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The socio-economic impact of a Polytechnic Institution in a local economy: some insights of field research

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The socio-economic impact of a Polytechnic Institution in a local economy: some insights of field research

Higher Education Institutions (HEI) are considered important mechanisms of regional development. However, due to the current economic recession and budget constraints, HEIs need to demonstrate the impact that their activities have on the surrounding community that contributes for its economic development. Hence, the aim of this paper is to present the results of a model to estimate the economic impact of different HEIs that are located in regions with different socio-economic development. Moreover, the common framework of analysis, whilst considering the different socio-economic realities, allows the comparisons of the results for the different HEIS.

Presentation

The socio-economic impact of a Polytechnic Institution in a local economy: some insights of field research

I. Introduction

The Portuguese Higher Education system has experienced a profound change in the last thirty nine years. In fact, in 1974, when democracy was installed in Portugal, there were only three Universities with around 86,000 students, and in 2006/07 there were 300 Higher Education Institutions (HEI) with about 360,000 students comprising 37,000 professors (OECD, 2008). In 2012, the number of students reached 385,000 (CHEPS, 2013).

Given this sharp increase and dissemination of HEIs around the country as well as the budgetary constraints they have been facing in the last years due to the profound economic crisis, an issue that has emerged in society is how to assess the economic impact of HEIs on the regions where they are located. In fact, there is evidence (e.g. Arbo and Benneworth, 2007; Hermannsson and Swales, 2010; Smith, 2003) that HEIs are important mechanisms for regional development, allowing educational, economic, and cultural opportunities that would not be there otherwise (Charney and Pavlakovich-Kochi, 2003; Smith, 2006).

In order to measure this regional impact two approaches have been adopted in the literature. One focuses in estimating the economic impact (Drucker and Goldstein, 2007; Siegfried et al. 2007) reflected, for example, in the increased level of economic activity, the additional number of jobs and income generated (Yserte and Rivera, 2010), higher skills and productivity of workers (Becker, 1993; Bluestone, 1993), or through HEIs' R&D activities and technology transfer (Rephann et al., 2009).

The other approach took a wider perspective and consisted of developing a cost-benefit analysis, in order to include not only private benefits but also the social benefits – or externalities – that emerge to society from the existence of a HEI in a given region. In fact, there are a broad range of non-monetary impacts on a local economy (e.g. better health, low crime rates, greater family stability, and reduced dependence on social welfare programs) that should be taken into account (Hermannsson and Swales, 2010).

The aim of the paper is to understand how the presence of a HEI in a given region contributes to its socio-economic development. In fact, the integration of a HEI in a given region can contribute, through the development of local networks, to a learning environment, the improvement of skills and qualifications, and to increase the competitiveness and regional social cohesion (Boucher et al., 2003). Given that HEIs are complex organisations with lots of communities and activities (Pinheiro et al., 2012) and there are many different mechanisms by which HEIs-community engagement can be analysed (Benneworth et al., 2013), in this work the focus is on a particular aspect: to measure the economic impact of an HEI on a given region.

The paper is organised as follows. In Section 2, the HEIs considered in this study are identified and some indicators about the regions where they are located are presented. Section 3 briefly describes the economic model used to measure the impact of HEIs. Section 4 deals with the methodological procedures adopted for the empirical study. Section 5 presents the main results obtained whereas Section 6 presents a brief discussion of these. Finally, Section 7 draws the main conclusions, presents some limitations of the work and possible avenues for future research.

II. HEIs and regions

The Portuguese higher education system is a binary one comprised of Universities and Polytechnic Institutes. For the present study, the focus is on the case of Polytechnic Institutes. This is particularly interesting since they are located in different regions of the country with very different levels of economic development, and include in

Figure 1 – Portuguese Polytechnic Institutes location (from CCISP web page).

their mission the promotion of regional development and a close relation with local organizations, applying more practical learning methodologies.

In Portugal there are 15 Polytechnic Institutes scattered all over the country (Figure 1). It should be noted that most of the population is located on the coastal area and, therefore, the location of a large number of Institutes in the countryside contributes for the improvement of less developed regions of Portugal. In this sense, the presence of these Institutes has a large impact on the equality of access to higher education as well as on the fixation of more educated individuals and the provision of services in general. Given the limitation of resources, and with the support of the Portuguese Polytechnics Coordinating Council (CCISP), in a first wave, it was decided to study the impact of seven Institutes, three of them located on the coastal area (Viana do Castelo, Leiria and Setúbal), and four in the countryside (Bragança, Viseu, Castelo Branco e Portalegre). Figure 1 shows the map of Portugal with the location of all the Polytechnic Institutes. Those enrolled in this first study are signalled in a red circle.

Some indicators show how the reality of the regions where institutions are located make their presence even more important. For example, Table 1 shows the upper and lower limits of the rates of illiteracy, aging and purchasing power of the municipalities where the seven Institutes are located.

Table 1: Some indicators regarding the regions where the Polytechnic Institutes are located

Region	Illiteracy [1]	Aging [2]	Purchasing power [3]
Bragança	12.2-14.0	181-208	74-101
Castelo Branco	7.0-20.6	188-494	60-97
Leiria	4.7-6.0	115-144	86-100
Portalegre	7.7-8.2	144-180	91-109
Setúbal	7.8-8.8	112-152	105-109
Viana	9.0-20.7	130-389	49-77
Viseu	5.4-7.6	122-145	79-94

1- Percentage of people with 10 or more years who do not know how to read and write.
2- Ratio between the number of people with 65 or more years of age and the number of people with ages between 0 and 14 years.
3- National average 100.

One can see that, in general, the levels of illiteracy and aging of the population are higher for the municipalities located on the countryside which have, also, a lower purchasing power. Table 2 shows the difference between the seven polytechnics included in the study in terms of the number of faculty, staff and students.

Table 2: Number of faculty, staff and students for each selected Polytechnic Institute

Polytechnic Institute	Faculty	Staff	Students
Bragança	449	214	6754
Castelo Branco	374	259	4582
Leiria	980	310	12102
Portalegre	210	165	2542
Setúbal	608	786	6730
Viana	340	172	4276
Viseu	438	266	6407

III. Economic impact model

In general, one can say that the objective of an economic impact study is to estimate the increase in the level of economic activity in a region caused by the presence of a HEI, being aware that a significant portion of the revenues generated in the local economy comes from external sources, assuming particular relevance the students' spending. Therefore, the economic impact of an HEI can be estimated taking into account three economic effects: direct, indirect and induced effects.

The direct effect corresponds to the direct spending of faculty, staff, students, and also the Institution in goods and services in the region. In computing these figures, a conservative approach was adopted in the sense that, for example, for the case of the students, only the spending of students who moved to the region to study in the Polytechnic (the so-called export effect) and the spending of students who are from the region but would study in another Polytechnic outside the region if the respective Polytechnic did not exist (the so-called import substitution effect) were considered.

The indirect and induced economic effects correspond to the impacts on the supply chain of the economic sector which is being considered and, also, to the changes in consumer spending as a result of changes in employment and income generated in the local economy. Overall, they correspond to the propagation and spreading of the initial impact spending (the direct effect) through the local economy.

Since these latter two effects are difficult to estimate, several authors have chosen to apply a multiplier value to the direct impact amount obtained, instead of calculating those indirect and induced effects. Ryan and Malgieri (1992) argue that the choice of the multiplier value should take into account the size of the region. Indeed, an issue always controversial in the economic impact studies is the appropriate definition of the geographical area under study because, depending on how the geographical area is defined, certain economic effects will be felt in the region itself or will be felt outside the region, which influences the multiplier effect. For example, MacFarland (1999) considers that when the study is restricted to a relatively small geographical area a conservative multiplier (e.g. 1.8 to 2.2) should be chosen, because a higher proportion of the first round of spending leaves the area immediately. In other words, a small region tends to buy a greater proportion of their inputs from other regions. On the other hand, for a larger geographical area the multiplier value should be higher (e.g. 2.4 to 3.0). Table 3 presents a brief summary of the values used as multipliers in several studies.

Table 3: Multiplier's 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 until 3.0] with mean 2.0
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 until 3.0] with mean 1.9
Siegfried et al. (2007)	Income: [1.34; 2.54] with median 1.7
	Employment: [1.32; 4.75] with median 1.8
Sudmant (2002)	Income: 1.5
University of Strathclyde (2006)	Income: 2.52
Yserte and Rivera (2010)	Income: [1.77; 2.04]

In the present study, a multiplier value of 1.7 was used to calculate the indirect and induced effects. That value was computed from the median of the multipliers presented in Table 3.

To summarise, in order to estimate an HEI's economic impact the model presented in Figure 2 was applied (Fernandes et al., 2008, Fernandes, 2009). This model allows the calculation of the export effect (the spending of those individuals that moved to the region to study in the local HEI) and the import substitution effect (the spending of those individuals that being local would go to other regions if the HEI was not located there).

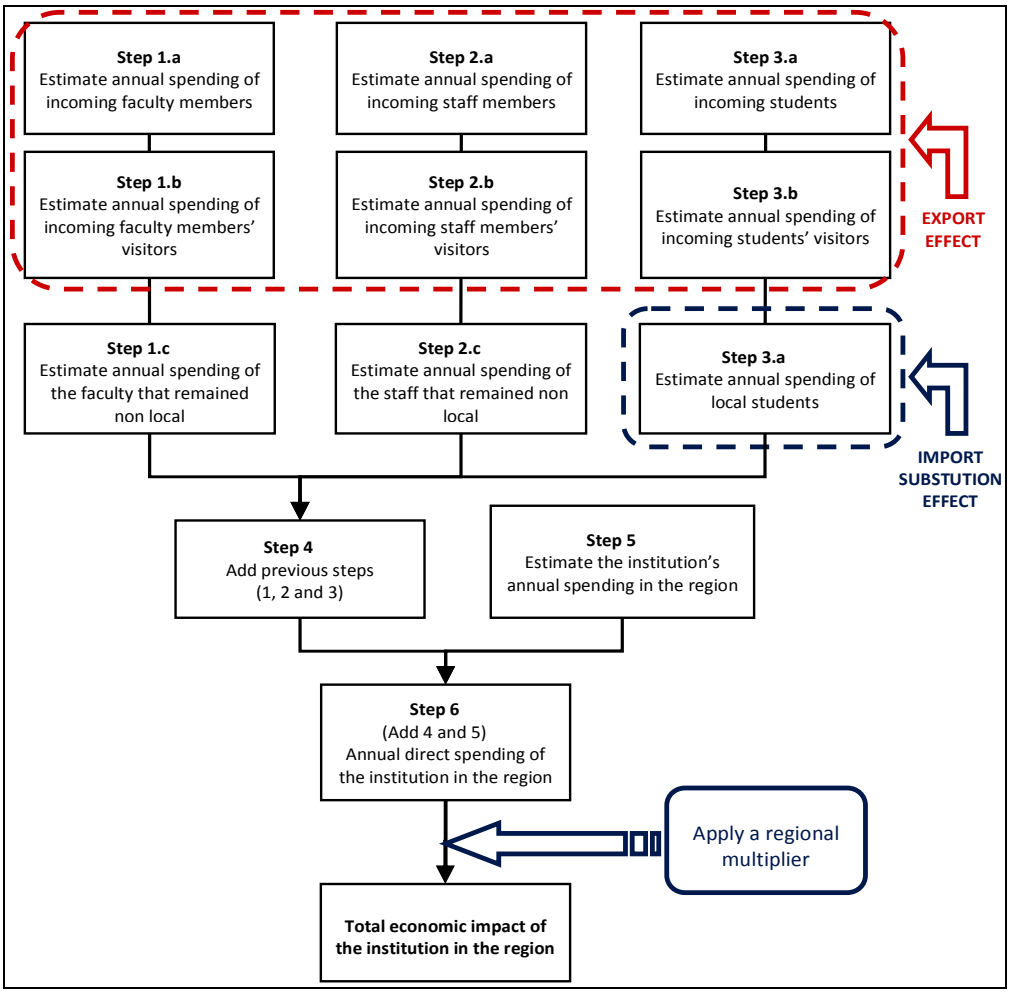

Figure 2 – The economic impact model

IV. Research methods

To apply the previous model, a comprehensive survey of students, faculty and staff of selected HEIs was undertaken, between the months of May and September of 2012, in order to collect the necessary data for the study. For that matter, an on-line questionnaire was developed based on the work of Buchanan (1984), Caffrey and Isaacs (1971), Martins, Mauritti and Costa (2005), and Seybert (2003). The final version of the questionnaire was the result of intensive discussions amongst the participating Institutions.

The questionnaire to the faculty and staff had three sections. The first relates to the professional description, and includes variables such as: academic position, college, years in HEI, working load, facilities evaluation. The second relates to personal and family background, including the following variables: gender, age, marital status, academic qualifications, home residence, present residence, number of people in the family, number of children. The final section deals with living conditions (e.g., type of residence, monthly income, family monthly expenses, use of university restaurants, use of transports, visits and respective length of stay, monthly savings, mortgages, investments).

The questionnaire for the students had six sections. In the first, a personal description is aimed (e.g., gender, age, nationality, marital status, home residence, current residence). The second relates to educational background (e.g., study degree, year of study, full/part time student, college, first choice of studies, upper

secondary degree, working experience). In the third, the present academic situation is evaluated (e.g., weekly number of classes, hours of study, working or full time students, working hours, study and work relation). In the fourth, an assessment of living conditions was intended (e.g., type of residence, conditions of the residence, monthly budget, disaggregation of expenses, finance situation appraisal, use of canteens and restaurants, use of transports, visits and respective length of stay). The fifth section describes family background (e.g., professional characterization, educational level, monthly income of parents). The final one regards students' mobility (and includes variables such as: participation in student exchange programs, and intention regarding staying in the region after degree conclusion).

To answer the questionnaire, a random selection of the three HEIs' related individuals was done. The number of questionnaires sent by Institution was adjusted in accordance to the dimension of the Polytechnic Institute. Therefore, the number of questionnaires sent to the faculty members ranged between 80 and 120. With respect to the staff the number of questionnaires was between 60 and 100. Finally, the numbers of questionnaires to the students ranged from 420 to 500. The response rate on average was about 50%, ranging from 42.5% to 78.0% for faculty, from 35.0% to 66.7% for staff, and from 29.2% to 69.2% for students.

The collected data allowed a full description of HEIs' related individuals, in a social and family perspective, and was also able to describe, in a thoroughly way, the spending of the individuals, as well as their investments, in order to understand the flow of funds they gave origin. It was, also, necessary to collect data from HEIs spending from official records.

V. Results

Although the survey undertook allowed gathering a large number of data in this section only the results related to the economic impact assessment are presented. Table 4 summarises the monthly estimated range of spending and the average spending for faculty and staff households.

Table 4: Average monthly expenditures for faculty and staff households.

	Faculty		Staff	
Institute	**Range €**	**Mean €**	**Range €**	**Mean €**
Bragança	1529-2769	2029	1166-1980	1047
Castelo Branco	1420-2136	1903	1192-2573	1479
Leiria	1379-3520	1831	1287-1771	1596
Portalegre	1346-3245	2149	874-2891	1287
Setúbal	1389-3927	2211	1140-1890	1791
Viana	1233-3676	1826	1106-2288	1587
Viseu	1938-2738	2193	735-2820	1818

From the answers to the questionnaires, it can be seen that the average spending of faculty's households ranged from 1,900 to 2,220 euros, and for staff ranged from 1,040 to 1,820 euros. It should be noted that the average age of teachers and staff ranges between 41 and 42 years.

With regard to students' expenses, Table 5 presents the summary of the average monthly spending as well as the percentages of students who moved to the region to attend the Polytechnic Institute (export effect) and the percentages of students in the region who said they would study in other region in the absence of the Institute in its region (import substitution effect).

Table 5: Average monthly expenses of students and percentage of exports and imports effects

Institute	Monthly (€)	Export Effect (%)	Import 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

On the one hand, it can be observed that the average monthly expenses of students that moved to the region to attend the Polytechnic Institute is on the order of 500 euros. It should be noted that the number of students who said they moved to the region to study, ranges between 14% and 64% for Setúbal and Bragança Polytechnic Institutes, respectively, with a median value about 40%. On the other hand, from the students whose origins lies in the region where the Institute is located, the percentage of those who said they would study in another institution outside the region ranges from 30% to 60%.

Table 6 presents a summary of the direct impact of each Polytechnic Institute (amounts in 1,000 EUR).

Table 6: Summary of the direct impact of each Polytechnic Institute

	Bragança	**Castelo Branco**	**Leiria**	**Portalegre**	**Setúbal**	**Viana do Castelo**	**Viseu**
(1) Faculty annual spending	4,230	3,823	9,107	1,517.	3,216	2,283	3,286
(2) Staff annual spending	691	1.041	1,979	987	880	591	507
(3) Students annual spending	33,264	15,401	86,607	13,060	27,678	16,060	35,660
(4) Institution annual spending	789	763	3,315	421	564	900	1,304
DIRECT IMPACT (1+2+3+4)	**38,974**	**21,028**	**101,008**	**15,984**	**32,339**	**19,835**	**40,758**

Table 7 summarises several indicators which attempt to illustrate the impact and relevance of the Polytechnics analysed on the regions where they are located.

Table 7: Summary of indicators for the Institute Polytechnics

	Bragança	Castelo Branco	Leiria	Portalegre	Setúbal	Viana do Castelo	Viseu
Regional GPD estimates (1000€)	601,447	717,289	2,872,816	480,343	3,205,803	1,637,111	1,554,075
Direct impact of HEIs (1000€)	38,974	21,028	101,008	15,984	32,339	19,835	40,758
Spending multiplier	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Total Impact of HEIs (1000€)	66,255	35,748	171,714	27,173	54,975	33,719	69,288
Weight in GDP	11.02%	4.98%	5.98%	5.66%	1.71%	2.06%	4.46%
Public funding (1000€)	16,025	13,568	21,270	7,935	15,699	10,724	14,953
Economic activity[1]	4.13	2.63	8.07	3.42	3.50	3.14	4.63
Employer position	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	913	1,678	1,377	3,269
% of active population	12.92%	6.40%	6.27%	4.21%	1.77%	1.99%	5.59%
Employment multiplier	4.90	2.87	4.90	2.43	2.14	2.59	4.64

1- Level of economic activity generated by each euro of public funds.

From the analysis of the table, the major findings are:

- The direct economic impact of each Polytechnic varies between 15,984,000 EUR for the Portalegre Polythecnic and 101,008,000 EUR and for Leiria Polythecnic;
- Considering the above mentioned multiplier value (1.7), the total impact in terms of the economic activity generated results in an amount of 27,173,000 EUR for the Portalegre Polythecnic and 171,714,000 EUR for the Leiria Polythecnic. There seems to be a linear trend between the number of students and the economic impact of the Institutions. Therefore, the larger Institutions in terms of students' numbers have a larger impact.
- In terms of the relative weight in the regional GDP these values vary from 1.71% for the Setúbal Polythecnic to 11.02% for the Bragança Polythecnic;

- In addition, an estimation of the level of economic activity generated in the region for every euro of funding received from the government in the year 2012 was produced. The values range between 2.63 EUR for the case of Castelo Branco Polythecnic and 8.07 EUR for the case of the Leiria Polythecnic.
- As was expected, the polytechnics are, in general, one of the major employers of the region.
- Through the concept of apparent labour productivity, it was possible to obtain an estimate of the number of jobs created due to the location of the Polytechnic in the region. Thus, for the different Polytechnics, it was found that the values are between 913 for the Portalegre Polythecnic and 6,321 for the Leiria Polythecnic.
- Considering their relative weight in terms of the active population, the range of values is between 1.77% for the Setúbal Polythecnic and 12.92% for the Bragança Polythecnic.
- Finally, the jobs multiplier obtained varies between 2.14 and 4.9 for the Setúbal Polythecnic and the Bragança Polythecnic, respectively.

Although the study has been made with the concern of greater methodological rigor, it was necessary (as in any study of this nature) to rely on some assumptions, which might affect the exact amounts actually obtained. Therefore, some caution should be taken into account when reading these numbers. The most sensitive assumptions are related to: the definition of the geographical area of study; the estimated value of regional GDP; the spending multiplier value used; and the calculation of the number of jobs created.

VI. Discussion

This study, based on a uniform methodology, inspired in a simplified version of the American Council of Education model (Caffrey and Isaacs, 1971), allows comparability between the different realities of the seven Polytechnic Institutes analysed. It should be emphasised the diversity of Institutions involved, both in terms of size and in terms of socio-economic and regional context. Despite some limitations of the study regarding, namely, the low response rate of some bodies in some institutions and the definition of the boundaries of the geographical area under study (which was limited to the municipalities where the HEIs were located), it was possible to approximate the impact of the seven institutes in the respective regions. Thus, the impact on GDP of the municipalities varies between 2-11%, which adds a multiplier effect on job creation ranging between 2-5. These results are important to highlight especially considering that a conservative approach was followed in assessing the impact (in the sense that only the impact of those students that moved to the region, the export effect, and of those that would go outside the region if the Polytechnic would not exist, the import substitution effect, were included in the calculations). In fact, it is evident that the largest contribution to the economic impact derives from the monthly expenses of students who moved to the region to study in the Polytechnic Institute.

Overall, the study allowed a first quantified estimation of HEIs' economic impact, the results of which enhances their public mission, especially in terms of regional development, ensuring access to higher education, and as an agent of transformation of the reality of the municipalities/regions where the Polytechnics are located, which is much valorised by the inhabitants of those regions.

VII. Conclusions

Although this is an on-going research project, some preliminary conclusions can be drawn. Firstly, the level of economic activity generated by the existence of the Polytechnic Institute in the studied regions ranged from 27 million euros to 172 million. Secondly, this impact in terms of local GDP ranged from 1.71% and 11.02%, with the more deprived regions exhibiting the highest values. In fact, the regions that were analysed are very different regarding the level of GDP per capita (ranging from 10,000 EUR to 16,000 EUR). Thirdly, for every euro spent by

the Government it was generated a level of economic activity ranging between 2.63 and 8.07 EUR. Also, there seems to be a linear relationship between the value of economic impact and the Institutions' number of students. Finally, it should be emphasised the role of HEIs as major local employers.

Besides these results, some caveats should be made about the study undertaken. Firstly, when computing the estimates of economic impact a conservative approach was used, given that only the export and the import substitution effects were taken into account. Secondly, a sensitive parameter of the model is the value of the multiplier used. Given the lack of information on this value at the local level, a median value calculated from several studies was used. Finally, the impact of HEIs on human capital formation was not taken into account, which probably underestimates the true impact of HEIs.

Moreover, it is important to recognise that the impact of Polytechnic Institutes is far beyond the purely economic impact, particularly in dimensions not easily quantifiable, such as the socio-cultural ones and the equity of access to higher education for young people in these regions. The work is not finished and in the future the impact on the training and education of populations will be studied, in line with the approach of Bluestone, trying to understand where the graduates are, where they work, and what their income is.

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