National Research University - Higher School of Economics, Moscow

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Plenary Session 3: Cultural diversity and globalization in higher education

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**Science and higher education in a more global era**

**and how Russia is positioned**

[Global convergence and pluralization in higher education and science]

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**Science and higher education in a more global era**

**and how Russia is positioned [opening slide]**

Доброе утро! Спасибо за возможность выступить. я рад быть здесь сегодня. Извините, пожалуйста. Я не говорю по-русски. Я понимаю, только немного. Я надеюсь узнать больше. Мне здесь очень нравится. Теперь я буду говорить по-английски.

**7 May 2012 . . .**

Last year it was announced there should be five Russian universities in the global top 100 by year 2020. Many other governments have similar goals. This target raises practical questions. Which global ranking should be used? How close is Russia to the target? Is eight years (now seven years) feasible? And if the goal is to re-strengthen Russia in science and technology, is five in 100 the best target for driving the science system towards that goal and measuring progress towards its achievement?

On the question of ‘which ranking?’ the only ones worth using are the research-based Shanghai Academic Ranking of World Universities, or better, the Leiden University or Scimago measures of science publishing and citation rates. QS and the Times Higher Education partly rely on reputational surveys and no one believes such rankings are accurate. To base a university ranking on opinion surveys, is like asking a group of people to guess the distance between the earth and the sun, and using the average guess to determine the distance. It wouldn’t be very good astro-physics. It isn’t very good social science of higher education, either. Individual universities can lift their position in the QS and Times Higher by negotiating with the ranking companies, and marketing themselves. But ‘success’ of this kind is an illusion. It disappears again tomorrow when a new survey comes out. What matters is the real firepower of Russian science and technology, not managing impressions, or promoting individual institutions. One of the reasons for the rapid growth in science in China is that the government focuses on genuine measures of science and technology performance.

**[Newspaper clipping of Yuri Gagarin]**

Let me say—as a non-Russian speaking to good colleagues in Russia—the ambition is true, matching history. Russia should expect a leading role in science and technology. Russian intellectual work is one of a small number of major and essential strands of culture and science. Great traditions do not disappear, though they may be eclipsed for a time, as in China from 1840 to 1950. Russia has made many contributions to knowledge, technology and understanding. It will make more such contributions in future. This benefits not only the national economy and quality of life, but all of human society, мир в целом. It is right to want to bring that process forward.

**Since 1990 we have seen not just transition from USSR to Russia, but also . . .**

At the same time, it is necessary to be realistic about the position of Russian science and the global conditions in which it seeks to progress. As a sympathetic outsider with a little knowledge of these matters, I hope you will permit me to speak freely and tell it like it is. I believe this is the best contribution I can make, to thank you for your kindness to me, in sharing with me the country and this important conference.

Much has changed since Soviet times, советский период, not only in Russia but the world. Internet-mediated communication has transformed science. Science always was something of a global conversation but organized in national systems. We now have a global science and technology system as well. There are pockets of secrecy but the vast bulk of strategic knowledge flows freely. The signs of this world system are web-based global publishing in English, the growth in science active nations and publications with international co-authors , the fact that two thirds of citations are international, and collaborative research grant programs such as the European Research Area.

**Components of a national innovation system**

All national innovation systems are now also part of the global innovation system. Most innovations in technology and product development are sourced wholly or partly from global sources. Countries partly disengaged from the global science system, such as North Korea, are increasingly penalized. They lack full access to knowledge and cutting edge expertise from elsewhere. Because they do not contribute freely into the global system, their scientists lack profile and fail to build international relationships, based on continuous exchange and collaboration, that allow them to anticipate new knowledge as it emerges. They do not draw strategic talent from other countries and their best people leave to work at the cutting edge. In this environment, open systems of science and people mobility tend to prosper, such as the American system. China, Korea and Singapore now realize this and have created broad highways between their systems and the systems of other countries.

**Total R&D spending 2000 & 2010 ($s bill.)**

You get what you pay for. There is a close correlation between R&D investment—especially government investment in basic research—and the number of science papers and highly cited science papers, and the number of highly ranked universities. Russia’s investment in R&D is lower on the international scale than was Soviet R&D. The graph focuses on total R&D investment. In 2010, Russia was eighth in total public and private investment, 6.4 per cent of the United States and less than half the level of South Korea which has only one third of Russia’s population..

**R&D as a proportion of GDP, 2010**

Russia’s total investment in R&D of 1.16 per cent of GDP in 2010 was the lowest of the top ten R&D countries. Within that investment, university research is on the low side. The standout countries are the US, smaller knowledge-intensive European countries in Scandinavia and Switzerland, and the rising science powers in East Asia and Singapore. China is increasing its R&D investment by 0.1 per cent of GDP per annum and exceed the United States within a decade. Korea, Taiwan and Singapore are smaller but almost as dynamic. It is already clear that in this century much of our science and technology will come from East Asia. How much will come from Russia?

**Science papers in global journals 2009**

Russia’s comparative international position in globally published science—science entering the common store of human knowledge—is weaker than its comparative R&D investment. Russia was eighth in investment in 2010 but thirteenth in science papers in 2009. Behind the Netherlands, with 10 per cent of Russia’s population.

Why is published science weaker than funded research? As you know, much of the research takes place in the academies and other institutes outside the universities, and in specialist universities that service manufacturing, energy, extraction and defence sectors. There has been some growth in comprehensive research universities but other research organizations still dominate. Many of their papers are in Russian not English. The Soviet strategy was ‘science and technology in one country’. Contacts between Russian and foreign researchers were not encouraged. Useful research from abroad was translated into Russian, and fed into the bounded national science system. Little research flowed out. The closed door legacy of the советский период still retards global awareness and engagement. Russian science and technology are less internationalized than those of all other nations ahead of Russia in the bar graph.

**Research papers per year, 1995-2009: China, India & Russia**

This compares trends in scientific output in Russia, China and India. The previous graph showed that in 2009 China had the second highest number of research papers after the US. China’s published science in English has grown at an amazing 17 per cent for the last ten years, despite the fact its research system is more focused on applied and commercial R&D than basic science, and its scientists have learnt English en masse in just one generation. China will become number one in the volume of published science in half a decade, though it will remain be well behind the US in citations per paper, and the weight of high citation papers, for some time to come.

In 1995 China produced the same number of papers as India, and was well behind Russia. China has now rocketed ahead. Russia has fallen back to third of the three countries. This is one of the very few countries where scientific output has gone down since 1995. We can attribute this to the continued erosion and ageing of the Soviet research system, the slow emergence of comprehensive research universities, and the slow rate at which the whole system has internationalized, much slower than China.

**Shanghai ARWU top 500: Chinese systems & Russia, 2005 & 2013**

Let’s focus on East Asia for am oment. China does not yet have any Shanghai ARWU top 100 universities. But its number of top 500 universities has Jumped from eight in 2005 to 28 in 2013, less than a decade later. And top 500 universities has risen from five to nine. It is hard to break into university research rankings. Everyone is continually improving. To rise up a university must improve faster than others.

**Since 1990 China, Taiwan, South Korea and Singapore have transformed their research and higher education. How**?

How has it happened in China, Taiwan, South Korea and Singapore? Some conditions and elements can be replicated in Russia, some cannot. The most distinctive feature is the traditional Confucian commitment to learning at home. This is at the core of parent-child relations; part of the responsibility of parents to their children, and a duty of children to their parents. Some Russian families have this, but not all. The Confucian tradition underpins all the extra schooling outside school, the private tutoring, the hours, the dedication. In Sinic tradition it is believed that success comes not from talent but hard work. One consequence is that East Asian systems lead the world in the OECD’s PISA comparison of achievement in reading, mathematics and science. Only Finland ranks with the East Asian systems.

The other main elements are effective states and accelerated internationalization. Governments focus investment and install strong achievement cultures. Targets are real. Once achieved, the system moves on to the next level. In short time, East Asian systems have lifted participation rates, restructured their systems and created world-class universities. Internationalization is a key driver: incentives for English language publication, bringing back the diaspora from the USA and attracting foreign talent, collaboration with foreign scholar-researchers, systematic benchmarking with strong foreign universities. A benchmarking approach is a more focused and transformative strategy than a rankings approach. East Asian governments see better rankings as the outcome of policy rather than a principal policy instrument or driver.

**Shanghai Academic Ranking of World Universities top 200, 2013**

Let’s return now to Russia. I want to look more especially at comparative performance in publication and citation, which are the most objective data.

There is one Russian university in the Shanghai ARWU top 200, Moscow State.

**Leiden University ranking for 2008-11**

However, Moscow State’s position in the ARWU is partly a function of its Novel Prize winners. We gain a clearer picture of the relative position of Moscow State by using the Leiden University ranking, which provides separate measures of science papers in global journals, citations per paper, and the proportion of all published papers that are in the top 10 per cent of their field of research, on the basis of citation rate. On these measures, MSU is at 326 in the world on paper volume, and its average citation rate on 0.65 is well below the world mean of 1.0. In 2008-11 there were just 135 papers in the top 10 per cent of their field, compared to 6492 at Harvard and 1274 at Tokyo where researchers are working in English as a second language.

**China and Russia: Top four research producers for each**

Is the modest performance of Russian universities in these global measures due to the strong role of the Academy of Science and non university research institutes, and continued university specialization? Certainly these factors retarded the emergence of comprehensive Russian universities. Nevertheless, China shows it is possible to maintain a strong academy and high-science research universities at the same time. The table is taken from the new Scopus data, Scimago, which include both universities and non university research organizations. It is notable that the citation impact rate of the Chinese institutions, in the last column, is much higher than for Russia. Again, this is partly due to the stronger take-up of English in China.

**Russia: Top eight university research producers**

If Russia had five universities in the top 100 who would they be? I do not know, but we can say which higher education institutions are the leading research producers at present. The table, from the Scopus collection, lists the top eight. This includes MSU. St Petersburg State, Novosibirsk and three federal universities. Those below MSU and St Petersburg State are currently ranked 1207 and 1698. Well below 100. You can see that five in the top 100 is a long way off. вы шутите, you might say. Certainly not without a transformation of capacity and performance.

**Russia: High citation impact research producers**

Yet Russian research is stronger than this suggests. There are pockets of excellence that show in the global literature. The strongest research organizations by citation rate—the indicator that captures the quantitative impact on scientific knowledge—are in the physical sciences, including nuclear. Institute for High Energy Physics is at 62nd in the world. отличная! Space science also continues to be strong.

**The global indicators under-estimate Russia’s S&T potential**

The global indicators under-estimate Russia’s S&T potential. While they are real world indicators, and in that sense valid, they do not cover all research in Russia. The exceptional science outside Russian universities falls outside the rankings. As suggested, much other research in Russia is published only in Russian, is mostly applied, and is focused on national industries. No doubt if all of this work was counted, Russia’s measured national output would increase sharply. This should not be too comforting. The global indicators cannot be changed to include work outside the common science system. There is a rationale to this. It is technically impossible to compare that work to work done elsewhere. At the same time, the continued part-isolation of Russian science slows the growth of science and makes five in the top 100 impossible.

**Elements of a strategy**

How then could Russian science and technology lift its global capability? Russia’s present science capacity is a good base for development, providing:

1. Existing capacity is consolidated, with no further erosion
2. Investment in R&D is increased and tightly targeted to on one hand existing areas of quality, on the other hand selected locations for capacity building
3. The innovation system is internationalized.

Investment in R&D does not generate rapid gains. There are lags between investment in capacity, the growth of science output, the increase in citations, the counting of those citations for comparison purposes, and growth in world-class universities. Eight years is too short a time horizon. China’s experience suggests that it takes 10-15 years for major gains to become apparent. The full benefits take at least a generation.

At the same time it is important to keep in mind national needs in S&T. By no means all national needs coincide with what is counted in global comparisons. This suggests policy should maintain a double set of performance indicators, using both (a) globally-defined targets, and (b) national indicators based on national needs.

**Internationalization is the key**

It is vital to adopt targets based on real, material qualities, not reputational surveys. When we use material measures like publication outputs, improvement in the indicators mean that science capacity really has lifted. However, in my view, rankings are not the best basis for targets. First, there are problems with the weightings of multi-indicator rankings. Second, rankings are normative, forcing all universities into the mould of the American research university. Third, rankings are not really about better performance. They are a status game and a zero-sum game. Rankings are steeply hierarchical, and encourage competition to the exclusion of cooperation. They elevate some universities above others, which undermines overall national performance at the same time as encouraging it. It is better to use targets that encourage all national systems to succeed, and all universities to contribute to the national effort, not just a favoured few. For example targets based on publication numbers and citation rates. This also allows non-university research to be included. It encourages the Academy of Science to break down the walls and internationalize.

Above all, when forming intellectual capacity in the global era, internationalization is key. Global engagement, global mobility in both directions, attracting foreign talent. Benchmarking. Use of nationally appropriate global standards (not just any global standards). This locks in institutions and the national science system to internationally strong performance. It is essential to maximize English language publication, including translation of important work in Russian for global audiences. At present there is only one global language in science. It may not always be the case. One day we might see Chinese, perhaps Spanish, perhaps even Arabic or Russian, become additional global languages. At present English is the one medium there is.

**Internationally co-authored articles**

Language capacity is the key to the international research collaboration where much of world science is moving. Between 1995 and 2010 the total number of jointly published journal articles more than doubled. In East Asia joint publishing increased by six to nine times. But in Russia it rose by just 20 per cent. Russian science is especially weak in joint publication. Despite the opening up in the late 1980s at the end of the Soviet period, and the twenty years since 1992, the science system remains more closed than open. Russian scientists and Russian universities have more freedom but they are not doing enough with it. National science is still seen by many as a sub-set of national defence and security. Its potential is much bigger than that.

But the closed nature of the system is not just a problem, it is also an opportunity. At the bottom of the curve all the ways point upwards. International collaboration and joint publishing are weak. Therefore they are domains in which Russia can make great gains. I wish you all good fortune in that endeavor. And I look forward to more opportunities to collaborate with my colleagues in Russia, for scholarship, for knowledge and in our mutual interest. Я подошел к концу. большое спасибо!