**26th RSEP** International Conference on Economics, Finance & Business
22-23 August 2022, Nippon Hotel, Istanbul, Türkiye

**www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022**

*Nemethova, V. pp.1-8*

# Evaluation of Public Support for Universities. Factors Influencing the Success of Research Projects in Slovakia

**Valeria Nemethova**[a]
[a] *Assist. Prof., Department of Public Administration and Regional Development, Faculty of National Economy, University of Economics in Bratislava, Slovakia*
*E-mail: valeria.nemethova@euba.sk*

**DOI:** https://doi.org/10.19275/RSEPCONFERENCES185

## Abstract

University research projects are extremely important, because only quality universities and their employees can produce quality outputs. At the same time, high-quality scientific outputs produce knowledge that increases competitiveness. The main goal is to evaluate the university research support at universities in Slovak Republic. We set three sub-objectives: to analyze the distribution of VEGA projects in individual scientific disciplines in the period from 2008 to 2022, to analyze the development of publications in VEGA projects in the period from 2005 to 2016, to identify the factors influencing publications in VEGA projects. The research was primarily focused on the analysis of grant applications for individual VEGA commissions. We identified the factors that influence the quality and lower quality publications of supported academics at universities in Slovakia. Through regression analyzes, we found that the statistically significant variables are: number of years of the project, academic career of the project leader, region in which the supported university is located, initial evaluation of the project proposal and gender of the project leader.

**Keywords:** public support, grant, evaluation, publications

**Jel Codes:** I2, I28

## 1. Introduction

Universities are an integral part of education, which have an important key role in this system. We divide their mission into an educational function, knowledge creation function, and recently there is more and more talk about the supporting development role of universities. In this presented article, we focus on the function of knowledge creation within the analysis of university scientific projects. Universities have several options for supporting research and development at their institutions. Various grants from national, transnational and international sources are used for this. We can expect different results from small grants compared to large-scale projects that require the international cooperation of several institutions. The main output of research and development at universities is intellectual property in the form of publications, patents, and other forms of inventions. In the presented article, the main object of research will be the results of smaller research grants in the form of publications that come from national sources in the Slovak Republic particularly from the Scientific Grant Agency (VEGA). The main goal is to evaluate the support of universities in the conditions of the Slovak Republic. The main research question is which factors influence the results of solved projects at universities, or what characteristics depend on the quantity and quality of the published outputs of these scientific projects.

## 2. Literature Review

Universities can be supported in a number of ways and these support resources can come from a number of sources. This is a lot of spent public as well as private financial and non-financial resources, while it is important that these resources have to be used as efficiently and effectively as possible. It should also be important that the implemented support programs and projects bring the desired effects and meet the predetermined goals. Due to these facts, various evaluation studies are done (Good et. Al. 2001). Also, there are various quantitative and qualitative methods that are used to measure these effects (Khandker et al., 2010). These studies also differ in which role of the university we evaluate. Because individual support projects can differ in whether they support education (Karlsson, 2014) or whether they are research (Auranen and Nieminen, 2010; Hicks 2012;, Hall 2002; Jacob and Lefgren 2011) or development projects. On the other hand, the success of these projects can be influenced by many factors (Godin, 2003; Ebadi and Schiffauerova, 2016). The amount of the grant itself is a decisive factor. Or, for example, international cooperation in projects can be a key characteristic (Lee and Bozeman, 2005). Different results are also achieved in individual scientific disciplines (Lissoni et al., 2011; Tahmooresnejad et al, 2015;

**www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022**



Vanecek, 2013). This may also depend on the specifics of support policy in individual states and international differences (Millar and Senker, 2000; Geuna and Martin, 2013, Vanecek 2013).

## 3. Data & Methodology

In this part of the presented article, we identify the methodology of the research, namely the method of data collection and the methods used in their processing. The subject of the research are projects that were financed from the grant schemes of the Scientific Grant Agency. The main goal is to evaluate the university research support at universities in Slovak Republic. We set three sub-objectives: to analyze the distribution of VEGA projects in individual scientific disciplines in the period from 2008 to 2022, to analyze the development of publications in VEGA projects in the period from 2005 to 2016, to identify the factors influencing publications in VEGA projects. The research focuses on various scientific fields, but for the regression analysis we selected only economic sciences. The research therefore focuses on comparing the publication activity of university researchers, and at the same time on identifying factors that influence project results, for this we used regression analysis.The main research question is which factors influence the results of solved projects at universities, or what characteristics depend on the quantity and quality of the published outputs of these scientific projects.

### *3.1. Data Collection and Descriptive Statistics*

As part of the data, we analyzed 10,845 projects that were supported by VEGA projects in the examined period 2008-2022. These were projects that were implemented at both public and private universities. From these projects, we subsequently selected a sample of 920 projects, which we subjected to analysis. The data were obtained from the lists of VEGA projects for the years 2008-2022, namely in the following scientific fields: humanities, medical sciences, agricultural sciences, natural sciences, social sciences, technical sciences. In the research, we present information about the basic researched set in the following breakdown: number of supported and unsupported projects, academic rank of the researcher (assistant, associate professor, professor), university, location of the university according to the NUTS2 classification (Bratislava region, western, eastern, central Slovakia) , gender of the main researcher (male/female), number of projects that were started in a specific year (2008-2022), VEGA evaluation commissions (number and name of the commission and number of projects that the given commission evaluated). The following table shows the observations, mean values, standard deviation, minimum and maximum values. Our analyzed variables will be the high quality, low quality publications , total number of publictions and their relative abundances. We have 625 observations and 20 indicators, while for some models we selected projects, and some we had to remove for further analyses.

The average value of the number of years of project duration is 1.89 years. In the analyze group, there are 48% men as project team leaders, 27% professors, 42% associated, 30% assistant professors. There are 47% of projects in the Bratislava Region, 15% in Western Slovakia, 22% in Central Slovakia and 17% in Eastern Slovakia. The average converted point value is 85.20 points for project proposal. The average allocated subsidy is 707.52 euros. On average, there are 1.38 significant publications within one project, 24.87 lower quality, and 26.25 publications in total. The average percentage of the best publications is 7.2%. The average percentage of worse publications is 92.8%. The average accreditation coefficient representing the quality of best faculties is 30%. The minimum number of years of project duration is one year, the maximum is three years. The minimum recalculated point rating is 50 points, the maximum is 98.78 points. The maximum allocated subsidy is 18,031 euros. The maximum number of high quality publications is 20.7 publications, the minimum is zero. The maximum number of lower quality publications is 154, the minimum is zero. The maximum number of publications in total is 169, the minimum is 7.

www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022



**Table 1.** Descriptive statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Project_years | 625 | 1.885 | .496 | 1 | 3 |
| Gender_Leader | 625 | .475 | .5 | 0 | 1 |
| prof. | 625 | .272 | .445 | 0 | 1 |
| Assoc. | 625 | .424 | .495 | 0 | 1 |
| Assist | 625 | .304 | .46 | 0 | 1 |
| Capital region | 625 | .466 | .499 | 0 | 1 |
| West region | 625 | .149 | .356 | 0 | 1 |
| Middle region | 625 | .218 | .413 | 0 | 1 |
| East region | 625 | .166 | .373 | 0 | 1 |
| Proposal rating | 625 | 85.203 | 8.489 | 50 | 98.78 |
| Funding | 624 | 707.516 | 2399.939 | 0 | 18031 |
| High Q Public | 625 | 1.378 | 2.478 | 0 | 20.7 |
| Low Q Public | 625 | 24.874 | 19.911 | 0 | 154 |
| Faculty Quality | 535 | .303 | .46 | 0 | 1 |

**Source:** own elaboration

*3.2. Regression models*

The methodology for investigating the impact of factors affecting publications in projects consists of a regression analysis, where we compiled 3 regression models:

reg High QPublic= f(Project_years + Gender_Leader + prof + Assoc. + Capital region + West region + Proposal rating + Faculty Quality) + ε (Model 1)

reg High QPublic= f(Project_years + Gender_Leader + prof + Assoc. + Capital region + East region + Proposal rating + Faculty Quality) + ε (Model 2)

reg High QPublic= f(Project_years + P Gender_Leader + prof + Assoc. + Capital region +West region + Middle region + Proposal rating + Faculty Quality) + ε (Model 3)

**4. Research results**

In this section, we present the results of the evaluation of university support. The first sub-goal was to analyze the projects of the Science Grant Agency in the examined years in individual scientific disciplines. The agency distinguishes 13 scientific fields in which individual commissions assess submitted grant applications. These scientific fields are: Commission 1 for mathematical sciences, computer and information sciences and physical sciences, Commission 2 for Earth and space sciences, environmental sciences (also earth resources), Commission VEGA no. 3 for chemical sciences, chemical engineering and biotechnology, VEGA Commission no. 4 for biological sciences, VEGA Commission no. 5 for electrical engineering, automation and control systems and related fields of information and communication technologies, VEGA Commission no. 6 for civil engineering (construction, transport and geodesy) and environmental engineering, including mining, metallurgy and water management sciences, VEGA Commission no. 7 for mechanical engineering and related fields of information and communication technologies and materials engineering, Commission VEGA no. 8 for agricultural, veterinary and wood sciences, Commission VEGA no. 9 for medical sciences and pharmaceutical sciences, VEGA Commission no. 10 for historical and social sciences (philosophy, sociology, political science, theology), Commission VEGA no. 11 for human sciences (psychology, pedagogy, sports sciences), VEGA Commission no. 12 for sciences of art, aesthetics and linguistics, VEGA Commission no. 13 for economic and legal sciences. As shown in the figure

www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022



1below, we found that out of the total set of 10,845 project applications, the most applications were in committee number 13 - economics and law (14.48%) and 9 - medicine and pharmacy (13.07%). the least, on the contrary, in the commission number 3 was chemistry and biotechnology (4.27%) and 1 – mathematics, physics and ICT (4.67%). The results for the indicated indicator are processed in Figure 1.

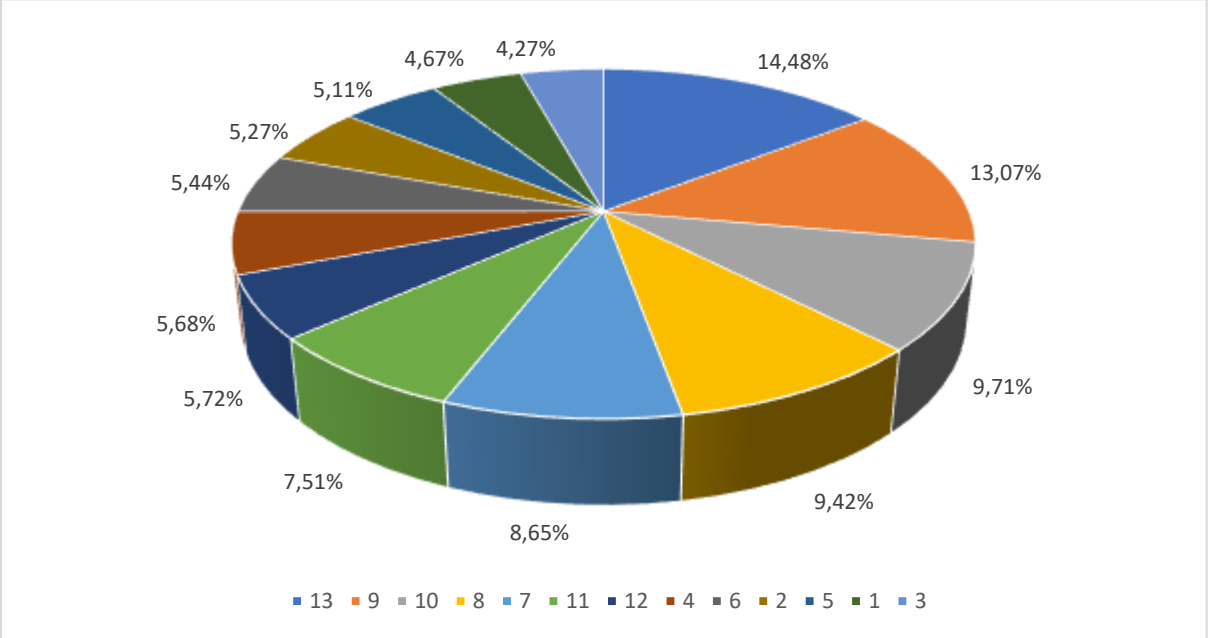


**Figure 1.** Project distribution according to scientific disciplines

**Source:** Own elaboration, Scientific Grant Agency data

Regarding the second partial aim of the presented article, we analyzed the outputs of the projects of the Scientific Grant Agency in terms of publications in years 2008 to 2016. High quality publications were defined as scientific works published in journals and proceedings registered in Scopus and Web of Science Databases. We found that there were more lower quality publications (94.75%) than high quality publications (5.25%).

**Table 2.** Number of Publications in SGA projects

| Year | High Quality Publications | Low Quality Publications | Total Number of Publications |
|---|---|---|---|
| 2008 | 30 | 2694,2 | 2724,2 |
| 2009 | 35 | 640 | 675 |
| 2010 | 20 | 1175,5 | 1195,5 |
| 2011 | 33,4 | 2035,9 | 2069,3 |
| 2012 | 83,2 | 2391,6 | 2474,8 |
| 2013 | 101 | 1681,5 | 1782,5 |
| 2014 | 134,7 | 2122,3 | 2257 |
| 2015 | 175,2 | 1631,1 | 1806,3 |
| 2016 | 248,6 | 1174,3 | 1422,9 |
| Total | 861,1 | 15546,4 | 16407,5 |

**Source:** Own elaboration, Scientific Grant Agency data

**www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022**



In this part of the presented article, we present the results of the regression analyzes of the three investigated empirical models. In the first model, we examined eight factors, four of which were statistically significant. The dependent variable in the first model is high quality publications. The factor number of years of project duration was statistically significant with a positive coefficient. The gender factor was statistically significant with a positive coefficient. The Bratislava Region factor was statistically significant with a negative coefficient. The recalculated point evaluation (proposal rating) factor was statistically significant with a positive coefficient. Four of the eight examined variables are statistically significant. The associate professor also moves around the statistics of the significant level of the variable. If the number of years of the project duration is higher, there are more significant publications. If the head of the research team is a man, the number of significant publications is higher. If the project is from the Bratislava region, the number of important publications is lower. If the recalculated point rating is higher, the number of significant publications is also higher. If the head of the research team is an associate professor, the number of publications is higher.

**Table 3.** Regression Results Model 1

| High Q Public | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| Project years | .611 | .229 | 2.67 | .008 | .162 | 1.061 | *** |
| Gender Leader | .429 | .213 | 2.01 | .045 | .01 | .848 | ** |
| prof. | -.163 | .287 | -0.57 | .57 | -.727 | .401 | |
| Assoc | .499 | .255 | 1.96 | .051 | -.001 | 1 | * |
| Capital region | -1.369 | .226 | -6.07 | 0 | -1.813 | -.926 | *** |
| West Region | -.443 | .341 | -1.30 | .195 | -1.113 | .227 | |
| Proposal Rating | .077 | .013 | 6.17 | 0 | .053 | .102 | *** |
| Faculty Quality | -.284 | .233 | -1.22 | .224 | -.742 | .175 | |
| Constant | -5.851 | 1.126 | -5.20 | 0 | -8.063 | -3.639 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 1.487 | SD dependent var | 2.611 |
| R-squared | 0.165 | Number of obs | 535 |
| F-test | 12.946 | Prob > F | 0.000 |
| Akaike crit. (AIC) | 2465.907 | Bayesian crit. (BIC) | 2504.448 |

**** p<.01, ** p<.05, * p<.1*

**Source:** Own elaboration

In the second model, we examined eight factors, five of which were statistically significant. The dependent variable in the second model is high quality publications. The factor number of years of project duration was statistically significant with a positive coefficient. The "associate" factor was statistically significant with a positive coefficient. The Bratislava Region factor was statistically significant with a negative coefficient. The Eastern Slovakia factor was statistically significant with a positive coefficient. The recalculated point evaluation factor was statistically significant with a positive coefficient. Five out of eight variables are statistically significant. If the number of years of project duration is higher, the number of important publications is also higher. If the head of the research team is an associate professor, the number of important publications is higher. If the project is from the Bratislava region, the number of significant publications is lower. If the project is from Eastern Slovakia, the number of important publications is higher. If the recalculated point rating is higher, the number of high quality publications is also higher.

**www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022**



**Table 4.** Regression Results Model 2

| High Q public | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| Project Years | .846 | .221 | 3.83 | 0 | .412 | 1.281 | *** |
| Gender Leader | .268 | .205 | 1.31 | .19 | -.134 | .67 | |
| prof. | -.07 | .275 | -0.25 | .799 | -.609 | .47 | |
| Assoc | .574 | .244 | 2.35 | .019 | .095 | 1.052 | ** |
| Capital Region | -.63 | .222 | -2.84 | .005 | -1.066 | -.193 | *** |
| East Region | 2.163 | .301 | 7.20 | 0 | 1.572 | 2.753 | *** |
| Project Proposal | .081 | .012 | 6.71 | 0 | .057 | .104 | *** |
| Faculty Quality | -.323 | .222 | -1.46 | .146 | -.759 | .113 | |
| Constant | -7.278 | 1.089 | -6.69 | 0 | -9.417 | -5.14 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 1.487 | SD dependent var | 2.611 |
| R-squared | 0.237 | Number of obs | 535 |
| F-test | 20.417 | Prob > F | 0.000 |
| Akaike crit. (AIC) | 2417.383 | Bayesian crit. (BIC) | 2455.924 |

**** p<.01, ** p<.05, * p<.1*

**Source:** Own elaboration

In the third model, we examined nine factors, six of which turned out to be statistically significant. The dependent variable in the first model is high quality publications. The project duration factor was statistically significant with a positive coefficient. The associate professor factor was statistically significant with a positive coefficient. The Bratislava Region factor was statistically significant with a negative coefficient. The Western Slovakia factor was statistically significant with a negative coefficient. The middle Slovakia factor was statistically significant with a negative coefficient. The proposal rating factor was statistically significant with a positive coefficient. Six of the nine investigated variables were statistically significant. If the number of years of project duration is more years, the number of high quality publications is also higher. If the head of the project is an associate professor, the number of important publications is higher. If the project comes from the Bratislava Region, Western Slovakia, or Central Slovakia, the number of important publications is lower. If the recalculated point rating is higher, the number of significant publications is also higher.

www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022



**Table 5.** Regression Results Model 3

| High Q Public | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| Project Years | .843 | .221 | 3.81 | 0 | .408 | 1.278 | *** |
| Gender Leader | .27 | .205 | 1.32 | .188 | -.133 | .673 | |
| prof. | -.061 | .275 | -0.22 | .825 | -.601 | .479 | |
| Assoc | .579 | .244 | 2.37 | .018 | .1 | 1.058 | ** |
| Bratislava region | -2.76 | .292 | -9.44 | 0 | -3.335 | -2.186 | *** |
| West Region | -1.818 | .38 | -4.79 | 0 | -2.565 | -1.072 | *** |
| Middle Region | -2.272 | .322 | -7.06 | 0 | -2.904 | -1.639 | *** |
| Proposal Rating | .081 | .012 | 6.75 | 0 | .058 | .105 | *** |
| Faculty Quality | -.35 | .223 | -1.57 | .118 | -.789 | .089 | |
| Constant | -5.191 | 1.081 | -4.80 | 0 | -7.315 | -3.067 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 1.487 | SD dependent var | 2.611 |
| R-squared | 0.237 | Number of obs | 535 |
| F-test | 18.109 | Prob > F | 0.000 |
| Akaike crit. (AIC) | 2419.416 | Bayesian crit. (BIC) | 2462.238 |

*** *p<.01*, ** *p<.05*, * *p<.1*

**Source:** Own elaboration

## 5. Conclusion

The main aim of the present article was to analyze the support of universities in the conditions of the Slovak Republic that were finances from the Scientific grant Agency. Regarding the first partial goal to evaluate projects according to scientific disciplines, we found that out of the total set of 10,845 project applications, the most applications were in committee number 13 - economics and law (14.48%) and 9 - medicine and pharmacy (13.07%). The least, on the contrary, in the commission number 3 was chemistry and biotechnology (4.27%) and 1 – mathematics, physics and ICT (4.67%). Regarding the second partial goal to analyze trends in publications in research projects of universities, in the analyzed period of years we found that there were more low quality publications (94.75%) than high quality scientific outputs of SGA projects (5.25%). The main research question was which factors influence the results of solved projects at universities, or what characteristics depend on the quantity and quality of the published outputs of these scientific projects. Through regression analyses, we found that statistically significant variables for the dependent variable of high quality publications are: number of years of project duration, associate professor, Bratislava region, Western Slovakia, Central Slovakia, Eastern Slovakia, project proposal quality and the gender of the project leader. However, to clearly confirm the influence of these factors, it will be necessary to build stronger econometric models and conduct further research in the future. As for the development trend, we can say that in Slovakia more emphasis has begun to be placed on the quality of publication outputs than their quantity in analyzed scientific university projects.

## Acknowledgement

This contribution was supported by Scientific Grant Agency VEGA (Vedecká Grantová Agentúra), grant number 1/0605/19 “New role of universities in regional innovation systems”

**www.rsepconferences.com CONFERENCE PROCEEDINGS/FULL PAPERS ISBN: 978-605-73146-1-1/September 2022**



## References

Auranen, Otto & Nieminen, Mika (2010) 'University research funding and publication performance--An international comparison', *Research Policy*, 39/6, 822-834.

Bergstrand, J. H. (1985). The Gravity equation in International Trade: Some Microeconomic Foundations and Empiricale Vidence. *Review of Economics and Statistics, 9(1),* 91-101.

Cheng, I.-H. & WaLL, H. J. (2005). Controlling for Heterogeneity in Gravity Models of Trade and Integration. *Federal Reserve Bank of St. Louis Review, 87(1),* 49-63.

Ebadi, Askhan., Schiffauerova, Andrea (2016) "How to boost scientific production? A statistical analysis of research funding and other influencing factors". *Scientometrics* 106, 1093–1116. https://doi.org/10.1007/s11192-015-1825-x

Geuna, Aldo & Martin, Ben. (2003). "University Research Evaluation and Funding: An International Comparison", *Minerva*. 41. 277-304. 10.1023/B:MINE.0000005155.70870.bd

Godin, Benoit (2003). *The impact of research grants on the productivity and quality of scientific research*. 2003. INRS Working Paper.

Good, C. D., Johnsrude, I. S., Ashburner, J., Henson, R. N. A., Firston, K. J., & Frackowiak, R. S. J. (2001). A voxel-based morphometric study of ageing in 465 normal adult human brains. *NeuroImage, 14*, 21–36.

Hall, Bronwyn (2002) "The Financing of Research and Development, Oxford Review of Economic Policy, 18/1, 1, 35–51, https://doi.org/10.1093/oxrep/18.1.35

Hicks, Diana. (2012) Performance-based university research funding systems. *Research Policy*, 41/2, 251-261

Jacob, Brian & Lefgren, Lars. (2011). The Impact of Research Grant Funding on Scientific Productivity. Journal of public economics. 95. 1168-1177. 10.1016/j.jpubeco.2011.05.005.

Lee, Sooho & Bozeman, Barry. (2005). The Impact of Research Collaboration on Scientific Productivity. Social Studies of Science. 35. 673-702. 10.1177/0306312705052359.

Lissoni, Francesco & Montobbio, Fabio & Mairesse, Jacques & Pezzoni, Michele. (2011). Scientific productivity and academic promotion: a study on French and Italian physicists. Industrial and Corporate Change. 20. 253-294.

Millar, J. - Senker, J. 2000. *International approaches to research policy and funding: university research policy in different national contexts.* Final Report. Brighton: SPRU.

Tahmooresnejad, Leila & Beaudry, Catherine & Schiffauerova, Andrea. (2015). The role of public funding in nanotechnology scientific production: Where Canada stands in comparison to the United States. *Scientometrics. 102(2).* 753-787. 10.1007/s11192-014-1432-2.

Vanecek, J. (2013). *The effect of performance-based research funding on output of R&D results in the Czech Republic. Scientometrics, 98(1), 657–681.* doi:10.1007/s11192-013-1061-1