

## Measuring the role of universities in regional development

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### Abstract

As universities have the potential to become a significant factor in regional development, influencing regions both directly and indirectly, the question of difficulties in measurement and precision in quantification of these effects arises. As the methodology used in papers dedicated to this topic vary significantly, we set a goal of describing, selecting and comparing the methods with respect to specific areas and topics concerned.

**Key words:** universities, regional development, short-term and long-term effects measurement

### 1 Introduction

This paper presents a review of different approaches to estimation of regional impact of universities. The main objective and concept of this estimation cannot be described as a new problem – relevant literature dates back to 1960s or 1970s. Recent emphasis on this kind of studies is driven by several factors.

The importance of universities within European Union can be seen by their inclusion within the Seventh Research Framework Programme (FP7). There are several references to the role of universities and their future in the work programme of “Socioeconomic Sciences and Humanities”, the eighth priority within the “Cooperation” part of FP7. This allocation of resources to address universities directly can be seen as a sign of status the universities have in the eyes of European Commission, as they are active in all aspects of so called “knowledge triangle” – education, research and innovation.

The more pragmatic reasons to pursue this kind of studies for most universities also include short-term motives. For example, many universities are using studies of their regional

impact to justify their budgetary needs, financed either by public or private sources. A number of universities emphasize the knowledge creation, employment effects, contribution of the faculty staff and students to regional GDP or employment, as well as their social and business activities in their public-relations policy. Economic impact studies are quite popular particularly in USA, as Stoke and Coomes [1] noted in 1998 that almost half of the colleges and universities in United States had such studies.

The need for assessing the economic effects universities have resulted in numerous papers estimating their impact by different techniques. This paper is the result of our preliminary analysis of possible approaches to this estimation problem, as part of a research to be conducted in the next two years.

## 2 Methodological basis and research objectives

The main idea behind estimating the economic impact of a university is conceptually a simple one, albeit the practical aspects of the calculation itself are not always straightforward. The usual approach is to evaluate the difference between basic economic indicators when university is present and when it is absent in a region. For an existing university this would mean the calculation of a hypothetical scenario in which it would discontinue its operation. In order to describe all the areas such an event would influence, we take into account the impact of universities on the local economy through backward and forward linkages [2], as described in figure 1.

Figure 1.: **Backward and forward linkages**

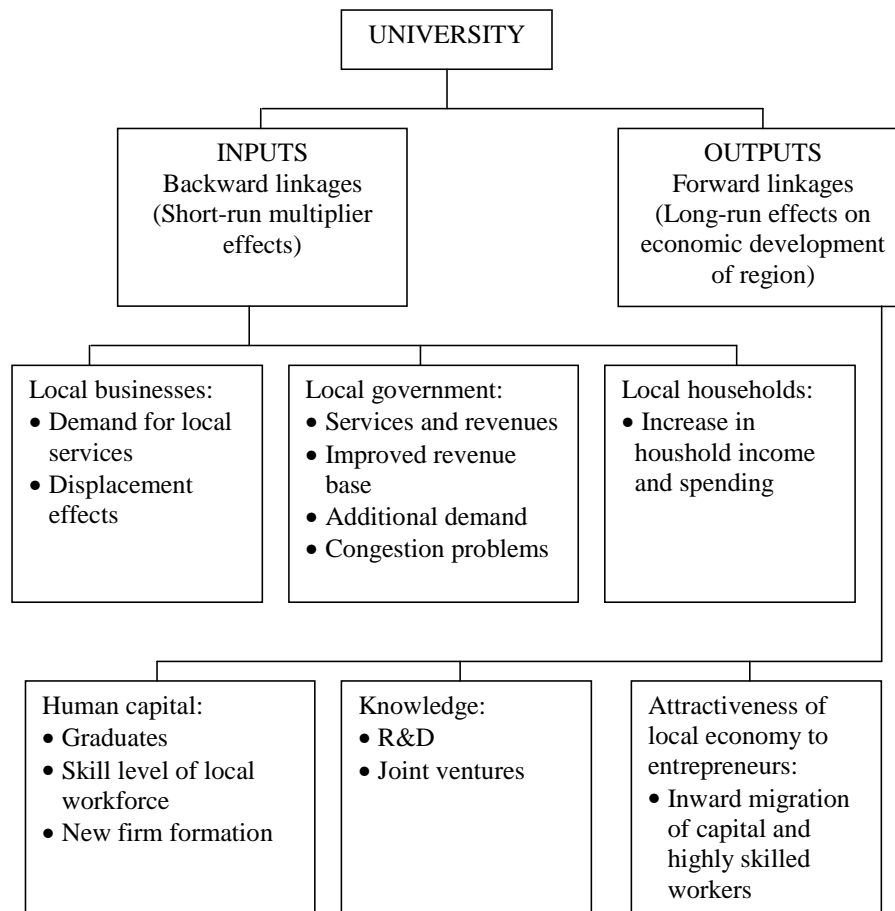
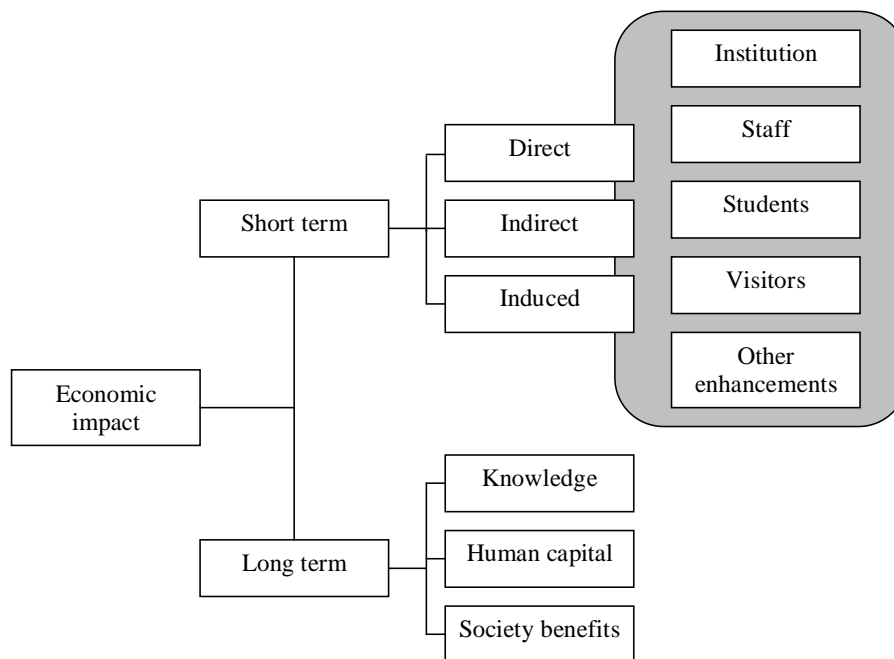


Figure 2.: Long-term and short-term economic impacts of a university



Source: authors

On the bases of the linkages it is possible to describe the impact of a university by both short and long-term effects, as seen in figure 2.

The short-term effects are described by the additional expenditures in the region attributable to the existence of the university. This generally includes all direct university spending and investments, within the institutions framework. However, the short-term view also takes into account the teaching and administrative staff, as well as spending of university students and visitors coming to the region (for example the families visiting foreign, or non-local students).

The spending of all these subjects has a direct impact on regional economy [4], [5] as it in fact increases the demand for locally produced goods and services (with the exception of regional expenditure leakages, which we will discuss below). These expenditures also have indirect effects in a Keynesian sense, because when dealing with increasing local demand, multiplier effects should be accounted for. The spending of visitors attracted to the region would fall into the category of effects induced by the presence of a university. All these factors directly translate to the level of employment and regional GDP growth.

Most studies estimating the economic impact of universities are able to describe the short-term effects by means of different methodologies. One of them is *income expenditure analysis*, which has its origin in John Maynard Keynes (1936) and was used for example by Bleaney et al. [6]. Bleaney et al. estimated the local multiplier effects of University of Nottingham. They calculate gross output and disposable income multipliers. Widely used method is *input-output model*, which was developed by Leontief, a Nobel prize winner in Economics. This method was used for evaluation of the university impact by Goldstein [7], Silva and Santos [8] or Rolim and Kureski [9]. The utility of IO approach is that “it allows for estimation of direct and first-round effects caused by initial change in the affected sector and indirect effect as a result of changes in direct spending throughout the regional economy.” [5] Many US studies used IMPLAN (IO modeling software) to obtain economic data for region and to compute IO multipliers and analyze changes in final demand.

The most widely used method is *ACE method*, which was developed by Caffrey and Isaacs in 1971 for American Council of Education [10]. Initial step is to identify the expenditures of the university community. Direct university spending in region, local spending of faculties, staff, students and visitors are multiplied with regional economic multiplier, which is often obtained from other studies. One problem of this method according to Stokes and Coomes is that ACE method usually doesn't distinguish between the spending of local residents and that of non-local residents. Therefore, all spendings are treated as new to the area. The main problem because of this relate to local universities in a large metropolitan area, drawing most student from the region, because in this example it will lead to overestimating the regional economic impact [1].

The attempts to estimate the long-term impact are more difficult, and are therefore less frequent. The long term impact of a university on a region takes into account not only financial measures, but also the effect higher education has in spreading knowledge, e.g. higher earnings of companies attained either by more qualified workforce or direct transfer of knowledge and technology from the university. Other aspects of indirect effects could be traced to a more enlightened society, as well as social and cultural benefits for the region (which is especially the case with faculties in particular areas, e.g. arts, humanities, theology etc.). As the long-term impact is less precisely defined and quantifiable, it is more difficult to agree on a widely acceptable methodology, which is reflected by the relevant literature.

### 3 Practical estimation aspects

Before the estimation of individual effects begins, the decision about the regional scope of the analysis has to be made. Although this might appear as a straightforward and easy decision, it is one with a decisive effect on the analysis performed. As we study the impact of the university on a region, its definition determines the scope of what we consider a regional impact and what we describe as a "leakage" to other regions. The term is used to describe the goods and services bought from outside of the studied region. The expenditure that originates because of university's presence contributes to the regional GDP and growth only as long as it is spent locally. Thus, university spending may or may not be contributing to regional development on the basis of the area where it is directed.

One of the important questions, which should be answered before measuring the impact of a university, is defining geographical area (region) in which we will study economic impact of a university. Impact of a university depends directly on size of the region. Using a definition of a region that is small has several consequences. First, a smaller region has usually a smaller probability of being able to satisfy the needs driving the expenditures. A larger region is usually better diversified, and therefore the chances for local spending are higher. As we have already stated the need for use of multipliers in quantification of short-term effects, it is clear that more local spending may lead to higher multipliers, significantly contributing to the impact of universities. An example frequently cited in this context involves comparison of universities located in metropolitan areas, and universities in smaller areas, lacking adequate infrastructure.

On the other hand in larger region there are more competing institutions, which students may use, resulting in smaller economic impact from student spending [5].

### 3.1 Short-term and long-term effects

After definition of the regional framework, short-term effects can be estimated. Calculation of short-term effects in general consists of estimating mainly:

- Consumption of the university (material cost, energies, services, books, classroom equipment, etc.)
- Investments of the university (buildings, property, new laboratories, etc.)
- Expenses of the faculty and administrative staff
- Expenses of the students
- Expenses of the visitors.

The investments and consumption of a university both have economic impact on a region, if they are spent locally. The primary source of information for estimating these values is usually budgeting, accounting and internal reports from the university.

An important aspect of determining the short-term impact of universities with regard to the rest of the expenditures is the decision about the ones which should be attributed to the existence of the university and which are not relevant to the analysis. The basic principle states, that all payments that would not take place if there would be no university are relevant. Thus the expenditures of local students (that is, students coming from the region under analysis) who would study in the region even if the given university would not exist do not influence its regional impact. On the other hand, expenditures of faculty staff are usually considered to be relevant, as the faculty members would probably be active in a different region, if there was no regional university. Another reason for the inclusion of their spending is the fact that the payrolls usually come from government budget, and thus represent a contribution for the region from outside sources.

The data necessary for acquiring the information needed for analysis can be obtained by surveys, which should take into account the difficulties and details needed as stated earlier. Therefore, it is reasonable to ask the students not only about their typical expenditure and its nature, but also about their study motives. It is necessary to find out, whether they would remain in the region and study on another local university, or they would leave the region, or whether they came to the region especially for studies on the given university. This allows for the decision about relevance of their spending.

Similar arguments hold for surveys of faculty and administrative staff, as well as visitors to the university.

After obtaining the information about expenditures, and thus calculating the direct short-term impact, the value of multipliers has to be determined in order to estimate indirect impacts. Previous steps should provide information not only about the amount spent, but also about the structure of spending. Then it is possible to use input-output analysis or social accounting matrix (SAM) to derive the expenditure multipliers. It is also possible to assess the induced effects, like community enhancements such as university's effects on property values, provision of services to local community (e.g. medical) and new local industries established through connection to the university [4].

The major shortcomings of using this approach are related to the use of multipliers. First of all, most studies use external analysis of different institutions, and therefore rely on the results on their estimates on either input-output, or social accounting matrixes. Getting the necessary information for own analysis is dependent on the data availability for a given region (e.g. the data availability from local statistical offices).

Even after finding the necessary data it is usually important to modify it for the effect of leakages, where part of the expenditure escapes the region by means of imports from other regions. Some of the data can be corrected more or less easily, as for example the university

accounting data, where it is possible to determine the local or foreign character of the payment made. The way different studies handle this problem varies significantly from detailed and thorough data verification to simple adjustments by a constant.

The critique for multiplier and input-output methods lies largely in the fact, that this approach mostly ignores the essence of higher education and its purpose, but focuses instead mainly on the spending. This is the reason, why the need for inclusion of long-term effects arises, as they capture the properties short-term analysis lacks. The disadvantages or restrictions of using input-output analysis or social accounting matrix include the fact that the model reflects only the changes in demand, doesn't consider limitation on the supply side, doesn't reflect changes in industry structure and technologies, etc.

The estimation of long-term impacts is more difficult. This is the consequence of the complex nature of long-term benefits higher education provides for local economy. Universities perform many tasks, which are not accounted for short-term analyses. By providing a different range of study programs, they influence the structure of labor supply [1].

The real impact is mainly characterized by knowledge advancements, which have economic as well as social aspects. Increases in knowledge have benefits both for individuals, as well as for society as a whole. These include:

- better labour skills as a direct result of education and consequently higher productivity, professional development programs, tendency of graduates to stay in the region [11],
- knowledge transfer and technological growth, impact on the industry [12],
- greater literacy, improvements in government ,
- indirect effects of knowledge like better health care, quality of human relations, citizen participation, reduced social exclusion [13] .

Bluestone showed that long-term effect could be measured in terms of the discounted future income stream of graduates who stay to work in the region [14]. He estimated the net income received by all graduates of university who remain in the region in excess of what they would have earned without a university education. He calculates difference between earnings of college and non-college graduates. Bluestone used cross-sectional earnings data and therefore ignores the effect of long-term increases in wages due to productivity growth. Another approach is represented by Berger a Black [15], they adjust future earnings for growth in productivity, but assume the same growth for all educational segments of the population.

For a complex study of economic impacts of a university it is important to combine analysis of both short-term and long-term effects.

### **3.2 Alternative methodologies**

We present three alternative methodologies, which try to approach the problem of measuring impact of universities on regional economy in a different way.

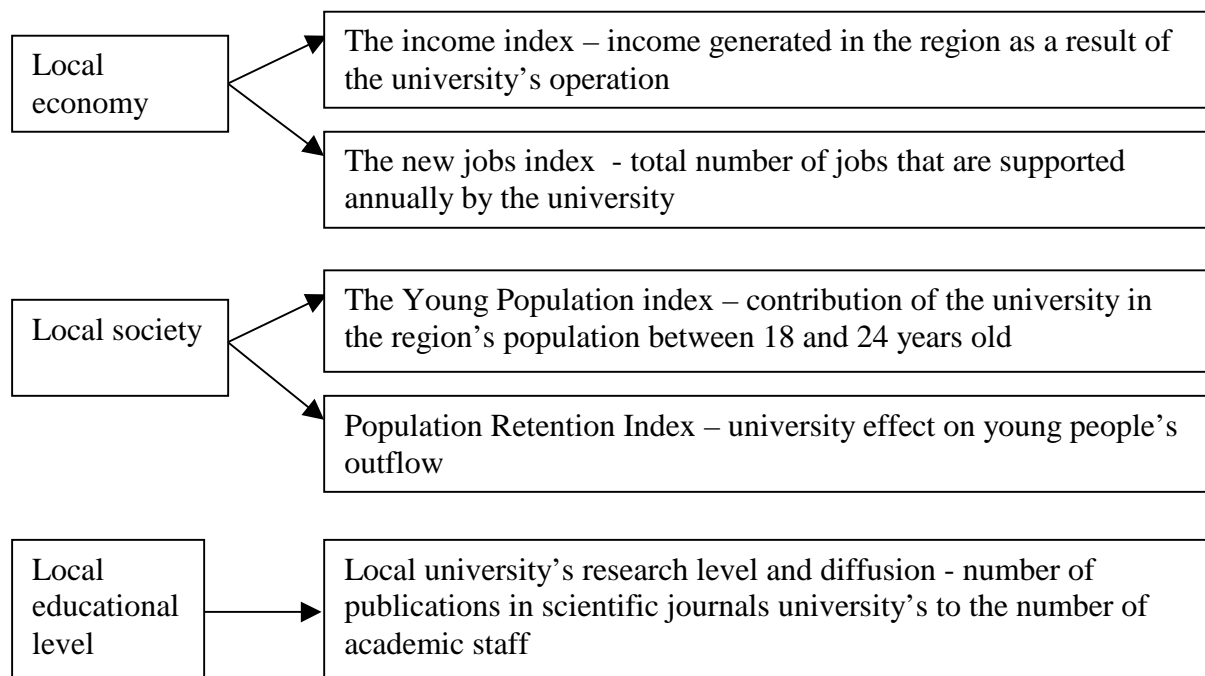
First approach tries to use standard econometric techniques to build models that could be used to assess the impact of a university. These methods have one methodological drawback, as they never prove a causal relationship. Therefore, the models never give a definitive answer on impact on modelled variables. The use of econometric models has been concentrated mainly in the estimation of what we describe as long-term impacts. Some studies modelled innovation depending on university and industry research and development expenditures. Other applications include growth models. Econometric studies include the

work of Gana [16], Griliches [17] and Jaffe [18]. Florax developed „a spatial econometric model to estimate the regional effects of knowledge production of Dutch universities. He analysed the effects of university expenditure and the diffusion of knowledge on investment in manufacturing building and equipment.“[19]

The second approach uses cost-benefit analysis, which allows incorporating a wide range of university effects into the analysis. The main strong point of this method is its flexibility, which simultaneously makes it difficult to implement, as there is currently no common ground on how to define its parameters and assumptions.

A different approach to the measurement of the role of a university in regional development is used by Vassilis et al., who contributed their own methodology. It is based on the assumption of three dimensions of a region which are affected by the university – local economy, local society and local educational level. They defined sets of indicators for every dimension, shown at figure 3.

Figure 3.: Indicators according to Vassilis et al.



Source: [20]

## 4 Conclusion

This paper was devoted to the description of ways for estimation of economic impact of universities in a region. There are several approaches that can be used for the purpose. The simplest methods account only for financial measures, which we describe as short-term effects of universities. Their impact is measured by additional demand attributable to a university, which in turn affects economic parameters like regional GDP and employment.

Several methods try to overcome the shortcomings of this short-term approach by introducing other variables, quantification of which should capture the essence of higher education and the impact on regional economy better than a simple increase in local demand would. Even though these approaches provide better view of the role universities have, their complexity and particularly data requirements grow steeply as opposed to expenditure-based methods. As there is currently no general framework to take into account factors like

advances in knowledge as a consequence of higher education, the methodology used and results obtained in impact studies vary greatly.

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