Effects of Research Evaluation on Balkan Post-Socialist Countries

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Abstract **– Research evaluation (RE) strongly affects actors in higher education nowadays. Accordingly, this article unveils the effects of RE on Balkan post-socialist countries (BPSCs). Stakeholder theory, systematic literature review, K-means cluster analysis, a sample of 25 papers, expert evaluations and synthesis/analysis underpin it. Main results: 1. Data was found for Bosnia and Herzegovina (BIH), Bulgaria, Croatia, Serbia, Romania, and Slovenia. 2. The negative RE effects outnumbered the positive (30 vs. 22). They were also more frequently cited (65 vs. 53). 3. The most cited negative effects were unfair evaluation in some disciplines and the rise of authors per publication, while enhanced collaboration was the most cited positive. 4. Specifics of RE effects on BPSCs were elucidated. 5. BPSCs 3-cluster maps were created for the positive, negative, and all RE effects. The maps of negative and all RE effects were the same, covering BIH and Romania in cluster 1 (titled 'least positive, mid negative'), Bulgaria and Serbia in cluster 2 ('mid positive, least negative'), Slovenia and Croatia in cluster 3 ('most positive, most negative'). The positive map differed only for Serbia, assigned to the 'least positive' cluster. The primary role of this article is as a landmark for BPSCs research evaluation effectiveness.**

Keywords **– Higher education, Balkan post-socialist countries, effects, research evaluation, academic governance.**

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1. Introduction

Research evaluation (RE) is vital to the prosperity of higher education (HE) worldwide [1]. It is a prominent criterion for university (inter)national rankings [2]. At the institutional level, RE is used to promote researchers [3], finance projects within the university, and publish scientific output. At the national level, RE is applied in academic governance primarily as a control tool, as it belongs to the management function of control [4]. Moreover, a number of countries have integrated RE into their strategic planning as a core element of science policy in recent decades [3], [5]. In addition, REs are used by funding [1], [2] and accreditation [6] agencies as KPIs of universities/scientific organizations.

Due to the great importance of RE for academic governance and HE stakeholders, there are many scholarly publications on RE. The literature review on this topic found publications reporting contrasting effects of RE, positive or negative [1], [7]. Regarding the negative effects, the scientific community and government organizations have made significant efforts to improve/regulate RE globally by introducing/signing several initiatives/documents (e.g. DORA, The Leiden Manifest, INORMS, CoARA) [2]. At the same time, some studies provide evidence of the specifics of research activity and governance, including RE, resulting from differences in disciplines, levels of development and traditions of individual scholarly communities and countries [8], [9]. The present study is oriented precisely to these specifics. It was evoked by the need to explore, systematise, and map the effects of RE on BPSCs, seeking to contribute to refining BPSCs' science policies.

This article aims to unveil the effects of RE on Balkan post-socialist countries (BPSCs). The nature of RE effects was qualified as positive and negative by the authors from the sample used here.

Methodologically, Scopus & Web of Science (WoS) systematic literature review, K-means cluster analysis, stakeholder theory, synthesis/analysis, and expert evaluations underlie this study.

Four research questions describe the author's tasks:
Q1. What are the positive and negative effects of RE on BPSCs?
Q2. Which effects of RE on BPSCs are dominant?
Q3. What are the specifics of RE effects on each BPSC?
Q4. How can BPSCs be arranged into clusters based on the effects of RE on them?

2. Methodology

In the research process, the following toolkit was employed: expert evaluations (round 1), systematic literature review (round 1), analysis (rounds 1, 2 and 3), stakeholder theory (round 2), synthesis (rounds 2 and 3), and K-means cluster analysis (round 3).

The systematic review is gaining popularity thanks to somewhat simplified methodologies [10]. PRISMA rules underpin the methodology of this study [11].

Expert evaluations are based on experts' skills, knowledge and experience in a field [12]. Here, the author is the expert and the field is academic governance.

IBM SPSS statistics by K-means clustering was employed to form BPSCs clusters and Geoff Flipp's template [13] for their graphical representation. Two clustering criteria were applied here: SSE and the number of countries in the clusters. SSE indicates the sum of the squared differences between each observation and its group's mean [14]. The smaller the SSE, the more compact the clusters [15].

Stakeholder theory was applied here to classify RE effects. The stakeholder perspective is considered a fundamental paradigm for research evaluation, as it accounts for the needs and interests of the broad spectrum of entities engaged in research processes, namely scholars, universities, regulators, etc. [16].

2.1. Data and Sample

Data fetched from Scopus & WoS before April 2024 through underlays this study. The sample was composed of 25 references ([17] to [41], Table 1) identified through a systematic approach.

2.2. Research Process

This study went through 3 rounds. In round 1, "Determining the effects of RE on BPSCs", the positive and negative effects of RE on BPSCs were extracted and sorted by country, thus answering Q1. Round 1 unfolded in 3 steps. During step 1, the sample applied here was drawn from a Scopus-&-WoS review. It was accomplished systematically on 31/03/2024 under PRISMA regulations. The review protocol is written on the example of [42] as follows:

- Sources - Scopus & WoS (All databases);
- Search phrase - ((scien* OR academ* OR research*) PRE(NEAR)/0 (assess* OR evaluat* OR estimat* OR valuat* OR apprais*)) AND (Montenegro OR Albania OR Macedonia OR Bosnia* OR Herzegovina OR BIH OR Bulgaria OR Romania OR Croatia OR Slovenia OR Serbia OR Kosovo), where PRE/NEAR were used in Scopus/WoS;
- Search strategy - Period: All; Field: topic (WoS), title, abstract and keywords (Scopus);
- Criteria for inclusion - Access, document type, language: All.

394 papers were extricated in the initial search (Scopus - 132 and WoS - 262). Among them, 104 were duplicates. They were excluded from this study. Abstracts of the remaining 290 non-duplicates were screened for consistency with this topic. 219 records were found to be inconsistent and were rejected for further review. Accordingly, the records for review were reduced to 71. There were 13 closed-access ones. Their full texts were not found. There were 58 papers left to examine. Using the author's expertise and the content analysis method, their eligibility for this research aim was explored through an in-depth re-examination. 33 inappropriate records were found and excluded from the study. Thus, 25 sources remained ([17] to [41]), forming the sample applied here. Using their affiliation, the authors of the sampled sources were linked to the BPSCs at step 2 of round 1 (Table 1). Records of RE effects on BPSCs were found for only 6 countries: Romania, Bulgaria, Serbia, Bosnia and Herzegovina (BIH), Croatia and Slovenia. The positive and negative RE effects on BPSCs were extricated from the sample during step 3 of round 1. To this end, expert evaluations and content analysis were employed.

Table 1. Sampled sources distributed by country

Source	Country
[26], [27], [28], [41]	BIH
[29], [40]	Bulgaria
[19], [23], [24], [31], [32]	Croatia
[35], [36], [38]	Romania
[30], [33], [34]	Serbia
[17], [18], [20], [21], [22], [25], [37], [39]	Slovenia

In round 2, "Ranking the effects of RE on BPSCs", Q2 was answered. Round 2 consisted of 2 steps. Based on stakeholder theory and methods of analysis and synthesis, in step 1 of this round, the positive and negative RE effects on BPSCs were organized into groups (Tables 2 and 3). In addition, RE effects were counted and reported in detail by country, type (positive and negative) and group. Using their citation frequency, the positive and negative RE effects were ranked (Q2) during step 2 of round 2.

In round 3, "Clustering BPSCs", Q3 and Q4 were answered. It was held in 2 steps. During the first, specifics of RE effects on each BPSC (Q3, Figure 1) were outlined using round 2 results and analysis and synthesis methods. Based on these specifics, BPSCs were mapped into clusters (Q4) in step 2. K-means cluster analyses were held separately for the positive, negative and all effects of RE on BPSCs. IBM SPSS Statistics was employed for this aim. Experiments were done for 2, 3, and 4 clusters to reduce the SSE value [43]. The most satisfactory for all RE effect types were the results for 3 clusters (Table 4). The segmentation maps and their central means were plotted through Geoff Flipp's template [13] in Figures 2, 3, and 4.

2.3. Cluster Analysis Variables

About the positive effects of RE (Table 2):

- PERS - on the researcher stakeholder (line- l. A);
- PEOS - on other stakeholders (l. B);
- PER - on research (l. C);
- All positive effects of RE (APE, l. D);

About the negative effects of RE (Table 3):

- NERS - on the researcher stakeholder (l. E);
- NEOS - on other stakeholders (l. F);
- NER - on research (l. G);
- All negative effects of RE (ANE, l. H).

3. Results

The results of this study are presented as follows:

- Positive and negative RE effects on BPSCs (Q1) and their rankings (Q2) - Tables 2 and Table 3;
- Distribution of the positive/negative effects of RE by country and by group (Q3) - Figure 1;
- Clustering of BPSCs to the positive and negative RE effects (Q4) – Figure 2 and Figure 3;
- Clustering of BPSCs to all RE effects (Q4) - Figure 4;
- Cluster analysis results - Table 4.

Some notes on BPSCs results:

1. On the effects of RE (Figure 1, Tables 2 and 3):

- Based on classifications by object/entity and stakeholder, 3 RE effect groups were identified for BPSCs: effects of RE on the researcher, research and other stakeholders. The third group brings together the stakeholders of the scientific organization, the publisher and the funding agency, as RE effects on them are very few.

Table 2. Positive effects of RE on BPSCs

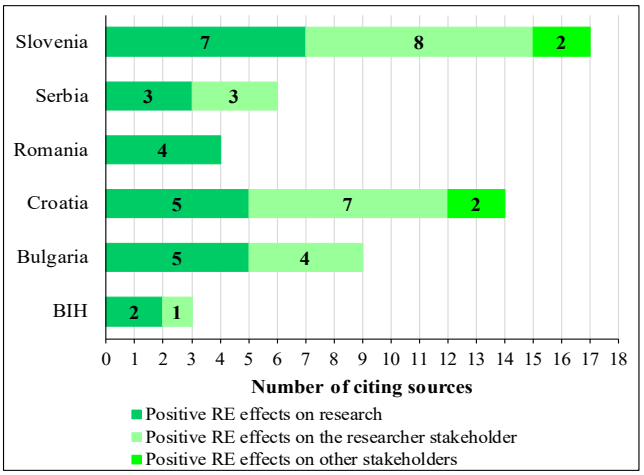
Positive RE effects on		(Number of) Sources[1]							Ranks
		BIH	Bulgaria	Croatia	Romania	Serbia	Slovenia	Total	
A.	**Researcher stakeholder (PERS)**	**1**	**4**	**7**		**3**	**8**	**23**	
A.1.	***Academic career***								
A.1.a	Greater interdisciplinarity of researchers						[22]	1	**7**
A.1.b	Greater involvement in research projects		[40]	[31]				2	**6**
A.1.c	Higher career internationality						[22]	1	**7**
A.1.d	Increased professional capacity and competitiveness		[40]	[31]				2	**6**
A.1.e	Successful career		[40]	[31]		[30]		3	**5**
A.2	***Behaviour regarding publication activity***								
A.2.a	Enhanced cooperation	[26]	[40]	[24], [32]		[30], [33]	[21], [25], [37]	9	**1**
A.2.b	Higher motivation to join high-performing teams			[19]				1	**7**
A.2.c	Striving to publish primarily in high-quality journals			[31]			[17], [20], [21]	4	**4**
B.	**Other stakeholders (PEOS)**			**2**			**2**	**4**	
B.1	***Funding agency***								
B.1.a	Improved model of funding			[19]				1	**7**
B.2	***Publisher***								
B.2.a	Greater number of indexed journals						[21]	1	**7**
B.3	***Scientific organization***								
B.3.a	Evidence-based conclusions			[24]				1	**7**
B.3.b	Stimulating publication activity						[21]	1	**7**
C.	**Research (PER)**	**2**	**5**	**5**	**4**	**3**	**7**	**26**	
C.1	***Research system***								
C.1.a	(Fair) Evaluation using bibliometrics and peer review				[35]		[20]	2	**6**
C.1.b	(Reliable) Evaluation system using bibliometrics						[21]	1	**7**
C.1.c	(Up-to-date) Evaluation using top research results		[29]	[19], [24]				3	**5**
C.1.d	Greater transparency of research results		[40]				[21]	2	**6**
C.1.e	Improved research information infrastructure			[24]				1	**7**
C.1.f	Increased number of international research projects		[40]					1	**7**
C.1.g	Increased number of PhDs obtained		[40]					1	**7**
C.2	***Scholarly publications***								
C.2.a	Increase in high-rank output	[26]			[35], [36]	[30]	[21]	5	**3**
C.2.b	No gender differences in publication activity			[23]		[34]		2	**6**
C.2.c	Substantial rise in the number of publications	[26]	[40]	[32]	[36]	[30]	[21], [22], [37]	8	**2**
D.	**All positive effects of RE (APE)**	**3**	**9**	**14**	**4**	**6**	**17**	**53**	

[1] *[ ] denotes the source number.*

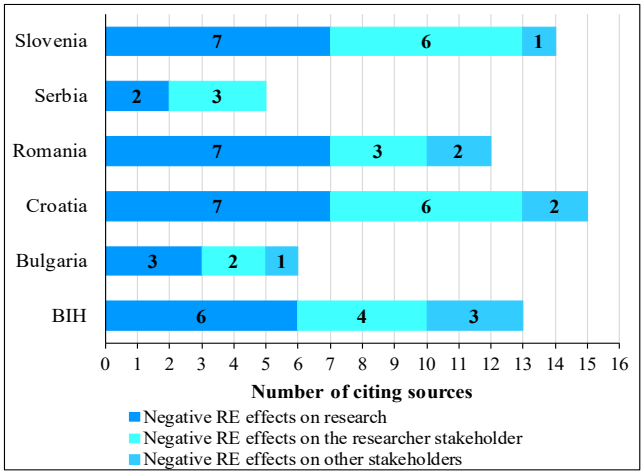
Table 3. Negative effects of RE on BPSCs

Negative RE effects on		(Number of) Sources[2]							Ranks
		BIH	Bulgaria	Croatia	Romania	Serbia	Slovenia	Total	
E.	**Researcher stakeholder (NERS)**	**4**	**2**	**6**	**3**	**3**	**6**	**24**	
E.1	***Ambience and well-being***								
E.1.a	Pressure to publish			[31]	[36]		[20], [22]	4	**3**
E.2	***Behaviour regarding publication activity***								
E.2.a	Authorship exchange and mutual citation clubs			[19]				1	**6**
E.2.b	Demotivation of top-performing researchers			[19]				1	**6**
E.2.c	Donated authorship	[27]		[23]			[39]	3	**4**
E.2.d	Fraud and misconduct				[35]			1	**6**
E.2.e	Gender inequalities in researchers' collaboration					[34]		1	**6**
E.2.f	Increase of self-citations					[30]		1	**6**
E.2.g	Plagiary	[26]						1	**6**
E.2.h	Reluctance to publish partial research results			[19]				1	**6**
E.2.i	Unethical behaviour					[30]	[37]	2	**5**
E.3	***Relations with the scientific organization***								
E.3.a	Unfair evaluation in some disciplines	[27], [28]	[29], [40]	[19]	[35]		[18], [37]	8	**1**
F.	**Other stakeholders (NEOS)**	**3**	**1**	**2**	**2**		**1**	**9**	
F.1	***Funding agency***								
F.1.a	Matthew effect			[23]				1	**6**
F.1.b	Unfair funding						[37]	1	**6**
F.2	***Publisher***								
F.2.a	Intolerance of journals in non-English language	[27], [28]	[29]					3	**4**
F.2.b	Pressure to be recognized by Scopus/WoS			[19]	[36]			2	**5**
F.3	***Scientific organization***								
F.3.a	Groundless management decisions	[41]						1	**6**
F.3.b	Homogeneity of HEIs' evaluations				[38]			1	**6**
G.	**Research (NER)**	**6**	**3**	**7**	**7**	**2**	**7**	**32**	
G.1	***Research system***								
G.1.a	Enormous number of scientists	[41]						1	**6**
G.1.b	Failure to stimulate or drop in research activity	[41]		[19]				2	**5**
G.1.c	Inefficiencies in evaluation metrics		[40]		[35]		[37]	3	**4**
G.1.d	Lack of international criteria for academic titles	[41]						1	**6**
G.1.e	Lack of transparency in evaluation				[35]			1	**6**
G.1.f	Low emphasis on research quality				[35], [36]			2	**5**
G.1.g	No impact on patents		[40]					1	**6**
G.1.h	Public controversies		[40]					1	**6**
G.2	***Scholarly publications***								
G.2.a	Altered types or locations of publishing			[31], [32]	[35], [36]	[30]	[17]	6	**2**
G.2.b	Decline in research quality	[28], [41]		[19]				3	**4**
G.2.c	Emphasis on core topics for mainstream journals				[35]		[21]	2	**5**
G.2.d	Narrowing views by stressing dominant views			[19]				1	**6**
G.2.e	Rise of authors per publication	[26]		[23], [32]		[30]	[17], [22], [25], [39]	8	**1**
H.	**All negative effects of RE (ANE)**	**13**	**6**	**15**	**12**	**5**	**14**	**65**	

[2] *[ ] denotes the source number and HEI denotes higher education institution.*

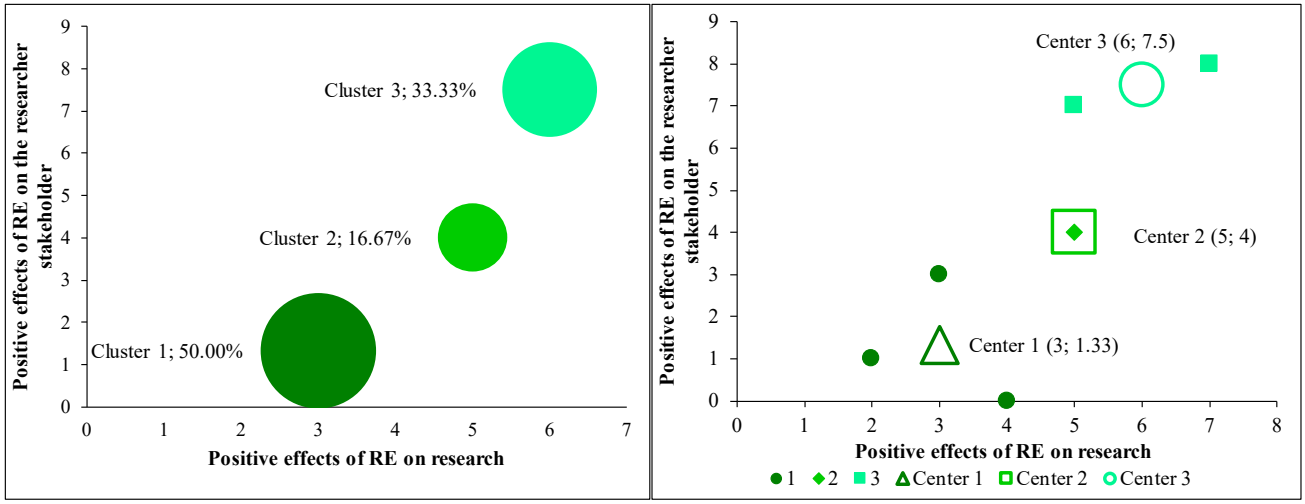


a) Positive RE effects



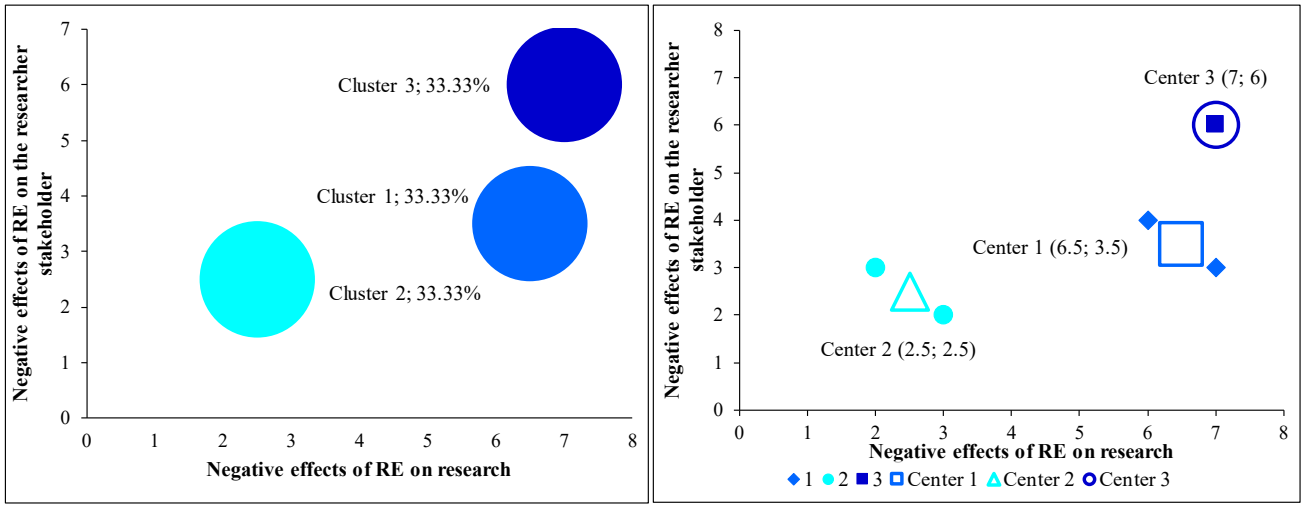
b) Negative RE effects

Figure 1. Effects of RE by BPSC and group



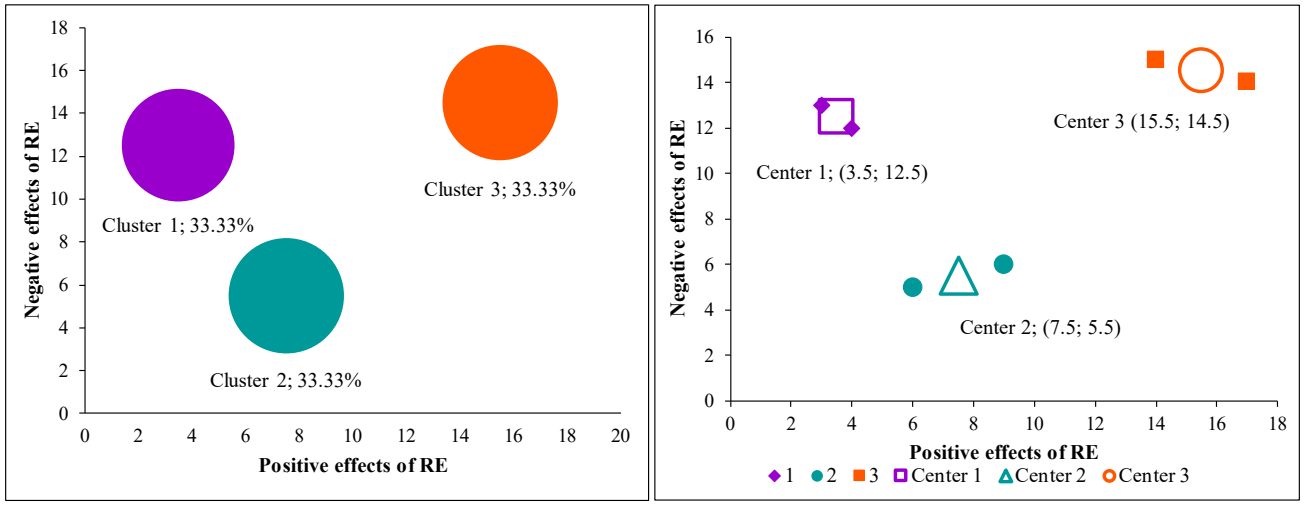
a) BPSCs positive map *b) Central means of the BPSCs positive map*

Figure 2. Clusters of BPSCs to the positive effects of RE



a) BPSCs negative map *b) Central means of the BPSCs negative map*

Figure 3. Clusters of BPSCs to the negative effects of RE



a) BPSCs map for all RE effects *b) Central means of the BPSCs map for all RE effects*

Figure 4. Clusters of BPSCs to all RE effects

Table 4. Cluster analysis results

Effects of RE/Indicator		Mean/Centroid of BPSCs clusters for RE effects on					SSE	Cluster content (BPSCs covered)		
		Stakeholder of the researcher	Other stakeholders	Rese-arch	All positive effects of RE	All negative effects of RE		Name	Num-ber	%
1	**Positive RE effects**	**PERS**	**PEOS**	**PER**			**9.17**		**6**	**100**
1.1	Cluster 1 (least positive)	1.33	0	3			6.67	BIH, Romania, Serbia	3	50
1.2	Cluster 2 (mid positive)	4	0	5			0	Bulgaria	1	16.67
1.3	Cluster 3 (most positive)	7.5	2	6			2.5	Croatia, Slovenia	2	33.33
1.4	Average (l. 1.1 to 1.3)	3.83	0.67	4.33						
2	**Negative RE effects**	**NERS**	**NEOS**	**NER**			**3.5**		**6**	**100**
2.1	Cluster 1 (mid negative)	3.5	2.5	6.5			1.5	BIH, Romania	2	33.33
2.2	Cluster 2 (least negative)	2.5	0.5	2.5			1.5	Bulgaria, Serbia	2	33.33
2.3	Cluster 3 (most negative)	6	1.5	7			0.5	Croatia, Slovenia	2	33.33
2.4	Average (l. 2.1 to 2.3)	4	1.5	5.33						
3	**All RE effects**				**APE**	**ANE**	**11**		**6**	**100**
3.1	Cluster 1 (least positive, mid negative)				3.5	12.5	1	BIH, Romania	2	33.33
3.2	Cluster 2 (mid positive, least negative)				7.5	5.5	5	Bulgaria, Serbia	2	33.33
3.3	Cluster 3 (most positive, most negative)				15.5	14.5	5	Croatia, Slovenia	2	33.33
3.4	Average (l. 3.1 to 3.3)				8.83	10.83				

Following their nature, the RE effects of the first two groups were subdivided. 2 subgroups were created for the research group: RE effects on the research system and scholarly publications. For the researcher group, 2 were the subgroups for the positive RE effects (on researcher's career and behaviour regarding publication activity, Table 2) and 3 for the negative RE effects (on researcher's ambience and well-being, behaviour regarding publication activity, and relations with the scientific organization, Table 3).

- Each RE effect was counted once per source.
- The effect rankings are based on their citation frequency in the sample (Total columns).
- The number of sources reporting RE effects by country and total is presented in the eponymous columns on summary lines A, B, C, D, E, F, G, and H. These are visualized in Figure 1.

2. On BPSCs' clusters (Figures 2, 3, 4, and Table 4):

- BPSCs were grouped 3 times: for the positive, the negative, and all effects RE effects. The content of the clusters is clarified in Table 4.
- BPSCs clustering is based on the RE effects of the 3 groups formed. Specifically, the variables used are 1. for the positive RE effects (Table 2) - PERS (l. A), PEOS (l. B), and PER (l. C); 2. for the negative RE effects (Table 3) - NERS (l. E), NEOS (l. F), and NER (l. G); 3. for all RE effects - APE (Table 2, l. D) and ANE (Table 3, l. H).
- Clustering visualizations for positive (Figure 2) and negative (Figure 3) RE effects refer to the two effect groups that most affect clustering.
- The summary SSE values of the three clustering types are presented in Table 4, lines 1, 2 and 3.

4. Discussion

Following the research questions, this section was arranged into four subsections.

4.1. RE Effects on BPSCs (Q1)

This study identified 22 positive RE effects on BPSCs (Table 2). They were grouped as follows: researcher - 8, research - 10, and other stakeholders - 4 (2 for the scientific organization and 1 for the publisher and funding agency each). The positive RE effects on BPSCs were cited 53 times in the sample. The citations (c.) were distributed as follows by group: 26 for the RE effects on research (Total column, l. C), 23 for those on the researcher (l. A), and 4 for those on other stakeholders (l. B). According to the summary results (l. D, Figure 1a), the Slovenian authors indicated the most positive RE effects - 17, and the authors from BIH the least - 3.

The negative RE effects on BPSC were 30 (Table 3). The largest group was formed by the negative RE effects on research (13), followed by those on the researcher (11). The least were the negative RE effects on other stakeholders (6). The total number of citations for negative RE effects on BPSCs was 65. Negative RE effects on research were the most cited (32, Total column, l. G). Citations for the eponymous RE effects on the researcher were 24 (l. E), and those for other stakeholders - 9 (l. F). The summary results (l. H and Figure 1b) showed that the Croatian authors pointed out the most negative RE effects - 15, and the Serbian authors the least - 5.

Response to Q1: Regarding their nature, the negative RE effects on BPSCs (30) found in the WoS & Scopus literature before April 2024 outnumbered the positive ones (22). It is assumed that these results are mainly due to the underdeveloped scientific systems of some BPSCs [33].

The most numerous negative and positive RE effects on BPSCs were those on research, and the fewest were those on the publisher and funding agency. The positive and negative RE effects on BPSCs uncovered here are tabulated in Tables 2 and 3. Regarding their citations, negative RE effects on BPSCs were cited more frequently (65) than positive ones (53). For both types of RE effects, the distribution of citations by group was analogous to that regarding the effect nature. Positive RE effects were cited most by Slovenian authors and least by those from BIH, while negative RE effects were cited most by Croatian authors and least by Serbian (Figure 1).

4.2. Dominant Effects of RE on BPSCs (Q2)

Here, the dominant effects of RE on BPSCs address effects ranked 1st to 3rd by their citation frequency in the sample used (Tables 2 and 3, Ranks columns). On this grasp, the *response to Q2* is as follows:

- Dominant positive RE effects on BPSCs (Table 2): Enhanced collaboration (9 c., l. A.2.a) was the most dominant positive RE effect on BPSCs (1st rank). The substantial rise in the publication number ranked 2nd (8 c., l. C.2.c) and the increase in high-rank output was 3rd (5 c., l. C.2.a).
- Dominant negative RE effects on BPSCs (Table 3): The most dominant negative RE effects on BPSCs (8 c.) were unfair evaluation in some disciplines and the rise of authors per publication (l. E.3.a and l. G.2.e). Altered types or locations of publishing ranked 2nd (6 c., l. G.2.a). Pressure on researchers to publish (4 c., l. E.1.a) was 3rd.

4.3. Specifics of the Effects of RE on BPSCs (Q3)

Specifics of RE effects on BPSCs were identified here based on their citation frequency in the sample. In this sense is my *response to Q3*:

➢ *For BIH:*

A. Only 3 positive RE effects (Figure 1a, Table 2, l. D) - least in the sample.
B. 13 negative RE effects (Figure 1b, Table 3, l. H) - an average score for the sample.
C. 4 negative RE effects unique to the sample (Table 3, l. E.2.g, F.3.a, G.1.d, G.1.a): plagiary, groundless management decisions, lack of international criteria for academic titles, an enormous number of scientists.

➢ *For Bulgaria:*

D. 9 positive RE effects - an average score for the sample.
E. 2 positive RE effects unique to the sample (Table 2, l. C.1.g and C.1.f): increased PhDs obtained and international research projects.
F. 6 negative RE effects - the 2nd least negative score in the sample.
G. 2 negative RE effects unique to the sample (Table 3, l. G.1.g and G.1.h): no impact on patents and public controversies.

➢ *For Croatia:*

H. 14 positive RE effects - the 2nd most positive score in the sample.
I. 4 positive RE effects unique to the sample (Table 2, l. C.1.e, B.3.a, B.1.a, A.2.b): improved research information infrastructure, evidence-based conclusions, improved model of funding, higher motivation to join high-performing teams.
J. 15 negative RE effects - the most negative score (1st) in the sample.
K. 5 negative effects RE unique to the sample (Table 3, l. G.2.d, F.1.a, E.2.h, E.2.b, E.2.a): narrowing views by stressing dominant views, Matthew effect, reluctance to publish partial results, demotivation of top researchers, authorship exchange and mutual citation clubs.

➢ *For Romania:*

L. 4 positive effects of RE - the 2nd least positive score in the sample.
M. 12 negative effects of RE - an average score for the sample.
N. 3 negative RE effects unique to the sample (Table 3, l. G.1.e, F.3.b, E.2.d): lack of transparency in evaluation, homogeneity of HEIs' evaluations, fraud and misconduct.

➢ *For Serbia:*

O. 6 positive RE effects - the 3rd least positive score in the sample.
P. 5 negative RE effects - least in the sample.
Q. 2 negative RE effects unique to the sample (Table 3, l. E.2.f, E.2.e): self-citation increase, gender inequalities in researchers' collaboration.

➢ *F. For Slovenia:*

R. 17 positive RE effects - the most positive score (1st) in the sample.
S. 5 positive RE effects unique to the sample (Table 2, l. C.1.b, B.3.b, B.2.a, A.1.a, A.1.c): (reliable) evaluation system using bibliometrics, stimulating publication activity, greater number of indexed journals, greater interdisciplinarity of researchers, higher career internationality.
T. 14 negative RE effects - the 2nd most negative score in the sample.
U. 1 negative RE effect unique to the sample (Table 3, l. F.1.b): unfair funding.

4.4. BPSCs Clustering to the Effects of RE (Q4)

This subsection presents the features of BPSCs 3-cluster maps (Table 4) to the positive (Figure 2), negative (Figure 3), and all RE effects (Figure 4). Clusters were titled following the nature and strength of RE effects on BPSCs in the respective clusters.

Features of the BPSCs positive map (Table 4, l. 1, Figure 2 and subsection 4.3):

- *Cluster 1*, titled 'least positive', covers the 3 BPSCs with the eponymous scores: BIH (4.3.A), Romania (4.3.L) and Serbia (4.3.O). Cluster 1 has the highest SSE (6.67) in this segmentation map, i.e. the largest deviations from the cluster centre (Figure 2b).
- *Cluster 2*, titled 'mid positive', covers Bulgaria, as it is the only BPSC with an average positive score (4.3.D). Logically, its SSE is 0 (Figure 2b).
- *Cluster 3*, titled 'most positive', consists of BPSCs with the highest scores for the positive RE effects - Slovenia (4.3.R) and Croatia (4.3.H). Cluster 3 SSE (2.5) is fairly low due to the close scores of these BPSCs (Figure 2b).
- The *SSE* of the BPSCs positive map is 9.17, an average but still high score across all 3 maps.

Features of the *BPSCs* negative map (Table 4, l. 2, Figure 3 and subsection 4.3):

- *Cluster 1*, titled 'mid negative', includes BPSCs with average negative scores - BIH (4.3.B) and Romania (4.3.M). Its SSE (1.5) is quite low (Figure 3b) for all 3 maps.
- *Cluster 2*, titled 'least negative', consists of Serbia (4.3.P) and Bulgaria (4.3.F) whose negative scores were the lowest. Cluster 2 has the same SSE (1.5) as Cluster 1 (Figure 3b).
- *Cluster 3*, titled 'most negative', covers the BPSCs with the most often cited negative RE effects - Croatia (4.3.J) and Slovenia (4.3.T). Because their negative scores are very close, Cluster 3 SSE (0.5) is the lowest, higher than 0, in all 3 maps (Figure 3b).
- The *SSE* of the BPSCs negative map is 3.5, the lowest value across all 3 maps in this study.

Features of the *BPSCs map for all RE effects* (Table 4, l. 3, Figure 4 and subsection 4.3):

- *Cluster 1*, titled 'least positive, mid negative', covers BPSCs achieving both scores simultaneously - BIH (4.3.A, 4.3.B) and Romania (4.3.L, 4.3.M). Cluster 1 SSE (1) is the lowest in this map (Figure 4b) and one of the lowest across all 3 maps.
- *Cluster 2*, titled 'mid positive, least negative', incorporates 2 BPSCs - Bulgaria and Serbia. Bulgaria achieves both scores of Cluster 2 title (4.3.D, 4.3.F). Logically, Serbia, which has one of the least negative results (4.3.P), is assigned to Cluster 2. However, Serbia's positive score is defined as mid-positive here despite 4.3.O in contrast to the BPSCs positive map. As a result, Cluster 2 SSE (5) goes high (Figure 4b).
- *Cluster 3*, titled 'most positive, most negative', consists of BPSCs achieving both eponymous scores - Croatia (4.3.H, 4.3.J) and Slovenia (4.3.R, 4.3.T). Cluster 3 SSE (5) is high, the same as Cluster 1 (Figure 4b).
- The *SSE* of the BPSCs map for all RE effects is 11, the highest across all three maps.

Response to Q4: In this study, 3 BPSCs 3-cluster maps were proposed based on RE effects on BPSCs (Table 4): maps of positive (Figure 2), negative (Figure 3), and all RE effects (Figure 4). The BPSCs maps of negative and all RE effects are the same, covering: Cluster 1 (titled in the second map 'least positive, mid negative') - BIH and Romania, Cluster 2 ('mid positive, least negative') - Bulgaria and Serbia, and Cluster 3 ('most positive, most negative') - Croatia and Slovenia. The BPSCs positive map differs only for Serbia, assigned here to Cluster 1 ('least positive'). Among the 3 BPSCs maps, the most precise (lowest SSE) is the negative map, and the most imprecise (highest SSE) is that of all RE effects. The results are consistent with the six countries' different development levels, given that education systems, including HE, are conservative with slow change [44]. The exception is Romania, whose results are surprising. Perhaps this can be explained in part by the limitations of this study.

5. Conclusion

This paper brought to light the effects of research evaluation on Balkan post-socialist countries. Stakeholder theory, WoS and Scopus systematic literature review, K-means cluster analysis, synthesis, analysis, and expert evaluation methods underpin it.

The major findings can be recapped as follows:

First, data on the RE effects on BPSCs were found for only 6 countries: BIH, Bulgaria, Croatia, Serbia, Romania and Slovenia.

Second, the negative RE effects on BPSCs (30) outnumbered the positive ones (22). Besides, the former were cited more (65) than the latter (53).

Third, the dominant (highly cited) positive RE effects on BPSCs were enhanced collaboration (1st rank), substantial rise in the publication number (2nd), and increase in high-rank output (3rd).

Fourth, the dominant negative RE effects on BPSCs were unfair evaluation in some disciplines and the rise of authors per publication (1st rank), altered types or locations of publishing (2nd), and pressure on researchers to publish (3rd).

Fifth, specifics of the RE effects on BPSCs based on the citation frequency of these effects are:

- Positive RE effects: least in number - BIH, few - Romania and Serbia, average - Bulgaria, many - Croatia, most - Slovenia;
- Negative RE effects: least - Serbia, few - Bulgaria, average - BIH and Romania, many - Slovenia, most - Croatia.

Sixth, three BPSCs 3-cluster maps were generated for the positive, negative, and all RE effects. The BPSCs positive map covers: BIH, Romania and Serbia in Cluster 1 (titled 'least positive'), Bulgaria in Cluster 2 ('mid positive'), and Slovenia and Croatia in Cluster 3 ('most positive'). The BPSCs maps for negative and all RE effects were the same. These include BIH and Romania in Cluster 1 (titled 'least positive, mid negative' in BPSCs map for all RE effects), Bulgaria and Serbia in Cluster 2 ('mid positive, least negative'), and Slovenia and Croatia in Cluster 3 ('most positive, most negative').

This study is not without limitations. The review protocol elements are its main limitations.

This article adds to the body of knowledge on the BPSCs' national specifics of academic governance regarding the effects of research evaluation. In terms of practice, this article provides a landmark for the status and opportunities for refining BPSCs research evaluation and, thus, HE governance policies and their control.

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References:

[1]. Owan, V. J., Agama, V. U., Odey, J. O., & Idika, D. O. (2024). Metrics in Research Impact Assessment and Grant Funding: Insights from Researchers in the "Reviewer 2 Must Be Stopped!" Facebook Group. *Journal of Applied Learning and Teaching*, *7*(1). Doi: 10.37074/jalt.2024.7.1.19.

[2]. Gadd, E. (2019). Influencing the Changing World of Research Evaluation. *Insights: The UKSG Journal*, *32*(1), 1–9. Doi: 10.1629/uksg.456

[3]. Tudy, R. A. (2023). The Journey of a Non-Native English Speaker towards Scopus Publication: An Autoethnography. *Recoletos Multidisciplinary Research Journal*, *11*(2), 97–106. Doi: 10.32871/rmrj2311.02.09

[4]. Angelova-Stanimirova, A. (2023). Academic Impact Factor according to the Scientific Database of Google Scholar. *KNOWLEDGE-International Journal*, *59*(1), 95–100.

[5]. Lambovska, M. R., & Raitskaya, L. K. (2022). High-Quality Publications in Russia: A Literature Review on How to Influence University Researchers. *Integration of Education*, *26*(2), 312–330. Doi: 10.15507/1991-9468.107.026.202202.312-330

[6]. Simeonova, E. (2023). When Hundredths Matter: Scaling and Calibrating Indicators in NEAA Criterion System. *Strategies for Policy in Science and Education*, *31*(4), 51–64. Doi:10.53656/str2023-4s-4-whe

[7]. Williams, K. (2022). What Counts: Making Sense of Metrics of Research Value. *Science and Public Policy*, *49*(3), 518–531. Doi: 10.1093/scipol/scac004

[8]. Alfirević, N., Pavičić, J., & Rendulić, D. (2023). A Bibliometric Analysis of Public Business School Scientific Productivity and Impact in South-East Europe (2017-2021). *South East European Journal of Economics and Business*, *18*(1), 27–45. Doi: 10.2478/jeb-2023-0003

[9]. Hladchenko, M., & Moed, H. F. (2021). The Effect of Publication Traditions and Requirements in Research Assessment and Funding Policies upon the Use of National Journals in 28 Post-Socialist Countries. *Journal of Informetrics*, *15*(4). Doi: 10.1016/j.joi.2021.101190

[10]. Raitskaya, L., & Tikhonova, E. (2019). Scoping reviews: What is in a Name? *Journal of Language and Education*, *5*(2), 4–9. Doi: 10.17323/jle.2019.9689

[11]. Page, M. J., McKenzie, J. E., Bossuyt *et al.* (2021). The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ*, *10*(1). Doi: 10.1186/s13643-021-01626-4

[12]. Nedyalkova, P. (2020). Quality of Internal Auditing in the Public Sector Perspectives from the Bulgarian and International Context. In *Contributions to Management Science*. Springer Nature. Doi: 10.1007/978-3-030-29329-1

[13]. Flipp, G. (2019). *Free Download of the Cluster Analysis Template.* Cluster Analysis 4 Marketing. Retrieved from: https://www.clusteranalysis4marketing.com//a-marketers-guide-to-cluster-analysis/free-download/ [accessed: 09 April 2024].

[14]. Manogaran, G., & Lopez, D. (2018). A Gaussian Process Based Big Data Processing Framework in Cluster Computing Environment. *Cluster Computing*, *21*(1), 189–204. Doi: 10.1007/s10586-017-0982-5

[15]. Fritz, M., Behringer, M., Tschechlov, D., & Schwarz, H. (2022). Efficient Exploratory Clustering Analyses in Large-Scale Exploration Processes. *VLDB Journal*, *31*(4), 711–732. Doi: 10.1007/s00778-021-00716-y

[16]. Chams, N., Guesmi, B., & Gil, J. M. (2023). The Nexus between Research Impact and Sustainability Assessment: From Stakeholders' Perspective. *Research Evaluation*, *32*(2), 484–495. Doi: 10.1093/reseval/rvad001

[17]. Bartol, T., & Stopar, K. (2004). Scientometric Assessment of Publishing Patterns of Agricultural Researchers in the Slovenian National Journals as Indexed by the National Online Bibliographic Database COBISS/COBIB. *Acta Agriculturae Slovenica, 83*(1), 191-204.

[18]. Bartol, T., Budimir, G., Juznic, P., & Stopar, K. (2016). Mapping and Classification of Agriculture in Web of Science: Other Subject Categories and Research Fields May Benefit. *Scientometrics, 109*(2), 979–996. Doi: 10.1007/s11192-016-2071-6

[19]. Ciurak, P., Mijač, T., & Wierczyński, G. (2021). An Overview of Science Evaluation in Poland and Croatia. *Management: Journal of Contemporary Management Issues*, *26*(2), 229–244. Doi: 10.30924/MJCMI.26.2.13

[20]. Curk, L. (2019). Implementation of the Evaluation of Researchers' Bibliographies in Slovenia. In *Procedia Computer Science*, *146,* 72–83. Doi: 10.1016/j.procs.2019.01.082

[21]. Demšar, F., & Južnič, P. (2014). Transparency of Research Policy and the Role of Librarians. *Journal of Librarianship and Information Science, 46*(2), 139-147. Doi: 10.1177/0961000613503002

[22]. Kastrin, A., Klisara, J., Lužar, B., & Povh, J. (2018). Is Science Driven by Principal Investigators? *Scientometrics, 117*(2), 1157–1182. Doi: 10.1007/s11192-018-2900-x

[23]. Letina, S., Zauder, K., & Jokić, M. (2012). The Productivity of Croatian Psychologists: A Scientometric Analysis of Network Cooperation on Works Indexed in the WOS Database from 1991 to 2010. *Suvremena Psihologija, 15*(1), 97–117.

[24]. Macan, B., & Petrak, J. (2019). The Current State and Future Perspectives of the Research Information Infrastructure in Croatia. *Journal of Information and Organizational Sciences, 43*(1), 15–31. Doi: 10.31341/jios.43.1.2

[25]. Mali, F., Kronegger, L., & Ferligoj, A. (2010). Co-Authorship Trends and Collaboration Patterns in the Slovenian Sociological Community. *Corvinus Journal of Sociology and Social Policy, 1*(2), 29–50. Doi: 10.14267/cjssp.2010.02.02

[26]. Masic, I., & Begic, E. (2015). Meta-Analysis as Statistical and Analytical Method of Journal's Content Scientific Evaluation. *Acta Informatica Medica, 23*(1), 4–11. Doi: 10.5455/aim.2015.23.4-11

[27]. Memisevic, H., Ajnadzic, N., & Memisevic, M. (2022). Measuring Scholarly Impact in Bosnia and Herzegovina: The Picture Beyond the Numbers. *Journal of Scientometric Research, 11*(1), 112–117. Doi: 10.5530/jscires.11.1.11

[28]. Memisevic, H., Pasalic, A., Mujkanovic, E., & Memisevic, M. (2019). In Search of a Silver Bullet: Evaluating Researchers' Performance in Bosnia and Herzegovina. *Journal of Scientometric Research, 8*(3), 125–130. Doi: 10.5530/JSCIRES.8.3.27

[29]. Milanova, M., Yavrukova, B., & Lozanova-Belcheva, E. (2020). The Impact of National Citation Indexes in the Research Evaluation Process: Development of Bulgarian Citation Index (Social Sciences). *Qualitative & Quantitative Methods in Libraries, 9*(3), 425–440.

[30]. Mitrović, I., Mišić, M., & Protić, J. (2023). Exploring High Scientific Productivity in International Co-Authorship of a Small Developing Country Based on Collaboration Patterns. *Journal of Big Data, 10*(1). Doi: 10.1186/s40537-023-00744-1

[31]. Pavlović, N. P. (2023). Publikacijske Prakse Autora iz Društvenog i Humanističkog Područja u Republici Hrvatskoj. *Vjesnik Bibliotekara Hrvatske, 66*(3), 27–60. Doi: 10.30754/vbh.66.3.1123

[32]. Pecaric, D., Bakovic, B., & Tudman, M. (2015). Characteristics of Scientific Production in Croatia from 1997 to 2014. *Qualitative & Quantitative Methods in Libraries*, *4*(2), 259–271.

[33]. Savić, M., Ivanović, M., & Dimić Surla, B. (2017). Analysis of Intra-Institutional Research Collaboration: A Case of a Serbian Faculty of Sciences. *Scientometrics, 110*(1), 195–216. Doi: 10.1007/s11192-016-2167-z

[34]. Savić, M., Ivanović, M., Radovanović, M., & Surla, B. D. (2018). Gender-Based Analysis of Intra-Institutional Research Productivity and Collaboration. *Fundamenta Informaticae, 162*(4), 237–258. Doi: 10.3233/FI-2018-1724

[35]. Spanache, I., Irimia, A., & Curaj, A. (2021). New Approaches in Research Assessment – From Bibliometrics to Goals-Oriented Approaches. The Case of Researchers' Assessment for Hiring and Career Development in Romania. *Europolity - Continuity and Change in European Governance, 15*(2), 185–220. Doi: 10.25019/europolity.2021.15.2.9

[36]. Tita, S. M., & Nestian, A. S. (2019). Comparative Analysis of Scientific Research Performance of Some Romanian Faculties of Economic Sciences. In *Proceedings of the 13-th International Management Conference: Management Strategies for High Performance* (Imc 2019), *13*(1), 357-366.

[37]. Tošic, A., & Vicic, J. (2021). Use of Benford's Law on Academic Publishing Networks. *Journal of Informetrics, 15*(3). Doi: 10.1016/j.joi.2021.101163

[38]. Vîiu, G. A., Păunescu, M., & Miroiu, A. (2016). Research-Driven Classification and Ranking in Higher Education: An Empirical Appraisal of a Romanian Policy Experience. *Scientometrics, 107*(2), 785–805. Doi: 10.1007/s11192-016-1860-2

[39]. Vilar, P., Juznic, P., & Bartol, T. (2015). Information Behaviour of Slovenian Researchers: Investigation of Activities, Preferences and Characteristics. *Information Research, 20*(2), 670.

[40]. Vutsova, A., Hristov, T., & Arabadzhieva, M. (2021). Impact Assessment of Research Evaluation in Bulgaria. *COLLNET Journal of Scientometrics and Information Management, 15*(2), 341–364. Doi: 10.1080/09737766.2021.1962767

[41]. Zerem, E., Kunosic, S., Imširovic, B., & Kurtcehajic, A. (2021). Science Metrics Systems and Academic Promotion: Bosnian Reality. *Psychiatria Danubina, 33*, 136–142.

[42]. Yousafzai, A. K., Sutanto, M. H., Khan, M. I., Baarimah, A. O., Mushtaha, A. W., & Khan, N. (2024). A Scientometric Analysis of Electrically Conductive Asphalt Concrete Technology. *2024 ASU International Conference in Emerging Technologies for Sustainability and Intelligent Systems (ICETSIS)*, 842–846. Doi:10.1109/ICETSIS61505.2024.10459656

[43]. Mikayilova, R., & Alekperov, R. (2022). Determination of the Level of Development of Commodity Markets by Segmentation of Economic Regions Based on the Theory of Fuzzy Sets. In *Intelligent and Fuzzy Techniques for Emerging Conditions and Digital Transformation: Proceedings of the INFUS 2021 Conference, held August 24-26, 2021, 1,* 121-128. Springer International Publishing. Doi: 10.1007/978-3-030-85626-7_15

[44]. Gkrimpizi, T., Peristeras, V., & Magnisalis, I. (2023). Classification of Barriers to Digital Transformation in Higher Education Institutions: Systematic Literature Review. *Education Sciences*, *13*(7). Doi: 10.3390/educsci13070746