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Analysis of Higher Education Efficiency in Serbia

The goal of this paper is to analyze the effects of a new investment model with slightly increased investment in the higher education system of Serbia. The primary objectives of the modified investment model are to increase human capital, achieve economic growth and reduce unemployment. The efficiency of higher education will be expressed through the number of students whose education is funded by the founder of higher education institutions, i.e. the state. The results indicate that the higher education system of Serbia would be more efficient if the new investment model was introduced, i.e. excellent quality and state funded higher education would be available to more students, with a relatively small increase in budgetary investments.

Keywords: operational efficiency, higher education, investment model, students

1. Introduction

The economics of higher education is determined by the scope and structure of investment in higher education by the state; on the other hand, the level of public investment is decisively determined by the investment model that is applied in higher education (Barr, 2004).The systems of public investment in higher education in the developed countries of Europe are characterized by a trend toward reorienting investment models that give institutions the freedom in the allocation of resources for instruction and/or research in a manner appropriate for these institutions (Vossensteyn & Jongbloed, 2001). The above method of investment is known as lump sum funding (Jongbloed, 2006, p.122), and it replaces the previously dominant investment model known as earmarked funding (Jongbloed, 2006, p.122). It is pointed out that the mechanism of lump sum funding provides greater autonomy for investment as well as greater accountability of higher education institutions for the economical expenditure of the allocated funds.

The goal of this paper is to analyze the effectiveness and efficiency of the budgetary funds allocated to higher education by establishing the boundary of operational efficiency of the current (Kabok, 2010) and new investment models (Kabok, Djaković & Andjelić, 2011) in higher education in Serbia. The current investment model in higher education is based on earmark funding, while the new model contains elements of lump sum funding. The boundary of operational efficiency in higher education is expressed as the number of students whose education is funded by the founder of institutions of higher education i.e. the state.

The aim of the research is to obtain concrete and quantifiable data on the boundary of efficiency of the current and the new investment model in higher education, and to compare the numbers of state-funded students, which represent the boundary of operational efficiency in the current and the new investment models.

The research that is presented in the paper is important for both the professional and academic communities in Serbia. The results of the research are of particular importance for policy and strategy makers of higher education in Serbia and the Ministry of Education, Science and Technological Development of the Republic of Serbia, but also for all higher education institutions in Serbia. The importance of the research is primarily in the fact that higher education has a crucial influence on the creation of a society of knowledge, learning and innovation that should be the real goal of economic transition in countries such as Serbia.

In this paper, after the introductory section, the second chapter relates to the theoretical basis of investment models in higher education. The third chapter presents the research methodology, and the fourth part discusses the results of research concerning the boundary of efficient management of the current and the new investment

model in higher education in Serbia. The conclusion, based on the analysis of the results of the research, proposes measures and activities to the policy and development strategy makers in Serbia. The conclusion also points out the limitations present in the study, as well as avenues for further research in this area.

2. Theoretical Foundations

The scientific and professional discussion of the investment model in higher education starts from the consideration of mechanisms for the allocation of public / budgetary funds, in order to include the channels of allocation, the ways of allocation as well as the criteria and mechanisms according to which the funds are allocated (Canton et.al, 2001).

The channels of budget allocations relate to the determination of the recipient of public funds for higher education, where there are two main possibilities, that the recipients of public funds are institutions of higher education or students. From the perspective of the recipient of the public funds, investment models in higher education include:

a) The investment model based on offer, the type of investment in which the funds are allocated for instructional activities directly to the institution of higher education under certain conditions and criteria. This investment model is used in most European countries;

b) The investment model based on demand, the type of investment in which the funds are awarded directly to students (all or a specific group of students, selected on the basis of predetermined and transparent criteria) in the form of vouchers. Students are free to opt for an institution of higher education in which to enter and the selected institutions receive vouchers from students, cashing them after their enrollment, (Jongbloed, 2006).

If the funds are invested in the facility, or if the investment model applied is based on offer, it is expedient to discuss the allocation and purpose of these funds. Discussions on this issue are ongoing when the founder of the institutions (for state institutions it is the government or the ministry) allocates a total amount of the budgetary funds and decides (in more or less detail) on which portion of that amount should be used for certain activities. In defining the purpose of the budgetary funds there are two ways of allocating expenses:

- the first one, which is, in terms of spending the funds, more general and defines a broad provision that a certain portion of the funds is intended for research and the other one for education;
- the second one, which is very specific, such as orders, e.g. "this amount of money will be used to pay the electricity bill."

Defining the purpose of funding by the founder does not mean that institutions will spend the funds in the proposed way, especially if higher education institutions have other sources of revenue (students or industry). In addition, the founder may decide on the share of the fixed and variable funds for the institution, as well as their ratio. The fixed part of the funds should provide a certain degree of continuity and stability of investment in facilities, which is desirable. The variable part of the funding is available on the basis of whether an institution has met certain criteria in order to increase performance in some aspects of higher education. The variable portion of the funds may be used as a mechanism for increasing competition among institutions (Canton et.al, 2001).

It is generally considered that lump sum funding increases the autonomy of institutions in relation to the state as the founder, increasing the possibilities for strategic development planning, internal structure, external position as well as contributing to the development of entrepreneurship in higher education. However, the development of entrepreneurship requires that the decision makers (the management) within the higher education institutions have sufficient capacity and legitimacy to make decisions, implement them, and that there is a consensus on the development strategies within the institution (Vukasović et al, 2009).

The criteria and mechanisms that are used to determine the amount of funds to be invested in higher education can be varied and include various models of investment:

a) Investment models based on formula are undoubtedly the most objective mechanisms One such model is applied in Serbia. The formula is based on a number of parameters that are related to the number of students enrolled, the number of teaching and non-teaching staff (input criteria), the number of students who

graduated from undergraduate studies or success that students achieve during their studies, the number of graduates who continue their higher education (master's or doctoral level), the duration of the studies, the number of graduates and dropouts (output criteria). It can be combined according to the criteria of inputs and outputs, the number of different programs of study, type of instruction, and the available infrastructure or equipment (Vossensteyn & Jongbloed, 2001). Formulae with a model that includes output criteria cause institutions to have a strong incentive to reduce costs but not to improve the quality of education, while the ones with a model that includes input criteria also have a strong incentive to reduce costs but little to deliver the quantity of output (Jacobs & Ploeg, 2005).

b) A contract-based investment model is based on determining the amount of investment in higher education on the basis of a contract, signed by the institution and its founders (usually the government). The advantage of determining the amount of investment through contracts with the founder is the possibility of it affecting the development of the institution based on the assessed needs of the society. The main disadvantage of this model is the fact that the final decision is significantly affected by lobbying or political influence that individual institutions can achieve. In this way, the institution can be in an unfavorable position, based on criteria that are not related to the academic potential of the institution.

c) The model of negotiation on the level of investment by the founder (the government) includes a relationship that is more like a partnership, between institutions of higher education and founders or intermediary bodies such as national councils for higher education, councils for investing in specific areas and disciplines of study (especially when it comes to research).

d) Investment model based on performance, is in essence a model based on a specific formula, but in addition to the parameters for the number of students, teaching purposes and existing infrastructure, it includes the results of the institution (Turajlić, 2007). In such a model, it is particularly important to select and define the criteria used in determining the amount of funds to invest in higher education, criteria which reflect the performance of institutions such as citations, patents, PhD theses, international cooperation, etc.

The investment model in higher education that is used in Serbia is based on the formulae and it has both qualitative and quantitative characteristics. This paper analyzes the ones relating to the boundary of operational efficiency, expressed as the number of state-financed students.

3. Research Methodology

The research methodology is based on the current (Kabok, 2010) and the newly created investment model investment in higher education in Serbia (Kabok, Djaković & Andjelić, 2011), and the available data on the investment of budgetary funds into the faculties of the University of Novi Sad in 2011. The data analysis is carried out using mathematical - statistical methods as well as methods of analysis and synthesis.
Firstly, the research applied the formula of the current investment model in higher education in Serbia, which reads (Kabok, 2010):

$$UGS = (FBNS \times PKSns \times CR \times D) + (FBNNO \times PKSnno \times CR \times D) + \frac{ST}{PUB} + OS + \frac{OT}{PUB} \qquad (1)$$

with the following explanations:

UGS: Annual total assets for investment in higher education;
FBNS: The number of teachers and staff financed;
PKSns: The average coefficient of the complexity of the teaching staff;
CR: The basic salary for employees in higher education, which is determined by the
          Government of the Republic of Serbia;
FBNNO: The number of non-teaching staff financed;
PKSnno: The average coefficient of the complexity of the non-teaching staff;
D: Additions to salaries or functional additives regulated by the laws and normative acts of the Republic
          of Serbia;
ST: Permanent (material) costs / expenses of institutions;
OS: Insurance expenses;
OT: Other expenses (current repairs, publishing, international cooperation and teaching material);
PUB: The percentage share of budget revenues in the total revenue of the institution.

The research then, ex post, in the same conditions, applied the formula of the new investment model in higher education in the Republic of Serbia using the same data. The formula consists of three parts, the first relating to the cost of education including salaries and other benefits of the teaching staff, the second relating to salaries and other benefits of the non-teaching staff which are determined as 25% of the cost of instruction and the third part, consisting of fixed costs / expenses relating to heating and insurance. The above formula can be expressed as (Kabok, Djaković & Andjelić, 2011):

$$Utr = Ts \times \left[(Bs + Ds) \times Kf \right] + 0,25 \times \left\{ Ts \times \left[(Bs + Ds) \times Kf \right] \right\} + \frac{Bs}{Us} \times (Tg + To) \qquad (2)$$

with the following explanations:

Utr: Total expenditures for the achievement of the program of study from budgetary funds;
Ts: Expenditures per student of the program of study;
Bs: The number of state-financed students of the program of study;
Ds: The number of graduates of the program of study;
Kf: The correction factor, which balances the economic status of institutions and eliminates the deficiency of the higher education market; it would be prescribed by the Government of the Republic of Serbia in the form of a normative act, as follows: for the social sciences and humanities in the amount of 1.5, the natural sciences and mathematics 2.5, technical and technological sciences 3, for medical science in the amount of 3.5, and for the arts in the amount of 5;
Us: The total number of students (both state-financed and self-financing) of the program of study;
Tg: Heating expenses;

The obtained data, pertaining to the investment of budgetary funds in the programs of study of the faculties of the University of Novi Sad in 2011 according to the new and the current investment model, was used to calculate the boundary of efficiency expressed as physical range of services i.e. the number of students. The boundary of operational efficiency is also called the lowest boundary of profitability or break-even point.

The boundary of operational efficiency in higher education depends on the price of education per student as the unit of service, the average cost per student within the appropriate accounting period (in this case, for a period of one year), and the structure of the average cost (the share of fixed costs). The boundary of operational efficiency is the point where the average costs per unit of service (per student) is equal to the price of higher education. The formula of the boundary of operational efficiency in higher education is set as follows:

$$Ge = \frac{Ft}{Co - Pt} \qquad (3)$$

with the following explanations:

Ge: The boundary of operational efficiency of higher education, expressed as the number of students;
Ft: The fixed costs of higher education, which are related to the amount of the total annual heating and insurance expenses;
Co: The price of higher education per student, refers to the total actual variable and fixed costs in higher education per student. Calculating the cost of education is done by relating the total actual cost in the accounting period (one year) to the total number of students;
Pt: The proportional costs of higher education per student, refer to the variable costs of higher education, or the cost of instruction, which includes the costs of salaries, material and other costs per student in the function of teaching in higher education. The calculation of these costs will be a ratio between the proportional costs for the accounting period (one year) and the total number of students.

According to the research objectives, the values of the boundary of operational efficiency according to the new and the current investment model in higher education were calculated. The data was reviewed and analyzed in order to determine the performance of the new investment model in higher education through the analyzed indicators.

4. The Research Results

Using the described methodology and based on the available data, the boundary of operational efficiency was calculated, according to the current and the new investment model investment in higher education; it is expressed as the number of state-funded students of the faculties of the University of Novi Sad and is shown in Table 1:

Table 1. - Overview of the boundary of operational efficiency according to the new and the current models of investment in 2011.

No	Name	2011	
		The current investment model	**The new investment model**
1.	The number of students - state-funded	19, 820	21, 406
2.	The proportional cost per student (EUR)	1, 932	2, 025
3.	The cost of higher education per student (EUR)	2, 407	2, 532
4.	The fixed costs of higher education (EUR 000)	9, 400	10, 853
5.	The boundary of operational efficiency - the number of state-financed students	19, 790	21, 406
6.	Index of the boundary of operational efficiency in % (the current model = 100)	100	110.2

Source: Statistical Office of the Republic of Serbia (2011), Provincial Assembly Decision on the Budget of AP Vojvodina for 2011 (2010) and author's own calculations

Based on the data from Table 1, an increase of 10.22% in the boundary of operational efficiency of higher education, expressed as the number of state-funded students according to the formula of the new investment model in higher education, can be noticed when compared to the current model. In addition, the data in the table show that in 2011, there were 30 students (19820 -19 790) more than the boundary of operational efficiency of the given budget for the current investment model in higher education. This fact suggests that the new model of investment contributes to the increase in the number of students; it also suggests that more public investment in higher education is necessary, which can be provided by applying the aforementioned new model.

Increasing investments particularly contributes to the improvement of working conditions in the field of higher education in terms of space, material and personnel requirements of instruction. Increased budgetary funds, as well as greater autonomy in the management of resources, allow for the engagement of better teaching staff and provision of adequate equipment, which in turn improves the quality of the implementation of the programs of study and increases the overall quality of knowledge as a factor of economic growth and development (Jednak & Kragulj, 2010).

The expertise and quality of the teaching staff is one of the determinants of the competitive position of higher education. More budgetary funds for salaries and other personal income, as well as for scientific and professional development motivates University employees to work better and more responsibly, improving the instruction performance. In addition, higher budget allocations for equipment and teaching resources in higher education allow higher education institutions to invest in modern teaching aids and increase their competitive position.

By analyzing the boundary of operational efficiency in higher education on the basis of the given data, another piece of evidence of the positive performance of the new investment model can be noticed. The implementation of the new investment model increases the cost of education per student, but that increase is

lower than the rate of improvement of the boundary of operational efficiency,i.e. the number of students under the new investment model increase faster in comparison with the increase in the cost of higher education per student. The above conclusion is illustrated in Table 2:

Table 2. – The differences between the index price of higher education by student and boundary of operational efficiency for 2011

No	Name	2011
1.	The cost of higher education per student in EUR – the current model	2,407
2.	The cost of higher education per student in EUR – the new model	2,532
3.	Index of the cost of higher education per state-funded student in % (the current model = 100)	105.19
4.	Index of the boundary of operational efficiency expressed as the number of state-funded students in % (the current model = 100)	110.22
5.	The difference in% (No 4 - No 3)	5.03

Source: Statistical Office of the Republic of Serbia (2011), Provincial Assembly Decision on the Budget of AP Vojvodina for 2011 (2010) and author's own calculations

It can be concluded from the data in Table 2 that in 2011, the index of the boundary of operational efficiency expressed as the number of state-funded students grew faster than the index of the cost of education per student, by 5.03%, and with the implementation of the new model of investment in higher education, the number of state-financed students increased by 10.22%, while the cost of higher education per state-financed student increased by 5.19%. These data confirm the conclusion already expressed about the good performance of the new investment models relating to the boundary of operational efficiency expressed as the number of students.

Conslusion

The results of this research indicate that the implementation of the new investment model in higher education increases the number of state-funded students in the function of the boundary of operational efficiency. Increasing the number of students in higher education is a key requirement for increasing the share of highly educated population in the total population, in accordance with the Strategy for the Development of Education in the Republic of Serbia until 2020 (Ministry of Education, Science and Technological Development of the Republic of Serbia, 2011). In line with the abovementioned strategy, the higher education system in Serbia should continue to improve its performance in order to enable all who wish to study to do so, regardless of social, economic and other conditions.

The increase in quality and competitive positions of higher education in Serbia is the requirement that must be met in order to join the modern European processes in higher education which are aimed at creating a "knowledge society" (Lisbon European Council 23 and 24 March 2000). From this point, it would be beneficial to use the new investment model in higher education, which will increase the budgetary investment in higher education, the number of students and employment of graduates. In addition, it is necessary to introduce mobility as an element of quality and a factor in the recruitment as well as to further develop measures that lead to the employment of graduates.

Increasing the number and mobility of students should provide intensive technological development of telecommunications. More information and data on programs of study and their quality allows a greater competitiveness of study programs and of higher education in general. The lack of information and data on study programs adversely affects competition in a free market education. When it is difficult to assess the quality of the program of study due to the lack of information, we cannot achieve healthy competition among the programs of study of higher education.

Improving the quality of instruction and the implementation of the programs of study enables a better position in the ranking of academic programs at the national reference list of higher education, improving their competitive and market positions. Higher-ranked programs of study attract more students, which results in obtaining higher revenues in higher education. The very fact that the study programs are ranked is a motive to increase the quality; it brings Serbia the status of a society with a high quality education, which provides, among other things, the influx of foreign students and teaching staff.

Based on the observation and analysis of the possibilities to increase the boundary of operational efficiency expressed as the number of students in the higher education of Serbia, it is suggested that the necessary conditions should be created for the implementation of the new investment model in higher education that provides quality outcomes, relevance and effectiveness, as well as the transparency of costs during studies. A prerequisite for transparency and the availability of investment budgetary funds is a public tender for funds from the budget that should be carried out by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Limitations of the research include the fact that it was, due to data availability, conducted on the data of the faculties of the University of Novi Sad. Therefore, the avenues of further research will be focused on the analysis of the boundary of operational efficiency of higher education expressed as the number of students at other universities in the Republic of Serbia, by implementing the new investment model, according to the methodology described. Future research will answer the question whether one of the important determinants of the boundary of efficiency is a new structure of the programs of study of higher education and their adaptation to the demands of the labor market.

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