

Analysis of the Impact of Universities on the Innovative Development of Russian Regions

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ABSTRACT

The modern post-industrial world, in which information is one of the main factors of production, and the economy is becoming more and more connected with the achievements of science and scientific and technological progress, is impossible to imagine without higher education. The role of higher education has now increased significantly: if earlier it was perceived mainly as a way of training personnel, now universities are also scientific centers, they are actively included in the innovative development of the territory and can determine its attractiveness for doing business and investing.

To actively include the higher education system in the process of innovative development of the country, a large-scale reform is currently underway, which includes including the formation of new institutions of higher education - federal and national research universities. It is assumed that these universities can really become competitive both domestically and on the world stage by the scientific and educational centers of our country, actively involved in the innovative development of the Russian economy.

Keywords: *education, higher education, regional economy, innovations*

1. INTRODUCTION

The problems of the influence of education and science on regional and, in particular, innovative development are in the focus of attention of many specialists. The modern concept of understanding the higher education system has laid the responsibility for the innovative development of the territory on the universities where they are located. This approach was called the third mission of the university [1,2,3]

A number of authors believe that the contribution of large universities to innovative development exceeds the activities of manufacturing firms and corporations. Universities are creating knowledge transfer mechanisms, such as generating and attracting talent to the local economy [4,5]

Some authors consider this topic more broadly and generally consider the contribution of the non-profit sector to the process of creating innovation in the regions [6,7].

The role of universities in terms of the formation and strengthening of formal and informal ties as a contribution to local and regional development is also considered in the works of scientists from different countries [8,9]

Studying the socio-economic impact of institutions of higher education such as a university is a problem that has attracted considerable attention from researchers. According to Bed and Kotosz effects from university activities can be observed in many areas of the economy. Defining them is the standard tool used by western universities to convince state legislatures of the importance of spending on higher education. [10]

In a joint scientific work the authors argue that research on the influence of universities on the regions is carried out using various methods, and their results are difficult to compare with each other. The authors themselves in their scientific work examined the influence of universities in Hungary and France on regional development, located in countries with different levels of economic development, the results of which showed an equal level of influence [11]

2. METHODOLOGY

Six universities were selected for analysis :

1. Siberian Federal University - Siberian Federal University (Krasnoyarsk, Krasnoyarsk Territory, Siberian Federal District, established in 2006),

2. Kazan (Volga) Federal University - KFU (Kazan, Republic of Tatarstan, Volga Federal District, 2009),
3. Baltic Federal University named after I. Kant - BFU (Kaliningrad, Kaliningrad Region, North-West Federal District, 2010),
4. Novosibirsk National Research State University - NSU (Novosibirsk, Novosibirsk Region, Siberian Federal District),
5. National Research Nizhny Novgorod State University named after N.I. Lobachevsky - UNN (Nizhny Novgorod, Nizhny Novgorod Region, Volga Federal District),
6. St. Pererburgsky Polytechnic University Peter the Great - SpbPU (St. Petersburg, Northwestern Federal District).

These universities were selected for the following reasons. First, three universities of different types were selected: 3 federal universities and 3 national research universities. Secondly, universities were selected that are located in different regions on the territory of three federal districts. This allowed, on the one hand, to see how specific universities influence the development of their regions, and on the other hand, it allowed to identify some general trends in the impact of universities on the innovative development of regions, regardless of their location. In addition, these universities are participants in the above-mentioned program of increasing the competitiveness of universities "5-100", that is, they receive additional funding for the development of their scientific and educational activities, which should contribute to their more active participation in the innovative development of the regions.

A practical study of the activities of these universities included several stages.

At the first stage of the work, the main groups of indicators were identified, according to which the contribution of universities to the innovative development of the territory was evaluated. So, based on the studied regulatory legal acts, it was found that universities can participate in the innovative development of the territory as follows:

Universities are responsible for training and the degree of their qualifications: the presence or absence of qualified specialists is directly related to the use of new technologies, the ability to understand and apply them in the work of organizations;

Universities, being not only educational institutions, but also research centers, responsible for the development of innovation, research and experimental development (R & D) and carrying out research activities (R & D), which are then used in the economy and ensure its innovative development

Universities can conduct independent business activities related to the production and sale of innovative developments, support for startups, opening and financing of small innovative enterprises.

In addition to such direct participation in the innovative development of the region, universities can indirectly

influence it through their scientific reputation. At the moment, as noted above, this area of activity is the highest priority (according to program-targeted federal documents). As it was found, the most popular method of evaluating the activities of universities, including scientific, is the compilation of ratings. The position of universities in these ratings indicates the authority of the university in the scientific world or in individual areas of research, the degree of confidence in the scientific achievements of the university, and its readiness for joint scientific development in collaboration with this university. This may be indirect evidence of how actively the university will be able to create innovative developments in the future, which in turn will already have a direct impact on the innovative development of the territory.

3. RESULTS

In connection with the above possibilities (direct and indirect) of university participation in the innovative development of the regions, indicators for assessing their performance were highlighted. In total, 35 indicators characterizing various aspects of the scientific activities of the university and its employees were identified. Then these indicators were grouped into thematic blocks:

1. Training (includes indicators related to the contingent of students, their quantity and quality of their training);
2. Development of innovations (includes indicators related to the number of patented developments created by the university and its employees, their relevance and business interest in them);
3. Commercialization of innovations (this section includes indicators reflecting the university's participation in commercial activities related to the sale of innovations, as well as the activities of universities related to the development of startups);
4. Scientific reputation of the university (this block includes two groups of indicators: firstly, indicators related to the position of universities in international and Russian ratings, which reflect the competitiveness of universities in comparison with others, and secondly, indicators related to scientific activity academic staff of the university, which reflect the personal authority of individual scientists in scientific fields; the degree of interest in cooperation with the university and its individual students depends on these indicators -workers to create innovative development).

Next, an assessment was made of each of the blocks of indicators reflecting the university's activities related to the innovative development of the region.

To calculate and summarize data of disparate indicators with each other, the authors propose to calculate normalized indicators by the formula:

$R = (X_i - X_{\min})$, if the best indicator has a maximum value, or

$R = (X_{\max} - X_i) / (X_{\max} - X_{\min})$, if the best indicator has a minimum value.

After conducting an assessment for each set of indicators, an integrated assessment of the activities of each considered university was deduced in the areas of activity related to the innovative development of the territory. The results of this assessment are shown in table 1.

Table 1 Integrated assessment of university activities related to the innovative development of regions

	Staff	Innovation	Business	Image	Total
Kazan federal university	0.72	0.57	0.33	0.48	2.10
Siberian Federal university	0.22	0.63	0.31	0,07	1.23
Baltic Federal University	0.13	0.14	0.03	0.00	0.30
Nizhny Novgorod State University	0.43	0.47	0.23	0.09	1.22
Novosibirsk State University	0.34	0.43	0.78	0.82	2,37
St. Petersburg State Polytechnic University	0.91	0.29	0.95	0.34	2.49

For greater clarity of this difference, reflect the results of table 1 in the form of a petal chart.

In this diagram, the graph of each university is represented by a broken line, the points of which are the university's estimates for each of the blocks. An ideal graph that reflects the highest possible result for each of the blocks would have the shape of a square as far from the center as possible. However, the graphs of the universities under study have a form closer to the shape of a rhombus or trapezoid, which indicates the presence of some more strengths of their activities (points more distant from the center), as well as some failures in their work (points on the graph that are closer to the center)

The least successful activity of the BFU can be called. The schedule of this university is closest to the center for each of the blocks for assessing innovation. I

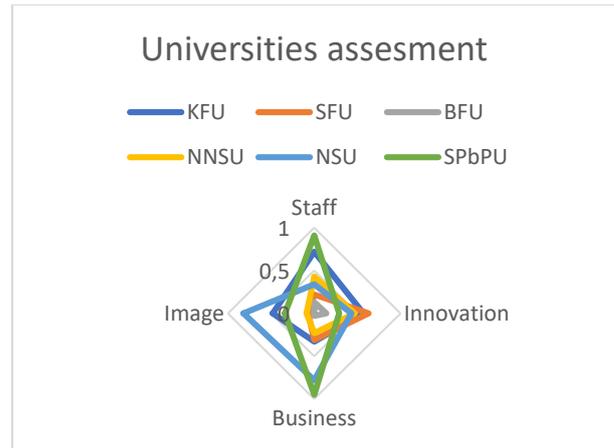


Figure 1 Integrated assessment of university activities related to the innovative development of regions

Universities are more stable: if the difference in grades of other universities is more than 30 points, then for BFU - only 14 points. In two blocks, the university's score is equal to or practically equal to 0, which indicates that the university turned out to be an outsider in all indicators of these blocks. In the block "Scientific Reputation", such a low rating is explained by the fact that the university turned out to be uncompetitive neither at the world level, nor when compared with domestic universities. However, it should be noted that in this block the BFU is not so far behind other universities (along the "Reputation" axis, two more universities have grades close to 0). In the "Innovative Business" block, the lag of the BFU from other universities is already more substantial.

Two more universities have a schedule of a form similar to the schedule of the BFU - UNN and SFU. This suggests that in the work of these universities there is a significant gap in one of the blocks, namely, in the "Scientific reputation" block. Despite the fact that these universities and

their activities are highly valued within the Russian Federation, nevertheless, at the international level, they have not yet formed their scientific authority either in general or in individual fields of knowledge and sciences. For the remaining blocks, the assessments of these universities are already more uniform.

The graphs of NSU and KFU are similar in form. At the given universities, the marks for each of the blocks are quite high (the points of the graph are quite far from the center), however, the marks for the two blocks are higher, and for the other two blocks a little lower. So, at NSU, grades in the "Personnel Training" and "Creating Innovations" blocks turned out to be lower.

It should be noted here that NSU is inferior to the other universities under consideration in quantitative terms (a smaller student population, a narrower staff of research and development staff, fewer patents, etc.), however, this university is ahead in qualitative terms (there are fewer quantitative developments, however, their demand is higher), due to which the University has higher grades in

the blocks “Scientific Reputation” and “Innovative Business” than most of the other universities under study .

4. DISCUSSIONS

Next, we turn to the consideration of the innovative development of the regions in whose territory the studied universities are located.

Regions were considered for a number of indicators reflecting the level of their innovative development:

gross regional product (GRP), reflecting the overall level of development of the region;

GRP per capita, reflecting the ratio of regions to each other according to the achieved level of economic development;

number of organizations performing research and development;

the number of personnel engaged in scientific research;

development of advanced manufacturing technologies ;

the use of advanced manufacturing technologies in practice;

the proportion of organizations implementing technological, organizational, marketing innovations, in the total number of organizations examined;

the costs of developing technological innovation;

volume of innovative goods, works and services;

the share of innovative goods, works and services in the total volume of goods, works and services shipped.

The results of the integrated assessment of these indicators are shown in table 2. The calculations were carried out according to the same methodology as the activities of universities

From table 2 it follows that the two highest regions reached the highest level of innovative development - the

city of federal significance St. Petersburg and the Republic of Tatarstan. Regarding St. Petersburg, it can be noted that this city, being the unofficial second capital of the Russian Federation, is ahead of other regions in absolute terms (for example, GRP), however, when comparing relative indicators (for example, in GRP per capita), this region is already in the middle. In relation to other regions, we can say that their level of development is below the average rating. The Nizhny Novgorod region is close to average, and the results of the other three regions are much lower. It should be noted that in the innovative development of the regions, one can trace some general trends in socio-economic development.

Thus, the position of St. Petersburg is ensured by its status, the regions of the European part of Russia (RT and Nizhny Novgorod region) are better developed than Siberia (Krasnoyarsk Territory, Novosibirsk Region), Kaliningrad Region has a special "Isolated" position, which affects the level of development of the region. These patterns already indicate that the innovative development of regions depends not only on the presence or absence of large universities in the regions. Nevertheless, this cannot be direct evidence that universities cannot influence the region through their activities.

To determine the degree of interconnection between the innovative development of the regions and the innovative activities of the respective universities, we compare their research data (see Table 3).

Table 2 Assessment of Russian regions innovative development

	1	2	3	4	5	6	7	8	9	10	Total
Republic of Tatarstan	0.56	0.69	0.34	0.14	0.41	0.66	1.00	0.58	1.00	1.00	6.38
Krasnoyarsk region	0.48	0.96	0.20	0,07	0.22	0.29	0.14	0.38	0.16	0.20	3.10
Kaliningrad region	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Nizhny Novgorod Region	0.27	0.00	0.29	0.53	0.39	1.00	0.48	0.54	0.57	0.84	4.91
Novosibirsk region	0.24	0.34	0.37	0.26	0.19	0.22	0.17	0.04	0.12	0.49	2.44
St. Petersburg	1.00	0.29	1.00	1.00	1.00	0.83	0.61	1.00	0.68	0.44	7.84

Table 3 Comparison of the results innovative development of regions assessment and universities innovation

	Rating university	Rating position	Rating the region	Rating position
KFU / RT	2.1	3	6.38	2
SFU / Krasnoyarsk region	1.23	5	3.10	4
BFU / Kaliningrad region	0.3	6	1.00	6
NNSU / Nizhny Novgorod Region	1.22	4	4.91	3
NSU / Novosibirsk region	2,37	2	2.44	5

5. CONCLUSION

The data shown in table 12 allow us to draw the following conclusions. The only university whose results do not correspond to the development of the region is NSU. For other regions and universities, a direct correlation of indicators can be traced. If we focus on the position of universities and regions in the ratings, we can say that between these data are directly related to each other. If NSU is excluded from the rating, then the positions of universities and regions will be identical to each other.

Thus, during the assessment of the innovative development of the regions and a comparative analysis of its results with an assessment of the activities of universities, it was found that there is indeed a direct connection between the development of the constituent entities of the Russian Federation and the development of universities, however, its degree of strength cannot yet be assessed as high, and therefore development measures to strengthen the direct relationship between the development of universities and regions.

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