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Analysis of Higher Education Indicators Coherency in Central and Eastern Europe

Andrea Andrejević Panić
Educons University, Faculty of Business Economics, Sremska Kamenica, Serbia
Zagorka Lozanov-Crvenković
University of Novi Sad, Faculty of Sciences, Department of Mathematics and Informatics, Novi Sad, Serbia

Abstract

Background: Higher education has the main role in generating innovative activity in knowledge-based economies. Therefore, the efficiency of the higher education sector reflects the alignment of the higher education policy with government expenditure. However, countries in Central and Eastern Europe (CEE region) have been struggling with national budget optimisation, which can cause fiscal stress and thus affect the efficiency of higher education. **Objectives:** The main objective is to examine mutual interaction of higher education indicators, through formulating financial models that connect performance and financial indicators. **Methods/Approach:** A total of 4 higher education indicators were analysed and observed in the time period of 10 years in selected CEE countries. The statistical analysis was based on panel data models. **Results:** The main result of the paper is the analysis of coherency of selected higher education indicators in selected CEE countries in order to establish functional links between government expenditure and efficiency through formulating financial models. **Conclusions:** Formulated financial models can predict the behaviour of selected performance indicators, depending on financial indicators. Therefore, the obtained models can contribute to the efficient allocation of funds and comprehensive macro-level decision making assessments in higher education policy reforms.

Keywords: higher education, government expenditure, UNESCO higher education indicators, panel data models, CEE region.
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Introduction

Over the last decade, respecting national priorities and different contexts, it is recommended by EU regulative to increase government expenditures on higher education and science on a national level in the countries in Central Eastern Europe (CEE countries). The implementation of these proposed measures is implied by aligning

with national priorities, through developmental guidelines and their contextualization through plans and strategies, respecting national education policies (European Commission, 2012). It is recommended: 1) allocation of at least 4% to 6% of gross domestic product (GDP) in education; 2) allocation of at least 15% to 20% of public spending in education. Those should encompass the objectives defined by law or strategy and should be oriented towards the learning outcomes, which is part of the reforms in line with the Bologna Process. The Framework for Action Education 2030 calls for changes in education into three priority segments of reform in education: Governance, Coordination, and Financing (UIS, 2015a).

In 2013, UNESCO set up a technical advisory group (TAG) to monitor and collect data by different criteria, from enrollment and completion (e.g. enrollment rate, graduation rate, percentage of enrolled students to certain levels of study, etc.) to criteria for human resources in education and financial resources, e.g. government investment indicators, current investments as a percentage of total government investment, etc., at all levels of education. Today, these criteria and indicators for measuring that make UNESCO's online database, the largest database in education. Indicators are relevant in all countries and also the improvement of databases and available data that would be comparable, by commonly being defined under similar standards (UIS, 2015b).

The main objective is to examine mutual interaction of higher education indicators, through formulating financial models that connect performance and financial indicators in higher education. Main hypothesis in this research is that the efficiency of the higher education sector must be achieved with a certain level of invested funds, which has to be justified through data analysis and connected with the implementation of national strategy.

Thus, the research question is to examine if it is possible to demonstrate and illustrate the significant impact among these indicators. Statistical links can be used to form financial models, which can be used as a preliminary finding in order to describe the connection that higher education indicators have among each other and efficiency of the HE sector, at the same time. Research goal in this paper is not only emphasizing the need, but also assessing the relationship between selected variables. In order to estimate and evaluate functional links between financial and performance indicators in the higher education sector, the relationship between indicators that are connected to the efficiency of the higher education sector should be identified and established. Data and methodology are specifically designed and used for evaluation of these links, based on the highest mutual correlation. Patterns of their impact could be calculated and compared through financial models which are obtained.

Financial models are used to describe and define the relationship and influence of financial indicators on performance indicators in the higher education sector. In this way, we can look at financial models for strategic planning of higher education policy paper guidance, for decision making process, with the purpose for improving governance in public sector, related to outcomes in higher education. The results of data analysis that are displayed through financial models can be used to decide whether investment in higher education sector can be explained and justified and are they going to give adequate results that are needed for achieving efficiency and to what extent. Those financial models are not to be mistaken for financing models or performance budget model or operational budgeting since they are not related to formulas for implementing measurements or calculating budgetary costs.

In the first part of the paper, the theoretical background is given as a short description of literature that is used. The second part of the paper presents how data

sampling was managed as well as a methodology for data analysing. In the third part, the results are summarized, and at the end of the paper discussion is proposed, and the main conclusions are explained.

Theoretical framework and literature review

From economic perspectives, the definition of costs can be viewed from three aspects: macro, micro, and individual aspects (Stiglitz, 2003). Higher education reforms in countries in CEE region are mainly directed to the allocation of resources of national budgets and financing higher education sector at the macro level, but effects that these reforms have are connected to micro level efficiency and the use of funds (Andrejević Panić, 2016). Macro-level efficiency is a concept that lies in the structure of funding sources and costs in the higher education sector in the world, depending on the national priorities of economic development. Many developing countries put emphasis on increasing student loans, rather than direct financial assistance to students, in order to reduce state investment in higher education and relieve pressure on the education budget. This pressure is called fiscal stress, because governments are struggling to increase their investment in higher education, recognizing its importance in the development of society, on the one hand, and, on the other hand, in the struggle for a proper allocation of positions they encounter a limited use of the public budget (Vossensteyn, 2004). Micro-level efficiency in the higher education sector is reflected in the change in the governance model, which implies for many countries a change in centralized management towards greater autonomy for higher education institutions. This means that higher education institutions must rely on the process of self-organization within the higher education system and integrate the basic principles of responsibility of higher education institutions and student care (Jongbloed, 2003). The efficiency in higher education is a research task that can be seen from different aspects and interpretation of many theories, but it all concerns functioning of modern economies and societies globally (Bas et al., 2005).

Empirical research on higher education indicators is oriented towards the change of higher education policy. Some of the review papers are exploring the choices for the "ideal tool" for analyzing critical parameters for sustainability in higher education with the intent of pursuing incremental and systemic change simultaneously (Shriberg, 2002). However, empirical papers that are based on higher education indicators, tent to concentrate on finding the right model for financing higher education, these are mostly based on display or comparisons of higher education indicators, ex. Gross enrollment ratio, teacher/pupil ratio, fees in higher education institutions as well as government expenditure on research and development in higher education as a percentage of GDP, etc. This kind of research is focused on the comparison of data for higher education indicators without using applied statistics models, but the conclusion is still leaning on higher education policy change as well as a critique on public governance model in terms of allocation mechanisms (Vukasović et al., 2009). Existence of inconsistencies in the high-level sectors at the macro and micro level address the efficiency issue, which is present in the reform processes, so the greater cohesion is needed. In order to achieve greater compliance and optimize efficiency, the government's investment in higher education as part of GDP should include structural aspects of higher education funding, in order to achieve a clearer differentiation of objectives and highlight possible positive effects of an alternative increase, which should be included in development strategies. Moreover, this corresponds to the developmental perspective at the macro level (the ratio of higher education funds as a share of GDP), which should be followed by an analysis of the micro-efficiency of the allocation of available resources (Vukasović et al., 2009).

Furthermore, research papers, that also address these issues are focused on European influences on national policymaking in higher education (HE) that have remained limited. Particular concerns have been brought out in terms of Bologna Process, and how these changes from 1999 onwards, affected and fostered considerable domestic reforms in terms of convergence national higher education policies towards a common model and whether a collective supranational platform was developed to confront problem pressure, especially in CEE countries (Dobbins et al., 2009).

Moreover, in empirical studies a question that rise the attention is the concentration on policy effects, neglecting the input side of policy formation, and the concern with macro level policy-making, which affect also meso-level and organizational adaptation, both neglecting and addressing the issues of micro level dynamics and effects in the actual practices and performances of academic work and possible outcomes (Enders, 2004). A few studies even examined coherent ways how the combined external pressure for change and at the same time affect the areas of education, research and innovation and the preservation of university identity as we know it (Maassen et al., 2011). Thus, the collection and use of data on funding in higher education is very important for policy makers and their monitoring at the national level, because based on annual funding data and sources of investment vs. costs incurred, analysis can be strengthened related to the prediction of movement and establishment trends in higher education (Paulsen et al., 2001). Moreover, the integrity of the approach that follows this concept is necessary, especially in terms of analyzing the impact of new public management on aspects such as efficiency, effectiveness, responsibility, social cohesion, etc. (Van de Walle et al., 2011). Often, the use of these management practices and planned monitoring is a phenomenon that is grounded in concepts such as "management", "new management", "new public management" (Santiago et al., 2006).

In empirical research papers, these issues are connected to the development of economics or development of higher education systems in terms of political and public management approaches. In first terms, the problem is tackled form public polices reform point of view and decision making processes. Regarding the second perspective, the problem is leaning towards creating policies, networks and policies regimes, which could foster national strategies. Therefore, public management reforms and their formation or combinations across regions is suggested (Ferlie et al., 2008).

In this research paper, the economic theory of supply and demand lies in the background, in terms of the need for creating the supply of new skilled workforce at the labor market, through monitoring graduation rate in the higher education sector, based on actual numbers and specific needs of the real economic sector. In this way, on the one hand, the influence on the supply of skilled workforce for the labor market can be predicted, and on the other hand, the needs for financing the demand in the labor market can be achieved through realized investments in higher education sector and achieved number of graduates through the years (Andrejević Panić, 2015). In literature, the empirical model shows that the traditional determinants, such as market potential, unit labor costs, a skilled workforce, and relative endowments, have significant and plausible effects. In addition, some of the literature further shows that use of dynamic panel data methods can be even used to examine the determinants of foreign direct investment (FDI) into CEE countries (Carstensen et al., 2004). Monitoring of these numbers related to the higher education sector is crucial, and it can be described through connection and established relationships that are inserted in the very essence of the idea of higher education indicators. Also, this can

significantly explore the possibilities for enhancement of the allocation mechanism in the public sector (Andrejević Panić, 2016).

Moreover, based on human capital theory, some of the empirical literature suggests results of estimates of returns to investment in education in attempts to establish patterns. The importance of human capital theory in higher education can also be seen and reaffirmed in the usage of new econometric techniques and over-time data evidence in drawing the conclusions (Psacharopoulos et al., 2004). The approach of the economic modelling in higher education can change the way, which corresponds to the need for educating youth through monitoring enrolment rates increase and creating the demand in real sector and at the same time allowing supply of labor market to be established, according to the specific needs for every national economy (Andrejević Panić, 2015).

Methodology

Data

The data and results presented here are the part of the broader research given in Ph.D. thesis (Andrejević Panić, 2016). Indicators that are used in the thesis are selected from UNESCO Institute for Statistics (UIS) database according to four different criteria groups: Financial Resource Indicators; Indicators of entry; Indicators of graduated students; Human Resource Indicators.

From the group of Financial Resource Indicators, the following indicators were selected: 1) Government expenditures in research and development (% of GDP); 2) Expenditure in higher education (% of government expenditure on education); 3) Current expenditures (% of total government expenditure on state higher education institutions); 4) Government expenditure in higher education (% of GDP). From the other three criteria groups selected indicators are: 5) Graduates from tertiary education, both sexes (number); 6) All staff compensation as % of total expenditure in public institution; 7) Researchers (headcount-HC) - higher education; 8) Pupil-teacher ratio in tertiary education (headcount basis); 9) Gross enrolment ratio, tertiary, both sexes (%); 10) School life expectancy, tertiary, both sexes (years) (UIS, 2015b).

Further, selected indicators were divided into two groups in order to establish the logical direction of observation in further analysis. The first group of indicators is indicators according to the financial criteria, and they are an economic category that represents investments in higher education (financial indicators). This group includes indicators from 1) - 4), mentioned above, they are inputs in higher education, and they represent independent variables. The second group is indicators from the remaining three criteria groups, and they represent dependent variables. These are performance indicators, these are indicators from 5) – 10) mentioned above, so they are considered as output in higher education.

In this paper, models for one selected dependent variable or performance indicator in a relationship with three independent variables will be presented. Dependent variable that is going to be used is performance indicator below and its abbreviation (UIS, 2015b):

- Expected - School life expectancy in the tertiary sector or higher education sector, both sexes, years.

The UIS definition of this indicator is that it presents the number of years for a person of school entrance age that can expect to spend within the specified level of education. The UIS purpose for this indicator can be explained that it shows the overall level of development of an educational system (the average number of years of schooling that the education system offers to the eligible population).

Three independent variables, which will be presented and used in the further analysis, are financial indicators:

- Government expenditure on research and development realized in higher education as a percentage of GDP (%), abbrev. GERD;
- Expenditures on higher education as % of government expenditure on education (%), abbrev. Expend and
- Current expenditures as % of total government expenditures in higher education institutions (%), abbrev. Current.

The choice of indicators is based on their mutual cross-correlations, which were examined and displayed in Ph.D. thesis (Andrejević Panić, 2016). The sample includes the data collected for five selected CEE countries: Bulgaria, Hungary, Romania, Slovakia, Serbia. The data are collected for period 2002-2012, and are unbalanced, due to lack of information in the UIS database. Basic descriptive statistics for selected variables are presented in table 1 below.

Table 1
Descriptive Statistics for Selected Indicators of Higher Education

Variable		N	Mean	St.Dev	Min	Max
GERD	Overall	55	0.625	0.246	0.300	1.270
	Countries			0.236	0.458	1.038
	Time			0.124	0.348	0.957
Expend	Overall	47	2.255	0.425	1.436	3.161
	Countries			0.395	1.964	2.936
	Time			0.284	1.717	2.931
Current	Overall	47	25.18	7.079	15.33	42.88
	Countries			7.966	20.06	40.17
	Time			3.531	19.77	33.22
Expected	Overall	54	2.485	*0.417*	*1.662*	*3.106*
	Countries			*0.243*	2.282	2.896
	Time			*0.353*	*1.747*	*3.176*

Source: Authors' work

Statisticaln analysis

Overall statistics are ordinary statistics that are based on all observations. Country statistics are calculated on the basis of summary statistics of five counties regardless the time period (between countries), while time statistics are calculated by summary statistics of 10 time periods regardless the country (within countries).

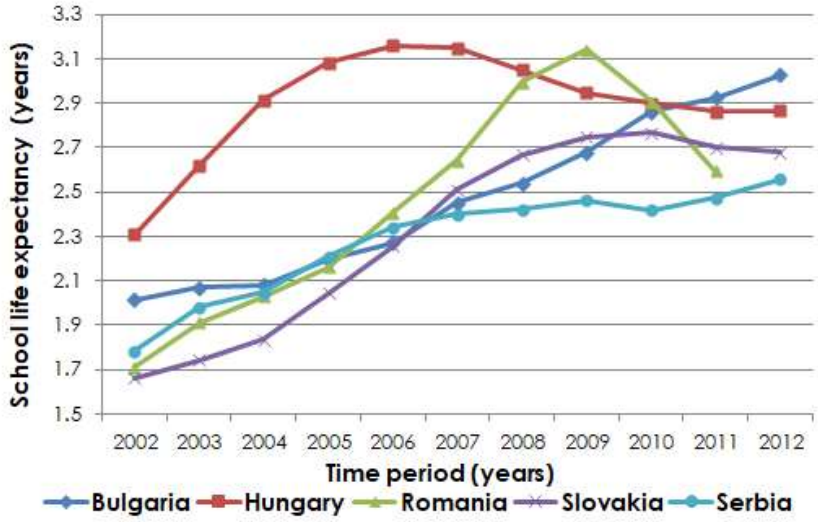
For independent variables GERD, Expend and Current between countries standard deviations are higher than those within countries, indicating that most of the variation is due to differences between countries. For the dependent variable, Expected, variation is higher over time than among countries.

In Figure 1, the values of the dependent variable, School-life expectancy in the higher education sector are displayed over the observed period.

Collected and analysed data are panel data, that is, longitudinal data in which more units (states) are observed in several evenly distributed periods (years) (Kennedy, 2008). The first model that can be set based on panel data is a unified linear regression model (OLS model), where all measurements are included, but it does not take into account the existence of units and repeated measurements (Park, 2011). In order to determine the correct model, the following necessary tests can be conducted: the F test for the fixed effect model and Breusch-Pagan Lagrange Multiplier (LM) test (Park, 2011).

However, in such a model it is assumed that the slopes of the regression are the same for all the units. In order to obtain the more appropriate model, it should be examined if panel data are poolable, that is - are the slopes of regressors same across the countries. This is done by performing the Chow test is to determine whether the data are poolable (Park, 2011). If the null hypothesis in Chow test - the regression slopes are the same for all units, is rejected, then a regression model with random coefficients (random coefficient model) is applied (Park, 2011).

Figure 1
School Life Expectancy in Higher Education for Selected CEE Countries



Source: Authors' work

The random coefficients model for the panel data assumes a variable slope for different units $(\beta_1 + \alpha_{1t})$, which is a random variable, as well as a random intercept$(\beta_0 + \alpha_{0t})$.

The model is

$$y_{it} = (\beta_0 + \alpha_{0t}) + (\beta_1 + \alpha_{1t})x_{it} + \varepsilon_{it} \quad (1)$$

where:

- β_0 and β_1 are fixed intercept and slope,
- $\alpha_{0t} \sim N(0, \sigma_{a0}^2)$ is a random deviation from β_0 for *i* unit (for *i* country),
- $\alpha_{1t} \sim N(0, \sigma_{a1}^2)$ is a random deviation from β_1 for *i* unit,
- $Cov(\alpha_{0t}, \alpha_{1t}) = \tau_{a0,a1}$,
- ε_{it} are random errors, iid with $N(0, \sigma^2)$ distribution.

The null hypothesis in the model (1) are: $H_0(\beta_0 = 0, \beta_1 = 0)$ - joint of intercept and slope are equal, $H_0(\alpha_{01} = \alpha_{02} = \cdots = \alpha_{0T})$ - that the unit specific coefficinets (slopes) are equal.

For statistical data processing, Microsoft Excel 2007, statistical packages Stata (StataCorp., 2017), (free trial) and Statistica 13, StatSoft Inc. (2016), Tulsa, OK, USA, license for the University of Novi Sad, were used. Differences for which p value was less than 0.05 are considered statistically significant.

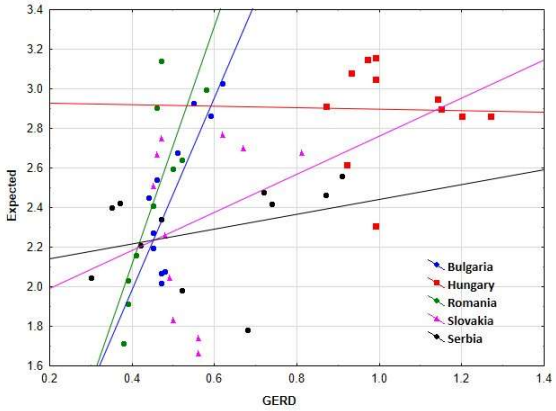
Results

Results are presented for one of the dependent variable, Expected, and three selected independent variables, GERD, Expend, and Current. In order to obtain the

preliminary results, describing the relationships between the dependent and independent variables, F test for the fixed effects model was conducted, resulting in rejecting null hypothesis F=94.61[3.38], p<0.001. Breusch-Pagan Lagrange Multiplier (LM) test for random effect was conducted, and the null hypothesis was not rejected p>0.05. Thus, as a first attempt, the fixed effect model was fitted. For that model, adjusted R^2 =0.9168, which shows that 91.68% of the Expected variation is explained by linear regression to all three independent variables GERD, Expend, and Current. Residual standard error 0.1289, shows how much the actual Expected deviates from the true regression, on average. This means that even if the model was correct, and the true values of the unknown coefficients were known exactly, any prediction of the Expected based on all three independent variables, would still be off by about 0.13%, on average. All regressors coefficients were statistically different from zero, being positive for GERD and Current, and negative for Expend.

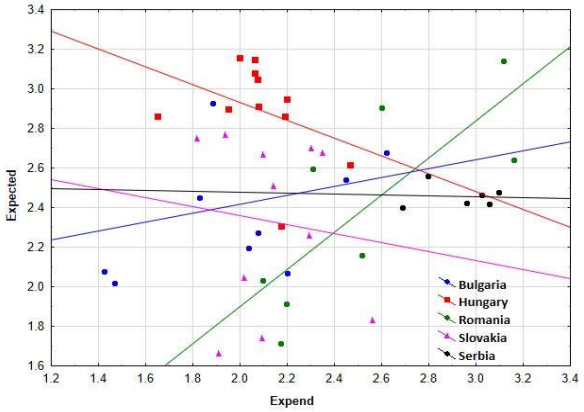
However, as it can be seen in figures 2-4, dependent variables have different slopes of regressors for different countries. Thus, it should be examined if panel data are poolable, that is - are the slopes of regressors same across countries. If the null hypothesis of poolability is rejected, countries may have their own slopes of regressors. Results of Chow test (F = 98.78[16,250], p<0.001), show that data are not poolable and that instead of the fixed effect model, the model with random coefficients should be applied.

Figure 2
Scatterplot of Expected against GERD



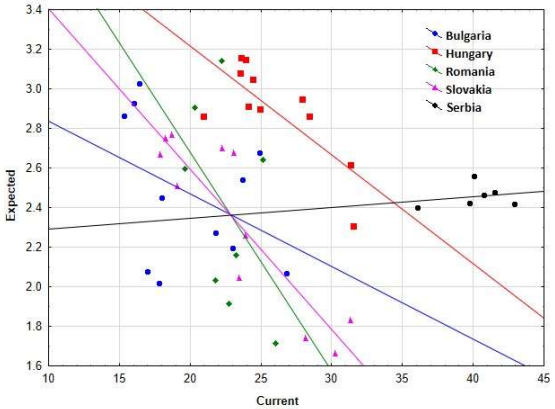
Source: Authors' work

Figure 3
Scatterplot of Expected against Expend



Source: Authors' work

Figure 4
Scatterplot of Expected against Current



Source: Authors' work

Thus, the final model that will be applied is the random coefficients model. In this model, Wald test of significance of the joint of intercept and slope (chi2 (4) = 17.43, is p = 0.0006), shows that the null hypothesis $H_0(\beta_0 = 0, \beta_1 = 0)$ in the model (1) is rejected, so fixed intercept and slope are statistically different from zero.

The statistical test of the parameter constancy (chi2(16) = 285.8, p < 0.001) shows that the null hypothesis $H_0(\alpha_{01} = \alpha_{02} = \cdots = \alpha_{0T})$ in the model (1) that the country specific coefficients (slopes) are equal, is rejected, so the countries have statistically different slopes of regressors.

The results of the random coefficients model are presented in tables 2 and 3, where in table 3 example for the specific country coefficients only for Hungary, will be presented, due to extensive data.

Table 2
Common Coefficients in the Random Coefficient Model for the Expected depending on Independent Variables

Variable	Coef.	St. Err	t	p	95%CI	
GERD	1.079	0.215	2.18	0.029	0.109	2.049
Expend	0.844	0.280	2.56	0.010	0.198	1.490
Current	- 0.091	0.019	-3.47	0.001	- 0.142	- 0.039
Intercept	2.202	0.330	5.25	0.000	1.380	3.024

Source: Authors' work

Table 3
Specific Country Coefficients for Hungary in the Random Coefficient Model for the Expected depending on Independent Variables

Variable	Coef.	St. Err	t	p	95%CI	
GERD	0.770	0.215	3.58	<0.001	0.349	1.191
Expend	1.604	0.280	5.73	<0.001	1.055	2.152
Current	- 0.127	0.019	6.78	<0.001	-0.164	-0.091
Intercept	2.049	0.330	6.20	<0.001	1.401	2.696

Source: Authors' work

Based on the results of the random coefficients model, financial models were formulated for selected CEE countries, and they are displayed in table 4, below.

Table 4
Results for Financial Models for Selected CEE Countries for Financial and Performance Higher Education Indicators

Country	Higher Education Indicators – predicted the amount of change
Bulgaria	$\boldsymbol{Expected = 3.40 + 3.32 * GERD + 1.96 * Expend - 3.40 * Current}$
Hungary	$\boldsymbol{Expected = 4.25 + 1.85 * GERD + 2.45 * Expend - 0.22 * Current}$
Romania	$\boldsymbol{Expected = 4.56 + 2.21 * GERD + 1.76 * Expend - 0.21 * Current}$
Slovakia	$\boldsymbol{Expected = 4.85 + 2.07 * GERD + 1.42 * Expend - 0.18 * Current}$
Serbia	$\boldsymbol{Expected = 4.96 + 1.33 * GERD + 0.86 * Expend - 0.10 * Current}$

Source: Authors' work
Note: based on authors calculations

The results of this research are formulated through financial model that evaluates the impact concerning the dependent variable or performance indicator Expected - School life expectancy in higher education sector, both sexes, (years), based on three

independent variables or financial indicators that presents three different types of government expenditures in higher education sector: GERD - Government expenditure on research and development realized in higher education as a percentage of GDP (%); Expend - Expenditures on higher education as % of government expenditure on education (%) and Current – Current expenditures as % of total government expenditures in higher education institutions, based on 2002-2012 data from five CEE countries.

All coefficients in the models in table 4 are statistically significant. Current expenditures as % of total government expenditures in higher education institutions have negative coefficients, indicating lower school life expectancy in the higher education sector with an increase of expenditures. Coefficients for other regressors are positive. For example, for Romania, with one unit increase in Current, school life expectancy duration is expected to decrease by 2.21 years on average, holding other variables constant. Based on displayed financial models, a direct relationship between government expenditures and performance in the higher education sector was found. These formulated models can be applied for countries in Central Eastern Europe (CEE region) for selected financial and performance indicator. This corresponds with macro level efficiency that lies between decision making process and performance in the higher education sector.

Discussion

In obtained models, it is shown that there exists significant co-dependence between selected indicators. It should be further on explored, whether these models can contribute significantly to the fulfillment of national goals set or have its usage in strategy or policy paper development tackling not only the efficiency but also change toward new public government models.

Main hypothesis is confirmed, and research goal is fulfilled through established functional links between financial and performance indicators in higher education. On the other hand, findings confirm that statistical links between the financial indicators and school-life expectancy are significant and that they can be used to form financial models that illustrate the impact of the changes. Also, obtained models show how selected financial indicators influence the amount of change of performance indicator and to what extent. In this way, they can be used to predict an increase or decrease of the study duration in selected CEE countries in relation to the selected financial indicators in the future period. Financial models can represent the scheme for further analysis and predictions for any higher education performance indicator based on their behaviour and trends over the past ten years in selected CEE countries.

The overall limitations of results are in the relatively small number of years and selected CEE countries as well as the limited availability of data related to indicators for some of the observed countries in the region. Also, limitation of the interpretation of results can be considered as a preliminary communication, specifically related to the possibility of examining the influence of financial to performance indicators in order to raise interest in connecting evaluated impact of their coherency to build-up efficiency in the higher education sector.

Conclusion

The displayed results through financial models correspond to the objectives of the research, regarding the determination of the relationship between indicators in the higher education sector and using those results for achieving efficiency. Obtained

financial models for the analysis of coherency between financial and performance indicators in the higher education sector can be used for projections of strategic planning, capital budgeting decisions, and the allocation of resources.

Particularly, financial models that are presented in the results are comprehensive and focused on the influence of multiple factors and their impact at the national levels in the higher education sector in CEE countries. In this way, these models can contribute as a key factor in the reallocation of funds and efficiency of the higher education sector. This could be of great importance to policy makers, institutional governance and management, and other interested parties. The scientific value can be found in the possibility of practical implications and use of such developed models in various processes of the definition of higher education policy goals as well as to provide an explanation for macro-level assessments decisions or even measures that are taken in higher education policy reforms. Further research may include other financial and performance indicators that are connected to the particular issues concerning efficiency and capacity building in higher education.

Although it is preliminary research and there is lack of empirical literature which includes new scientific results, obtained results could be used for further research and comparison on the regional or national level within national strategy goals.

References

1. Andrejević Panić, A. (2015), "Analysis of compliance of higher education with the labour market with the implementation of the Europe 2020 strategy", Structural changes in Serbia, editor-in-chief Ivan Stošić, Institute of Economic Sciences, Belgrade, pp. 416-430.
2. Andrejević Panić, A. (2016), "The impact of financial management on the development of non-profit organizations: case study of higher education institutions in Central-Eastern Europe", doctoral dissertation, University Educons, Sremska Kamenica.
3. Bas, J., Van der Ploeg, F. (2005), "Guide to reform of higher education: a European perspective", Centre for Economic Policy Research, Discussion Paper No. 5327, London, UK.
4. Carstensen, K., Toubal, F. (2004), "Foreign direct investment in Central and Eastern European countries: a dynamic panel analysis", Journal of Comparative Economics, Elsevier, Netherlands, Vol. 32, No. 1, pp. 3-22.
5. Dobbins, M., Knill, C. (2009), "Higher Education Policies in Central and Eastern Europe: Convergence toward a Common Model?", Governance, Vol. 22, No. 3, pp. 397-430.
6. Enders, J. (2004), "Higher education, internationalisation, and the nation-state: Recent developments and challenges to governance theory", Higher Education, Vol. 47, No. 3, pp. 361-382.
7. European Commission (2012), Rethinking Education: Investing in skills for better socio-economic outcomes, Communication from the Commission to the European Parliament, the Council, European economic and social committee and the Committee of the regions, EU, available at: https://ec.europa.eu/europeaid/rethinking-education-investing-skills-better-socio-economic-outcomes-com2012-669_en (16 June 2018).
8. Ferlie, E., Musselin, C., Andresani, G. (2008), "The steering of higher education systems: a public management perspective", Higher Education, Vol. 56, No. 3, pp. 325-348.
9. Jongbloed, B. W. A. (2003), "Institutional funding and institutional change", in File, J., Goedegebuure, L. (Eds.), Real-time systems: Reflections on higher education in the Czech Republic, Hungary, Poland and Slovenia, Center for Higher Education Policy Studies, Brno, pp. 115-146.
10. Kennedy, P. (2008), A Guide to Econometrics, 6th ed., Wiley-Blackwell, NY, USA.
11. Maassen, P., Stensaker, B. (2011), "The knowledge triangle, European higher education policy logics and policy implications", Higher Education, Vol. 61, No. 6, pp. 757–769.
12. Park, H. M. (2011), Practical Guides To Panel Data Modeling: A Step by Step Analysis Using Stata, PhD, International University of Japan, Japan.
13. Paulsen, M. B., Smart, J. C. (2001), The Finance of Higher Education: Theory, Research, Policy, and Practice, Algora Publishing, USA.

14. Psacharopoulos G., Patrinos, H. A. (2004), "Returns to investment in education: a further update", Education Economics, Vol. 12, No. 2, pp. 111-134.
15. Santiago, R., Carvalho T., Amaral, A., Meek, V. L. (2006), "Changing patterns in the middle management of higher education institutions: The case of Portugal", Higher Education, Vol. 52, No. 2, pp. 215–250.
16. Shriberg, M. (2002), "Institutional assessment tools for sustainability in higher education: strengths, weaknesses, and implications for practice and theory", Higher Education Policy, Vol. 15, No. 2, pp. 153-167.
17. StatSoft Inc. (2016), STATISTICA - data analysis software system, v.13., licence for University of Novi Sad, available at: www.statsoft.com (16 June 2018).
18. StataCorp. (2017), Stata - Statistical Software: Release 15., College Station, TX: StataCorp LLC, free trial.
19. Stiglitz, J. (2003), Economics of Public Sector, 2nd ed., McGraw- Hill, NY, USA.
20. UIS (2015a), A Roadmap to Better Data on Education Financing, Summary of UIS study on: How to leverage current initiatives: National Education Accounts, Public Expenditure Reviews, BOOST, Education Country Status Reports, and the UIS-UOE Data Collection, UNESCO, Montreal, Quebec.
21. UIS (2015b), Thematic Indicators to Monitor the Education 2030 Agenda, Technical Advisory Group Proposal, Education 2030, UNESCO, Montreal, Quebec.
22. Van de Walle, S., Hammerschmid, G. (2011), "The Impact of the New Public Management: Challenges for Coordination and Cohesion in European Public Sectors", Halduskultuur, Vol. 12, No. 2, pp. 190-209.
23. Vossensteyn, H. (2004), "Fiscal stress: Worldwide trends in higher education finance", Journal of Student Financial Aid, Vol. 34, No. 1, pp. 39-55.
24. Vukasović, M., Babin, M., Ivošević, V, Lažetić, P., Miklavič, K. (2009), Financing Higher Education in South East Europe: Albania, Montenegro, Croatia, Slovenia, Serbia, Center for higher education policy, Belgrade.

About the authors

Andrea Andrejević Panić, Ph.D. is an assistant professor at the Faculty of business economics at Educons University. She received a Master's degree in 2009. From December 2016, she holds Ph.D. degree in economics from Educons University. From 2008, she is active in publishing scientific papers and involved in several scientific projects. Main research interests include macroeconomics of transition economies, international finance, and financial management. Her growing research interests include development economics and higher education. She is a member of the team for university - industry cooperation and coordinator for development and transformation processes at university. The author can be contacted at **andrea.andrejevic@educons.edu.rs**.

Zagorka Lozanov-Crvenković, Ph.D. is a full professor at the Department of Mathematics and Informatics, Faculty of Sciences, University of Novi Sad. She is teaching courses in Probability and Statistics. Main area of her scientific research is applied statistics and generalized functions. She is the author of more than 90 scientific papers, with more than 29 on SSCI list. Since 2010 is the president of Statistical society of Vojvodina. The author can be contacted at **zagorka.lozanov-crvenkovic@dmi.uns.ac.rs**.