was, from the very beginning, intended to ensure a wider territorial coverage, which undoubtedly constitutes a key factor for equality in access to higher education (see Figure 1).

Figure 1 here

Despite this growth, in 1974, the percentage of youths aged 18 to 24 enrolled in higher education was around 8%, having essentially grown in the decades

of 1980, 1990 and 2000, reaching around 48% in 2012. However, Portugal remains far below the average of its European counterparts both in terms of secondary and higher education graduates (see Table 1).

Table 1 here

In 2010, the percentage of the Portuguese population who had graduated from tertiary education, within the 25-64 age group, was 15%, whereas for Europe (UE-21[1]) this percentage was 28% (OECD, 2012) (see Table 2).

Table 2 here

Tables 1 and 2 clearly show that, despite the huge efforts that Portugal has dedicated to education, and its clear progress, other countries were equally industrious and, therefore, the gap that separates Portugal from the European average is still quite significant.

Despite these indicators, a topic that has emerged recently within Portuguese society, as a result of the economic crisis and budget constraints, is the assessment of the economic impact of Higher education institutions on their respective regions. Evidence seems to show (e.g. Arbo & Benneworth, 2007; Hermannsson & Swales, 2010; Lawton-Smith, 2003) that Higher education institutions are important mechanisms for regional development, which create educational and cultural opportunities that would not exist in these regions without these institutions (Charney & Pavlakovich-Kochi, 2003; Smith, 2006).

The assessment of the regional impact followed two approaches. One of the approaches is based on the estimation of the economic impact (Drucker & Goldstein, 2007; Siegfried *et al.*, 2007) reflected, for instance, in increased economic activity, increased number of jobs and income levels (Yserte &

[1] EU21 – Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Luxemburg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Rivera, 2010), in the higher qualification of active population and in workers' productivity (Becker, 1993; Bluestone, 1993), or in R&D activities and technology transfer (Rephann *et al*., 2009).

The other approach adopts a more global perspective and consists of the development of a cost-benefit analysis, by including not only individual benefits but also social benefits – externalities – which emerge in society as a result of the existence of a higher education institution in a given region. There is a wide range of non-monetary impacts on local economy that must be taken into consideration (Hermannsson & Swales, 2010). In fact, the presence of a higher education institution may bring public (e.g. more taxes, more leases) and private (e.g. better salaries, better jobs) economic benefits, as well as public (e.g. decreased unemployment rate, reduction in poverty and criminality and reduced welfare dependency) and private (e.g. greater life expectancy, greater satisfaction at the workplace, better quality of life, improved health and greater family stability) social benefits, despite the likelihood of some costs being incurred (e.g. land use and tax exemptions).

The integration of an Institute into a region may constitute a contribution in the form of the development of local networks that promote a good learning environment and, the improvement of skills, capabilities and qualifications, as well as increased competitiveness and social cohesion (Boucher *et al.*, 2003). Given that polytechnics are complex organisations with different activities and communities (Pinheiro *et al.*, 2012) and given the existence of different mechanisms by which the involvement of the institutions may be reviewed (Benneworth *et al.*, 2013), this paper focuses on a particular dimension - measuring the economic impact of a polytechnic institution on a given region.

The Portuguese polytechnic system

Over the last few decades, the Portuguese Higher Education system has undergone deep changes. As in other European countries, in the 1980s, the polytechnic higher education network was created, thus introducing a binary Higher Education system.

In the early 1970s, international organisations, such as the OCDE, highlighted the importance of developing and enlarging the medium and higher cadres in Portugal, so that they would be able to meet the needs of ongoing social and economic development, namely graduates with shorter but highly professionalised training, conducive to the exercise of technical professions.

On the other hand, there is wide consensus around the importance of higher education as a promoter of social and economic development, especially at a regional level (Charles, 2006; Arbo & Benneworth, 2007; Mueller, 2005; Etzkowitz & Leydesdorff, 2000).

It was based on the assumption that they would constitute regional development agents that polytechnic institutes were created, and their mission would be to develop more reproducible applied research, with significant repercussions on economic and social development, thus playing an important role in the less developed regions located throughout the inner strip of the country.

The polytechnic institute network is well distributed across the entire country (see Figure 1), reaching less-developed regions and, for that reason, constituting a powerful mechanism to promote equity in the access to higher education, in addition to the aforementioned economic benefits. It should be noted that the highest percentage of the Portuguese population is concentrated along the coastal area, so Institutes located further inland contribute to the improvement of those less-developed regions, as they constitute both a factor of attraction and a factor of fixation of the population.

Table 3 presents a brief characterisation of the seven polytechnic Institutes studied (see Figure 1), including number of students, staff (administrative and technical employees) and faculty (academics) and percentage of academics who hold a Ph.D.

Table 3 here

Table 4 shows the population and the rates (lower and upper limits) of Illiteracy, Ageing population and Purchasing Power for to the municipalities where the seven Institutes are located (minimum and maximum values for the municipalities of each Institute). These indicators, among others, show how the reality of the regions makes the presence of the Institutes ever more important.

Table 4 here

The table shows that, generally speaking, illiteracy and ageing population levels are higher in municipalities located in rural areas, which also present lower purchasing power and lower numbers of resident population. It should, however, be noted that some Institutes are located in regions that cover municipalities with very diverse indicators, so the analysis can be somewhat biased by a simplistic division between coastal and rural areas.

Economic impact

An economic impact study aims at estimating the increase in the level of economic activity within a given region as a result of the presence of a higher education institution (Elliott et al., 1988). Therefore, the contribution of a polytechnic institute to local economy might be measured based on its impact on the levels of economic activity of that region, with positive effects on local employment and income levels. It is known that a significant portion of the revenue generated in local economies comes from sources that are external to those regions, but that are directly associated with them.

Given the approach adopted in this study (known in the literature as a demand-side approach, Brown & Heaney, 1997), the economic impact of a higher education institution can be estimated by considering three kinds of effects (Yserte & Rivera, 2010): direct, indirect and induced economic effects.

Direct effects correspond to the direct spending of the faculty, staff, students and also of the institution itself, on local goods and services. For this estimate, a conservative perspective was adopted: for example, in the case of students, it only included the spending of students who had moved to the region to study at the polytechnic (the export effect), as well as that of local students that would be studying at another higher education institution outside the region, should this polytechnic not exist (the import substitution effect).

The indirect and induced economic effects correspond to the impacts on the supply chain of the economic sector whose activity is being considered for direct effects and changes in consumer spending as a result of the variation in the number of jobs and income generated in the local economy. In other words, they represent the propagation of the impact caused by the initial spending throughout the local economy.

Since the latter two effects are difficult to estimate, several authors have chosen to apply a multiplier value. For example, Ryan & Malgieri (1992) consider that this value depends on the size of the region under analysis. In fact, an ever-controversial topic in economic impact analysis is the definition of an appropriate geographic area to be considered in the study (Siegfried et al., 2007). The main reason is that, depending on how geographic area is defined, specific economic effects will be felt within and outside the region (Elliott et al., 1988), thus determining the multiplier value to use.

Table 5 here

For example, MacFarland (1999) considers that when the study is confined to a relatively small geographical area, a conservative multiplier should be used (1.8 to 2.2), because the proportion of the first round of spending that will leave the area immediately will be greater, that is, a small region tends to purchase a larger proportion of its inputs from other regions. On the other hand, for a larger geographical area, a higher multiplier should be used (2.4 to 3.0).

Thus, in this study, a multiplier of 1.7 was used. It was determined from the median of the various multipliers used in several studies (see Table 5) and actually falls within the range reported by Weisbrod & Weisbrod (1997). Indeed, these authors argue that the values of the multipliers to be used in most industries are usually around 2.5-3.5 where the geographical area of impact is nationwide; 2.0-2.5 when measuring the impact at state level, and 1.5-2.0 for local studies.

Figure 2 shows the economic model used in this study. This model allows calculating the export effect and the import substitution effect.

Figure 2 here

This model's design is derived from the Caffrey & Isaacs' (1971) American Council on Education (ACE) model. During the application of the ACE model by Fernandes (2009), there were several aspects that made its application rather difficult. It should be noted, among others aspects, that either not all the required information is available, or it requires a significant amount of time and resources to collect the information needed on an annual basis. Caffrey & Isaacs (1971) included in their calculations all students attending Higher education institutions, without considering that only students coming from other regions introduce new inputs into the region where the higher education institution is located, a fact that can distort the analysis carried out. Thus, only students who have moved from their original region to attend the polytechnic should be considered as impacts of the institution (the export effect). Moreover, according to other authors (e.g. Blackwell et al., 2002; Elliott et al., 1988; Johnson, 1994; Kamerschen, 2001; Smith, 2006), local students that would have gone to study in another region should the polytechnic not exist also represent an impact caused by the existence of the polytechnic, since, otherwise, their spending would take place in another region (the import substitution effect).

Considering the difficulties encountered and the results obtained by applying the ACE model, Fernandes (2009) proposed a simplified version of that model, adapted to the Portuguese reality, which allows a fairly accurate approximation to the impact of Higher education institutions on the regions where they are located and enables a comparison between institutions/regions[2].

Methodology

A methodological approach similar to the one adopted by Fernandes (2009) was followed in this study. Thus, the simplified model proposed required the surveying of students, faculty and staff, which was conducted between May and September 2012. An online questionnaire was developed based on the works of Buchanan (1994), Caffrey & Isaacs (1971), Martins et al. (2005), Seybert (2003) and Fernandes (2009). The final version of the questionnaires was the result of intensive discussions with representatives of the Institutions participating in the study.

The selected groups of individuals (i.e. faculty members, staff members and students) completed different surveys. For faculty members and staff members, the questionnaire consisted of three sections. The first related to their professional profile, and included information such as: academic position, college, years at the higher education institution, workload and assessment of the facilities. The second relates to their personal and family background, including the following variables: gender, age, marital status, academic qualifications, home residence, current residence, number of people in their household and number of children. The final section dealt with living conditions (type of residence, monthly income, family monthly expenses, use of university restaurants, use of transports, visitors and respective stay durations, monthly savings, mortgages and investments).

Regarding the questionnaire administered to students, it consisted of six sections. The first collected their personal information (gender, age,

[2] The equations that define the model shown in Figure 2 can be provided by the authors.

nationality, marital status, home residence and current residence). The second addressed their educational background (qualifications, year of study, full/part time student, college, first choice of studies, upper secondary degree and work experience). The third assessed their current academic situation (weekly number of classes, professional activity and study subject). The fourth was intended to assess the living conditions (e.g., type of residence, characteristics of the residence, monthly budget, disaggregation of expenses, financial situation appraisal, use of canteens and restaurants, use of transport, visitors and respective stay durations). The fifth section described their family background (e.g., professional profile, educational level, monthly income of parents). The last section discussed the students' mobility (and included variables such as: participation in student exchange programmes and intentions regarding a future settlement in the region after graduation).

To answer the questionnaire, a random selection of the three Higher education institutions' related individuals was carried out. The number of questionnaires sent per Institution was adjusted in accordance with the size of the polytechnic institute. Thus, the number of questionnaires sent to faculty members ranged between 80 and 120. With regard to staff members, the number of questionnaires was between 60 and 100. Lastly, the number of questionnaires administered to students ranged from 420 to 500. The average response rate was about 50%, ranging from 42.5% to 78.0% for faculty members, 35.0% to 66.7% for staff members, and 29.2% to 69.2% for students.

The data collected allowed a full description of each higher educations institutions related individuals, from a social and family perspective, and was also able to thoroughly describe the spending of such individuals, as well as their investments, in order to understand their flow of funds originated. It was also necessary to collect data on the higher education institutions' spending from official records.

Results

Although the survey allowed for the collection of a large amount of data, which then enabled a fairly detailed socio-economic description of the different polytechnic Institutes involved in this study, this paper focuses only on presenting a summary of the main results obtained regarding the economic dimension of those polytechnics' impact on the regions where they are located.

From the study, it was possible to estimate the range of spending and the average monthly household expenditures of the faculty and staff, which are summarised in Table 6.

Table 6 here

From the answers given to the questionnaires, it can be seen that the average spending of the faculty members' households ranged between 1,800 and 2,200 euros, which for staff was between 1,000 and 1,800 euros. It should be noted that the average age of the faculty and staff members ranges between 41 and 42. With regard to the expenditure of students who moved to a different municipality to study, Table 7 presents a summary of the findings, as well as the percentage of students who went to study to a different part of the Country to attend the polytechnic institute (export effect) and the percentage of students from the region who reported they would move to another region to study if an Institute did not exist in their own region (import substitution effect).

Table 7 here

It can be observed that the average monthly spending of students that moved to the region to attend the polytechnic institute is *circa* 500 euros. It should be noted that the number of students who reported having moved to the region to study ranges between 14% and 64% for the Setúbal and Bragança polytechnic institutes, respectively, with a median percentage of about 40%. It

should be noted that the percentage of the export effect for polytechnics located in the inner regions of the country (which is generally higher than that of the coastal area) does not seem irrelevant. From another standpoint, Figure 3 illustrates the relationship between the export effect and the population residing in the municipalities where the respective polytechnic is located. In fact, it appears that the polytechnics located in the inner regions have a much higher export effect than those located in the coastal area of the country. In this sense, the former contribute to attracting young people towards more deserted and ageing regions, potentially improving their fixation on those regions.

Figure 3 here

From Table 7, it can also be seen that, among students who reside in the region where the Institute is located, the percentage of those who reported that they would study at another institution outside the region if the polytechnic did not exist, ranges between 30% and 60% for Portalegre and Setúbal, respectively. This dimension reinforces the youth fixation effect of polytechnics for the municipalities where they are located, which obviously impacts the life of these communities. This finding reinforces the role that the polytechnics located in rural areas play in promoting equality in access to higher education.

Table 8 presents a summary of the direct impact of each polytechnic institute within its region.

Table 8 here

From Table 8 we can see that the highest direct impact was reported in Leiria (reaching approximately 101×10^6 euros) and that the lowest was reported in Portalegre (16×10^6 euros). These results are consistent with the observation

that the direct impact's main component is related to student spending, representing, for most polytechnics, about 85% of the direct impact.

If ordered by number of students, the group of polytechnics considered in this study would be as follows: Leiria, Bragança, Setúbal, Viseu, Castelo Branco, Viana do Castelo, and Portalegre. The direct impacts, on the other hand, feature a similar sequence, with an exchange of positions half-way in the distribution.

These figures constitute evidence of the existence of a linear relationship between the direct impact and the number of students attending each institution. Figure 4 shows the graph depicting the direct impact as a function of the number of students with a linear equation relating the two variables (Direct Impact = - 19.000 + 9.300 x Number of students). We can see that, for each additional student, there is a direct annual impact of about 9,000 euros which translates, in turn, into a total impact of about 16,000 euros, by applying the multiplier selected (1.7).

Figure 4 here

Table 9 summarises several indicators which attempt to illustrate the impact and relevance of the polytechnics under analysis in the regions where they are located.

Table 9 here

From the analysis of Table 9, we may highlight the following results:

- The total impact in terms of economic activity generated results in an amount of $27x10^6$ euros for Portalegre and $172x10^6$ euros for Leiria, considering the value of the multiplier mentioned above (1.7).
- In terms of the relative weight on the GDP of all the municipalities where the respective polytechnics are located, the figures range from

1.71% for Setúbal and 11.02% for Bragança. It seems that this relative impact tends to be higher for polytechnics located in the municipalities of the inner regions of the country.

- The level of economic activity generated in the municipalities where the polytechnic is located, for every euro of funding received from the State Budget, ranged from 2.63 euros in the case of Castelo Branco to 8.07 euros in the case of Leiria.
- Polytechnic institutes are major employers in the regions where they are located, ranking, in general, second place.
- The estimated number of jobs created as a result of the location of the polytechnics in the region under analysis ranges from 915 in the case of Portalegre and 6,321 in the case of Leiria. These figures were calculated based on the concept of apparent productivity of labour.
- The relative weight of the jobs created in terms of active population ranged from 1.77% in Setúbal to 12.92% in Bragança. It appears that this relative weight tends to be higher for polytechnics located in municipalities of the inner regions of the country.
- The multiplier obtained, associated with the number of jobs created, ranges from 2.14 in Setúbal to 4.9 in Bragança and Leiria.

Discussion of the results

From the group of polytechnics studied, Leiria clearly stands out from the other polytechnics, essentially because of its size and consequent number of students. As we can see in Figure 4, the direct impact of the polytechnic of Leiria appears to be quite above that of other polytechnics. A cluster analysis covering the following variables: number of students, direct impact, weight on local GDP, public funding, economic activity generated and export effect, shows the existence of three groups: one comprising only Leiria, another consisting of Bragança, Viseu and Setúbal and, finally, a third cluster composed of Castelo Branco, Viana do Castelo and Portalegre. It seems,

therefore, that the formation of clusters is significantly determined by the number of students and, consequently, the direct impact.

These results should, however, be interpreted while bearing in mind some limitations of the study itself. Firstly, the response rate of some groups of individuals in some institutions. Secondly, the estimated value of the GDP of the municipalities where the polytechnics are located, as there was no official data from the Statistics Institute at this level of disaggregation. Thirdly, a sensitive parameter of the model is the value of the multiplier used. Fourthly, it was assumed that the sphere of influence of each polytechnic focused mainly on the municipalities where the schools of each polytechnic are located. While this approach may be limitative, it was justified by the difficulty in defining the geographical area of the study, particularly in regions located in metropolitan areas. Finally, the impact of Higher education institutions on the formation of human capital was not taken into account, which probably causes the true impact of Higher education institutions to be underestimated.

The findings of our study are in line with the results reported by Yserte and Rivera (2010), where the impact of the University of Alcalá, based on a simplified ACE model, represented 4.8% of the local GDP with a multiplier effect on jobs created of 2.6 and an economic multiplier effect of 2.04. Pastor, Pérez and Guevara (2013), on the other hand, referring to the five Public Universities of the Valencian Community, Spain, found an impact of 3.6% on the community's GDP, with a multiplier on jobs generated of 2.39, and an economic multiplier of 1.75. It should be noted that the city of Alcalá de Henares has a population of 197,804 inhabitants (2005 data), whereas the Valencian Community has a population of 5.1 million inhabitants (2012 data).

A recent report on America's Community Colleges' economic impact (Economic Modelling Specialist Intl., 2014) emphasises that educational institutions, beyond their principal aim of education and training, provide external benefits that improve society as whole, namely the improvement of the skills of the workforce, increased income, improved health, reduced employment, enhanced cultural activities and, consequently, improved social cohesion. Additionally, the presence of educational institutions tend to promote an increase in economic activity, inducing innovative activities, which

require more skilled workers. Moreover, the report recognises that the government funds allocated to educational institutions create positive social benefits that outweigh costs.

Similarly, the Universities UK (2014) report stresses “the role of higher education in the economy and its potential contribution to supporting economic recovery and development” (page 3). In this way, the Higher Education system is seen as a part of the economic infrastructure of the UK, stressing its role in the present economic recession. The report concludes that the impact of the Higher Education system is “comparable in sectoral gross output terms to the advertising and market research industry and the legal services industry and larger than the basic pharmaceuticals sector” (page 4). With regard to the direct multiplier effect, for every full time job, 1.17 jobs are generated, and for every pound invested, 1.35 pounds of output are generated on other sectors of the economy; lastly, in terms of GDP, the Higher Education system represented 2.8% of the UK’s GDP in 2011.

Conclusion

This study, based on the simplified model developed by Fernandes (2009), allowed for a comprehensive and simultaneous analysis of the different realities of the seven polytechnics covered by the study. It is important to highlight the diversity of the institutions involved, both in terms of size and regional and socio-economic context.

Therefore, it was possible to obtain an estimation of the impacts of the seven Institutes in their respective regions. Thus, the impact on local GDP varied between 2 and 11%, with a multiplier effect on job creation ranging from 2 to 5. These results are highly significant, given that a conservative approach was followed in the assessment of the economic impact, in the sense that, essentially, only the impacts of individuals who had moved to the region were considered, taking into account the export and import substitution effects for students, faculty and staff. It is clear in this paper that the largest contribution

to this impact resulted from the monthly spending of students who had moved to a particular region to study at the polytechnic institute. Also, the results seem to substantiate a linear relationship between the value of the economic impact and the Institutions' number of students. Finally, it is important to highlight the role of Higher education institutions as major employers and, consequently, as fixators of qualified people in their respective regions.

It should be emphasised that the impact of polytechnic institutes goes far beyond the economic dimension, namely in aspects not easily quantifiable, such as socio-cultural benefits and equality of access to higher education for youths in these regions. In the future, the impact on the training and education of populations will be studied, following the approach proposed by Bluestone (1993), while trying to understand where graduates are, where they work, and what their incomes are. Moreover, future research will also address the effects of R&D activities and technology transfer, as well as the promotion of entrepreneurship.

Overall, the study allowed for the first quantified estimation of the economic impact of polytechnic institutes and its results clarified the importance of their public mission, particularly in terms of regional development, ensuring access to higher education and acting as transformation agents within the reality of the municipalities/regions where they are located. It is precisely this understanding of the many dimensions of their overall impact that makes local people appreciate the presence of polytechnics in their regions. They strengthen and assert the identity of those communities.

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Table 1: Percentage of the population with at least a secondary education

	25-64	25-34	35-44	45-54	55-64
Portugal	32	52	34	22	16
EU21	75	83	80	73	64

Source: OECD (2012) - Education at a Glance 2012.

Table 2: Percentage of the population graduated from higher education

	25-64	25-34	35-44	45-54	55-64
Portugal	15	25	16	10	9
EU21	28	35	30	25	20

Source: OECD (2012) - Education at a Glance 2012.

Table 3: Characterisation of polytechnic institutes - students, staff and faculty.

Institute	Faculty	Staff	Students	%Ph.D.
Bragança	449	214	6,754	38
Castelo Branco	374	259	4,582	35
Leiria	980	310	12,102	31
Portalegre	210	165	2,542	28
Setúbal	608	166	6,730	23
Viana do Castelo	340	172	4,276	35
Viseu	438	266	6,407	26

Note: Reference year 2012.

Table 4: Some indicators of the seven municipalities where the chosen polytechnic institutes are located

Institute	Inhabitants[1]	Illiteracy[2]	Ageing[3]	Purchasing Power[4]
Bragança	59,191	7.9-9.0	181-208	80-96
Castelo Branco	65,825	7.0-20.6	188-494	61-95
Leiria	206,379	4.7-6.0	113-139	86-103
Portalegre	48,008	7.7-8.2	144-180	85-102
Setúbal	199,949	7.8-8.8	112-152	100-107
Viana do Castelo	155,563	4.4-9.5	130-389	62-93
Viseu	125,965	5.4-7.6	122-145	79-96

1- Total number of inhabitants of each municipality where the polytechnic institute has schools.
2- Percentage of people aged 10 or older who cannot read or write.
3- Ratio between the number of people aged 65 or older and the number of people aged 0 to 14.
4- National average equal to 100.
Source: INE – Reference year: 2011.

Table 5. Multiplier values used in several studies.

Author	Multiplier
Anton and Burns (2007)	Income: 1.825
Bluestone (1993)	Income: 1.341
Caleiro and Rego (2003)	Income: [1.2; 1.3]
Carr and Roessner (2002); Smith (2006)	Income: 2.0
Clarck et al. (1998).	Income: 1.4
Duhart (2002)	Income: 1.6
Emmett and Manaloor (2000)	Employment: 2.49
Healey and Akerblom (2003); Livingston (2001); Ohme (2004)	Income: 1.8
Jefferson College (2003); Seybert (2003)	Income: 1.9
Langworthy (2001)	Income: 1.58
MacFarland (2001)	Income: [1.8 to 3.0] with a 2.0 mean
McNicoll et al. (1997)	Income: 3.21
Miller (1994)	Income: [1.0; 3.0]
Nagowski (2006)	Income: [1.8; 3.1]
Ryan and Malgieri (1992)	Income: [1.2 to 3.0] with a 1.9 mean
Siegfried et al. (2007)	Income: [1.34; 2.54] with a 1.7 median
	Employment: [1.32; 4.75] with a 1.8 median
Sudmant (2002)	Income: 1.5
University of Strathclyde (2006)	Income: 2.52
Yserte and Rivera (2010)	Income: [1.77; 2.04]

Table 6: Average monthly expenditures of the households of faculty and staff members.

Institute	Faculty		Staff	
	Range €	**Mean €**	**Range €**	**Mean €**
Bragança	1,529-2,769	2,029	1,166-1,980	1,047
Castelo Branco	1,420-2,136	1,903	1,192-2,573	1,479
Leiria	1,379-3,520	1,831	1,287-1,771	1,596
Portalegre	1,346-3,245	2,149	874-2.891	1,287
Setúbal	1,389-3,927	2,211	1,140-1,890	1,791
Viana do Castelo	1,233-3,676	1,826	1,106-2,288	1,587
Viseu	1,938-2,738	2,193	735-2,820	1,818

Table 7: Average monthly expenditure of students and percentage of export and import effects.

Institute	Monthly (€)	Export Effect (%)	Import Substitution Effect (%)
Bragança	496.8	63.7	53.3
Castelo Branco	428.6	43.2	47.8
Leiria	508.7	41.2	52.5
Portalegre	545.1	46.6	31.0
Setúbal	474.7	14.1	61.5
Viana do Castelo	476.5	36.9	54.0
Viseu	514.2	37.0	33.8

Table 8: Summary of the direct impact of each polytechnic institute.

	IP Bragança	IP Castelo Branco	IP Leiria	IP Portalegre	IP Setúbal	IP Viana do Castelo	IP Viseu
(1) Faculty spending	4,230	3,823	9,107	1,545	3,216	2,283	3,418
(2) Staff spending	691	1,041	1,979	999	880	591	507
(3) Students spending	33,264	15,401	86,607	13,060	27,678	16,060	35,660
(4) Institution spending	789	763	3,315	421	564	900	1,304
DIRECT IMPACT (1+2+3+4)	**38,974**	**21,028**	**101,008**	**16,025**	**32,339**	**19,835**	**40,890**

Note: Amounts in thousands of euros for the year 2012.

Table 9: Summary of indicators of polytechnic institutes

	IP Bragança	IP Castelo Branco	IP Leiria	IP Portalegre	IP Setúbal	IP Viana do Castelo	IP Viseu
Regional GPD estimate (1000€)	601,447	717,289	2,872,816	480,343	3,205,803	1,637,111	1,554,075
Total Impact (1000€)	66,255	35,748	171,714	27,243	54,975	33,719	69,513
Weight in local GDP	11.02%	4.98%	5.98%	5.67%	1.71%	2.06%	4.47%
Public funding (1000€)	16,025	13,568	21,270	7,935	15,699	10,724	14,953
Economic activity[2]	4.13	2.63	8.07	3.43	3.50	3.14	4.65
Employer rank[3]	2ª	2ª	2ª	3ª	2ª	5ª	7ª
Active population	25,127	28,418	100,757	21,660	95,018	69,347	58,539
Number of jobs created	3,247	1,820	6,321	915	1,678	1,377	3,280
% of active population	12.92%	6.40%	6.27%	4.22%	1.77%	1.99%	5.60%
Employment multiplier	4.90	2.87	4.90	2.44	2.14	2.59	4.66

1 – Total Impact equals the Direct Impact (Table 7) times the multiplier (1.7).

2 – Level of economic activity generated per Euro of public funding.

3 – Employer rank defines the ranking of the polytechnic institute, in terms of jobs, within its region.

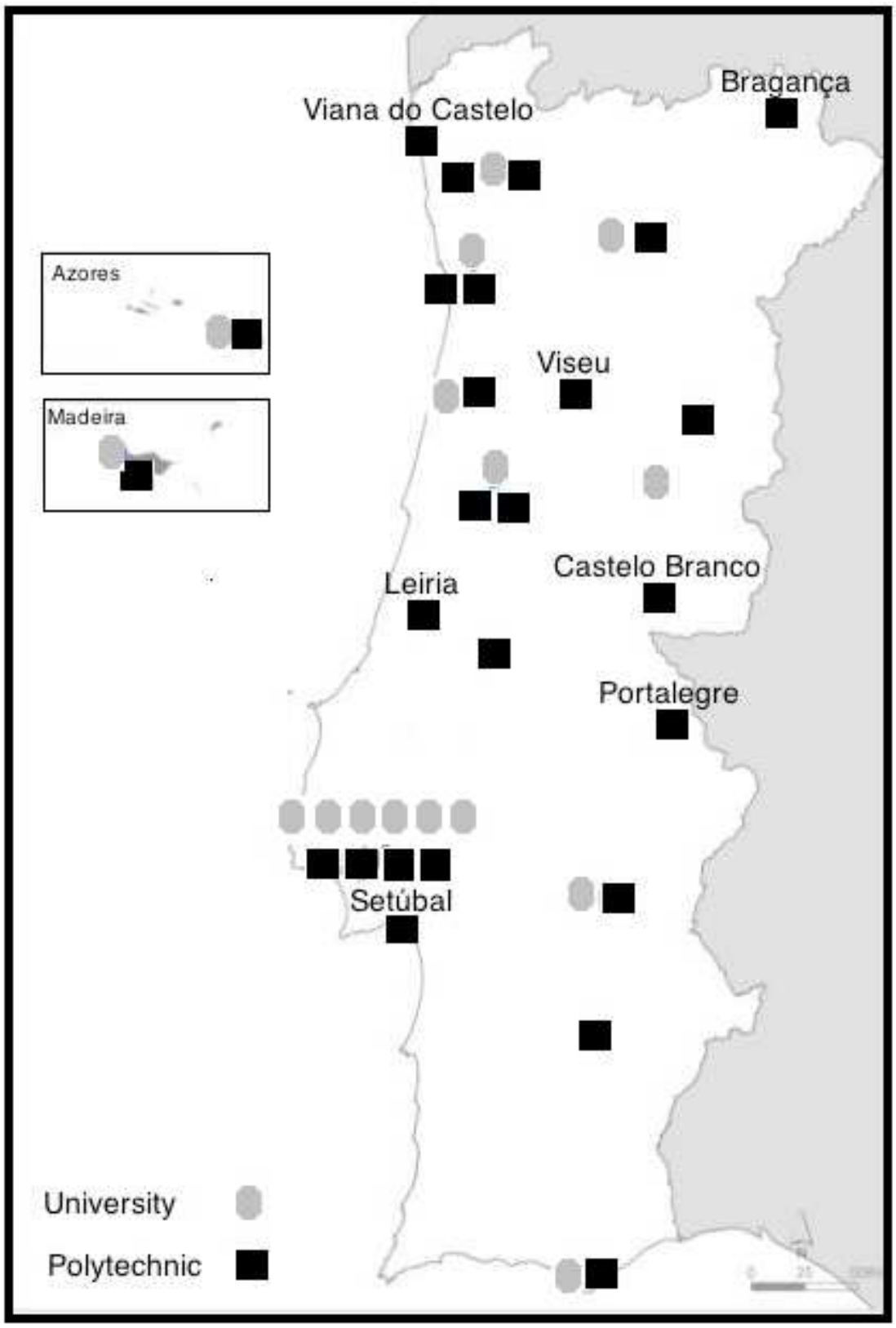

Figure 1 – Distribution of public higher educations institutions in Portugal (universities and polytechnics)

Source: A3ES, 2012.

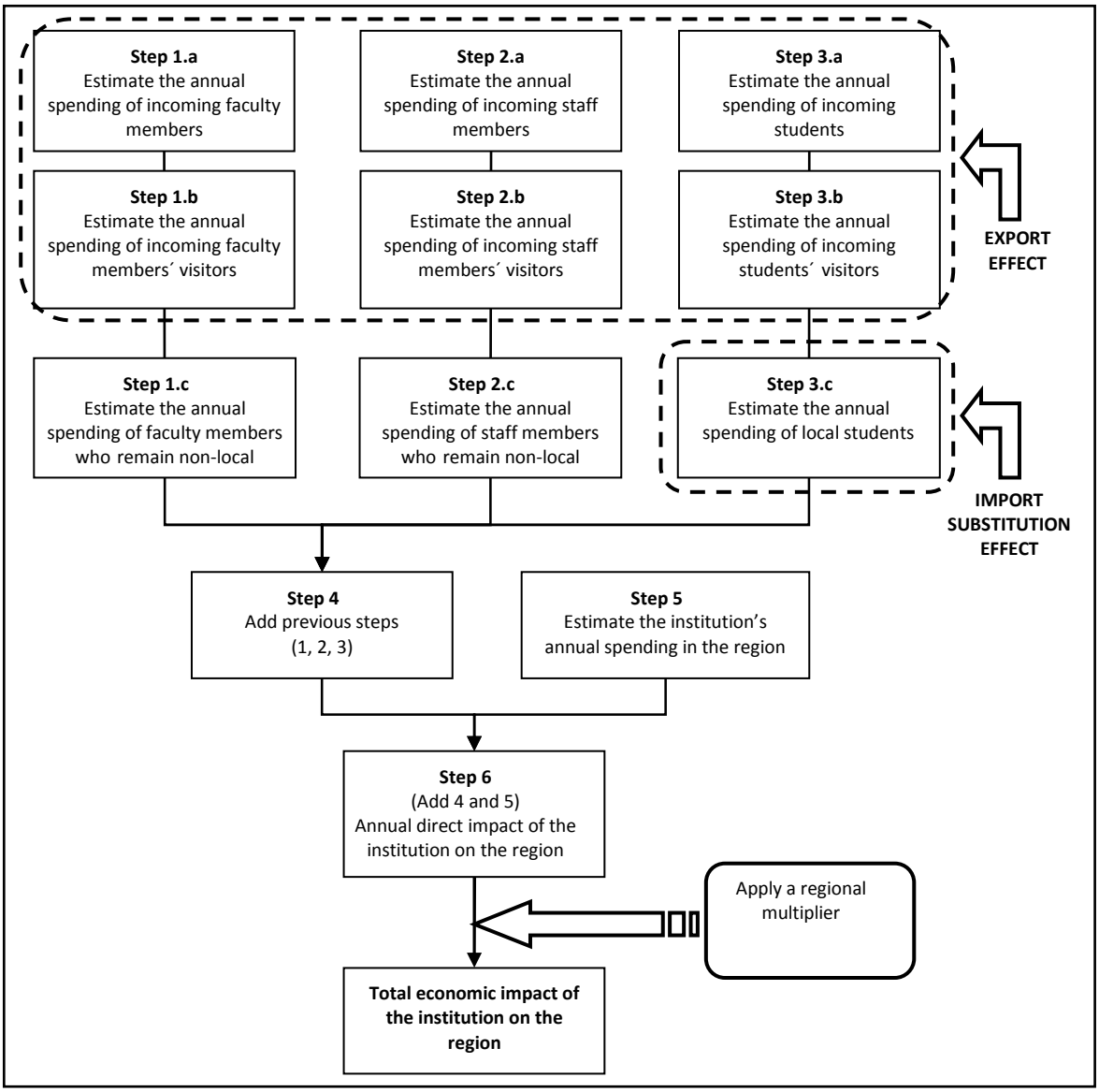

Figure 2: The economic impact model. Source: Fernandes (2009: 198).

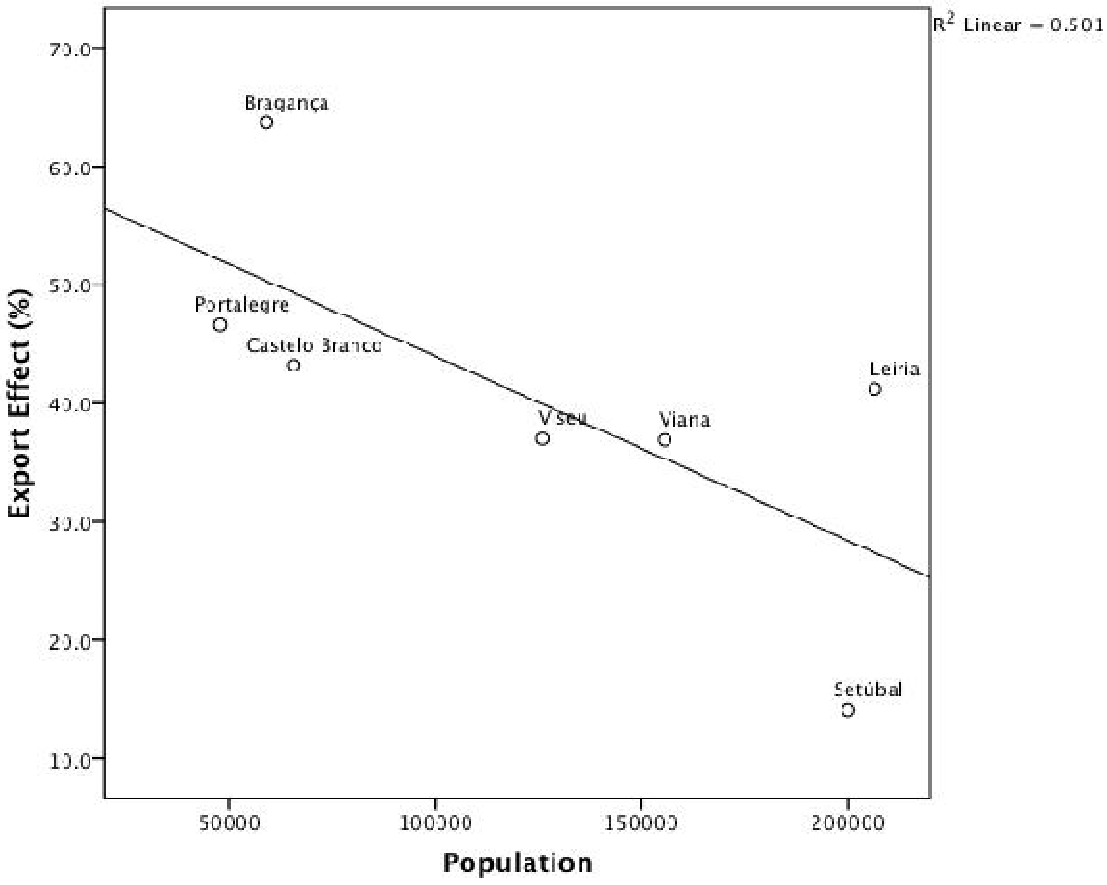

Figure 3: Relationship between the export effect and the resident population.

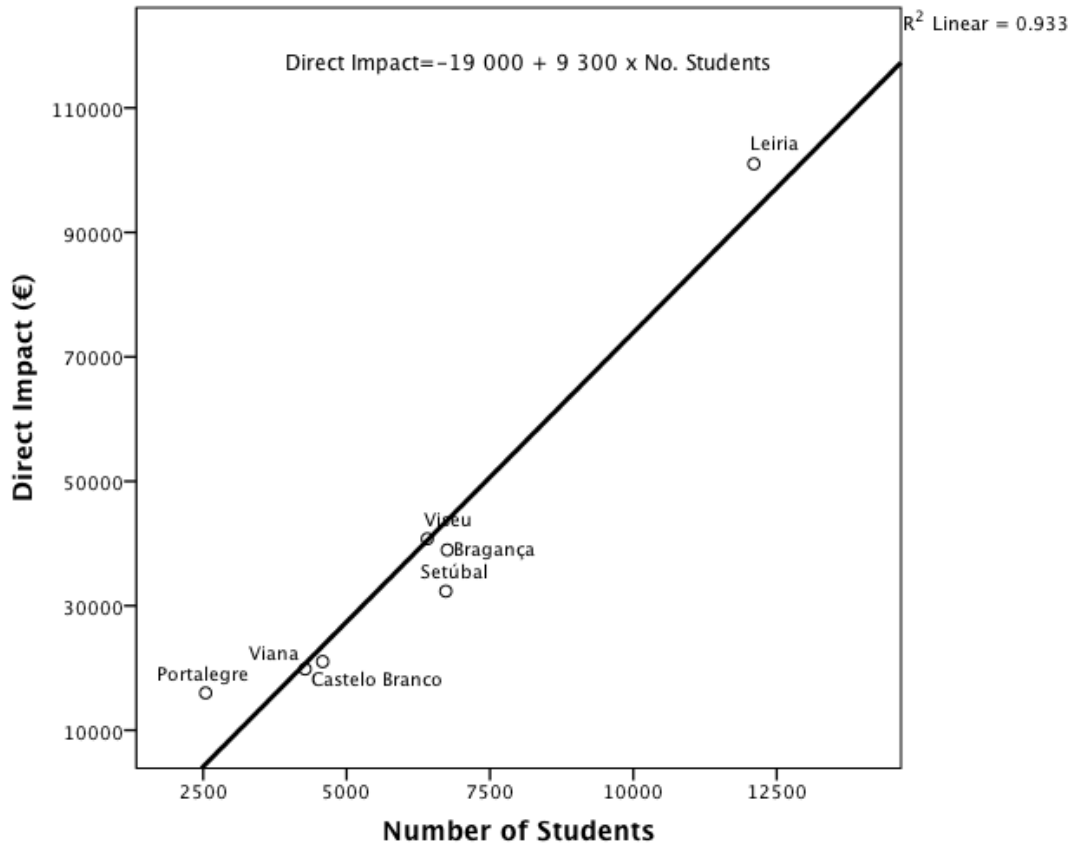

Figure 4: Relationship between the direct economic impact and the number of students attending the polytechnic institute.