THE MULTIPLIER EFFECT OF UNIVERSITY OF ECONOMICS IN BRATISLAVA ON THE REGIONAL LEVEL

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ABSTRACT

Universities are generally considered to be the engine of economic development. Increase the number of university students, the establishment of new universities, and the growth of investment in higher education raises the question, what impact had this trend to the cities where they are located. In this article, we focus on short-term regional economic impact of University of Economics in Bratislava which is the result of growth in demand caused by the presence of universities in the region. Regional multipliers, which are used to measure economic impact are calculated from the Regional Input-Output tables. In the Slovak Republic, institutions are not producing IO tables at regional level, so we have to estimate from national input-output table. Recent studies show, that the location quotient method developed by Flegg and Webber (1997) tends to outperform the other methods in estimating regional output multipliers and input coefficients (KOWALEWSKI, 2012). The aim of this article is to estimate regional multipliers, through location quotient method for calculation economic impact of university on the region. Economic impact of the University of Economics in Bratislava is around 12 million € per year.

JEL: *R11.*

KEYWORDS: *University, University of Economics Bratislava, Students, Multiplier effect*

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INTRODUCTION

The new concept of "studentification" is a process that has significantly helped in explaining regional changes (Allinson 2006; Munro et al. 2009; Allen and Hollingworth, 2013). The expansion of higher education contributes to the attractiveness of the university towns. (Allisnson, 2006). The concentration of a large number of students in one place has lead to a significant change in the cultural, social and economic dimensions of these towns. The term "studentification" was defined by Smith (2002) to describe the growth of a concentration of students in the realm of higher education, often placed in student houses. The economic dimension: from an economic perspective studentification brings benefits such as a rise in spending onto the local economy, for example: property prices change in relation to the rental housing utilized by these social groups. Further positive effects include business development, development of Innovations and others.

The number of full-time students in the first and second level of universities in Slovakia, between 1990 and 2006, more than tripled. The year 2009 was the peak of enrolment with 144,000 full-time students. Since 2010, the number of students has started to decrease slightly, by 2013 the number had decreased by 8% (11,400 students). The high growth of students brought a significant impact on the region. This article focuses on the short-term effects of full-time students, and examinestheir economic impact on the region.

1 THEORETICAL BACKGROUND

University provides two types of economic impacts: short and long term (Felsenstein, 1996). In the long term it is associated with the growth of human capital (wage growth), with the formation and growth of the companies etc. Short-term effects associated with the expenditures of the institution, staff, students, visitors and so on. Short-term effects of university affect households, local government and local businesses in the host cities. University had expenditures on staff, goods and services; costs and expenses of students and visitors. These changes represent the impact of universities on the local economy. The key issue of measuring the impact of the university is question, if the expenditure of university is spent locally (regionally) or leakage from the local (regional) economy. Florax (1992) lists more than 40 studies of regional economic impact of university expenditures.

Total economic impact of UEBA students can be divided into direct and secondary effects (indirect + induced effects). Change in spending can affect virtually every sector of the economy through indirect and induced effects. The direct effect is the change in local business activity occurring as a result of the change in revenue flowing to local businesses from that spending activity. (WEISBROD, 1997). In our case, the direct effects of the changes are related with expenditure by students. For example, the number of students at the university will cause a direct increase in sales around the university.Indirect effects are changes in the production of the supply sectors (eg. industries supplying products and services for universities). The extent of these secondary effects is directly proportional to the slope to local businesses and households to purchase from the local suppliers. Induced effects can be observed when there is a significant increase in jobs and household income. This changes in economic activity in consequence of students and employees expenditures, influence directly or indirectly local (regional) economy as a result of university's location in the town.

If we will measure the impact of these institutions, we need to explore the corresponding direct expenditures and consequently estimate the multiplier for calculate the impact of universities. The multiplier can be determined as the total economic impact (direct and side effects) divided by direct impact. The multiplier is based on the recirculation of revenue: the resident will use part of their income on consumption, which is then the result of additional income and employment. It captures secondary economic consequences and is different for every region and industry. There are many different kinds of multipliers depending on side effects which are a measure of economic activity (sales, income or employment). For example, it is related to creating a technical base of accommodation, catering and ancillary equipment and the development of transport. Students have also impact on the economy via encourage of the development of other services directly linked to their needs. The impact of study uses complex sort of information which explain the full range of possible effects to selected objects of research. In our case, this object is region, due to the available data. This article aims to clarify the effects of short-term university in the region through expenditures of students of Economics in Bratislava.

2 THE REGIONALIZATION OF INPUT−OUTPUT MATRIX

Input-output analysis, is widely used in the vast majority of developed economies. Input–output analysis is the name given to an analytical framework developed by Professor Wassily Leontief in the late 1930s, in recognition of which he received the Nobel Prize in Economic Science in 1973 (MILLER and BLAIR, 2009) At the beginning it is used primarily at the national level. Later, however, they were derived and regional IO models, sectoral models and international models. Increased interest and needs for more effectively (at lower cost and faster) empirical methods for analysis of regional economies in the early 70's led the researchers to the development of an adequate research tool, called non-survey technique for regionalization (KUHAR, A., et al., 2009).With the non-survey methods derivation is based on various secondary sources of statistical data applied on the national model (Richardson, 1972). Recent studies show that the location quotient (LQ) method developed by Flegg and Webber (1997) (FLQ) tends to outperform the other methods in estimating regional output multipliers and input coefficients (KOWALEWSKI, 2012). The aim of this chapter should be to estimating regional output multipliers for calculation impact of university on the region.

For regional input-output analyses is needed the regional input-output tables.But in the Slovakia are not compiled a regional input-output tables.Thus, estimates about inter- and intraregional trade have to compensate for this lack of data. A common way to estimate regional coefficients is to regionalize the national input-output table using location quotients (KOWALEWSKI, 2012).

At the national level, we can defineInput−Output model as:

A to be an n × n matrix of interindustry technical coefficients (where **A** = $[a_{ij}]$),

yto be an n × 1 vector of final demands,

xto be an n × 1 vector of gross outputs,

I to be an n × n identity matrix,

The simplest version of the input-output model is:

$$\mathbf{x} = \mathbf{Ax} + \mathbf{y} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y},$$

where$(\mathbf{I} - \mathbf{A})^{-1}$ = $[b_{ij}]$ is the Leontief inverse matrix.The sum of each column of this matrix represents the multiplier for that sector. The problem facing the regional analyst is how to transform the national coefficient matrix, **A** = $[a_{ij}]$.], into a suitable regional coefficient matrix, **R** = $[r]$ and herein lies the role of the location quotients (Flegg and Webber, 1997).

The LQ methods are based on the assumptions that:

- regional and national technologies are identical,
- and that regional trade coefficients differ from the national input coefficients in the extent to which goods and services are imported from other regions.

Let $a_{ij}^{N}$and a_{ij}^{R}be the national (N) and regional (R) input coefficients, i.e. the values of goods and services purchased by industry *j* from industry *i* divided by the total output of industry j in the nation and the region, respectively. The national input coefficient $a_{ij}^{N}$is then equal to the regional input coefficient a_{ij}^{R} plus the regional import coefficientm_{ij}^{R}. The regional input coefficients are estimated in the following way: $a_{ij}^{R} = a_{ij}^{N} - q_j$, where $q_j$represents the degree of modification of the national coefficient(KOWALEWSKI, 2012).

Among the most widely used a localization quotients include: Simple Location Quotient (SLQ), Cross-Industry Location Quotient (CILQ) and Flegg location quotients (FLQ). This localization quotients are defined as:

1. $\mathrm{SLQ} = \frac{E_{ir}/E_{.r}}{E_{i.}/E_{..}};\ a_{ij}^{R} = \begin{cases} a_{ij}^{N} & if\ SLQ_i \geq 1 \\ SLQ_i\ .\ a_{ij}^{N} & if\ SLQ_i < 1 \end{cases}$

withE_{ir} ($E_{i.}$) the regional (national) employment in (the selling) industry i with i =1, ..., n industries and $E_{.r}$ ($E_{..}$) total regional (national) employment.

2. $CILQ_{ij} = \frac{E_{ir}/E_{jr}}{E_{i.}/E_{j.}} = \frac{SLQ_i}{SLQ_j};\ a_{ij}^{R} = \begin{cases} a_{ij}^{N} & if\ CILQ_{ij} \geq 1 \\ CILQ_{ij}\ .\ a_{ij}^{N} & if\ CILQ_{ij} < 1 \end{cases}$

withE_{jr} ($E_{j.}$) the regional (national) employment in the purchasing industry.

3. FLQ_{ij} = $CILQ_{ij} \cdot \lambda^*$; $\lambda^* = [log_{2\ (1+\ E_r/E)}]^{\delta}$

If LQ>1, it is assumed that the region is specialized in the specific industry. This implies that the regional industry is able to meet the regional demand requirements for its products or services and therefore the regional coefficient is assumed to be equal to the national coefficient (a_{ij}^{N} = a_{ij}^{R}). The same assumption holds if LQi =1. However, if LQi <1, it is assumed that the regional production is less than the national average. Consequently, the industry needs to import from other regions to meet the whole regional demand requirements and a_{ij}^{R}=$a_{ij}^{N}.LQ_i$(KOWALEWSKI, 2012).

3 FLEGG'S LOCATION QUOTIENT

Flegg's location quotient was developed by Flegg et al. and later it was reformulated by Flegg and Webber (1997).And is defined by the following formula:

$$FLQ_{ij} = CILQ_{ij} \cdot \lambda^*$$

$$a_{ij}^R = \begin{cases} a_{ij}^N & if\ FLQ_{ij} \geq 1 \\ FLQ_{ij}\ .\ a_{ij}^N & if\ FLQ_{ij} < 1 \end{cases}$$

with $\lambda^* = [log_{2\ (1+\ E_r/E)}]^{\delta}$

The FLQ is different compared to the CILQ, that takes into account the relative size of the region through λ * (0 < λ * <1).If λ* = 1 then FLQij equals CILQij. The value of λ* increases monotonically with the size of the region so that a greater adjustment for imports is made in smaller regions. Thereby, an increase in regional imports implies a decrease in intraregional trade. Thus, the underlying assumption is that any method, which correctly estimates total imports, would at the same time result in better estimates of input coefficients and output multipliers(KOWALEWSKI, 2012).The δ is the weighting parameter based on the size of the region. The larger the regional size, the greater the regional input coefficients and the smaller the regional import coefficients (KUHAR, A., et al., 2009).It has been carried out for many estimates of exponent δ. The newest estimate according Flegg / Tohmo (2011), found that a value of δ = 0.25 produced acceptable estimates of industrial multipliers for most of the regions using the FLQ formula. In our reseach we also using value 0.25 for δ.

4 TWO-REGION INTERREGIONAL MODEL

We used a two-region interregional model in our research.According Miller and Blair (2009), this model use some measure of a region's import or export orientation with respect to each good; and if region r (in our case, r = Bratislava region - NUTS 3) is found to be an exporter of good i, then it is assumed that all the requirements for i in region r will be met by local production and hence there will be no imports of i to region r (no cross-hauling). One important feature in a two-region interregional model is that one region's (domestic) exports of a particular good are the other region's (domestic) imports.

$$A^{rr} = a_{ij}^{rr} = \begin{cases} a_{ij}^N & if\ LQ_i \geq 1 \\ LQ_i\ .\ a_{ij}^N & if\ LQ_i < 1 \end{cases}$$

Then import coefficients from the rest of the economy to *r*, A^{sr}=a_{ij}^{sr}= a_{ij}^{N} $-$ a_{ij}^{rr}.Similarly, find A^{ss} $= a_{ij}^{ss}$using location quotients for the aggregate "rest of theeconomy" region. Finally, imports from region 1 to the rest of the economy, A^{rs}=a_{ij}^{rs}= a_{ij}^{N} $-$ a_{ij}^{ss}. The result is

$$\begin{bmatrix} A^{rr} & A^{rs} \\ A^{sr} & A^{ss} \end{bmatrix}.$$

5 INTERREGIONAL SIMPLEOUTPUT MULTIPLIERS

With interregional and multiregional input–output models output, various multiplier effects can be calculated (a) for a single region (region *r*), (b) for each of the other regions, (c) for the "rest of the economy" (aggregated over *all* regions outside of *r*), and (d) for the total, many-region (national) economy (MILLER and BLAIR, 2009). Leontief inverse:

$$\mathrm{L} = (\mathrm{I} - \mathrm{A})^{-1} = \begin{bmatrix} L^{11} & L^{12} \\ L^{21} & L^{22} \end{bmatrix}$$

In general, the simple output multiplier for sector *j* is:

$$m(o)j = \sum_{i=1}^{n} l_{ij}.$$

Miller and Blair (2009) identify three effects:

1. Intraregional Effects −exogenous changes in final demands for region r goods represent impacts on the outputs of sectors in region r.

$$\mathbf{m}(o)rr = \mathbf{i}' [\mathbf{L}11]$$

$$\mathbf{m}(o)ss = \mathbf{i}' [\mathbf{L}22]$$

2. Interregional spillover effects − the essence of an interregional input–output model is that it includes impacts in one region that are caused by changes in another region.

$$\mathbf{m}(o)sr = \mathbf{i}' [\mathbf{L}21]$$

$$\mathbf{m}(o)rs = \mathbf{i}' [\mathbf{L}12]$$

3. National Effects − there are exogenous increases in final demands for region r goods and hence in outputs of region r sectors, we can denote as national effects the sums of columns in both L11 and L21.

$$\mathbf{m}(o)r = \mathbf{i}' \begin{bmatrix} \mathbf{L}11 \\ \mathbf{L}21 \end{bmatrix}$$

$$\mathbf{m}(o)s = \mathbf{i}' \begin{bmatrix} \mathbf{L}22 \\ \mathbf{L}12 \end{bmatrix}$$

6 METHODOLOGY

Research is composed of two parts: a questionnaire survey of student's University of Economics in Bratislava and regionalization of national input-output tables for subsequent calculation of the regional multiplier for the Bratislava region. The University of Economics in Bratislava is the oldest university of economics in Slovakia. On the university study around 8000 full time students. The aim of the questionnaire was to determine the local impact of UEBA students on Bratislava. In creating data collection questionnaire we followed the statistical rules of questionnaire surveys. The questionnaire consisted of eleven questions. The first 3 questions were used for removing the respondents without impact on the region. In the fourth question we focused on the total monthly income and the structure of monthly income (regular and irregular). Then in the next question we asked on overall expenditures and their structure. Expenditures were divided into 15 items. In other questions we asked on the grade, gender, age and place of residence. Our survey was conducted on a sample of full-time students, which represented the total composition of full-time students of UEBA (except of faculty of Business Economy, because it locates in Košice). Before data collection, we randomly choose classes of individual faculties by level of study to present a representative sample. This represent the core set of 8062 full-time students, the sample 629 questionnaires. Return of questionnaires was 70 %.

We have obtained data from Eurostat about national input–output tables and data about employment in industry by regions, we obtained from the Slovak Statistical Office (we haven't obtained more data for the industry at regional level). Regional multiplier were estimated from two-region interregional model (Bratislava region and Rest of Slovakia) using localization coefficients (SLQ, CILQand FLQ).FLQ has the smallest difference between national and regional level of X (matrix of inputs).Therefore, the FLQ appears to be the most accurate estimate. On the calculation we used software MATLAB.

7 RESULTS

In the analytical part we estimate the impact of full-time students of UEBA on the Bratislava region. According to the first question of questionnaire, we determined the percentage of students who have an impact on the city. These are the students who came to the city only because of the existence UEBA so we can exclude categories: *I'd attended another university in Bratislava*, *I did not attend the EU, but would like to work in Bratislava.* Impact on the Bratislava has only the following groups: *I'd attended* *another university in another city, I'd worked in another city,* which constitute 47.7% of full-time students UEBA.

Table 1 The percentage structure of students who have an impact on the city Bratislava

	Number	%	Cumulative (%)
I'd attended another university in Bratislava	283	45,0	45,1
I did not attend the EU, but would like to work in Bratislava	45	7,2	52,2
I'd attended another university in another city	247	39,3	91,6
I'd worked in another city	53	8,4	100,0
Together	628	99,8	
Mistake	1	0,2	
Together	629	100,0	

Source: Author's own elaboration

Table no.1, we determine from the number of full-time students EU BA (8062 students) number of student with impact on the city Bratislava, 3846 students (47.7%). Average expenditure was divided according to the sector, where students spent their money in the local area. Largest expenditure of UEBA students was in sectors: Wholesale and retail trade, repair of motor vehicles and motorcycles; Accommodation and food services; Transport and storage. Average monthly expenditure by students with impact is 217 €. Then we calculate the total expenditure as a multiple the average expenditure and income with the number of students (who have impact on city).Total net monthly expenditures are 832,951 € and the **total annual expenditure is 8,329,509** €, which was calculated as the monthly income multiplied by 10 months (assuming that students don't stay in Bratislava during the summer holidays).

Table 2 Multiplier effect of university of UEBA students (FLQ)

Sector	Number of UEBA students with impact	Average monthly expenditure (€)	Total monthly expenditure (€)	Total annual expenditure (€)	Intraregional Effects (€)	Interregional spillover effects (€)	National Effects (€)
Wholesale and retail trade, repair of motor vehicles and motorcycles	3,846	94	360,431	3,604,308	5,234,182	2,182,707	7,416,889
Accommodation and food services	3,846	66	254,169	2,541,689	3,617,514	1,928,655	5,546,168
Transport and storage	3,846	24	91,319	913,185	1,556,854	784,094	2,340,948
Arts, entertainment and recreation	3,846	13	48,848	488,483	614,941	170,515	785,457
Information and communication	3,846	8	29,489	294,885	401,357	188,799	590,156
Education, human health and social work activities	3,846	5	19,509	195,086	253,164	53,980	307,145
Health care and social assistance	3,846	4	13,748	137,483	202,395	67,715	270,110
Financial and insurance activities	3,846	2	8,846	88,463	128,959	37,355	166,314
Electricity, gas, steam and air conditioning	3,846	2	6,593	65,927	128,054	69,958	198,012
Together		217	832,951	8,329,509	12,137,420	5,483,779	17,621,199

Source: Author's own elaboration

In table no. 2, we can see the types of impacts selected by sectors. To calculate the impact we will use the FLQ, because according literature and also according to our calculations, the FLQ appears to be the most accurate estimate. Intraregional effects of UEBA is 12,137,420 € per year. If final demand increase on 8,329,509 € per year by UEBA students for region BA, it represents impact 12,137,420 € per year on economy in region Bratislava. Interregional spillover effects is 5,483,779 € per year. If final demand increase on 8,329,509 € per year by UEBA students for region BA, it represents impact 2,330,582 € per year on economy in region Rest of Slovakia. And national effects is 17,621,199 € per year. If final demand increase on 8,329,509 € per year by UEBA students for region BA, it represents impact 17,621,199 € per year on economy in Slovakia.

CONCLUSION

This paper analyses the short-term impact the of full-time UEBA students on the region Bratislava. The expansion of higher education has had an impact on the increasing concentration of students, especially in large towns such as Bratislava. Universities are traditionally perceived in two ways; on one hand they're seen as educational institutions, and on the other, as ways to attract new demand for local goods and services from other regions. In this work, we found that impact of UEBA students is around 12 million € per year on the region Bratislava. And UEBA students also brings spillover effects to the rest of Slovakia, around 5.5 million € per year. Impact on whole economy in Slovakia is around 17.5 million € per year. The UEBA students have the greatest impact on sectors: Wholesale and retail trade, repair of motor vehicles and motorcycles; Accommodation and food services; Transport and storage.

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