AN APPROACH TO THE DETERMINATION OF THE TOTAL ECONOMIC IMPACT OF A HEI IN A DEPRIVED REGION OF NORTHERN PORTUGAL

PEDRO OLIVEIRA[1], Minho University
JORGE CUNHA[2], Minho University
JOANA FERNANDES[3], Polytechnic Institute of Bragança

Abstract

The purpose of the paper is to describe the study that is being conducted in the Polytechnic Institute of Bragança (IPB). The main objective of this study is to determine the total economic impact of the institution in the hosting regions.
To achieve that, we used the traditional or economic-base approach and the skill-base approach. From the traditional approach, based in the Caffrey and Isaacs's impact model, we obtained the direct economic impact of the IPB. From the skill-base approach we are currently estimating the human capital that is directly linked to the IPB.
We expect to determine the total economic impact of the IPB and how a change in its local demand will affect the economy of the surrounding regions, and also what is the higher education institutions' impact on the individuals and how it will affect their lifelong earnings.

1. Introduction

It is accepted in a general way that Higher Education Institutions (HEIs) are important mechanisms for regional development. However, it is essential that the HEIs can quantify the impact that their activities have in the hosting communities and in their economic development. This is a way to demonstrate the advantages they obtain from hosting the HEI.

Another reason for the HEIs to conduct this analysis is because they have to justify the state's support and compete with other public policies or activities or even with other HEIs, where these public funds could also be spent. In Portugal there are 160 Higher Education Institutions, public and private. The public institutions are universities or polytechnics, but both are financed according to the same formula: the direct financing (which is the basis for the annual institutional budget) is calculated taking in consideration mainly the total number of students enrolled each year; the social services financing; and the fraction that is dedicated to research (Portela *et al*., 2007; Guichard and Larre, 2006). However, since the academic year of 2003/04 there are more vacancies than applicants, and, as such, in 2006 the formula was altered so it would incorporate other quality criteria, in order to financially reward the institutions that deserve it the most. The main changes were the inclusion of a faculty quality criteria (educational degree) and the graduating rate of the institution, and at the same time those courses with less than 20 students enrolled each year would no longer be eligible for financing (Portela *et al*., 2007). This brought a new wave of competition between institutions and an urgent need to prove one's quality and importance in local economy.

There are many international studies that estimate the impact HEIs have in the regions[1]. Specifically, they try to determine how much a region benefits economically from hosting them. However, with minor variations, almost all the studied institutions follow the same procedure. The calculus is made by determining the additional impact that occurs, above the regular economic activity if the HEI did not exist. The reason for this logic derives from the fact that most of the HEI revenues come from out of the region and only because of the HEI existence.

There are two main approaches to determine this additional impact: the traditional base approach and the ability base approach (Brown and Heaney, 1997). The traditional approach, based on the pioneer work of Caffrey and Isaacs (1971), measures the total impact in local employment and revenues from the total spending related to the institution, in the region. While the ability base approach, greatly supported by Bluestone's work (1993), considers that to estimate the total economic impact of a HEI it should also be measured the additional productivity and the superior lifelong earnings of the graduates. Nevertheless, both approaches agree that although the main objective of a HEI is to educate, they do more than that. They are important financial, technological and social institutions on the regions where they are established.

Initially, a brief description of the two referred approaches and the assumptions held, in order to estimate the economic impact of the IPB in the Bragança and Mirandela's regions, is presented. Afterwards, the steps taken to achieve these estimates are explained. The description of the first approach comprehends the survey to the faculty, staff and students, and the estimate of the monetary flows from the individuals to the region as local spending. It also includes the estimated direct economic impact of the IPB. The figures achieved in this analysis are the initial data needed for the economic model that is being developed, based in the American Council on Education model (Caffrey and Isaacs, 1971). A description of the second approach and of the assumptions made to apply it, to allow an estimate of the human capital created by the Polytechnic Institute of Bragança (IPB), is offered. And, finally, the total economic impact of the IPB in the regions is estimated.

2. Review of Literature

This section reviews the existing literature on both types of higher education institutions' regional impacts: the demand-side impacts, which represent the economic impacts, and the supply-side impacts, which comprehend the human capital impacts. While on the demand-side impacts we have

[1] See for example Smith (2006), Arik and Nsiah (2004), Ohme (2004), Arizona State University (2003), Carr and Roessner (2002), Baldwin and Brann (1997), Buchanan [*et al.*] (1994),

the direct economic stimuli from the new funds that are brought into the region (the enhancement of the economic activities by non local sources due to the university activities), on the supply-side impacts we have the indirect economic stimuli by enhancing the region's ability to compete within the national and global economies (Smith, 2006; Blackwell, Cobb and Weinberg, 2002).
The demand-side impacts are mostly of short term. They derive from the additional selling, income and jobs, due to the funds from outside of the region that are now being used in the region. The supply-side effects are more permanent and of long term. They correspond to the expansion of the region's economic capability due to a more educated and productive labour force (Strayhorn, 2005).

As was stated above, the demand-side analysis considers only the monetary value that is invested or spent in the region where the HEI is implemented. However, several authors that estimated the HEIs impacts using this approach consider that it underestimates the true impact, since none of the non-monetary effects are included in the calculation. These non-monetary impacts are the supply-side effects, the ones that are generated by the HEI activity and that will benefit the region and their local individuals. Contrary to the traditional approach (where one can only estimate the amount that is transferred to the region through the purchase of goods - the demand-side analysis), this approach intends to determine the impact of the HEI in regional economies by estimating the economic earnings due to higher productivities. This higher productivity can be generated if more physical capital is used by the worker; if the health or capability of the worker improves (i.e. human capital); or if the stock of capital knowledge grows[2] (Strayhorn, 2005).

The two types of impacts are representative the two main approaches (the traditional-base or economic-base approach and the skill-base approach) that try to explain the impacts that higher education institutions (HEI) have in their hosting regions.
Although the latter approach intended to complete the analysis obtained by the traditional-base approach, there are many criticism from some authors saying that it is very difficult to accept that one can achieve a global value adding the results of those two approaches, considering that one looks from the demand perspective and the other from the supply (Carrol and Smith, 2006). As such, we decided to maintain both analyses separate, nevertheless acknowledging that they are complementary. The following subsections describe the state of the art concerning each one.

[2] The main difference between human capital and knowledge capital is that the first cannot be separated from the human being that possesses it (Strayhorn, 2005).

2.1. The Demand-Side Analysis

The demand-side analysis considers only the monetary value that is invested or spent in the region where the HEI is implemented. In the traditional approach, to measure the impact of the HEI in the hosting regions, one should measure its effects in the local employment and revenues. Some authors consider also the enhancement of the technological base of the region due to the transfer of HEI's technology for local companies. However, when the HEI is for undergraduates and the region is underdeveloped (like the ones under study) the technology transfer effects can be overlooked because they are not significant and cannot be accurately estimated (Carrol and Smith, 2006; Blackwell, Cobb and Weinberg, 2002).

The ACE model traditionally used to determine the economic impact is based on an estimate of the total spending from the institution, the staff and faculty members, the students, and the visitors in local business[3].

Briefly, the ACE model identifies who is spending, how much, what is being bought, and where. It also considers 4 sources of impact, gathered in the following formula:

HEI's direct economic impact = $X_1+X_2+X_3+X_4$;

Where:

X_1 represents the HEI's local spending (for example, in supplies, communication, and other goods or services);

X2 represents the local spending of the faculty and staff members;

X3 represents the local spending of the students;

X4 represents the local spending of the visitors.

In the reviewed literature some other economic impact models were found, however, they are all in the spirit of the traditional-base approach and founded in the ACE model (for example, the Short-Cut Ryan model, the EACUBO, or the IMPACT model) (Ohme, 2004; Charney and Pavlakovich-Kochi, 2003; Gunderson, Eastwood and Fox, 2003; Lantz, Brander and Yigezu, 2002; Austrian and Sadowski, 2002; Macfarland, 2001; Head, 1997; Ryan and Malgieri, 1992).

This model is still in use although with some suggested improvements. In fact, recent studies introduced another source of impact, the substitution effect, that is the impact of those local students that would have gone to another region had they not been admitted in this HEI (Blackwell, Cobb and Weinberg, 2002). Other authors, although recognizing the critics, consider that this model still

[3] Charney and Pavlakovich-Kochi, 2003; Seybert, 2003; Healey and Akerblom, 2003; Arizona State University, 2003; Carr and Roessner, 2002; Brown and Heaney, 1997; Buchanan, 1994; Caffrey and Isaacs, 1971.

delivers a very accurate estimative of the economic impacts (Arik and Nsiah, 2004; Duhart, 2002; Chatterton, 1997; Head, 1997; Clark, 1993).

The data for the ACE model is mostly obtained by pure surveys and official sources (but some authors conducted an analysis with only official data, like Baldwin and Brann, 1997), and applied a retail gravity model to estimate the retail purchase indicator. The main impacts that it estimates are in local business, local governments and local individuals (Caffrey and Isaacs, 1971).
These impacts can be categorized as direct, indirect and induced. The indirect impacts are the effects felt in the chain of suppliers, from whose activities are being considered as the direct effect. The induced impacts are changes that occur in the consumers spending behaviour. Both these impacts are difficult to be obtained and need the presence of a multiplier. To the amount that the model estimates (the direct economic impact) one should apply a multiplier to obtain the indirect and induced impact (Carr and Roessner, 2002).
The sum of these 3 obtained figures is the total economic impact of the HEI in the region.

2.2. The Supply-Side Analysis

This analysis, based in the skill-base approach developed by Bluestone (1993), intends to measure the increase of productivity and the enhancement of the incomes and economic activities of the individuals due to the knowledge and competences acquired from attending the HEI (Blackwell, Cobb and Weinberg, 2002). However, these benefits can only count as a HEI impact if the individuals remain in the region (Sanders, 2003; Bluestone, 1993).
Carrol and Smith (2006) support that there is an enhancement of the competences and skills of the graduates with the education achievement, but they also sustain that the measurement of this impact is problematic and controversial, and that the inclusion of this value in the total amount will overestimate the impacts. These authors argue that if a conservative and objective analysis is intended then only the economic impacts should be considered. Other authors consider that an impact analysis cannot be limited to the economic benefits. Although the non economic benefits from attending a HEI are very difficult or even impossible to quantify, they exist and therefore should be considered. It is always better to overestimate the value of the human capital created by a HEI than to have none (Baum and Payea, 2004).
Some authors question the validity of this approach - that sustains that HEIs through education will create more qualified workers, that will earn more than if they did not had that education, and so will pay more taxes - for its subjectivity (Brown and Heaney, 1997). Other authors criticize this approach because it establishes that the earning differentials are based exclusively in the education

and does not consider that there are differences based in individual skills (Blackwell, Cobb and Weinberg, 2002).

Another criticism regards some studies that try to relate the human capital effects with a specific institution, but this is very difficult and controversial (and problematic, especially in the cases where the authors try to compare among different types of institutions). Even the earning differences due to the education obtained in a specific institution are difficult to estimate, because what most studies determine is the difference between an individual that has a higher education degree and a high school graduate (Blackwell, Cobb and Weinberg, 2002).

It is a fact that, although their core mission is to educate students with quality, HEIs accomplish more than simply educate. They are institutions of major importance for the regions, which can facilitate educational, economic, social and cultural opportunities that wouldn't be there otherwise (Charney and Pavlakovich-Kochi, 2003, Carr and Roessner, 2002; Goddard, 1987).

The value of a higher education may be regarded as the human capital effects obtained by the individuals with a higher education degree. These effects can be of economic and non economic nature and can be grouped in 4 major categories: public economic benefits; private economic benefits; public social benefits; and private social benefits (IHEP, 2005; Arizona State University, 2003). Specifically, the main benefits identified in the literature[4] are:

a) Public economic benefits: In this category we can identify, among others, the enhancement of the labour force skill and productivity levels, higher consumption levels, enhancement of the local human capital, higher labour flexibility, lower dependency for state's financial support or social welfare, and higher tax return rates on investment and on property values.

b) Private economic benefits: Higher and better salaries and benefits, higher employment rate and lower unemployment risk, higher saving levels, better working conditions, higher personal and professional mobility, and enhancement of the potential incomes.

c) Public social benefits: In this category one can find the lower levels of unemployment and poverty, lower criminal rates and lower prisoners' percentages, higher donations and community service, higher levels of civic participation, higher trust in social institutions, higher ability to adjust and to use technology, preservation of cultural heritage, and, recently, it is being related with lower smoking rates.

d) Private social benefits: Enhancement of life expectation and a better perception of individual health, lower health insurances, higher sport activities, better life quality (of the graduates and their

[4] IHEP (2005), Baum and Payea (2004), Owings and Kaplan (2004), Healey and Akerblom (2003), Desjardins (2003), Bryant (2001), Gloucester County College (2001), NASULGC (2001), University of South Carolina (2000).

descendants), better and more rational decisions concerning the consumption, higher personal status, more hobbies and leisure activities.

However, when the supply-side effects are included in the analysis, most studies focus on one specific aspect: the human capital. As a matter of fact, the human capital is currently a major issue in the impact studies (see for example the study from the University of Strathclyde, 2006). Owings and Kaplan (2004) state that the money spent in education clearly returns dividends in human capital. Individuals are therefore motivated to obtain higher educational degrees, in order to achieve higher salaries and better working positions (Sanchez and Laanan, 1998).

The two major economic theories concerning education's economic impacts are the human capital theory and the signal or screening theory. While the human capital theory argues that education enhances the individuals' productivity and incomes, the sign theory[5] sustains that individuals signal their productivity levels with the attainment of a higher education degree, i.e. they send a sign of their educational status as a proof of their productivity (Sanchez and Laanan, 1998).

When Bluestone (1993) analysed the supply-side effects, he already added the human capital issue to the economic approach. Human capital has an important role in the process of economic growth, and individuals' labour market outcomes are linked to their educational attainment (OCDE, 2006).

It is difficult to define human capital. Woodhal (1995) considered it to be "(…) *the investment that individuals do in themselves, throw education, training, and other activities to potentially enhance their present value of their future earnings"* (*in* Desjardins, 2003: 12).

According to Schultz (the proponent of the human capital theory, for which he won the Nobel Prize in 1979), human capital – which is the capital incorporated in the human beings, particularly in the form of health and education – is the main component that explains the uneven economic development between countries. In short, Schultz (1961) considers human capital as the gain in knowledge, skills and competences obtained from investing in education. The human capital theory states that education can enhance future incomes and, as such, the acquisition of education is a private investment in future incomes. The idea, according to which the education contributes to growth, is the origin and the result of the human capital theory (Altinok, 2007).

Schultz (1961) developed the theoretical base for the development of growth models, and he is the author of the inclusion of the human capital accumulation as the key element in the long term economic growth process, considering it the principal source.

[5] Some authors refer to this theory as the screening theory, in which the potential employers will screen the candidates, estimating their productivity or capability by the analysis of their educational degree or by establishing a minimum acceptance degree (Saito, 2008).

For Schultz (1961) education explains the majority of the productivity factor, especially the growth part that neither physical capital nor labour volume can predict. The main limitation to his theory is the implicit assumption that education has the same effect in every individual (as the capital factor does). Perna (2003) sustains that theoretically individual's incomes are determined by their productivity, and therefore it is expected that additional years spent in education will enhance labour productivity. Although it is very difficult to determine the benefits that come from the education, some studies tried to determine the earning premium of a higher education. One example is Perna (2003), who proposed the following equation for the earning premium:

$$\ell n(W_i) = \beta_0 + \beta_1 \cdot S + \beta_2 \cdot X + \beta_3 \cdot L + e;$$

Where W is the annual income; S the education attained (number of years of higher education or secondary education, obtained degree, etc.); X is the vector that represents the background characteristics; L the vector that represents labour market experience (type of position, number of years in that position, total of labour years since graduation, type of industry, and so on). Applying this equation it is possible to obtain the alpha factor, meaning the education premium, which is the proportion in the differences of the observed incomes that is associated with the higher education attendance and graduation (Perna, 2003). Other authors considered that, although the model of Perna was a valid attempt to estimate the alpha factor or education premium, there were some aspects that should be analysed that still made the model a little unreliable (Monks, 2000).

Singell (2002) supports the statement that says that the first responsibility of a HEI is to produce human capital, which enhances labour force's productivity and the region/state's tax base. This author has a conservative vision because he considers only the individuals that attended a HEI and graduated. The ones that drop out are not considered, but, from the reasoning underlying this theory, they too must have enhanced their capabilities and productivity[6] (Singell, 2002; Sanchez and Laanan, 1998).

Although some authors argue that there is no empirical evidences that support this statement (see for example Romer, 1986), others sustain that it's not just education that potentially enhances the economic growth but only the quality education. The key element is the education's quality instead of quantity (Pritchett, 2001). This opinion is shared by Altinok (2007) who conducted a major study about the association between the investment in human capital - in the education element - and economic development. He found that when the quality dimension of the education is taken into consideration there is a positive and significant effect from the education in the economic growth.

[6] See for example Sanchez, Laanan and Wiseley (1999), who conducted several studies comparing different educational levels, namely secondary school incomplete and complete, some higher education attendance (< 2 years), more than 3 years, bachelor degree, master degree, and so on.

Following this perspective, other authors associated education's quality with the perceived quality of the institutions that grant the higher education degree, and it has been proved that the individuals that obtained a degree from a higher quality or prestigious HEI have a considerable income premium comparatively with those that graduate from HEI not so prestigious (Thomas e Zhang, 2005; Lindahl and Regnér, 2002; Monks, 2000). This line of research, focusing in the HEIs characteristics, brought another light to the heterogeneity of education returns. It was established with strong evidence that the graduates from the more selective HEIs earn more, and this is justified by the probability that these students will contact with more brilliant colleagues or better teachers, hence the selectivity of the institution (Monks, 2000).

Desjardins (2003) considers that there is ample empirical evidence supporting the idea that the number of years spent in the formal education and the obtained degrees have a positive and significant effect in the individual's incomes, due to the creation of human capital. Furthermore, he argues that formal education, of all types of education, is the one with the strongest relative influence in the economic results. Pritchett (2001) even developed a human capital indicator: $h=\exp(r*S)-1$, where $\underline{h}$ is the human capital of each individual, $\underline{r}$ is the return on education, and $\underline{S}$ is the average number of years of school. There are difficulties in identifying and measuring the enhancement of the incomes that are associated with education, because this enhancement is also affected by the different individual innate capabilities, race, type of job, or motivation (Bryant, 2001).

Currently, it is accepted in all modern economies, that there is a positive correlation between human capital and economic growth, that the educational level which an individual possess is positively correlated with his personal incomes, and that the critical contribution from the HEIs to economic development are skills and capability (Thomas and Zhang, 2005; Appleseed, 2003). Human capital has been an important determinant of the social and individual progress, but it is even more important in the global economy, that is becoming more and more knowledge competitive and intensive (Marshall, 2005; Owings and Kaplan, 2004).

In societies where the efficient production and competent management are of vital importance, to be economic competitive is to be educationally competitive (Goddard, 1987).
The future economy will be based in intellect and knowledge, and, no doubtfully, what already matters in today's economy are capabilities and skills above average (Rosan, 2002).

3. The Polytechnic Institute of Bragança

This section describes the data and the assumptions held, in order to estimate the direct economic impact of the IPB in the regions of Bragança and Mirandela. It also describes the research that is being conducted to obtain the indicators of the human capital impacts of the IPB.

The Polytechnic Institute of Bragança (IPB) is a polytechnic higher education institution, located in the far Northeast of Portugal in an isolated and deprived region (among numerous indicators that support this description we can name the population density. In fact, in 2006 the population density of Bragança reached 29.5 inhabitants per km^2 and Mirandela the 39.6 inhabitants per km^2, while Portugal as a whole had in the same year a population density of 113.6 inhabitants per km^2).
The IPB has 5 colleges, 4 of them located in the city of Bragança and 1 located in the city of Mirandela. As such, the analysis conducted intended to determine the IPB impact in both regions.
In terms of individuals, the IPB enrolment consists of about 6,000 undergraduates, and there are approximately 400 faculty members and 200 staff members.

3.1. Economic Analysis

As was stated before, the main focus of this paper is on the human capital impacts of the Polytechnic Institute of Bragança, and thus the economic analysis and direct economic impacts of the IPB will be presented in a brief summary.
To determine the direct economic impact of the IPB in the regions of Bragança and Mirandela, it was used the ACE model (Caffrey and Isaacs, 1971). This model determines the direct economic impact as the sum of the following impacts: in local individuals (I), local business (B), and local government (G), as shown in the next figure.

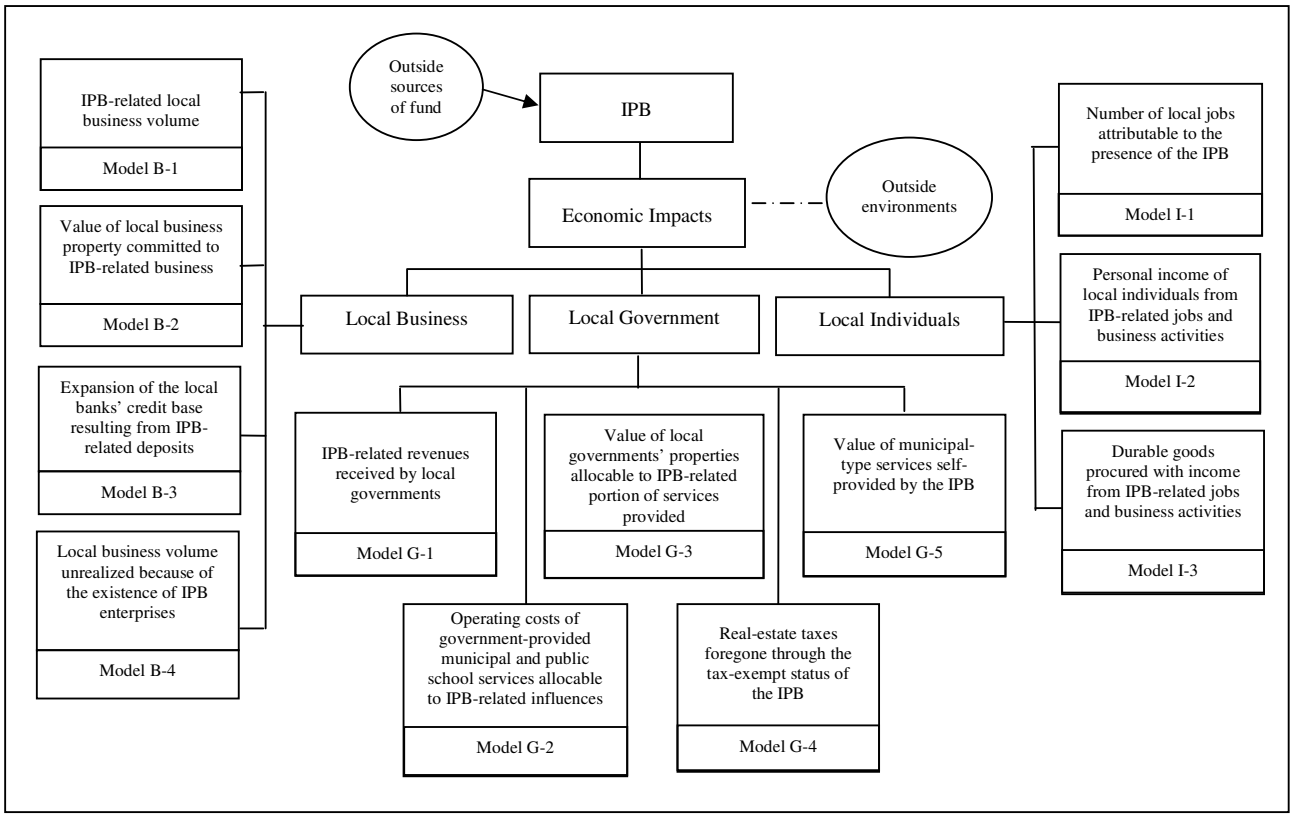

Figure 1 – Economic impact of the IPB on the business, government and individuals of the region
Source: Adapted from Caffrey and Isaacs (1971: 10).

To obtain the data, a survey to the faculty, staff and students, during the 2nd semester of the scholar year of 2006/07, was conducted. The population in study, according to official data from 31 of December of 2006, had 396 faculty members, 233 staff members, and 5119 students. The number of responses obtained was: 166 from the faculty, 105 from the staff and 1388 from the students.
The collected data was processed using the SPSS 15.0 - Statistical Package for the Social Sciences.

From that analysis it was possible to obtain the following figures:

- From the sample, 48.8% of the faculty members changed their permanent addresses to work in the IPB. In monthly average terms, the faculty members that answered the survey identified their monthly household spending as reaching the 1,717.4 euros. The visits received by the faculty members annually spend in the region 628.2 euros per year.
- The staff members that answer the survey responded that only 21.2% changed their permanent address to work in the IPB. Each household to which the staff members belong spend 1,258.5 euros in the region. The visits that these staff members receive each year spend in the region 449.3 euros per year.

- About 73.5% of the sampled students moved to Bragança or Mirandela to attend the IPB. Each student spends every month an average amount of 449.8 euros and every year they receive visitors that spend another 134.8 euros per year. From the survey, 26.3% stated that they intend to remain in the region if they can find a job.

The total direct impact due to the spending of the individuals' related to the IPB in the regions under analysis, Bragança e Mirandela, exceed slightly over 24 million euros for scholar year of 2006/07. As the institution's spending in the region and the substitution effects were not added to the previous amount[7], the impact is expected to be much higher. However, considering only these amounts, the spending from the individuals related to the IPB are 8.56% higher than the institution's annual budget for the year 2007, which was 22,293,335 euros (DGO, 2007).

3.2. Human Capital Analysis

In this analysis it is assumed that the rational individual, ideally, compares the present value of his future earnings from a particular educational investment with present value of its costs, and will choose the educational program that maximizes his return on investment (ROI) (Perna, 2003). Studies show that even though the cost of higher education is high, the return on investment for the individual is sufficiently high to cover that cost (Bryant, 2001). The only concern that the authors underline is that those benefits can take several years after graduation to happen (Bryant, 2001).

However, this analysis is more than simply the determination of an individual's economic earnings. Singell (2002) argues that the higher earnings that the graduates have when compared with those that don't have a degree is one measure of the human capital obtained, and this can be estimated by calculating the wage differential on a lifelong basis, together with the marginal tax rate. To estimate the ROI for the students of the IPB, one can use the model developed by Rubi (1995). This model estimates the human capital market value assuming that the annual average income is correlated with the individual educational level or scholar years (Guichard and Larre, 2006; Rubi, 1995).

Rubi (1995) developed his model based on 2 different perspectives:
a) The student's perspective, where he compared the education cost and the expectable return on investment, to determine if for a specific institution or region the students' investment pays off.

[7] At this point the institution's spending on the region and the substitution effect still remains uncalculated because the data were still unavailable.

b) The government perspective, where he compared the government investment with the lifelong return payments that the graduates (that benefit from that public investment) will pay to the government in the form of taxes. This way, it can be determined if the government financial support is a cost or an investment with a measurable profit rate.

First, we tried to obtain from official sources the required data, namely the average earnings according to the degree. Some assumptions were made, such as that the differential of earnings between higher education graduates and high school graduates are due solely to the knowledge acquired in the HEI.

In the first perspective (a), it was estimated the cost of education versus the ROI for the IPB students. The ROI was estimated comparing 40 years of labour income, between a higher education graduate and a high school graduate. Although there are many criticisms to this assumption, due to time and data constrains, it was the only way to estimate this figure. In present values, an IPB graduate earns, in average, during his 40 years of work approximately 745,415.2 euros while a high school graduate will earn in the same period of time 382,095.9 euros (INE, 2007). These calculi were made considering an annual average inflation rate of 3.0% and an interest rate of 5.0%. Both obtained from the analysis of the last 10 years (1996-2006)[8]. The wage differential after 40 years of labour, in present value, is approximately 363,319.3 euros.
The cost was determined by estimating the spending that a graduate supports, during his 4 years of higher education attendance until graduation[9]. This amount was estimated based in the student's survey. However, the costs of house and food were excluded because both individuals have these living costs. The calculated costs achieved the amount of 7,370.4 euros, in present value. There are also the opportunity costs that should be considered, since the graduate during the course is not making any income like the high school graduate is. The opportunity cost of these 4 years is 52,718.2 euros. In this perspective a student that attends the IPB will have a direct economic human capital impact, an expected return on the investment that he does in the 4 years of education, of 303,230.7 euros. Clearly the investment pays off.

The second perspective (b) was estimated by determining the taxes return on income and sales and comparing it with the government cost to finance an undergraduate for 4 years. In this perspective it was assumed that those that earn more pay more taxes and have more money to spend. So it was

[8] Portuguese Central Bank. At <http://www.bportugal.pt>.
[9] The analysis considers 4 years to attain a graduation degree because the existing data is from 2006, and the IPB degrees were not yet implemented according to the Bologna Treaty. It is also assumed that the students will not fail any year.

calculated the annual tax payments made by a graduate and a high school graduate during 40 years of working life. The government spends during the four years of a student's attendance an average amount of 13,635.0 euros. For the working period of 40 years, a higher education graduated pays in the form of taxes to the government, an average present value of 111,812.0 euros, while a high school graduate pays 57,314.0 euros (with an average annual tax rate of 15.0%). The taxes payment differential, in present value, reaches an average amount of 54,498.0 euros. The government has a return on its investment of 40,863.0 euros per student. This means that the government does not have a cost when he supports the higher education by financing the HEIs, in fact, the government is making an investment that has a very high profitability rate.

This second approach allows more specific estimates than the general ones obtained from Rubi's model. Some authors added that with this approach one can determine several benefits that the individual and the society benefit from attending a specific higher education. According to this, one can, not only estimate the human capital an individual will create from attending a HEI, but also, estimate the human capital an individual gains from attending a specific HEI. Bluestone presented some guidelines to estimate a direct human capital effect, and based in his work Carr and Roessner (2002) developed the following model adjusted to a specific region (figure 2).

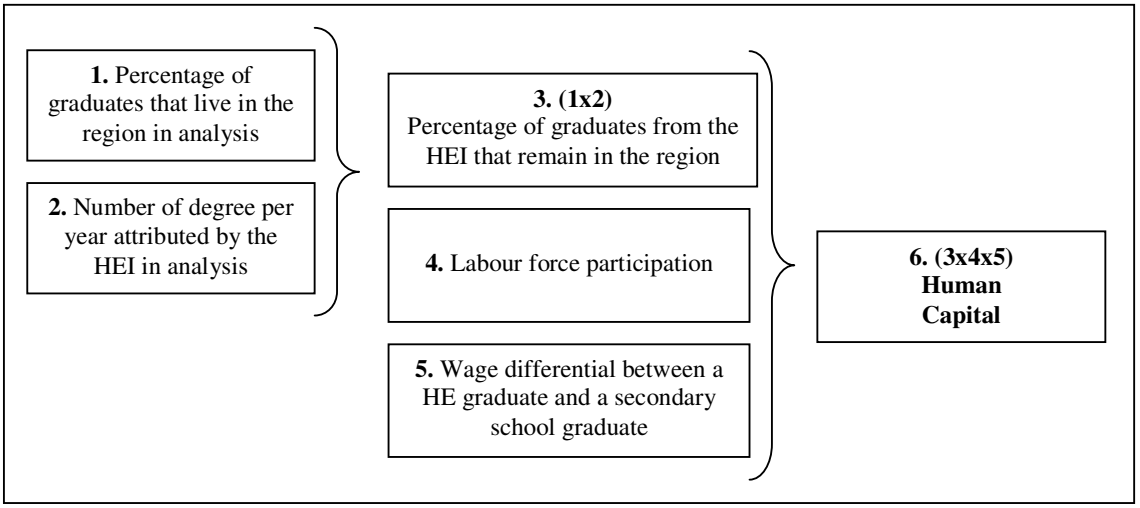

Figure 2 – Estimating the direct human capital impact
Source: Developed from Carr and Roessner theory (2002).

The human capital analysis is being presently conducted, and we are consolidating the values obtained from Rubi's and Bluestone's models.

We acknowledge that the figures obtained may appear as estimates for any average Portuguese graduated, and not for an IPB graduated. However, since the required data is still not available, this is the most accurate calculi that are possible to make at this stage.

It is also in progress a survey among the graduates of the IPB of the last 20 years, concerning where they are now, what is their occupation, and what is their annual income, that will allow a more specific and precise analysis.

Therefore, we do not presume this to be a precise figure of the value-added of an IPB education, but as a needed and valid attempt that will be improved. Nevertheless it is possible to assume that the IPB has an important contribution to the economic health of the regions and of the individuals.

4. Concluding Remarks

This paper presented the estimate of the total economic impact of the Polytechnic Institute of Bragança in its hosting regions, namely Bragança and Mirandela.

While the direct economic impacts are reasonably obtainable, reaching slightly over 24 million euros, that represents an increase of 8.56% compared to the annual budget granted by the government, the human capital impacts are much more difficult to estimate. We intended to discuss the different perspectives presented in literature and to describe the research that is currently being prepared concerning this higher education institution. Even though the accurate figures are certainly much higher, it is already possible to state that the IPB has a major economic impact in the hosting regions.

References

1. **ALTINOK**, N. (2007). Human Capital Quality and Economic Growth [Online]. Institute for Research in the Sociology and Economics of Education, working paper DT 2007/1, actual. September 2007. [Acc. 21/05/2008]. At <http://halshs.archives-ouvertes.fr/docs/00/17/24/71/PDF/DT2007-1.pdf>.
2. **APPLESEED**, Inc. (2003). Engines of Economic Growth: The Economic Impact of Boston's Eight Research Universities on the Metropolitan Boston Area [Online]. [Acc. 03/02/2006]. At <http://www.aicum.org/files/downloads/economicimpact/EconomicReport_Summary%20Report_FINAL.pdf>.
3. **ARIK**, M.; **NSIAH**, C. (2004). Measuring the Economic Impact of Middle Tennessee State University. Business and Economic Research Center, Jennings A. Jones College of Business, Middle Tennessee State University, June-2004.
4. **ARIZONA STATE UNIVERSITY** (2003). The Contribution of Arizona State University to the Arizona Economy, FY 2002. Center for Business Research, L. William Seidman Research Institute, Arizona State University, April-2003.
5. **AUSTRIAN**, Z.; **SADOWSKI**, R. (2002). Cleveland State University: An Economic Impact Study. Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University, September 17-2002.
6. **BALDWIN**, A.; **BRANN**, H. (1997). The Economic Impact of Miami-Dade Community College on the Local Dade County Economy. Miami-Dade Community College, Research Report Nº 97-07R. ED 422 997 – JC 980 391.
7. **BAUM**, G.; **PAYEA**, K. (2004). Education Pays 2004: The benefits of higher education for individuals and society. Washington, DC: College Board.

8. **BLACKWELL**, M.; **COBB**, S.; **WEINBERG**, D. (2002). The Economic Impact of Educational Institutions: Issues and Methodology. *Economic Development Quarterly*, 16 (1), 88-95 (2002).
9. **BLUESTONE**, B. (1993). UMASS/Boston: An Economic Impact Analysis. University of Massachusetts, Boston. January 93. EDRS. HE 026 389. ED 356 733.
10. **BROWN**, K.; **HEANEY**, M. (1997). A Note on Measuring The Economic Impact of Institutions of Higher Education. *Research in Higher Education*, 38 (2), pp.229-240. 1997 Human Science Press.
11. **BRYANT**, A. (2001). The Economic Outcomes of Community College Attendance. ERIC Digest. ERIC Clearinghouse for Community Colleges, Los Angeles. CA. ED467981. September, 2001.
12. **BUCHANAN**, D. [*et al.*] (1994). The Economic Impact of Mississippi Valley State University on the Local economy, 1992-93. Mississippi Valley State University. ED 384 280 – HE 027 990.
13. **CAFFREY**, J.; **ISAACS**, H. (1971). Estimating the Impact of a College or University on the Local Economy. Washington, DC: American Council on Education. ERIC ED 252100.
14. **CARR**, R.; **ROESSNER**, D. (2002). The Economic Impact of Michigan's Public Universities. SRI Project: PDH 02-019, May-2002.
15. **CARROL**, M.; **SMITH**, B. (2006). Estimating the Economic Impact of Universities: The Case of Bowling Green State University. *The Industrial Geographer*, 3, pp. 1-12, 2006.
16. **CHARNEY**, A.; **PAVLAKOVICH-KOCHI**, V. (2003). University of Arizona Research Expenditures: Generating Jobs, Wages and Tax Revenues in the Local Economy. Office of Economic Development, the University of Arizona, Tucson, Arizona, February 18-2003.
17. **CHATTERTON**, P. (1997). The University and its Economic Impact - The Economic Impact of the University of Bristol on its Region. The University of Bristol, UK, August-1997. [Acc. 20/02/2006]. At <http://www.bristol.ac.uk>.
18. **DESJARDINS**, R. (2003). Determinants of economic and Social Outcomes from a Life-Wide Learning Perspective in Canada. *Education Economics*, 11 (1), pp.11-38. Taylor & Francis Ltd. ISSN 0964-5292.
19. **DUHART**, S. (2002). The Economic Impact of University System of Georgia Institutions on Their Regional Economies. Board of Regents. Office of Economic Development. March, 2002.
20. **GLOUCESTER COUNTY COLLEGE** (2001). Economic Impact: A report of the impact of Gloucester County College on the local economy, Fiscal Year 2001. Office of Institutional Research & Office of Finance and Administration. December-2002. [Acc. 17/12/2005]. At <http://www.gccnj.edu>.
21. **GODDARD**, J. (1987). Universities and Regional Development: An Overview [Online]. Centre for Urban and Regional Developments Studies, University of Newcastle upon Tyne, July-1987. [Acc. 17/12/2005]. At <http://www.ncl.ac.uk/>.
22. **GUICHARD**, S.; **LARRE**, B. (2006). Enhancing Portugal's Human Capital [Online]. OECD Economics Department Working Papers. Nº 505, 28-Jul-2006 (OECD, Paris). [Acc. 17/08/2007]. At <http://www.sourceoecd.org/vl=20550968/cl=21/nw=1/rpsv/cgi-bin/wppdf?file=5l9lzs6tggq3.pdf>.
23. **GUNDERSON**, R.; **EASTWOOD**, J.; **FOX**, W. (2003). The Economic Contributions of Northern Arizona University to the State of Arizona in 2003. Bank One Center for Business Outreach. College of Business Administration. Northern Arizona University. November 2003.
24. **HEAD**, R. (1997). The Economic Impact of Piedmont Virginia Community College upon its Service Region (1996-97). Office of Institutional Research, Piedmont Virginia Community College, Research Report Nº 2-98, November-1997.
25. **HEALEY**, R.; **AKERBLOM**, K. (2003). An Economic Partnership. Queen's University and the Kingston Area, Office of Institutional Research and Planning. September 2003.
26. **IHEP - INSTITUTE FOR HIGHER EDUCATION POLICY** (2005) [Online]. The Investment payoff – A 50 State Analysis of the Public and Private Benefits of Higher Education, February, 2005. ED484570. [Acc. 15/06/2006]. At <http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/a3/eb.pdf>.
27. **INE – INSTITUTO NACIONAL DE ESTATÍSTICA** (2007). Indicadores Sociais 2006 [Online]. Lisboa-Portugal. ISSN 0874-4572. At <http://www.ine.pt>.
28. **LANTZ**, V.; **BRANDER**, J.; **YIGEZU**, Y. (2002). The Economic Impact of the University of New Brunswick: estimations and comparisons with other Canadian Universities. University of New Brunswick. Department of Economics. September 2002.
29. **LINDAHL**, L.; **REGNÉR**, H. (2002). College Choice and Subsequent Earnings – Results Using Swedish Sibling Data. Stockholm University, Swedish Institute for Social Research (SOFI), February-2002.
30. **MACFARLAND**, T. (2001). An Estimate of Nova Southeastern University's Economic Impact on South Florida and Florida for fiscal year 2000. Nova Southeastern University Research and Planning, Report 01-08, May-2001.
31. **MARSHALL**, R. (2005). Labor Standards, Human Capital, and Economic Development [Online]. Economic Policy Institute, working paper Nº 271. [Acc. 21/05/2008]. At <http://www.epi.org/workingpapers/epi_wp_271.pdf>.
32. **MONKS**, J. (2000). The Returns to Individual and College Characteristics – Evidence from the National Longitudinal Survey of Youth. *Economic of Education Review*, 19 (3), June 2000, pp. 279-289.
33. **NASULGC** (2001). Shaping the Future - The Economic Impact of Public Universities. National Association of State Universities and Land Grant Colleges, Office of Public Affairs, New York, August-2001.
34. **OECD** (2006). Higher Education in Portugal [Online]. Draft of the Country Background Report for the OECD Review of the Portuguese Higher Education System. [Acc. 19/09/2006]. At <http://www.oecd.org>.

35. **OHME**, A. (2004). The Economic Impact of a University on its Community and State: Examining Trends Four Years Later. University of Delaware, Office of Institutional Research and Planning.
36. **OWINGS**, W.; **KAPLAN**, L. (2004). Pushing the Perks of Public Education. *NASSP Bulletin*, pp. 8-16. [Acc. 03/05/2006]. At <http://www.eddigest.com>.
37. **PERNA**, L. (2003). The Private Benefits of Higher Education: An Examination of the Earnings Premium. *Research in Higher Education*, 44 (4), August 2003. 2003 Human Science Press.
38. **PORTELA**, M. [*et al*.] (2007). Regulation and Marketisation in the Portuguese Higher Education System [Online]. Núcleo de Investigação em Políticas Económicas, Universidade do Minho. NIPE WP 11/2007. [Acc. 12/11/2007]. At <http://www.eeg.uminho.pt/economia/nipe>.
39. **ROSAN**, R. (2002). The Key Role of Universities in Our Nation's Economic Growth and Urban Revitalization. Urban Land Institute.
40. **RUBI**, D. (1995). The State's Return on Investment in the Arizona Community Colleges. Arizona State Board of Directors for Community Colleges. Institutional Effectiveness Series: Return on Investment Measure, May 1995, Phoenix. ED 382261 – JC 950244.
41. **RYAN**, J.; **MALGIERI**, P. (1992). Economic Impact Studies in Community Colleges: The Short Cut Method. National Council for Resource Development, Washington, DC. ED 469 387. JC 020 682.
42. **SAITO**, Keiji (Acc. 2008). Do Schools Form Human Capital? Distributional divide and cohort-based analysis in Japan [Online]. [Acc. 21/05/2008]. At <http://keijisaito.info/pdf/human_capital_cohort_japan.pdf>.
43. **SANCHEZ**, J.; **LAANAN**, F. (1998). Economic Benefits of a Community College Education: Issues of Accountability and Performance Measures. *New Directions for Community Colleges*, (104), winter 1998, pp. 5-15. Jossey-Bass Publishers.
44. **SANCHEZ**, J.; **LAANAN**, F.; **WISELEY**, W. (1999). Postcollege Earnings of Former Students of California Community Colleges: Methods, Analysis, and Implications. *Research in Higher Education*, 40 (1), pp. 87-113.
45. **SANDERS**, J. (2003). Does Spending on Higher Education Drive Economic Growth? 20 Years of Evidence Reviewed. *Policy Report*, Goldwater Institute, Nº. 181, May 12, 2003.
46. **SCHULTZ**, T. (1961). Investment in Human Capital. *American Economic Review*, 51 (1), pp. 1-17.
47. **SEYBERT**, J. (2003). The Economic Impact of Barton County Community College on its Service Area 2001 – 2002. Office of Institutional Research. Johnson County Community College. March-2003. 913.469.8500 #3442.
48. **SINGELL**, L. (2002). A Study of the Economic Impact of the University of Oregon. University of Oregon, November 2002.
49. **SMITH**, B. (2006). The Economic Impact of Higher Education: A case study of the university of Houston System [Online]. University of Houston's Institute for regional Forecasting. [Acc. 21/04/2008]. At <http://www.advancement.uh.edu/impact/download/report.ppt>.
50. **STRAYHORN**, C. (2005). The Impact of the State Higher Education System on Texas Economy [Online]. Window on State Government, Texas, Special Report. February 2005. [Acc. 18/06/2005]. At <http://www.window.state.tx.us/specialrpt/highered05/>.
51. **THOMAS**, S.; **ZHANG**, L. (2005). Pos-Baccalaureate Wage Growth within Four Years of Graduation: The Effects of College Quality and College Major. *Research in Higher Education*, 46 (4), June 2005, pp. 437-459.
52. **UNIVERSITY OF STRATHCLYDE** (2006). The Economic Impact of UK Higher Education Institutions [Online]. Universities of UK. [Acc. 17/04/2007]. At <http://www.universitiesuk.ac.uk>. ISBN: 1 84036 0968.
53. **DGO – DIRECÇÃO GERAL DO ORÇAMENTO** (2007). Mapas Informativos – Programas e Medidas Orçamentais [Online]. Ministério das Finanças e da Administração Pública, Portugal. [Acc. 25/11/2007]. At <http://www.dgo.pt/oe/2007/Aprovado/2_MapasInformativos/ProgramasMedidasOrcamentais/Mapa18.pdf>.

[1] Minho University, Campus de Azurém, 4800-058 Guimarães, Portugal. E-mail: pno@dps.uminho.pt.
[2] Minho University, Campus de Azurém, 4800-058 Guimarães, Portugal. E-mail: jscunha@dps.uminho.pt.
[3] Polytechnic Institute of Bragança - ESTGM, Apartado 128, 5370-326 Mirandela, Portugal. E-mail: joana@ipb.pt.