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## Conference Paper

# Communication and location: their interdependencies in contemporary Russian regions

52nd Congress of the European Regional Science Association: "Regions in Motion - Breaking the Path", 21-25 August 2012, Bratislava, Slovakia

### Provided in Cooperation with:

European Regional Science Association (ERSA)

*Suggested Citation:* Pelyasov, Alexander; Zamyatina, Nadezhda (2012) : Communication and location: their interdependencies in contemporary Russian regions, 52nd Congress of the European Regional Science Association: "Regions in Motion - Breaking the Path", 21-25 August 2012, Bratislava, Slovakia, European Regional Science Association (ERSA), Louvain-la-Neuve

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**Communication and location: their interdependencies in contemporary Russian regions**

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*Paper to be presented at the 52th European Congress of the  
European Regional Science Association,  
Bratislava, August 21-25, 2012*

### **Abstract**

The main idea of the research is to investigate how the communication processes could result in the location of productive forces in contemporary Russian regions. The results are based on utilizing several traditional and new methods of regional analysis. We have analyzed:

- 1) Inter-regional flows of skilled migrants, including special case of PhD holders (the official statistics of arrivals and departures for all Russian regions for 2008--2010);
- 2) Internet links between the sites of 40 Russian universities (the selected universities are located in 25 Russian cities; the results of more than 1800 retrieval requests were investigated); the number of internet links was compared with the national scientific, educational, and other University ratings;
- 3) career paths studied on the material of Internet social networks for the case of Tomsk University graduates (more than 1200 students graduated from the University in 2006-2009);
- 4) location of new biotechnology firms in the cluster of the city of Biysk, Altai Krai region.

We have elaborated several lines of research.

- 1) Location of the new industries (like biotechnology) and communication pattern between economic actors in this industry.
- 2) Spatial structure of the Higher Education Institutions in contemporary Russia, their status and mobility patterns of the labor force.
- 3) Different location behavior among post-graduates of Tomsk University, that is specific assets like specialists in chemistry and physics, and common assets like specialists in arts and applied mathematics. For example the significant portion of specialists in physics born in small towns around Tomsk move to such R&D centers like Snezhinsk and Sarov located more than 1000 km far from Tomsk; the specialists in chemistry born in south cities move to the labor markets of the Russian North; the graduates in arts and applied mathematics tend to stay in Tomsk or to move back to the cities where they were born.
- 4) Different location behavior among skilled migrants and PhD holders (for example, in 2008-2010 PhD holders moved to such peripheral regions as Altai and Kurgan which were losing both the skilled and the total population.

Regional competitive advantage is closely related with the local communication process. Location or relocation of the most innovative activities depends on the model of local community communication as well as on the scale and substance of its outward communication network.

## 1. Introduction

Russia has a significant specificity in the relation of communication and the location of productive forces. The vast spaces of the country in conjunction with relatively low infrastructural development make connections between the regions much more expensive than in Europe and the United States. Any transformations in the territorial distribution of productive forces require greater incentives than in the European space. As it is typical for countries with economies in transition, Russia is characterized by the high role of informal communications and contracts. Apparently, Russian communication space is less homogeneous and more complex than the communication space in the Western countries. Unevenly developed spaces of the country and the specificity of the interaction of economic agents make communication particularly important factor of the territorial organization of the productive forces.

Communications influence on the location of productive forces in different ways. Within the labor market the distribution of skilled human capital is of the most importance. Since Lucas (1988) argued that the spatial concentration of skilled labor through a new kind of externalities increases economic productivity and growth a large number of works has been written on the problem of skilled migration. Some articles had payed attention to the process of training of the labor force. For example, G. Maier, M. Trippl and B. Kurka (2009) have investigated how the presence of a star scientist in a region affects on the regional economy by means of training and education of the regional human capital.

Both skilled human capital production and migrations are the two main processes forming labor market in contemporary economy. Looking at the communication factors of the location of productive forces we very often deal with the distribution of skilled labor forces.

The paper is organized into four sections. In the next section we do some conceptual notes on the role of communication in labor force location. The main point here is that Russian universities are the key points shaping the career paths of young people. So universities are the very important actors not only in skilled human capital production but also in labor force migration.

The third part devoted to the empirical analysis shows the concrete mechanisms shaping labor force market by means of communications in university social and institutional environment.

The paper ends with a section that summarizes the results and formulates conclusions relevant for the university's role as a communication agent in the interregional labor market.

## 2. Methodological approach: Universities as a communication agent in the location of productive forces

In this section we shall pay attention to theoretical notions for the analysis of the communication factors in the location of productive forces as they work in Russia. Furthermore, the data used in the empirical analysis will be described.

### *Theoretical notes*

Among a vast field of migration of skilled human capital we shall look in detail at the student migration flows to the Universities and the post-graduates flows from Universities. Our reason is based on the specific role of Universities in the Russian contemporary economy.

In many European or American works universities are examined first of all as innovation sources in knowledge economy (Anselin L., Varga A. and Acs Z., 1997; Audretsch D., Lehmann E. and Warning S., 2004). The flows of human (and creative) capital are determined by other factors such as wages, job places, the availability of housing, amenities, beauty, tolerance in the society and so on (Florida R., 2008).

The role of universities has increased significantly for the most knowledge-sensitive industries as ICT or biotech where the tacit knowledge flows and inter-firm communications are very important.

It is surprising that Russian universities play a very important role in the location of productive forces. They act not as labor force distributor but as the magnets for human capital itself. The situation seems to be similar to that of China where both human and creative capital concentration is determined by the university location but not by amenities (Florida, Mellander and Qian, 2008)

Looking at the universities as key points of labor market reconfiguration we took into consideration the following peculiarities of their role in Russia.

**A.** In the Russian economy universities traditionally have the solely educational functions - but meanwhile the main sources of innovation, knowledge spillovers and high-tech spin-offs are non-educational scientific institutes (so-called “scientific research institutes”) or even state military-industrial corporations.

For example we have done a case-study of Byisk biotech cluster in Altai krai. Here we exposed how the new communication system was shaped while the numerous spin-offs appear around the military-industrial complex-organized corporation “Altai”. The scientific institute (Institute for Problems of Chemical & Energetic Technologies) established in 2001 can be recognized as a kind of large-scale spin-off. Some new educational institutions had been established later. So the cluster was created under the basis of the military-industrial corporation in the process of its restructurization while the role of universities (Tomsk State Polytechnic University etc.) were weak.

**B.** University is a career step for the large portion of Russian labor market actors: 17% of total labor force and approximately 20% of the city labor force have high educational (university or similarly) diploma.

**C.** Meanwhile the university diploma holders form the major portion of the whole labor force interregional migration flows. We can see it from the similarities in migration flows distribution of the adults (14 years old and older) and skilled specialists (with high educational diploma). We have received the positive correlation between these two variables of 0,86 (for 2008-2010).

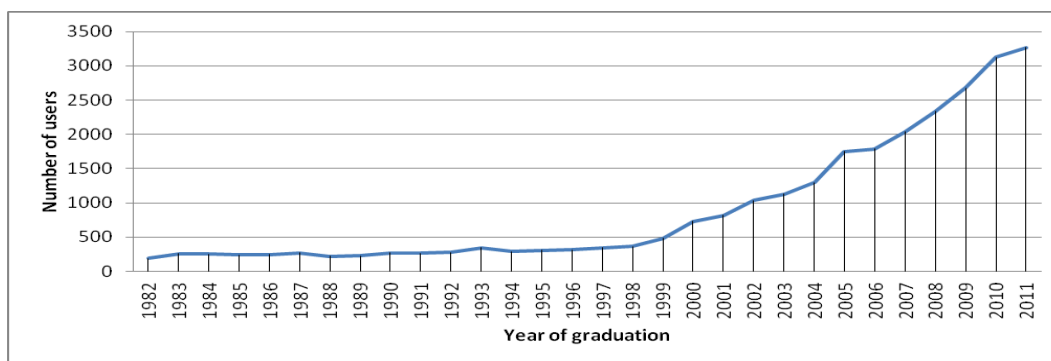
So we can recognize universities as an important factor of the location of the Russian labor force. Due to the fact that informal communications are the very important factor in finding a job in contemporary Russia (Yakubovich, 2002) we can apply to the communications as a mechanism by means of which the universities act on the location of the Russian labor force.

#### *Data and methods*

The main method in our research was the analysis of career paths studied on the material of Internet social network [www.vk.com](http://www.vk.com). The selection of such a method was done due to two reasons. First was the absence of available detailed regional statistic data in Russia to study migrations. Such detailed migration case studies as for example Duke-Williams (2009) are not possible in Russia. But there is no evil without good. Without good statistics we have to use the internet social networks as one of the most useful material in regional studies. The factors of productive forces location in knowledge economy become more and more delicate and even tacit. So the experts in regional science began to use social internet networks to study the very special personal cases. The internet social network LinkedIn was used for example to study career paths (Feldman, 2011) and Facebook and LinkedIn were used for collecting data on Indian and Chinese entrepreneurs studied in Silicon Valley (Wadhwa V., Saxenian A. and others, 2009; Wadhwa V., Jain S., Saxenian A. and others, 2011). So the second reason was to use the most actual data that can fit for the analysis of knowledge and communication factors of location.

We have chosen the network [www.vk.com](http://www.vk.com) for the analysis. It is the most popular Internet network in Russia (Mirovaya karta..., 2011) but it can fit for study of migration of youth only. For example, in the Figure 1 we could see that the number of graduates of Tomsk state University registered at vk.com rises especially after 2005 (1983 year of birth and younger). But as for the case of students it is especially a good source: in our estimations [www.vk.com](http://www.vk.com) network connects more than 60% of all Russian present-day students.

**Figure 1. Graduates of Tomsk state University registered at vk.com (by graduation year)**



The personal user's page includes here the information of birth place, the year and place of school and university graduation and working places of the user. So we have extracted two data sets.

First we have collected data on the working place (at October 2011) of approximately 1000 graduates of Tomsk state university (one of the most famous non-Moscow Russian universities included in Top 10 Russian Universities National Rating) of 2005-2010 years of graduation from following faculties: faculty of Chemistry, Physical and Technical Science, Applied Mathematics and Cybernetics, Arts and Culture.

Second data set (March 2012) contents information on the places of school graduation for graduators of Novosibirsk state University<sup>1</sup> (4402 personal user pages were examined for the 2005-2010 year post-graduates in Physical Science, Natural Science (chemistry and biology), Mathematics, Arts and Culture) and Tomsk state university (1037 personal user pages for the same specialties as in the first set). For the collection of data the special software<sup>2</sup> was used.

We have also used some other methods and data for subsidiary researches and comparison.

#### *Migration statistics*

We have used official regional level migration statistics (2008-2010). The regional level data on departures and arrivals of migrants of the various educational levels (the all migrants in the age 16-60 years; university graduates and PhD-holders) (Chislennost i migratsii naseleniya Rossiiskoi Federatsii,) and also regional level data on departures and arrivals on different reasons (education, work, etc.) were used (the city-level data are not available).

#### *Internet links between Russian universities' Internet sites*

We have also studied Internet links between 40 Russian universities' Internet sites (the selected universities are located in 25 Russian cities; the results of more than 1800 retrieval requests were investigated); the number of internet links was compared with the national scientific, educational, and other University ratings.

<sup>1</sup> Also in Top 10 Russian University.

<sup>2</sup> Developed by Alexey Yashunsky.

Used method is similar to the Thelwall's method of Internet hyperlinks analysis (Thelwall, 2002 and also Thelwall, 2009) used also in a number of works on regional science (for example, Maggioni M. and Uberti T., 2009) but there are some differences.

Thelwall and his followers explored the Internet hyperlinks between university sites forming the special cyberspace structure. We used not hyperlinks but all citations of one internet site done in the text of the other internet site (including citations in conference working papers for example) The reason was the assumption that the space of links is more closer to knowledge spillover space than the hyperlinks space.

After testing some search engines (Yahoo!, Yandex and Google) we used the Google advanced search tool permitting to search some text (in our case it was the internet address of a university site) in a special domain zone. We had chosen 40 Russian universities in 25 cities (from the top 50 Russian National rating of universities (National... 2010) with the largest number of their sites citations from other university sites. In the end we got a matrix of 1560 citations from one university site to another for all 40 universities.

#### *Spin-off firms in biotech cluster*

We also did the genetic analysis of spin-off firms in the biotech cluster of Biysk (South Siberia).

### **3. Empirical Analysis: How does the communication in the University environment influence the location of productive forces**

In this section we shall present the findings of our empirical analysis. We shall investigate how the communication space configuration results in the location of productive forces. The main process here is how the communications shape the labor market.

The distinguishing feature forming the labor market in contemporary Russia is that the key point of career path of the students is their choice of the University that strongly influence the further choice of the place of residence.

We analyze the role of University-based communications on the location of productive forces on three different levels.

Firstly, we investigate the spatial distribution of schools graduated by students of the defined university (the cases of technical and humanitarian faculties of Novosibirsk and Tomsk State universities). The results are interpreted in the light of the communication mechanisms driving school graduate to the defined university.

Secondly, we study the spatial distribution of places where the university graduates find their jobs (also Novosibirsk and Tomsk State universities). Especially we pay attention to the cases of residence choice in mono-specialized industrial towns and also in the university city.

Thirdly, we verify that the large-scale potential of the University communications is due to its higher place in the rating and image status among other Universities.

#### *3.1. From which cities do students come: how local communication pattern specifies their route to the university?*

A first approach to the question of the role of the university in a productive forces location is to look at the student origins.

Our hypothesis was based on the following suggestion:

- The closer one lives to the defined university the more opportunities he has to enter the university (due to low costs of moving between cities);
- so the school-leavers from the nearest cities are more likely to enter the university than those from distant ones;
- if school-leavers from one far-distant city enter the university more often than school-leavers from the other far-distant places, some special factor could be found that facilitate student moving to the university.

So we have chosen far distant cities in which many students of this university did leave their schools and after that we investigated the mechanisms of student moving to the university in the light of communication factors search.

As it turns out (we can see it in the Appendix and Table 1), the distant places of school-leavers are really concentrated in a few cities (or even regions).

**Table 1. Places of school-leaving of the university students: zone of the complex university attraction factors and zone of communication university attraction factors**

City of school-leaving	Novosibirsk university students				Tomsk university students			
	Faculty of physical science	Faculty of arts and culture	Faculty of physical science	Faculty of arts and culture	Faculty of physical and technical science	Faculty of arts and culture	Faculty of physical and technical science	Faculty of arts and culture
	Total number	Total number	%	%	Total number	Total number	%	%
<b>Total number of personal pages</b>	<b>1032</b>	<b>817</b>	-	-	<b>410</b>	<b>338</b>	-	-
<b>Total number of pages containing information on the school-leaving place or birth-place</b>	<b>364</b>	<b>272</b>	<b>100</b>	<b>100</b>	<b>146</b>	<b>135</b>	<b>100,0</b>	<b>100,0</b>
<b>Cities with complex factor of university attraction based on the close distance to the university</b>								
Berdsk	4	7	1,1	2,6	0	0	0,0	0,0
Seversk	0	0	0	0	3	5	2,1	3,7
Kogalym	0	0	0	0	3	0	2,1	0,0
Anzhero-Sudzhensk	0	0	0	0	2	4	1,4	3,0
Kemerovo	4	2	1,1	0,7	1	3	0,7	2,2
Novokuznetsk	11	1	3	0,4	0	2	0,0	1,5
Barnaul	9	1	2,5	0,4	0	0	0,0	0,0
Ust'-Kamenogorsk	6	0	1,6	0	3	0	2,1	0,0
Pavlodar	3	1	0,8	0,4	1	2	0,7	1,5
<b>Cities with prevailing communicational factor of attraction of the university</b>								
Biysk	8	2	2,2	0,7	21	1	14,4	0,7
Mezhdurechensk	0	0	0	0	16	3	11,0	2,2
Angarsk	3	0	0,8	0	0	0	0,0	0,0
Zheleznogorsk	9	1	2,5	0,4	0	0	0,0	0,0
Small cities of Sakhalin Region (Korsakov, Yuzhno-Sakhalinsk, etc.)	5	1	1,4	0,4	0	0	0,0	0,0
Ulan-Ude	2	1	0,5	0,4	8	4	5,5	3,0
Karaganda	0	0	0	0	9	0	6,2	0,0
Kokchetau	3	1	0,8	0,4	4	0	2,7	0,0
Schuchinsk	0	0	0	0	5	0	3,4	0,0
<b>Total number of students from cities included in the table</b>	<b>67</b>	<b>18</b>	<b>18,4</b>	<b>6,6</b>	<b>76</b>	<b>24</b>	<b>52,1</b>	<b>17,8</b>

***Data on cities with communication privileges***

The detailed investigation shows that in the distant places of school-leaving the *communication factor is really the major factor of university attraction*. It is some special forms of entrance examinations, taking place in a number of cities (especially so called Olympiads). Due to this Olympiad a school-leaver could enter the university without expensive travel to the university city (it is especially true for Novosibirsk students from Sakhalin and other Far Eastern regions located more than 5000 km from the university). So *some institutionalized*



*communication channels in a portion of cities reduce transaction costs to enter in the University so that potential skilled labor force could move to the university city across several thousands of kilometers.*

This factor acts mainly for the technical faculties. The choice of cities to drive students to the university is tied to their industry specialization: more students come from cities specialized in high-tech industries (Biysk, Zheleznogorsk, Angarsk), aircraft building<sup>3</sup> (Ulan-Ude), mining (Mezhdurechensk, Karaganda).

It is interesting that students from such cities moving to the university due to special conditions in their cities do not move back to their cities after graduating the university. This problem will be discussed in the next subsection.

*3.2. Where do they go after graduation of the university: following the institutionalized communication channels and «boggling down» in the city*

Finding a residence after graduating a university is a key point where communication influence the location of productive forces. The study of career paths of university graduates shows us that they concentrated in a very few number of cities. In fact there are three groups of cities where university graduates find their residence (see Table 2):

- the university city;
- Moscow, Saint-Petersburg (and also some foreign cities);
- some highly specialized industrial cities where the technical-skilled graduates concentrate.

**Table 2. Concentration of Tomsk university graduates (2007-2010): Tomsk, Moscow, S.-Petersburg, specialized industrial cities**

The city of residence	The share of graduates with a residence in the city (from the total number of graduates that gave information on their residence) by faculty, %			
	Faculty of chemical science	Faculty of physical and technical science	Faculty of applied mathematics and cybernetics	Faculty of arts and culture
Tomsk	67,0	59,9	69,0	80,2
Moscow	-	3,6	2,2	2,4
Saint-Petersburg	-	4,8	3,4	1,6
Biysk	-	4,8	0,6	1,6
Snezhinsk	-	1,8	-	-
Noril'sk	5,3	-	-	-
Novosibirsk	8,5	2,4	2,8	1,6
Novokuznetsk	4,8	-	-	-
Surgut	3,2	-	-	-
Anzhero-Sudzhensk	3,2	-	-	-
Kemerovo	-	-	1,1	0,8
Omsk	-	-	0,6	-
Tyumen'	-	1,8	0,6	-
Seversk	0,6	0,6	2,2	1,6
Krasnoyarsk	-	-	1,1	1,6
Zheleznogorsk	-	-	1,1	-
Mezhdurechensk	-	4,2	-	-
Ulan-Ude	-	3,6	-	-
<b>Total</b>	<b>92,6</b>	<b>87,5</b>	<b>84,7</b>	<b>91,4</b>

All cities with more than 2% graduates in at least one faculty were included in the table. Cities with industries needs in specific Tomsk university educated specialists were marked.

<sup>3</sup> Same specialization is present at the Tomsk University.

We have done special research of how do graduates move to such distant specialized cities like Noril'sk (polar mining city) or Snezhinsk (a Ural city of nuclear industry). It includes personal survey among graduates (via personal messages to internet network members) and a study of agreements between the university and corporations in such a cities. We find that there are some stable institutionalized communication channels for moving.

It is interesting to mention that communication channels facilitating school-leaver move from a specialized industrial city to the university and channels facilitating university-post-graduates move to specialized industrial city are different. In general they do not correspond each other. For example, some people move from Biysk to Tomsk for study but they do not move back to Biysk after graduation and other people move from Tomsk to Biysk for a job (mostly those born in peripheral towns of Kazakhstan or Kemerovo Region).

*The main tendency is that the last share of peripheral people moved to university city would not move to other cities (or even to their home cities) after graduation but find a job in the university city* (sometimes more than 75% of moved). It is especially true for humanitarian-skilled post-graduates (table 3).

**Table 3. «Bogging down» of post-graduates in the university city**

Novosibirsk State university					Tomsk State university				
	Faculty of physical science	Faculty of arts and culture	Faculty of applied mathematics and cybernetics	Faculty of natural science		Faculty of physical and technical science	Faculty of arts and culture	Faculty of applied mathematics and cybernetics	Faculty of chemical science
<b>Total number of post-graduates</b>	<b>1032</b>	<b>817</b>	<b>1686</b>	<b>867</b>	<b>Total number of post-graduates</b>	<b>410</b>	<b>337</b>	<b>134</b>	<b>156</b>
<i>Number of post-graduates that gave information of their residence after graduation</i>	<i>359</i>	<i>263</i>	<i>543</i>	<i>270</i>	<i>Number of post-graduates that gave information of their residence after graduation</i>	<i>177</i>	<i>129</i>	<i>127</i>	<i>138</i>
including:					including:				
Moved to Novosibirsk University from other cities	174	57	249	131	Moved to Tomsk University from other cities	126	45	51	75
<b>The share of post-graduates (in the total number) that gave information of their residence after graduation, %</b>									
Novosibirsk-born or leave school in Novosibirsk and stay in Novosibirsk after graduation	44,0	67,3	46,8	45,6	Tomsk-born or leave school in Tomsk and stay in Tomsk after graduation	17,5	57,4	46,5	35,5
Novosibirsk-born or leave school in Novosibirsk and move to other cities after graduation	4,7	8,0	4,6	5,2	Tomsk-born or leave school in Tomsk and move to other cities after graduation	1,7	3,9	7,1	2,2
Moved to Novosibirsk university from other cities, move to other cities from Novosibirsk after graduation	7,8	8,7	9,6	8,5	Moved to Tomsk university from other cities, move to other cities from Novosibirsk after graduation	33,9	10,1	12,6	19,6

					graduation				
-including moving back home	2,8	3,0	2,8	0,7	-including moving back home	9,6	3,9	6,3	8,0
Moved to Novosibirsk university from other cities and stay in Novosibirsk	40,7	12,9	36,3	40,0	Moved to Tomsk university from other cities and stay in Tomsk	37,3	24,8	27,6	34,8
<b>The share of post-graduates (in the total number) moved to the University from other cities, that gave information on their residence after graduation, %</b>									
Moved to Novosibirsk university from other cities, move to other cities from Novosibirsk after graduation	16,1	40,4	20,9	17,6	Moved to Tomsk university from other cities, move to other Tomsk after graduation	47,6	28,9	31,4	36,0
-including moving back home	5,7	14,0	6,0	1,5	-including moving back home	13,5	11,1	15,7	14,7
Moved to Novosibirsk university from other cities, stay in Novosibirsk	<b>83,9</b>	<b>59,6</b>	<b>79,1</b>	<b>82,4</b>	Moved to Tomsk university from other cities, stay in Tomsk	<b>52,4</b>	<b>71,1</b>	<b>68,6</b>	<b>64,0</b>

*So the universities do not produce human capital for their surroundings but on the contrary suck out the potential human capital from their surroundings. Only some special communication channels can break this tendency for technical-skilled post-graduates.*

### 3.3. Status and communication: internet citations and rating of the university

The internet citation of the University site is the most common (universal) rating of its communication. Our hypothesis was that the larger is the internet communication field of a university the more human capital could the university attract from the periphery.

As it could be seen from the Table 4 the citation of a university internet site is somehow tied to the interregional student flows. It means that the universities with low-cited sites teach students mainly born in the same region, the universities with high-cited sites teach students from a vast peripheral zone. *So the scale of university internet communication is tied to the inter-region flows of human capital.*

**Table 4. Regions of Top 10 high-cited university internet sites and top 10 regions with the highest student migration<sup>4</sup>**

№	Regions of Top 10 high-cited university internet sites (by cited university)	Top 10 regions with the highest student migration (2008-2010)	For comparison: top 10 regions with high total migration balance (migrants of 14 years old and older), 2008-2010
1	<b>Moscow</b> (Lomonosov Moscow State university, )	Saint Petersburg	Moscow City
2	<b>Tomsk Region</b> (Tomsk State University)	Moscow City	Moscow Region
3	<b>Saint Petersburg</b> (The Saint Petersburg State University of Information Technologies, Mechanics and Optics -- University ITMO)	Novosibirsk Region	Saint Petersburg
4	<b>Moscow</b> (National Research	Sverdlovsk Region	Krasnodar Region

<sup>4</sup> Balance of educational migration on a regional level; in fact it means the educational migration in a university city.

	university “Higher School of Economics”)		
5	<b>Novosibirsk Region</b> (Novosibirsk State university)	Samara Region	Novosibirsk region
6	<b>Saint Petersburg</b> (Saint Petersburg State university)	Tomsk Region	Leningrad Region
7	<b>Tomsk Region</b> (Tomsk State Polytechnic university)	Voronezh Region	Belgorod Region
8	<b>Tatarstan</b> (Kazan Federal university)	Krasnoyarsk Region	Samara Region
9	<b>Voronezh Region</b> (Voronezh State university)	Moscow Region	Tatarstan
10	<b>Sverdlovsk Region</b> (Gor’ky Ural State university)	Rostov Region	Sverdlovsk Region

Coincidencies are marked.

The correlation analysis shows that the number of the university sites citations correlates with the rating of the university<sup>5</sup> on such criteria as “brand” and “researching” but not with the rating on the criterion “innovation and R&D commercialization” (see Table 5). The total number of students also does not correlate significantly with university site citation.

**Table 5. Correlations between University site citation and rating of the University**

Variables for sites	Variables for universities				
	Number of students	Total ranking in the National university rating	Ranking on the “research” criterion	Ranking on the “brand” criterion	Ranking on the “innovation and R&D commercialization” criterion
Total number of the university site citations (on the other university sites)	0,24	-0,31	<b>0,80</b>	<b>0,74</b>	-0,12
Total number of the university site citations (on the other university sites) excluding the site of MPTI <sup>6</sup>	0,13	-0,37	<b>0,71</b>	<b>0,73</b>	-0,06
Average number of the university site citations (on the other university sites) excluding the site of MPTI	0,13	-0,37	<b>0,71</b>	<b>0,73</b>	-0,06
Total number of other university sites cites (on the site of the university)	-0,21	-0,26	0,33	0,44	0,02
Average number of other university sites cites (on the site of the university)	-0,21	-0,27	0,33	0,44	0,02

So the image of a university also could acts on the interregional human capital flows shaping via concentrating the majority of talented people from vast territories to a few number of universities with a good rating and broad internet communications.

In the next section we shall summarize our results on the investigation of the role of communications in the migration of the highly-skilled labor forces in Russia.

<sup>5</sup> National university rating, 2010 г. (<http://unirating.ru/>)

<sup>6</sup> Because site of MPTI has extremely great number of citations if was excluded from the matrix.

### **Summary and conclusions**

The Universities are the main points in the human capital redistribution and communications play an important role here. This occurs from the following processes found from the social Internet-network analysis.

First of all in the places which are very remote from the university the communication factor is really the major factor of a university attraction. There are some permanent and institutionalized communication channels (like special forms of entrance examinations) which reduce transaction costs on entering the university in a number of cities. So the first step of how the university relocate potential skilled labor force is how it attracts its students.

This factor acts mainly for the technical faculties. It is interesting that students from such cities being moved to the university due to special conditions in their cities do not move back to their cities after graduating the university.

The next step in shaping the labor market by the university is the distribution of its post-graduates. In fact, there are three groups of cities where university graduates find their residence:

- 1) The University city;
- 2) Moscow, Saint-Petersburg (and also some foreign cities);
- 3) Some highly specialized industrial cities where the technical-skilled graduates concentrate.

In the third case we are sure that it is the result of existing institutionalized communication channels that attract post-graduates in such cities.

It is interesting that communication channels “moving” a school-leaver from a specialized industrial city to the university and that moving a university post-graduate to a specialized industrial city are different and they do not correspond each other.

But the main tendency in skilled human capital distribution is «boggling down» of post-graduates in university city. Sometimes more than 75% of students moved from other cities to the university find a job in the university city. It is especially true for humanitarian-skilled gradulators. So the Russian universities do not produce human capital for their surroundings but on the contrary suck out the potential human capital from their surroundings. Only some special communication channels break this tendency for technical-skilled gradulators.

The attractiveness of a university for students from the other regions of the country is also tied with the scale of university’s communication in the Internet space.

The next challenge can be the exploration of the most-skilled labor force migration communication mechanism. While migration flows of the University-educated specialists correlate with the total migration flows (of all grown-ups), the migration flows of PhD holders are quite different. The correlation between the migration balance of PhD holders and the total adults (14 years old and older) migration balance on a regional level is positive but very low (for 2008-2010). So there are some new factors influencing the most-skilled labor force migration that need our research.

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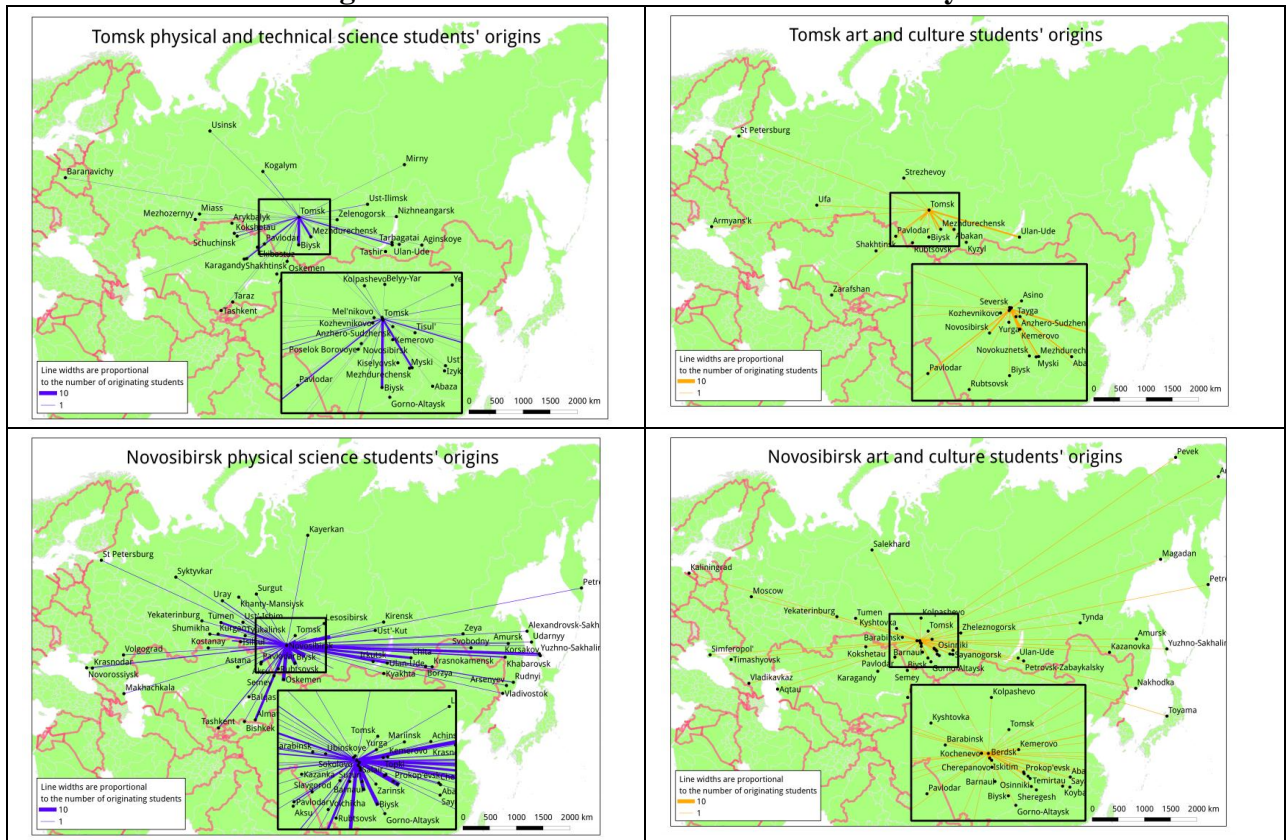
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### Origins of the Novosibirsk and Tomsk university students<sup>7</sup>



<sup>7</sup> The maps were prepared by Alexey Yashunsky.