

Negative Effects of Performance Based Funding of Universities: The Case of Slovakia

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Abstract

Although it is well-known that public-funded research has contributed to economic development, even these days it is not clear how to support this research effectively. Tailoring the proper support system still remains a challenge for the government. This is also the case for research support for universities, which are one of the main “engines” of public-funded research. One possible answer is performance-based funding. This funding has recently come to be increasingly used by many countries. However, performance-based funding may have several inconveniences. This article will analyze the performance-based funding that has already been introduced in the Slovak Republic. Our research outcomes prove the fact that this system has resulted in an increase in publication performance, but at the same time in a higher orientation on quantity instead of quality with several new negative effects.

Keywords:

Higher education, Universities, Performance-based funding, Slovakia

1. Introduction

These days the issue of funding public services and their effectiveness is becoming increasingly important. This trend also concerns the process of funding research and education at universities. University funding is a multi-source issue, both in terms of resources and the content. In terms of resources, their largest share comes from public resources. Within the European Union, this share ranges from 40 % in the UK to up to 90 % in Denmark and Norway (see EUA 2015). The way in which these public resources are reallocated among individual universities thus becomes an issue of high importance. There are a number of models in existence worldwide, and within these models, three are applied most frequently: firstly, re-financ-

ing through performance or historical indicators, secondly, through projects and thirdly, through negotiation of individual contracts. Performance-based funding is becoming commonly used predominantly at the level of support for universities that are the main bearers of these public services, especially in the area of support for Research and Development (see EUA 2015).

Examining the different effects of this funding method has been dealt with by several studies, identifying several advantages and disadvantages of this funding method. The main advantages lie mainly in its objectivity, clear criteria, low possibility of influencing results or low financial difficulty (Moed et al. 2002; Butler and McAllister 2009). The disadvantages of the study point to the impossibility of objectively assessing different types of research, the different publishing needs of individual disciplines, or the risk of homogenizing research (EUA 2015; Geuna and Martin 2003; Nederhof 2006; Norris and Oppenheim 2007). Several studies have confirmed that measuring the quality of the same outputs using expert judgment on the one hand or bibliographic evaluation on the other can lead to a significantly different quality assessment of these outputs (Bertocchi et al. 2015).

Since these systems have been introduced relatively recently, there are only few studies which directly identify the effects of performance-oriented funding. In their study of eight countries involved, Auranen and Nieminen (2010) highlight the positive impact of this funding, but on the other hand some exceptions show that this relationship may not be so clear. At the same time this also signifies that the specific circumstances are a key factor for the successful application of any system. Also Butler (2003) found mixed effects of performance-based funding in Australia.

So far there is no empirical data regarding the impact of performance-based funding on educational systems that are not among the best. Within these systems, science and education do not reach the level of those that are at the top, as they operate under different conditions in comparison to the countries with developed science. To respond to the higher demands, such systems may tend to look for alternative ways to enhance and improve the quality of science, and thus the introduction of performance funding might not bring the desired effects. An investigation that focuses on the process of operation under these conditions is of even higher importance since universities in the developed countries also respond and adapt their activities to the established system (Agasisti and Haelermans 2016). The radical introduction of performance-based funding in the Czech Republic might be taken as an example. In this country this funding has resulted in an increase in publications, but especially in those areas in which this system might be abused (monographs, domestic non-indexed journals), and consequently this led to significant discrepancies within particular research areas (Good et al. 2015). Pajić (2015) came to similar findings within the countries of Central and Eastern Europe. He pointed to a quantitative increase in publications, simultaneously with a decrease in their average citation, which is an indicator of their quality.

The aim of this article is to point out the impact of implementing performance funding within a country which is not among the leaders in research. We will focus on the process of applying performance-based funding to universities in the Slovak Republic. Since some significant elements of performance funding were introduced in 2011 in this country, it is possible to compare the changes involved. We will compare the development in research outcomes before and after the introduction of this form of funding, and this development will be consequently compared to the situation in Austria, as it is a neighboring country, but with a different funding system. We will also deal with interrelations of this system, as only little attention has been paid to them recently; these interrelations could be considered to be even more important than the choice of these instruments (Lepori 2007).

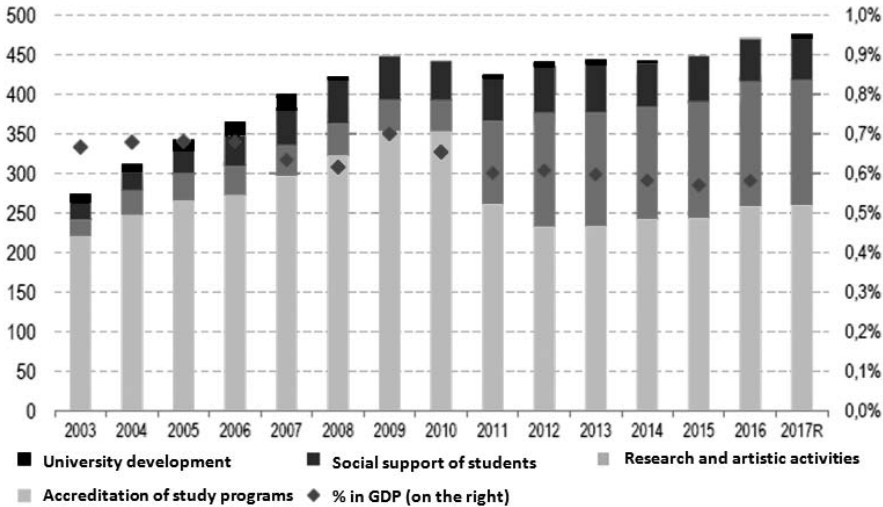
2. Performance-based funding in the Slovak Republic

Slovak universities are funded from public sources in several ways. In the first division, this is mainly the financing of education and science. With regard to the funding of education, the number of students is primarily taken into consideration, thus in relation to the budget the elements of performance funding are applied to a small extent (in recent years, the employability of students measured by their unemployment rate has also been taken into account, which might be understood as a component of performance funding). On the other hand, in the case of research, the main part of funding is based on performance indicators, and that is the reason why this aspect will be dealt with here. Research in Slovakia is currently funded in four basic ways: funding from the state budget, in accordance with the Ministry of Education, Science, Research and Sport of the SR (hereinafter referred to as the MŠVVaŠ SR); project funding through national and international grants; support from the Structural Funds and entrepreneurial activities; or from resources obtained in the framework of cooperation with the private sector. The key resources are those which are predominantly allocated by the Ministry of Education of the SR (under the sub-program 077012) on the basis of performance. Several performance indicators are defined in this program, within which publishing and project activities of universities are dominant (MŠVVaŠ SR 2016).

In Slovakia performance-based funding began to be used more frequently in the year 2011, when the method of calculating grants for universities was changed. By then, funds allocated to “accredited study programs” made up almost all of the financing, and this system was primarily dependent on the number of university students. This funding currently accounts for approximately a proportional share of total funding, together with research-based funding (Graph 1).

Graph 1

Direct subsidies to public higher-education institutions and their share of GDP (in EUR million) by region



Sources: Annual report on the conditions of higher education MŠVVaŠR SR, RVS, IFP

At present, the following parameters are applied to fund research (MŠVVaŠR SR 2015):

- results of the assessment related to the quality of the research activities of the higher-education institution according to the last complex accreditation (value 0.43),
- the share of the higher education institution in the amount of funds received in last two years for research activities within the framework of foreign grant schemes (value 0.10),
- the share of the higher education institution in the volume of funds (current transfers) acquired in last two years for research activities from public-administration bodies (excluding state programs), (value 0.09),
- the share of higher education institution in the volume of funds (current transfers) acquired in the last two years for research activities from entities other than public-administration bodies and from foreign entities (excluding grant schemes) (value 0.03),
- the share of the higher-education institution in the average number of postgraduate students in full-time doctoral studies after the dissertation examination in the last calendar year (value 0.10),

- f) the share of the higher-education institution in publishing activities with the use of scales for subsidies for scientific, research or artistic activities based on a point system (value 0.225), and
- g) the share of the higher-education institution in artistic creation according to the performance in these activities (value 0.025).

In the case of educational funding, 15 % of the resources are allocated on the basis of publication outputs, but these have a slightly different evaluating point system compared to research. A higher emphasis is placed on university textbooks and study materials that are totally ignored in the case of research funding.

Taking all the aforementioned into consideration, it is obvious that performance-based financing primarily focuses on gaining other public resources and publishing. This means that a large number of different outputs, with an emphasis on current indexed journals, is then evaluated within publication activities. Even the complex accreditation, which is of the highest scale, is largely based on performance parameters, although expert assessments also play a role. Our analysis will monitor the change in outputs related to publishing activities, which accounts for the highest share of this funding, and we will focus on publications issued in indexed journals. As this system of funding came into existence in 2011, we will monitor the development of this indicator before and after that year.

The second form of financing relates to project-oriented challenges that are available to all universities and other research entities. With regard to these, higher-education institutions have had opportunities to be involved in a number of the programs in order to support research and innovation. Among them are programs such as the grant national scheme (see MŠVVaŠ SR 2015), VEGA (Scientific grant agency) and APVV (Agency for research and development support). Specific resources of public funds, which are also based on project funding, include resources from EU Cohesion Policy. The primary objective of this policy is to support the development of less developed regions and to make use of local potential for their development. This support is implemented through several operational programs and, unlike state subsidies, is project-oriented (see MŠVVaŠ SR 2015). The overall distribution of resources, except for the Structural Funds, shows a high degree of correlation (see Table 1). Structural funds are exceptional since their primary objective is not related to support in accordance with performance.

On the other hand performance-based funding is based on the latest performance over a very short period. For example, according to the valid rulebook that concerns the allocation of financial sources to higher-education institutions in the Slovak Republic, the process of funding is always planned only for the period of one consecutive year. In reality this means that the budgets for higher-education institutions are not calculated at the beginning of the calendar year. Thus the total budgets for universities are very often approved only in March of the particular year. With

regard to this, the two previous years are assessed. All in all, this covers a very short time period within which the higher-education institutions have to perform well, and this situation may consequently result in the aforementioned problems in terms of the management of universities (EUA 2015).

Table 1
Correlation matrix of particular ways of financing universities

	Scopus	APVV	VEGA	EU funds	MŠVVaŠ
Scopus	1				
APVV	0.973303614	1			
VEGA	0.966656065	0.97452	1		
EU funds	0.87306506	0.869933	0.904693	1	
MŠ SR	0.976181142	0.979796	0.972195	0.890095	1

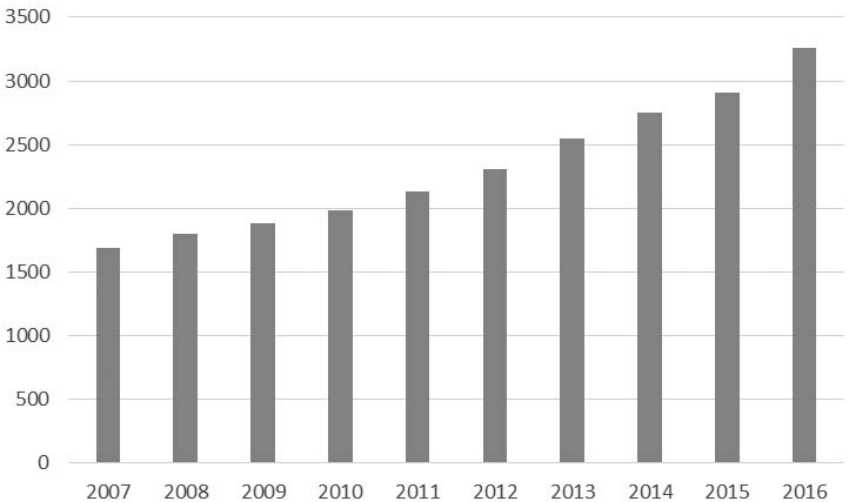
Source: Šipikal and Némethová (2016)

3. Changes in university performance

This part of the paper will analyze changes in outputs that occurred after the implementation of this system of funding. Scientific publications are considered to be a good indicator of the volume of research output (Moed et al. 2004, Hicks 2012). Therefore, this is the reason why we will compare the volume of scientific articles in the Scopus database in the period between the years 2008 and 2014, which includes three years before and three years after the change in the method of funding. The method of “Difference in Difference” will be applied to analyze performance in another country, namely Austria. Austria, unlike Slovakia, has implemented a model of funding that is based on performance agreements. These agreements are negotiated and concluded by higher-education institutions and public-administration bodies.

During the whole period, publishing activity increased significantly in Slovakia (for more details concerning the increase in published articles, see Graph 2). As the graph shows, in 2016 the total volume of published articles in the Web of Knowledge – Web of Science nearly doubled compared to the year 2007. This figure shows an extreme increase. The same trend can be seen in terms of articles registered in the Scopus database.

Graph 2
The volume of articles published in the Web of Knowledge – Web of Science database by Slovak public universities



Source: Own processing according to the Web of Knowledge – Web of Science database

Table 2 shows the distribution of this increase within particular categories as being recorded in the database. It can be seen that a significant increase was recorded primarily in the “Engineering” category, which includes mostly industrial research with a focus on the engineering industry in a broader sense. Humanities and social sciences represent the second largest group with a considerable increase. On the other hand, the smallest increase was recorded in the field of medical science. With regard to this field, the area of psychology even recorded a decline in outcomes within this period. From the point of view of performance-based financing, the fastest-growing category – “Multidisciplinary” – may attract the attention since a significant increase in this category was recorded only after the year 2011 (for more details, see Table 2). However, this category is mostly associated with journals of predator content that seek to cover as much scope as possible. This issue will be discussed in the following part of this paper.

Table 2

The most significant changes in performance in particular categories (articles in the Scopus database)

Category / field	Total change (2014/2008)	Change (2014/2011)	Change (2011/2008)
Multidisciplinary	471.24 %	347.36 %	135.71 %
Engineering	378.15 %	218.97 %	172.69 %
Business and Management	287.50 %	106.25 %	270.58 %
Social Science	257.85 %	184.61 %	139.66 %
Arts and Humanities	252.80 %	154.10 %	164.04 %
Computer Science	249.38 %	134.67 %	185.18 %

Source: Šipikal and Némethová 2017b, forthcoming

If we take the DiD method into consideration to evaluate this issue, it is obvious that the higher increase in publication was reached only after the implementation of a larger value which was given to performance-based financing. The overall increase between 2008 and 2011 was 15.80 %, compared to 25.23 % between 2011 and 2014. From this point of view, the introduction of performance-based funding could lead to an increase in the publishing activities of universities. To compare the change in the performance, we did the same analysis for Austria, which is a neighboring country, but with a different funding system based on individual university negotiations with the Ministry of Education. In accordance with this system, the budget is allocated on the basis of social needs of the state and the functions that are expected from the university (EUA 2015). Here, the opposite trend was recorded, as before 2013 the system of financing was still determined by performance indicators. When we consider the changes in Austria, a significant increase in publishing activities might be seen over that period. The overall increase in publishing activities within the period from 2008 to 2011 was 28.97 %, while in 2011–2014 this performance grew at a lower rate, i.e. 26.02 %, although the total value increased. However, this was growing faster than in Slovakia. Concerning the total figures, these differences are even greater, as the total publishing activity in Austria is 2.8 times higher. Table 3 shows this change with regard to DiD in total figures.

Despite the introduction of the performance-based funding, the result is a very comparable development of overall publishing activities in both countries. However, significant differences might be seen within individual areas. For example, in most areas of medicine the differences have become more significant while in parts of economic sciences and engineering these differences have become smaller.

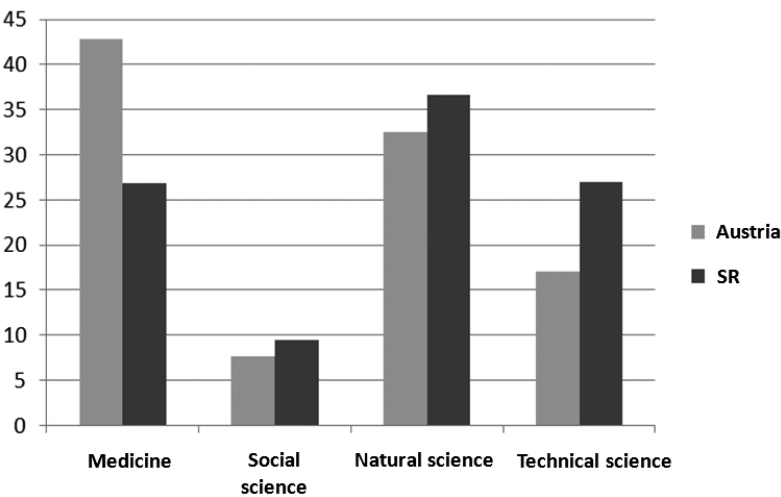
Some positive changes have occurred in the areas that are represented in a higher range in the particular country (Graph 3).

Table 3
Total changes in Austria and Slovakia (articles in the Scopus database)

	Change (2014/2011)	Change (2011/2008)	Change
SR	2021	1093	928
Austria	6268	5411	857
Difference	-4247	-4318	71

Source: Šipikal and Némethová 2017b, forthcoming

Graph 3
Share of particular categories in the total publication activities of the compared countries



Source: Own processing according to Scopus data

Therefore, the issue of supporting appropriate research specialization and highly professional centers seems to be of a higher importance than performance-based financing. While Austria was “lagging behind” in the field of medicine, which is relatively stronger in Austria than in Slovakia, publishing in areas which were typical of higher relative shares in Slovakia was becoming almost equal. If we summarize the performance change in the number of publication outputs, performance-

based financing led to an increase in the number of publications after its introduction. However, if we look at the whole system in more detail, we can identify some of the key factors that point to an adaptation to the university's research system rather than increasing the volume of quality scientific research.

4. Negative influences of a performance-based finance system

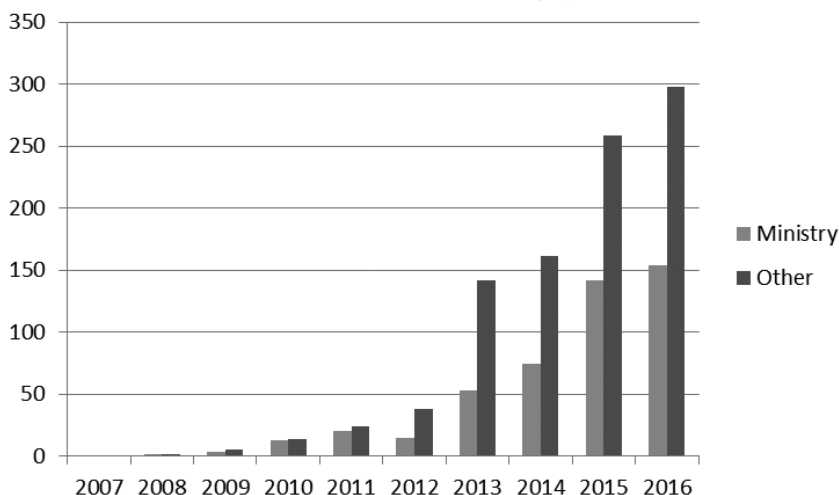
As we have already mentioned, universities tend to adapt to the system that was created. In our analysis, we focused on factors that could affect the aforementioned increase in publishing activity. One option is to create your own publishing platforms. As part of performance-based financing in the SR, the emphasis is placed on publications registered in the Scopus and Web of Knowledge – Web of Science databases. It should be noted here that these databases are a record of scientific journals that meet certain conditions, but they work on a commercial basis, and their role is not to primarily guard the quality of magazines. As a result, the number of magazines in the region of Central and Eastern Europe almost tripled over the period (Pajić 2015). For example, the number of journals registered in the Web of Knowledge – Web of Science or Scopus in economics has increased from 4 in 2000 to 17 in 2015 (Grančay et al. 2017).

Even as the number of journals has increased, there has been virtually no increase in the numbers of higher-level publications related due to performance-based funding. A large part of this increase comes from magazines published by the universities themselves, which is unusual in Western Europe. They often support each other.

Not only universities but also private publishers have responded to the importance of the databases as a quality control center, creating journals to be included in these databases. Thus they are able to publish lower-quality outputs for financial consideration. These types of journals are referred to as “predatory”. In the year 2016, the Ministry of Education identified these journals as a means to obtain funds. In the first step, the Ministry of Education of the SR made a comparatively narrow list of only 11 magazines which were labeled as predatory and were thus excluded from the system of funding. In Graph 4, we can see the number of articles in these journals, with a clear picture of their growth after the implementation of performance-based funding. Other authors (Vančo 2016; Grančay 2017) who have studied this issue have also seen a wider range of these journals. We have also analyzed the possible sources of these journals and expand this list to 6 other journals that also had predatory features. If we also include their output, the total number of articles in these journals has clearly expanded. In both cases, we see a rising trend, showing a gradual adaptation to the need to publish articles that are listed on these databases and to find ways to make this process easier. If we were to take 2011 as the basis, since that time, the number of publications has increased several-fold

and at a considerably faster rate than for all publications in the Scopus database. Overall, their share of publishing activity has changed from 1.5 % in 2011 to around 5 % in 2016. Before 2010, when there was no performance-based financing, publication in such magazines was practically non-existent. In an international comparison (Srholec and Macháček 2017), the Slovak Republic has the second worst results among countries in the OECD, albeit still less than developing countries. This increase is still partly eliminated by the fact that, in recent years, databases have also taken steps to reassess the inclusion of some journals, and a few have been expunged from the database (e.g. the *Mediterranean Journal of Social Sciences*). As such, the trend would be even stronger if such publications were still listed. An even larger range of such outputs can be seen among journals not included in the Scopus database and therefore not subject to at least some degree of quality control.

Graph 4
Number of articles in “predatory” journals



Source: Own computation from the Scopus database

It is not only in journals where universities are trying to improve performance. A very good example in this direction is the publication of foreign monographs, which is considered to be the highest category and twice as significant as a home monograph. Universities then simply publish substantially more monographs abroad, even though they are in the Slovak language and have the same characteristic as the domestic monograph. For example, in 2014 and 2015, out of 465 foreign monographs, 148 were in Slovak (about a third), which did not differ in qualitative terms from the half-rated home-based monographs (MŠVVaŠ SR 2016). Given that monographs issued by the universities themselves are often just a question of paying for editions of monographs, they dominate compared to publications in indexed

journals, which is again the phenomenon of Central and Eastern European countries. The authors thus just adapted their activity to the criteria and published the domestic monographs they would have published at home abroad.

The use of the aforementioned methods of budgeting means that it is not possible to predict the influence of a higher quality of publications on future financial allocations of the universities. The first reason is the fact that till the previous year all registered journals in these databases had the same share in the allocated financial resources. This year, for the first time, the numerical score of the Impact Factor of these journals is being applied by the creation of six categories, where a higher impact factor again leads to more resources for the university. The second reason was the very late and inconsistent allocation of financial resources, including the methodology of allocation itself. The methodology of the calculation has changed on an annual basis, with the change being made at a time when the financial allocations were already implemented (e.g. the system works in accordance to the 2016 methodology for allocation of 2017 finances, but using the account performances of 2014 and 2015).

This also greatly affects the way universities transfer these performance requirements to the scientists themselves. Given that the criteria for budget calculations and the performance-based financing system are not known in advance, universities face internal pressure to create systems within universities that are detrimental to higher quality but guarantee a large volume. As the governance of universities is elected and academically self-governing and, at the same time, subject to labor legislation that does not allow for retrospective performance assessment, universities must create their own ways of communicating performance to the scientists themselves.

One way is to specify the work responsibilities of individual employees. An example can be found with the University of Economics in Bratislava (EUBA 2016), which has a particular points requirement for employees in publishing activity (e.g. a professor has to reach 240 points), with each category of publishing activity having a score. In terms of gaining points, the quality of outputs within the different categories is not closely monitored in detail. In the end, quality is distinguished by the fact that there are two point categories for impacted journals (100 points if the IF is over 0.4 and 75 points if it is below 0.4). This also encourages individual employees to publish the highest possible number of outputs, regardless of their quality. Indications of such behavior can be seen, for example, in data on the average impact of magazines in which the Slovak scientists published in the field of economics (and apart from magazines within the CEE). Under the old regime, the averages improved from 0.365 in 2000 and 0.479 in 2005 to 1.137 in 2010. After the introduction of performance funding, this average fell to 0.817 in 2014 (Grňačay et al. 2017). As an example from the University of Economics, we can see how the evaluation of the outputs of conferences has changed with the new funding scheme.

Prior to performance funding, conferences served as an interface to the article in the reviewed journal. Performance-based funding has introduced financial evaluation for the conferences themselves but does not distinguish between conferences and their financial value, as they are the same. However, the University of Economics has increased points for conferences where the proceedings are registered in the Web of Knowledge – Web of Science databases. In Table 4 we can see how this has led to the adaptation of research activities.

Table 4
Participation in conferences by Economic University staff in Bratislava

	2010	2011	2012	2013	2014	2015
All conferences	1,449	1,128	1,225	1,313	1,128	999
Conferences in Web of Knowledge – Web of Science	91	63	126	162	317	343
Ratio of Web of Knowledge – Web of Science conferences	6.28	5.59	10.29	12.34	28.10	34.33

Source: Own evaluation of data according to the Economic University of Bratislava's annual Reports on science and research and EUBA library records

The share of conference attendances has had a significant increase in the Web of Science, but at the same time attendance at conferences dropped overall. From a budget point of view, this step has had a negative effect on funding. At the same time, it has restricted participation in conferences that have no direct record in a database, which is usually the best means for getting comments, while the publication itself is only the realized form of a scientific article. These examples show that scientists are also greatly adapting their outcomes to set rules, thus incorrectly using the performance indicators as a greater way to maximize the effectiveness of this performance-based funding system.

The number of articles in conference proceedings has increased, especially in lower-performing universities. At Comenius University, which is considered to be the best university in Slovakia, the number of proceedings has increased from 149 in 2007 to 173 in 2014, an increase of only 24 %, while in 2013 the conference proceedings were less than in 2007. Still, compared to the number of articles in the database (884 in 2014), proceedings amounted to less than 20 %. On the other hand, at some universities, especially at lower-performing ones, these ratios have been strongly reversed. For example, UKF Nitra had 3 proceedings and 21 journal articles in 2007 as opposed to 90 articles in magazines and 99 in collections in 2015. The most significant change was at the University of Žilina, which had 34 articles in journals and 49 in proceedings in 2007 and 88 in journals and 495 in proceedings in 2014, so the ratio was more than five times.

A similar effect can be seen in the increase in citations, even though they are not yet directly linked to performance financing. They have a primary impact on the career-growth potential. This is where the countries of Central and Eastern Europe are creating citation circles (Teodorescu and Andrei 2014). To identify these impacts, we analyzed quotes from one of the faculties of the University of Economics – the Faculty of Business Management. Table 5 shows the development of citation numbers of the scientific work of faculty members registered in Scopus or Web of Knowledge – Web of Science databases. As we can see from the table, the number of citations has a growing trend. In 2007, the work of faculty members was cited only 8 times, in 2015 it was 270 times, which represents a huge increase.

Significant increases have started especially after applying performance-oriented evaluations of study programs when the number of citations began to play a role in their accreditation process. However, the number of citations does not yet enter universities' funding directly, even though there have been considerations to include this factor directly into funding, but affects the careers of individuals. However, this citation trend also points to the risks of purely performance-based evaluation. As shown in our example, while in 2007 there were only 8 citations, all were in impact journals and more than 50 % of them from abroad. In 2015, however, only 10 % of all citations were from abroad, although their absolute number was higher than in 2007 – 29 citations, but it was still only a fraction of the total number of citations in that year. The increased record of the proceedings also led to a significant increase in citations, with 86 % of all Slovak citations representing citations from conference proceedings, with more than 50 % of all citations coming from the authors' own faculty. Another example of the unnatural tendencies of the citation circles is the year 2010, which is beyond the standard step-by-step increase of citations as well as the transfer of quotations to the proceedings. The reason is the organization of the faculty's own conference in 2010, which was included in the Web of Knowledge – Web of Science databases and which led to publications for a large part of the faculty. The resulting 80 citations from among the faculty members represented more than 75 % of all citations of the faculty's scientific works in that year. It is clear from the table that although the changes in the system had a positive effect on citations, a very significant part of it were artificially elevated citation numbers through the proceedings and citations of colleagues.

5. Discussion

Based on the above findings, it is possible to define a few policy recommendations. We showed that performance-based funding in a system that is noncompetitive or performs at a lower level could bring very mixed results. This is in line with some other studies for Central and Eastern European countries (e.g. Nemec 2010, Good

Table 5
Citation development at Faculty of Business Management

	Total citations	From abroad	% from abroad	From Slovakia	From proceedings	% from proceedings	From own faculty	% from own faculty
2007	8	4	50	4	0	0	0	0
2008	20	2	10	18	6	33.33	4	20
2009	26	4	15.38	22	7	31.82	7	26.92
2010	111	12	10.81	99	89	89.9	84	75.68
2011	40	14	35	26	14	53.85	9	22.5
2012	69	14	20.29	55	44	80	31	44.93
2013	82	8	9.76	74	58	78.38	28	34.15
2014	128	26	20.31	102	89	87.25	66	51.56
2015	270	29	10.74	241	208	86.31	141	52.22

Source: Own evaluation of data according to the Economic University of Bratislava's annual Reports on science and research as well as EUBA library records

et al. 2015, Grančay et al. 2017), so it is very important to pay a lot of attention to the proper design and implementation of this type of funding.

With a policy-based financing scheme itself, it is important to correctly set the ratios among different kinds of outputs. If such funding has to lead to excellent research, excellent performance (publications) should be evaluated much higher, otherwise universities will try to replace it with a larger number of less important publications. As shown by the study of Sýkora (2015), the Slovak system is set up to support a certain amount of this substitution. It is a very complicated system with over 50 different publication categories, and the improper ratio between them led to an orientation towards quantity instead of quality.

The interaction with other national or transnational policies may also influence the effectiveness and efficiency of performance-based financing. In the case of the Slovak Republic, this is mainly the issue of supporting Cohesion Policy funding. As we have already shown in the analysis, the distribution of these resources is different from performance-driven resources, partly negating the primary goal of performance-based financing that promotes what is most effective (Šipikal and Némethová 2017). This is still supported by a large volume of resources, which accounted for nearly 20 % of the total funding allocation for universities in 2007–2013 (Šipikal and Némethová 2017). As a result, universities replace the lack of finance from performance-based funding with cohesion funds. For a successful performance-based policy it is necessary not to allow other policies to influence the intention of this policy to reward excellence.

It is also necessary to permanently evaluate the whole system to eliminate negative tendencies that attempt to undermine the intent of the whole system. For example, in the case of Slovakia, the tendencies to create own journals or to publish in predatory journals have to be eliminated. In other words, some external peer-review processes within performance-based funding could improve the effectiveness of this system, as indicated also by other studies (Moed 2007).

6. Conclusion

The number of cases where the state uses university performance-based funding for decisions about operations is increasing more and more. However, this funding also has its own risks, which can lead to negative effects. In this paper, we have attempted to analyze empirically what the impact of this funding method should be in order to strengthen publication outputs in the Slovak Republic.

In recent years there has been a significant increase in the publishing activity of universities in the Slovak Republic. For the reference period from 2008 to 2014, the total amount of output increased by more than 30 %. However, this increase is comparable to the higher performance in Austria, which does not use this type of funding. This, in turn, points to important factors other than funding.

We have pointed out some factors that lead to negative tendencies caused by the introduction of performance-based financing. This is in particular true with efforts to create one's own magazines, publishing in predatory journals and bad timing of the whole model, leading to impossibilities of adjusting performances in advance. These aspects lead to a tendency not to increase real-world performance but rather favoring easier ways of achieving the necessary outcomes to secure higher-education funding. In order to better understand the impact of performance-based funding, it would also be necessary to analyze its impact on lower levels than universities themselves, especially in the case of a dissimilar distribution system (Abramo et al. 2011).

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