



Learning to Innovate? Education and Knowledge-Based Economies in Russia and China

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Higher education in the 21st Century has become a genuinely international phenomenon, with all of the opportunities and challenges that accompany expanded playing fields. A growing number of countries recognize that successful innovation economies depend on knowledge and the human capital able to advance and deploy that knowledge. There is a broad consensus that knowledge is produced and transmitted most effectively by research universities, and that the best research universities are not merely national but global.²

Competing on a global scale is challenging and expensive. Nevertheless, a growing number of governments perceive higher education to be necessary to their future well-being and security. To gauge their performance in this growing competition, they pay increasing attention to university rankings. Standing among international peer institutions is not just a matter of prestige: it has direct economic ramifications for financial support from governments and the ability to attract fee-paying students; more important, quality and prestige are a way to move from "brain drain" to participation in "brain circulation."³

Russians and Chinese express similar aspirations to foster world class research universities. Leaders in both countries want modernization in the guise of high-tech innovation economies, and recognize that achieving this goal requires an investment in human capital. They share the challenges of building competitive innovation economies on the remains of Soviet-style systems characterized by separation of research and education, where large, block-funded institutes conducted basic research while a plethora of industrial R&D facilities pursued "practical" applications. Engineers rarely needed to consider cost as a major factor and hardly ever saw their innovations implemented in production.⁴

Comparing Russian and Chinese development in education and science is instructive for two reasons. First, while sharing aspirations for international prestige and starting with similar institutional configurations, their approaches and outcomes differ markedly. China has been more successful in fostering university-based R&D, developing university linkages with industry, integrating with the global higher education sector, and encouraging talented co-nationals to return home. Second, China has achieved these results despite starting from a much lower base of science and education resources. The comparison offers important lessons about how globally competitive science and education systems are built, maintained, and renewed (or not).

This article begins with a short description of higher education expansion in both countries. The second section describes the shift to prioritizing a limited number of research universities. The third section examines performance indicators for both countries in the interrelated areas of research productivity (scientific publications, patents and similar indicators), global university rankings, and turning the brain drain into brain circulation. Section four discusses internationalization and innovation. The final section explores reasons for China's greater success in internationalizing its scientific-educational system despite having a much weaker base when Deng initiated "reform and openness."

Expansion:

Both countries have significantly expanded their higher education systems since beginning economic reforms. In Russia, the number of VUZy has more than doubled since 1990, mainly due to opening 474 private institutions. The number of state VUZy grew from 514 in 1990 to 660 at the beginning of the 2008/09 academic year (an increase of 30%). The number of students has also grown, to the point where Russia enrolls a higher proportion of high school graduates in higher education than any other country. Beginning in 2000, admissions to higher education exceeded graduations from secondary schools.⁵ From 2,824,500 in 1990, the number of students increased to 7,513,100 in 2008, overwhelmingly at State VUZy. Private VUZy represent 42% of the institutions, but enroll only 17% of the students. About 46% of Russians study full-time; at state VUZy more than half the students are full-time, while at private VUZy less than 1/4 are in the daytime (*ochnyi*) division. In 1990, VUZ students represented less than 2% of the Russian population; by 2000, more than 5% of Russians were students.⁶

China began from a much lower base, and the major expansion has been more recent. Since 1999, growth in the number of students and graduate students has been geometric. In 1997 Chinese VUZy enrolled just over 1 million students; in 2006 the number was 5.5 million. By 2010 the number at all varieties of post-secondary education was projected to be 30 million. Numbers of both matriculants and graduates have been growing at about 30% per year. Students represent a far smaller portion of the Chinese population, and although the government has adopted strong policies to increase rural enrollments, it will take decades for China to approach Russia's level of higher education. The 11th Five Year Plan called for enrolling 25% of the entrance age cohort by 2010.⁷

Although China's much larger population means that a smaller percentage of Chinese will be students, the absolute number of graduates, and the number of scientists and engineers, is enormous. More important in terms of building an innovation economy, China is getting a higher economic return on its investment in tertiary education. Despite serious problems of brain drain and lack of major scientific-technological breakthroughs, Chinese firms have performed reasonably well in adapting technology for the growing domestic market.⁸ In automobiles, ICT, and several other realms, they appear poised to engage in global competition.

Research Universities:

In both countries, the expanded higher education systems are under severe financial strains, forcing administrators to abandon ideals of equality in favor of creating a limited number of “research universities” that receive priority funding.

In Russia, two competitions have been held for a network of national research universities that will receive special funding and attention. The program draws on experience with the BRHE collaborative project, two competitions in 2006-08 that selected 57 VUZy for special status,⁹ and similar programs in China, Malaysia, and other countries. In the first competition, 12 institutions were selected, eleven in the natural sciences and one in social science. In the second competition an additional 15 winners were announced in April 2010, to receive funding through 2019. For the first three years, 2010-12, 20 billion rubles has been allocated for the 15 winners.¹⁰

Moscow State University and St. Petersburg State University both continue to receive designated funding from the Federal budget, projected to amount to 10 billion rubles for 2010-12. Seven additional universities have been designated “Federal Universities.” The first two pilot project Federal Universities were the Southern Federal University in Rostov-on-Don, and the Siberian Federal University in Krasnoyarsk. During 2009-10 they were joined by the Far-East Federal University in Vladivostok, the North-East Federal University in Yakutsk, the Urals Federal University in Ekaterinburg, the Privolzhsky Federal University in Kazan, and the Northern (Arctic) Federal University in Arkhangelsk. These institutions will each receive 400 million rubles for three years, with the promise of additional funding in 2013. At a meeting in Novosibirsk in April 2010 Prime Minister Putin ordered the rektors of these universities to submit expenditure plans within one month.¹¹

The Federal Universities have been created involve combining several existing VUZy in each location. Amalgamation of institutions into mega-universities represents a growing global trend. It works best when governments provide incentives and require universities to compete for status and funding.¹² When administrators designate specific institutions to receive significant infusions of funds without soliciting proposals on a competitive basis it reduces incentives to change.

Despite the two successful competitions for research universities that have been conducted, prioritizing a select group of VUZy remains highly contested.¹³ Pressure to make sure that competition winners were spread across the country was quite intense in the BRHE selection process. It will be even more pronounced in a situation where not just extra funding, but base budgets are at stake. Battles between the elite institutions in Moscow and St. Petersburg on one hand and the regional universities on the other explain the “parallel” project of Federal Universities in each of the Federal Districts at the same time that significant funds are being spent on the “Research Universities.”

Since the 1950s, China has identified a select group of VUZy as “key” (*zhongdian*). There were just 11 in this group in 1956. It grew to 88 in 1978. In the 1990s, the government introduced two major programs to prioritize research universities. In 1993 the 211 Program (named for the 21st century and the goal of 100 VUZy) aimed to make about 100 Chinese universities into world class institutions by the early 21st Century. It includes 106 institutions, or about 6% of China’s 1700 VUZy that receive extra funding.

Five years later the 985 Program (named to commemorate Jiang Zemin’s May 1998 speech on the centenary of Beijing University that reaffirmed the goal of creating research universities) initially identified nine institutions for priority funding. An additional 30 VUZy were added in the early 2000s, and by 2010 the list included 49 institutions.¹⁴

While the approaches taken to support priority institutions in the two countries are similar on the surface, the surrounding environment in China has been much more favorable. China’s elite research universities are becoming globally competitive, while Russia’s remain at best promises for the future. The differences are visible in scientific publications, global rankings, and brain circulation.

Performance:

Both countries significantly increased their financial support for education and science in the decade 1999-2008, with quite different results. Across a range of metrics, China’s performance in education and science since 1999 has been breathtaking. In measurements of publications in international peer reviewed journals, patent registrations and other forms of intellectual property protection, global rankings of universities, and the ability to attract talent from abroad, China and Russia have been on opposite trajectories.

Productivity:

In 1999, Russian and Chinese scholars published the same number of articles (about 20,000) in international peer reviewed scientific journals. Between 1999 and 2008, Russian publications remained at about the same level; China increased its annual number of publications by 400%, to 112,000 in 2008. China now ranks second to the United States in international publications, having surpassed Germany and Japan (in the same period, American publications increased by about 30%).

A similar change in relative positions can be seen in patent filings. In 2001, Russia (1.8%) and China (1.9%) accounted for about the same share of world patent filings. In 2006, Russia’s share declined to 1.6%, while China’s grew to 7.3%. Russia still had a better “intensity” of patent filings relative to expenditure on R&D, but this was changing rapidly.¹⁵ In the field of Nanotechnology, one of Russia’s priority areas for development, during 2004-06 China generated 1% of world patents, ranking 13th among all countries. Russia generated 0.4% of world Nanotechnology patents, putting it in

22nd place.¹⁶ China makes far greater use of Utility Model filings, which are easier to obtain but are for shorter duration and are not renewable. China accounted for 18 times as many Utility Model filings as Russia in 2007. China also accounts for far more industrial design applications.¹⁷ In the European Patent Office measures of patents filed per million inhabitants, Russia's number declined from 1.6 to 1.2 between 2000 and 2005.¹⁸

In a newly published study of Russia's human resources, Nicholas Eberstadt finds that it is not merely in patents that Russia substantially underperforms relative to the sums the country spends on science and technology.¹⁹ Given that a greater proportion of the working age population in Russia is enrolled in higher education than in any other country in the world, "economic and social advantages ordinarily conferred by greater education have proved in practice to be very largely illusory." Russia's tertiary education enrollments are double the OECD average, yet Russian men aged 29-59 die at four times the rate of European men in the same age group. Russian students ranked in the bottom third of the 32 OECD countries on each of the PISA tests administered in 2000. With 2% of the world's population and 6% of global VUZ graduates, not to mention a large share of the world's scientists and engineers, Russians accounted for just 0.1% of the patents granted in the U.S. Just on the basis of per capita income, Russia would have been expected to file three times as many patents.

Most striking, Russia's large number of highly educated people demonstrate shockingly low labor productivity. Outside the natural resources sector, which employs just 2% of the labor force, labor productivity in Russia is well below G-8 and OECD levels. The disparity between productivity in the resource sector and the non-extractive and service sectors in Russia is far greater than in other resource-exporting countries like Canada and Australia. Export revenues per worker in the non-extractive sector in Russia in 2002 (about \$1000) were comparable to Brazil, a country with 10% illiteracy and a primary school completion rate of just 50%. Eberstadt attributes the low Russian labor productivity in part to poor health and excess mortality, which are difficult to remedy in the short term. But a substantial part of the explanation involves institutions and policy, which can be changed more quickly. Corruption, economic openness, business climate and the transparency and predictability of institutions all play a role. In addition, as global rankings indicate, the education system itself must perform better to meet the needs of an innovation economy.

Global Rankings:

University rankings are both dubious and widely followed. In America, where the cost of higher education has risen at twice the rate of inflation, more and more families want to know what they are paying for. While questioning the validity of annual ranking of American universities by *U.S. News and World Report*, academic administrators follow it avidly. Several major ratings systems now endeavor to rate VUZy on a global scale. Each uses a different methodology.²⁰

The *Times Higher Education Supplement* is probably the best-known. In 2009 it ranked six mainland Chinese institutions and five from Hong Kong among its top 200. Two of the mainland China institutions are in the top hundred (Beijing 49; Tsinghua 52). A third, is # 103. Three Hong Kong VUZy are in the top 50. No Russian institutions are in the top 150. Two Russian universities are in the top 200: Moscow State University at 155 and St. Petersburg State University at 168.

In ratings of specific fields, the *Times* rates one Chinese institution (Beijing) in the top 50 in engineering and information technology; three (Peking University (19); Tsinghua University (30) and University of Science and Technology of China (50) among the top 50 in natural sciences; and four among the top 50 in social sciences (Peking University, University of Hong Kong, Fudan University, and Tsinghua University). The only Russian VUZ to appear on any of these lists is Moscow University, tied for #30 in natural sciences.

A second UK-based rating system, Quacquarelli Symonds (QS) World University Rankings,²¹ includes reputation and international students and faculty among its criteria. In 2009 it included two mainland China and three Hong Kong VUZy in its top 100. Another four mainland and two HK institutions are in the second 100. Thirteen Chinese VUZy make the top 600. Only six Russian institutions rank in the global top 600, and none in the top 100. Moscow University (101) and St. Petersburg University (168) are in the second 100.

Rankings by Shanghai Jian Tao University's Academic Ranking of World Universities²² are kinder to Moscow, putting it at # 77 in 2009. No Chinese institutions were in Shanghai's top 200, which may be attributed to courtesy or to a desire to use the rankings to leverage additional funding from the government. The Shanghai list does include 16 mainland and 5 HK VUZy among institutions ranked 200-500. No other Russian institutions are in the top 500.

The Spanish-based Webometrics rankings²³ place China #23 in the world (tied with Mexico), and Russia #34 (tied with Estonia) among 58 countries. The only Russian institution in the top 500 is Moscow University (226). China places one institution (Beijing University) in the top 200, and five in the top 500.

One Russian reaction to this poor showing has been to develop an alternative ranking system that, not surprisingly, is more favorable to Russian institutions.²⁴ As in a growing number of realms, the Russian approach has been to avoid the difficult work of meeting international standards by proposing their own criteria. Rather than mastering international economic relationships, Presidents Putin and Medvedev have proposed making Russia an alternative global financial center, with the ruble as a reserve currency. Unhappy with Russia's standing in the Davos rankings of political and economic performance, Russian specialists have proposed their own criteria, including "stateness."²⁵

Russia's higher education rankings incorporate size and number of specialties among the criteria. The results put Moscow and St. Petersburg in the top 100, two in the second 100; three in the third 100, and 45 in the final group, ranked 301-430. This gives Russia 52 of the top 430 VUZy in the world, or 12%.

Russians are not alone in offering an alternative based on criteria more favorable to their national institutions. The French have done the same, with even more egregious results. The Professional Ranking of World Universities by the Grande École Mines Paris Tech bases its ratings on the number of graduates who occupy top positions in Fortune 500 companies. By this standard, French institutions occupy two of the top ten positions, and five of the top twenty.²⁶ China ties with Belgium, Canada and Spain for 6th place on the French list; Russia is ranked # 20, below South Africa but above Australia. St. Petersburg University of Economics and Finance and Tiumen State Oil & Gas University tie for # 89 with 119 other institutions. Buguruslan Oil Technical School; Omsk State University, St. Petersburg State University, and the Ufa Petroleum Institute are among 135 institutions tied for # 216. Moscow University does not make the list, suggesting that the French ranking system is a rather poor gauge of overall university quality, but may be a useful indicator of how Russian VUZy prepare their graduates to compete in the global business world.

Brain Circulation:

The key to creating world class universities is attracting top students and faculty from around the world, including co-nationals with education and work experience abroad who return to work in their home country. There is no clearer indication of the difference in Chinese and Russian approaches to internationalization than their differing evaluations of and responses to the "brain drain," and to integrating foreign-educated personnel into the education system. Deng Xiaoping recognized that not all students and scholars who went abroad would return, consistently underestimated the magnitude of the potential losses, but always insisted that it was a price the country had to pay to integrate with the world academic and economic community.²⁷ In Russia, it has been difficult to overcome the view that those who leave are betraying the motherland that paid for their education.²⁸

Neither country's government really knows how many students or researchers have left, and estimates vary widely. Data do show that Chinese VUZy enroll more foreign students than Russia's; more Chinese students who go abroad return; China has had more success in attracting specialists who have spent time abroad to return to work in China; and as a result China now is more deeply integrated with the global scientific community.

China now sends more students abroad than any other country. Estimates vary, but most put the total number at more than 1 million since 1978.²⁹ In 2010 there were some 320,000 Chinese students studying abroad, of whom 80% expressed a wish to return to China to work, most in the technology sector.³⁰ While this in part reflects the

sheer size of China's population, it would not be possible without openness and quality. Chinese students must be talented enough to compete for funding, or at least competitive among students willing to pay tuition.

Less attention has been devoted to the more than 200,000 foreign students studying in China. These numbers dwarf the figures for Russia, where 40% of the 90,000 foreign students are from former Soviet republics (nearly half from Kazakhstan), and another 40% are from Asia (more than 1/3 from China). China attracts more students from industrialized countries. The top five sending countries to China are South Korea, Japan, the United States, Vietnam and Thailand. Overall, China receives about 5% of the world's foreign students; Russia about 2%.³¹

About 3/4 of the foreign students in Russia pay tuition, but Russia does not reap a significant economic return from this source. VUZy in the U.S. and UK earn about \$24 billion each year from foreign students. China makes nearly \$ 1 billion. Russia's "take" is about half of that, \$500 million.³² Students from Europe and the U.S. who study in Russia overwhelmingly choose Russian language and literature as their specialty. Few opt for natural science or technical fields. Perhaps more serious in terms of knowledge gains, 2/3 of the foreign students in Russia are undergraduates, most of whom are not involved in research. In the U.S., almost half of the foreign students are graduate students, mainly from China and India. Many of the best remain as post-docs, and here again Chinese and Indian students are the majority.³³

In 2008 the Chinese government announced an increase in financial support for foreign students in China, raising the number receiving stipends to 20,000 and increasing the stipend for undergraduates to \$200 per month. In announcing the policy, Liu Jinghui, secretary-general of the China Scholarship Council, explicitly stated that the presence of the foreign students would "help Chinese universities become more international." To attract more foreign students (the goal is 500,000 by 2020), some Chinese universities now offer instruction in English.³⁴ The Chinese government project to recruit foreign students and promote internationalization includes sophisticated indicators to measure the internationalization of Chinese universities, with decisions about funding tied to these performance indicators.³⁵

The range of measures the Chinese government and individual institutions have adopted to encourage returnees offers a stunning contrast to the dismal failure of Russian programs to induce "compatriots" to return to Russia.³⁶ Chinese VUZy, research institutions, and municipal governments actively recruit Chinese who were educated abroad. The government waived job assignment rules, allowing returnees to choose their place of employment. Special grants are awarded to returning scholars, some quite substantial, and they are also encouraged to compete for additional research funding in regular peer reviewed programs. Chinese who have received citizenship in other countries are given help with visas, and accorded special status. Decent housing is provided, along with assistance in finding jobs for spouses. Special arrangements are made to provide schooling and Chinese language instruction for

children of returnees who do not speak Chinese.³⁷

Major Chinese government programs include:³⁸

- The Cheung Kong Scholars Program established in 1998 by the Ministry of Education and the Li Ka-shing Foundation provides grants of up to 1 million RMB (\$120,000) to appoint distinguished scholars as professors or special professors (allowed to work in China for 3-4 months each year) at Chinese VUZy. More than 1000 faculty have been recruited through the program, most from abroad. The Ministry now selects 200 scholars and 60 innovative teams each year. The Cheung Kong program has encouraged imitation by several provincial and municipal governments.

- Ministry of Education High Level Talent Programs merged the Cheung Kong Program with two other initiatives in 2004. The New Century Outstanding Talent Support Program annually identifies 1000 scholars with the potential to become leaders in science and technology. The Nurturing Young Core Faculty Program identifies 10,000 individuals each year to become teachers and researchers in both natural and social sciences.

- The Chinese Academy of Sciences in 1994 created the One-Hundred Talent Program to attract scientists under age 45. It provided funding of about \$240,000 for three years, including research support, subsidized housing and high salaries. Since 1998 the Hundred Talents Program has been merged with the Academy "Knowledge Innovation Initiative." By 2004 it had supported 899 individuals, of whom 392 had foreign degrees and 778 had work experience abroad. These programs have made the Chinese Academy more integrated with international science. Some 81% of the members of Chinese Academy of Science and 54% of those in the Academy of Engineering Science are returnees from abroad. 72% of key research projects are headed by returnees.³⁹

- The National Natural Science Foundation (China's equivalent to the American NSF, established in 1986) created the National Science Fund for Distinguished Young Scholars in 1994. Funding levels have been increased frequently. In its first decade it supported more than 1000 young scientists. Among the grantees, about 1/3 had foreign doctorates, and nearly half had experience abroad. During the 11th Five Year Plan (2006-10), it is to make 190 awards each year.

Despite deep resentment from the "land turtles" who stayed home, Chinese VUZy and research institutes continue to attract thousands of "sea turtle" returnees each year. Some of them are making a major contribution. Recognizing that the top Chinese specialists may not be willing to give up their positions at leading institutions elsewhere, Chinese universities allow "swallows" to work for part of the year in China while retaining their positions abroad. Rather than viewing this as an indication of disloyalty, Chinese administrators have come to view it as a valuable form of networking, increasing the international circulation of talent.

Of more than 1 million Chinese who have studied or conducted research abroad, somewhere between 1/4 and 1/3 have returned. Ironically, China has benefitted from its lag in addressing the brain drain. The total number of returnees is less important than key individuals, and few individuals become “key” in year or two of work in foreign institutions. Japan’s experience illustrates this point. Young Japanese scientists tend to spend just a year or two outside Japan as post-docs. When these young specialists return to Japan, most continue to work as post-docs or junior researchers in laboratories in their home country. In contrast, many South Korean and Taiwanese scientists, including many educated in America, spent a decade or more working abroad. Not all of them have returned to their home countries, but those who do return are prepared to be laboratory directors, chief engineers, or to start their own businesses. The benefits of extended work in major S&T centers include not just research experience, but managerial skills, business acumen, and international networks of colleagues.⁴⁰

China experienced only a moderate brain drain in the 1980s. Following Tiananmen, however, the U.S. dropped visa requirements and allowed Chinese students to remain in the country, while many talented young Chinese sought to leave China. A decade after Tiananmen, as the Chinese economy developed and the government introduced more focused programs to encourage returnees, they were able to tap a large pool of talent with one to two decades of experience working abroad.⁴¹

Russia has a similar “reserve” of talented Russians who left in the 1980s and 1990s and acquired invaluable international experience. The key to tapping this pool of emigre Russian talent is to find ways to entice them back to Russia. Here the Chinese experience offers invaluable lessons, along with some important cautionary notes. The privileges accorded to returnees create resentment among those who did not “go out,” and perversely may encourage young researchers to go abroad so that they will be more “marketable.” The returnees include some who did not succeed in building solid careers abroad. Most serious, the top-level Chinese scientists, engineers and entrepreneurs show little desire to return to work in China. The challenge is finding alternative ways to involve them in networks so that colleagues working in China can benefit from their experience. China encountered all of the difficulties that have bedeviled Russian projects to attract compatriots: skepticism on the part of emigres that the government was serious, resentment from those who remained “loyal,” lack of housing, bureaucratic opposition, unevenly applied rules, etc.

The most important factors in China’s success have been incentives and competition. Leaders, supported by coalitions of innovation-oriented researchers, educators and entrepreneurs and investors, have radically altered the incentive structure to promote internationalization. China has mutual degree recognition agreements with 34 countries.⁴² The number of faculty with foreign degrees and publications in international peer reviewed journals are key criteria in selecting institutions for elite status and awarding funding. For individuals, tenure has become much less common, and a performance standard of three publications per year in

international peer reviewed journals is becoming widespread.⁴³ The changed incentive structure has helped attract Chinese to return to teach and conduct research.

The new incentives have fostered competition among institutions, local governments, and bureaucratic actors to attract returnees and increase internationalization. The Chinese Ministry of Education has a plethora of organizations promoting internationalization and recruitment of overseas Chinese talent. Chinese embassies and consulates actively recruit talented graduates. Cities do their own recruiting and have established “service centers” to assist returnees. Some operate “Postdoc stations” to help match returning researchers with VUZy and institutes.⁴⁴ The competition continually fosters creativity in offering incentives, and this over time this has begun to overcome the most difficult challenge in attracting returnees: changing the overall climate.⁴⁵

In contrast to the broad changes in China, much of the recent discussion about inviting specialists from abroad to participate in education and research in Russia has focused on visa rules.⁴⁶ Removing quotas, easing requirements and permitting longer time periods for visiting and working certainly represent a positive development (provided Russia’s *chinovniki* are prepared to implement both the letter and the spirit of the new rules in a timely manner). Even if all of the visa, registration and employment rules for foreign specialists are “fixed,” this is just the beginning. The incentive structure and accompanying psychology at VUZy must be changed radically. The overwhelming majority of academic personnel at almost any university in the world prefer things as they are. They certainly do not want competition from outside their academic circles. Current practices favor their conservatism. Many VUZy reward researchers for publishing in the institution’s own journals or with its in-house press, rather than in international peer reviewed venues. Russian VUZy do not recognize foreign PhD degrees unless the credential is vetted on an individual basis. This has severely limited the number of foreigners teaching at Russian VUZy and the length of time visitors may remain at an institution. The attestation process for VUZy includes counting the number of faculty with *kandidat* and *doktor nauk* degrees. Adding faculty with foreign degrees, even if the credentials are deemed adequate for them to teach, does not count in these statistics. Current VUZ faculty, threatened by the prospects of competition from outsiders, are not inclined to fight to change this system.⁴⁷ The Bologna process may help, but resistance remains significant.⁴⁸

In addition to involving Russian VUZy in research projects related to Skolkovo (see below), the Ministry of Education and Science has announced a competition, open to researchers from abroad, to attract 80 top scientists to Russian universities. The government has allocated 12 billion rubles of new money to this program during 2010-12 with the possibility of extending the funding for two additional years. While any new project of this magnitude has potential, the urgency with which this initiative is being introduced raises serious concerns. Current plans are for the competition to be formally announced early in July, proposals will be due within six weeks, decisions will be made in September, and grantees will receive their funding for 2010 in November.⁴⁹ This

sounds like characteristic Soviet-style bureaucratic behavior. The timetable is extremely compressed. Few outstanding scholars abroad are likely to submit proposals to uproot their professional lives on such short notice. It is more likely that scholars from the Russian Academy of Sciences will dominate the competition, perhaps promoting integration of VUZ and Academic science but not advancing internationalization. The Priority National Project for Education suffered from similar problems of tempos determined by overly rigid budget cycles. In some instances, the only legal way to use allocated funds within the mandated time period was to send every faculty member somewhere on *komandirovka*. Greater flexibility in the financing process would vastly improve the prospects for good results.

For most countries, an education system producing talented scientists and engineers is not an end in itself. Unless a government wants to be a donor to the global talent pool, the national R&D system must make use of the graduates. Increasingly, this requires integration into the international circulation of scientific, technical and entrepreneurial activity.

Internationalization, Innovation, and Institutions:

The most coveted prize in the global brain competition is to become a place where creative people want to work. Clusters of innovation like Silicon Valley, Bangalore, Zhongguancun, Grenoble, or Milan become self-perpetuating, as talented people congregate to work alongside the best minds in their fields. While Stalin may have achieved something resembling this in the World War II *sharashki*,⁵⁰ brute force limits the recruitment pool rather severely. It takes time to establish centers of technology and innovation, and quality of life is as important as funding for research.⁵¹ Researchers from abroad are not likely to congregate until there is a significant concentration of local talent. This requires developing an indigenous community of scholars with international experience and networks. Both in overcoming administrative barriers to inviting foreign specialists to teach at universities and in battling with bureaucrats over opening up to innovation, the Russian approach has been less successful than China's.

China and Taiwan are the only countries where the high tech center is located in or near the capital. China's high tech center is Zhongguancun. Many analysts doubted that China could develop a competitive IT center, and few would have bet on Beijing as the location: Shanghai, Guangdong and Xi'an appeared more promising. The weakness of the local government in Beijing played a major role in successful development: lacking the power to interfere or control, local officials sought ways to help foster technology businesses drawing on the existing R&D community. Often this involved ignoring if not flouting existing rules. In Deng's China, "catching mice" was more important than obeying the letter of the law. Local officials were evaluated on the basis of improving the local economy. Over time, the R&D and business communities based in Zhongguancun exerted significant influence on Chinese government policy, helping to preserve and promote internationalization.⁵²

As a large country and a country with many large enterprises, China was not in the most favorable position to develop an IT industry. Smaller countries do better (Taiwan, Israel), and economies dominated by large corporations (Japanese *kairesu*; South Korean *chaebols*) are not easily penetrated by the small entrepreneurs who found startups.⁵³ This largely explains why Shanghai, dominated by large SOEs, did not become China's IT capital. In an industry dominated by small start-up firms; venture capital funding; clusters of creative people, and product cycles as short as nine months, no country has succeeded in building a leading center from the top down.⁵⁴

Despite the challenges, creating a "Russian Silicon Valley" at Skolkovo is a top priority project in 2010. President Medvedev established a working group to develop the project at the end of 2009. Vladislav Surkov gave an interview on February 15, 2010 in which he laid out the basic concept. He stated that Russia already has all the basic components to succeed, but has experienced problems because of lack of demand: "Throughout the entire world, demand for innovation is determined by the state and major corporations . . . we need to start with creating the demand, with the order. . ."⁵⁵ (He appears to have left out consumers in this formulation.) Sukov added that innovations are developed by large corporations in response to state orders. This will be news to most experts. Arkady Dvorkovich sounds better-informed when he talks about the project, but Surkov is officially in charge. Both the President and the Prime Minister have teams working on making Russia an innovation economy. An optimistic view would be that this demonstrates the importance of the project. A pessimistic explanation is that those benefitting from development based on resource exports want to embrace the innovation initiative in a bear hug tight enough to smother it.

A parade of Russian administrators now visit MIT, Stanford and Silicon Valley, and groups of foreign academic administrators, researchers and venture capitalists are touring Russia to discuss potential collaboration. The first project was announced in June 2010. Skolkovo was prominently featured at the St. Petersburg Economic Forum in June 2010, and it will take time for the impact to become clear.

Even if Russia defies world experience and all the goals for Skolkovo are met, however, it will have only a limited impact on the rest of Russia. Enclaves do not change societies.⁵⁶ At best Skolkovo will resemble Peter the Great's "German suburb." In China, dozens of small enterprises in Zhongguancun and other technology centers pushed for changes in rules inhibiting their development. Coalitions of entrepreneurs, researchers, investors and officials initially sought special privileges, but over time lobbied to change the rules, making entire sectors of the Chinese economy more dynamic and promoting the internationalization of education and research.⁵⁷

Conclusion:

Why has Russia failed to maintain and augment the research and education infrastructure inherited from the USSR while China, a less wealthy country starting from a weaker base, now ranks second in the world in international peer reviewed scientific

publications? At least eight possible explanations merit attention:

- Perhaps Russian/Soviet education and science were not that good to begin with? The Soviet achievement in science and education is often overstated, but Russia in 1992 had a much better educated population and far stronger R&D base than China in 1976. Ironically, the very strength of Russia's starting position has made it difficult to learn and adapt. China's post-Mao leadership began reforms after the Cultural Revolution had demoralized the scientific, educational and professional elites. In the USSR, perestroika was initiated at a time when Soviet scientists remained under the spell of Sputnik, convinced that their research and education institutions were on a par with the best in the world. The "Sputnik mentality" has persisted despite Russia's low international standing in global measures of science and education.

- Is it just money? It is impossible to ignore Russia's economic crisis in 1988-98, which induced many talented individuals to leave the country or to change their professions. Yet in the 1920s, despite difficult economic conditions, the Soviet government managed to attract leading scientists back to Russia by offering significant support for their research. Scholars like Vernadskii and Pavlov came back because the government provided opportunities to create research centers that no European country would match.⁵⁸ Russia's per capital GDP is four times that of China, yet China spends more per student and devotes a greater share of its GDP to research.

- Could it be that the "resource curse" inhibits public goods provision? Norway, Australia and Canada have managed to create successful knowledge-based sectors despite their heavy dependence on natural resource income. The Russian economy is much less productive in the non-resource sector than the country's human capital endowment would predict, suggesting major opportunities for development.

- Should the problems be blamed on privatization? Many would agree. Yet China's success in IT and other fields has derived in large part from non-state enterprises. Rather than privatization, it is the dominance of the economy by large state corporations that inhibits innovation.

- Is policy to blame? Russia has been slow to develop proactive programs to recruit foreign talent, but it appears that resistance to programs like compatriots returning or Bologna is as much to blame as the policies themselves. China has done better at changing the incentive structure to overcome resistance to internationalization.

- Many Russian commentators focus on *mentalitet*. They are correct that large numbers of Russians are ambivalent about globalization and prefer "traditional" ways of doing things. But this hardly makes them unique. In the Russian case, the normal human proclivity to resist unsettling change is undergirded by strong individual and institutional interests. Bureaucrats resist policies that would undermine their capacity to control and exact rents. Academy of Science officials resist policies that would limit their discretionary control over resources and research decisions. VUZ administrators resist

competition, both from foreign sources and even in employing their own graduates.

- Many Russians attribute China's success to state programs carried out by enlightened authoritarian rulers. A narrative of state-led development by a single ruling party justifies "sovereign democracy." China's Communist Party has no reason to dispute this explanation, since success confers legitimacy. But China's rise is not a story of successful state-led development, nor a case of "East Asian" development through industrial policy. Rather, China has performed well where the state *partially* lost control, and where competition has been most intense.⁵⁹ State-owned enterprises have not been leaders in developing high technology.

- Russia's policy failures point to institutional weaknesses. Russian institutions perform poorly, in large part due to self-interest, and Russians have been less successful than Chinese in generating social forces to contest institutional obstacles. Corruption is among the most damaging institutional weakness in Russian education. The data compiled by INDEM on the amounts Russians spend for tutors, bribes, and side payments to ensure passing grades were contested vehemently when first published.⁶⁰ Recently, these data have been confirmed by top Russian education officials⁶¹

The institutional explanations are the most convincing. And this is good news. Institutional problems can be fixed. It is not easy, takes time, and reformist leaders need help to overcome bureaucratic resistance and entrenched interests. If institutions are the problem, China's experience, and others, suggest that changing incentive structures and fostering competition are the answer.

Russia's situation is both better and worse than this comparison with China indicates. It is worse because Russia has wasted two decades, market reforms have been discredited by proponents of "national champions," many talented people will never return, and entrenched interests resist genuine internationalization and competition. Yet Russia's situation is in some ways better than it was a decade ago. Traditional fields of strength like math and theoretical physics retain their reputations. The government is spending more on education and science, despite the economic crisis. Younger Russian scientists are more mobile internally and more open to international contact and collaboration.⁶² It is also better because the solutions are clear, even if politically difficult..

China and Russia face daunting problems in their efforts to compete in an increasingly crowded global innovation race. Their challenges are both similar and different. China must continue its uphill climb even as returns become harder to achieve. It must resist the temptation to revert to nationalist as opposed to internationalist approaches. And it must permit greater intellectual and information freedom, which could threaten the CCP's political monopoly. Russia must do all of these things, but to even begin to confront the problem it must improve institutional performance by creating incentive structures that change the behavior of academic and bureaucratic elites. China's successes have not come easily, and are due in large part

to coalitions of scientific, educational, local government and business interests with incentives to support and increasingly influence reform and top-level reformers. Russia needs a comparable constituency for internationalization and innovation to overcome unfavorable incentive structures and entrenched interests.

ENDNOTES

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