Interregional Youth Migration in Russia: A Comprehensive Analysis of Demographic Statistical Data

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Abstract. Not dissimilar to many other countries, migration in Russia has a pronounced age-dependent pattern with the peak intensity at the age when people obtain a professional education. In this paper, we analyze migration intensity at student age (17–21) using three sources of demographic data with due regard for their key opportunities and limitations. We compare the migration attractiveness of Russian regions in three ways: (1) applying APC analysis to registration data, separately for two periods: 2003–2010 and 2011–2013; the reason for sampling these two periods is because there was a significant change in the migration statistics collection practices in 2011; (2) using the age-shift method to analyze the data of the 2002 and 2010 Russian Censuses; we offer a way to refine the census data by discarding the non-migration-related changes in the age-sex structure; (3) using information about the average ratio of full-time university enrolments to the number of high school graduates in the academic years 2012/13 and 2013/14 across the regions. Based on the four indicators of migration intensity (intercensal estimates, statistical records for the two periods, and the graduate-enrolment ratio), we develop a ranking of the regions of Russia in migration attractiveness for young adults. A position in this ranking depends not only on the level of higher education development in a region but also on the consistent patterns of interregional migration in Russia. The regions in the European part of the country have a much higher chance of attracting student migrants.

Keywords: youth migration, educational migration, positive net migration, age-period-cohort analysis, age-shift method, rating of region attractiveness.

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Youth migration is an independent area of research, primarily because it is related to education [Raghuram, 2013; Knapp, White, Wolaver, 2013; Smith, Rérat, Sage, 2014]. Researchers have been progressively shifting their focus to the youngest age cohorts associated with the very first education and migration decisions [Smith, Rérat, Sage, 2014]. Such decisions impact greatly on the entire futures of young people and the spatial distribution of human capital as such [Faggian, McCann, 2009; Faggian, McCann, Sheppard, 2007; Mulder, Clark, 2002]. Competing for the most talented students becomes an important factor of development for the regions [Findlay, 2011].

Western researchers identify the category of *thecollege-bound* [Plane, Heins, 2003; Plane, Henrie, Perry, 2005], who demonstrate a clear age-specific migration pattern with peaks in the late teens, when most young people move for educational purposes [Pittenger, 1974; Castro, Rogers, 1983; Rogers et al., 2002; Wilson, 2010]. Empirical research has proven that, in contrast to all other age groups, migration rates have never dropped at student ages[1], even in the light of the recent economic crisis [Smith, Sage, 2014]. This is partially explained by the ubiquitousness of higher education [Chudnovskaya, Kolk, 2015]. The economic benefits of gaining a higher education beat all the constraints [Psacharopoulos, 1994; Psacharopoulos, Patrinos, 2004]. An integrated analysis shows that the cost of moving at an early age is lower than the aggregate costs of missed opportunities [Belfield, Morris, 1999].

Student migration flows are directed towards not only large cities but also university centers that are sometimes far from metropolitan areas [Cooke, Boyle, 2011]; this is how migration of youth differs from migration of other age groups[Dustmann, Glitz, 2011; Van Mol, Timmerman, 2014]. The quality and reputation of a university plays the critical role in the complex process of shaping high school graduate migration flows [Abbott, Schmid, 1975; Agasisti, Dal Bianco, 2007; Ciriaci, 2014]. Economic well-being of the region also has a significant influence on the migration decisions of youth [Findlay, 2011], but this effect becomes dominant later, with the migration of university graduates [Baryla Jr, Dotterweich, 2001; Beine, Noël, Ragot, 2014]. Thus, educational migration of youth follows specific regularities and requires a close study.

Researchers in many Western countries study migration of specific age groups by drawing on the comprehensive statistics which includes both census and register data [Raymer, Beer, Erf, 2011; Raymer, Smith, Giulietti, 2011; 2010] which allows them to trace the migration trajectories and the structural characteristics of different types of migrants.

[1] Specific age ranges vary from study to study depending on the national and regional peculiarities of education systems and statistical data collection techniques. They normally lie within the period from 15 to 24 years.

In Russia, the research on youth and particularly student migration has been mostly based on sample surveys among high school graduates [Katrovsky, 1999; Florinskaya, Roshchina, 2005] and university students (asking them about their migration experience and intentions) [Chudinovskikh, Denisenko, 2003]. Some studies focus on specific regional universities [Popova, 2010], and there has also been some post-educational migration research [Varshavskaya, Chudinovskikh, 2014]. A special niche belongs to the works by NadezhdaZamyatina, who explores youth migration in a broader, non-educational context, paying particular attention to the perception of migration, the choice of destinations and the attitude of youth to their "small motherland" and the host city as a complex system of orientations [Zamyatina, 2012].

However, although this field of research is quite well developed, there are still some major information constraints in studying youth migration in Russia. The existing demographic statistics can only be used on certain conditions due to the data collection techniques used and the temporal-conditional nature of student migration (student migrants have a temporary registration in the city of studies, which was not included in Russian statistics until recently). In this paper, we analyze migration of student-age youth by comparing three sources of information:

1) Current statistical migration data: data from the Russian Federal State Statistics Service (Rosstat) based on the records of registration at the place of residence (and also at the place of stay for nine months or more since 2011);
2) Russian national censuses of 2002 and 2010: these provide an opportunity to compare the size of specific age groups between the two years;
3) Rosstat data on the ratio of full-time university enrolments to the number of high school graduates in the academic years 2012/13 and 2013/14 across the regions.

A major part of our research is about providing a critical assessment of the data sources mentioned above. In particular, we analyze one by one the situations where such sources are inadequate to the youth migration rates reported and identify the reasons behind these situations. The drawbacks of each source can be mitigated to some extent by using more than one of them at the same time. Our analysis is not intended to give a correct assessment of interregional youth redistribution, but it determines quite precisely the interregional differentiation of increase/decrease in the size of youth cohorts due to migration. We compare the data from available information sources to rank the regions by this parameter. In our view, the reliability of the comprehensive ranking method is confirmed by the essential similarities in the distribution of regions among the indicators estimated based on different sources.

Our study is designed to demonstrate the opportunities and limitations of demographic statistics in research on youth migration in Russia, to assess the education-induced youth migration trajectories of recent years, and to compare the results obtained using different information sources. However, we do not analyze the factors of youth migration and cannot trace all possible trajectories of social and spatial youth mobility as Russian statistics provide no sufficient data for this. In this study, we proceed on the assumption that education plays the title role in interregional youth mobility [Klyachko, 2016] and only consider other factors marginally, as far as statistics are available.

We expect to draw the attention of researchers analyzing the development of education structures in Russia to the opportunities and pitfalls presented by Russian statistical data. The research findings can be applied as analytical material in discussing regional aspects of the development of higher education in Russia.

Youth migration according to 2003–2010 statistical records

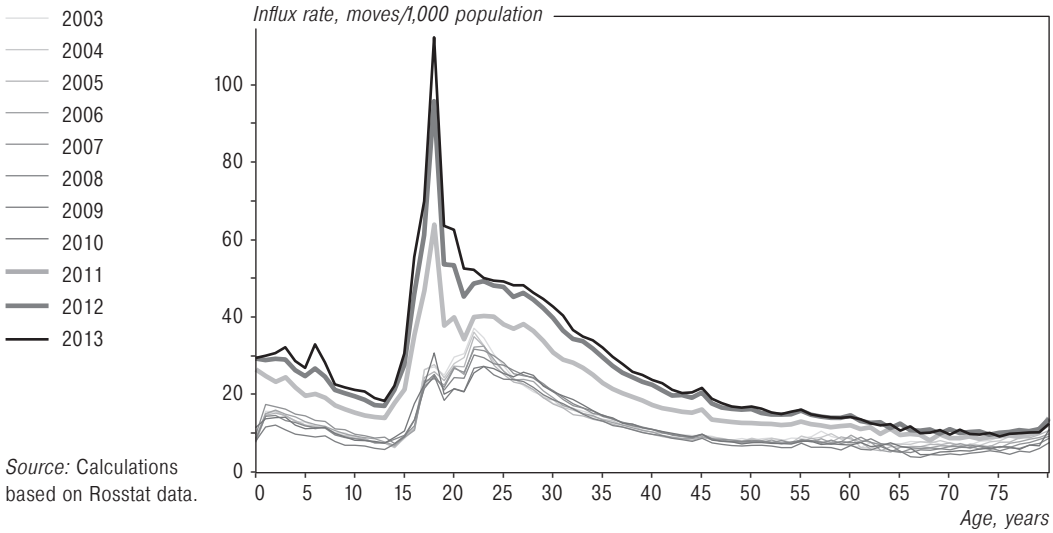
Back in the Soviet era, when strict rules applied to registration at the place of residence/stay, current statistical records were traditionally the main source of migration data. However, the source became less accurate when the Soviet Union collapsed and the registration rules were liberalized [Chudinovskikh, 2004].

The inability to trace migrations of youth, mostly students, became one of the key challenges for the current statistical records [Chudinovskikh, 2008; 2010]. For the most part, students were registered every year (for a period shorter than one year) at *the place of their stay*, not *residence*. Such migrations did not make it into the statistics until recently. It was only in 2011 that statisticians began to record those who were registered at their place of stay for nine months or more, which produced a sharp "increase" in internal migration rates (Fig. 1). Yet, this improvement in Russian statistics, though incredibly valuable, does not apply to 2003–2010, which is the best part of the analyzed period (for a more detailed analysis of discrepancies between registration and census data in the last intercensal period, see our previous works [Kashnitsky, 2015; Kashnitsky, Mkrtchyan, 2014]).

In this chapter, we analyze how current statistical records reflect interregional migration of student population despite all the above-mentioned limitations. To do this, we need to compare the regions of Russia to one another, but we do not seek to make accurate assessments of youth migration rates for each region.

Changes in the size of population or specific age group in a region may be caused by interregional or international migration. Given our goal to assess the redistribution of youths between Russian regions, the latter is of no particular interest to us. Of course, there is also internal redistribution of international immigrants, but part of these migration flows is documented in international migration statistics, while the rate of undocumented flows is anyone's guess. The overwhelm-

Figure 1. **The number of youth migrants per 1,000 cohort population,** internal migration, 2003–2013



Source: Calculations based on Rosstat data.

ing majority of international immigrants come to Russia in search of a job, not education. The rates and trajectories of these immigrant migration flows is a topic for a different study.

Despite the considerable underestimation of youth migration, the highest rates are observed at a young age (Fig. 1), this peak being time-constant.

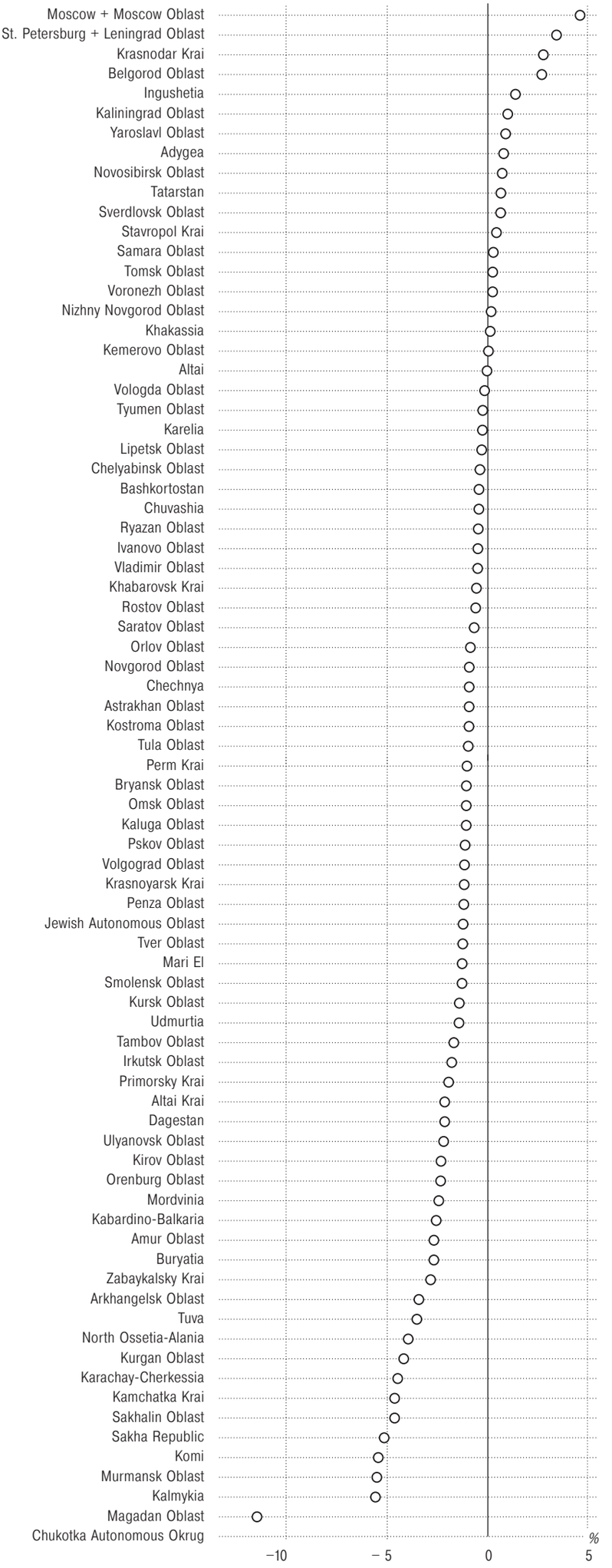
In 2011–2013, the peak of migration shifted even more obviously to the age of 17–18, when most young people graduate from high school and enter university. Even the aggregate data on Russia confirms the hypothesis that student migration used to be underestimated before the 2011 reform.

Figure 2 displays the common 2003–2010 migration balance broken down by region. The absolute youth migration data is set against the common migration balance of the region.

Unsurprisingly, Moscow and Moscow Oblast turned out to be the undisputable leader in attracting internal migrants: the metropolitan area grew by 780,000 people in the intercensal period. The increase in the student population (hereinafter understood as population aged between 17 and 21) is the highest in Moscow and St. Petersburg. We consider it necessary to merge the capitals with their federal subjects for the purpose of this analysis: there is no use in treating Moscow and Leningrad Oblasts as independent players in the migration market. In addition, registration data provides no opportunity to analyze Khanty-Mansi and Yamalo-Nenets Autonomous Okrugs separately from Tyumen Oblast and Nenets Autonomous Okrug from Arkhan-

Figure 2. **Common interregional migration balance**, Russia, (1,000 population)

Figure 3. **Common interregional migration balance**, Russia (% of change in the initial size of population)



gelsk Oblast. Thereby, the number of analyzed regions is reduced from 83 (the official figure) to 78.

The total migration influx does not always correlate strongly with the influx of youth. For instance, Krasnodar Krai, a popular destination for internal migrants, rather attracts older adults than youth. We operate with absolute data that are not weighted by the size of regions or the proportion of the student population in them. While weighting adjustment of population at large is an easy job, a cohort analysis is required when we choose the coefficient denominator to assess the rates of youth migration (see below).

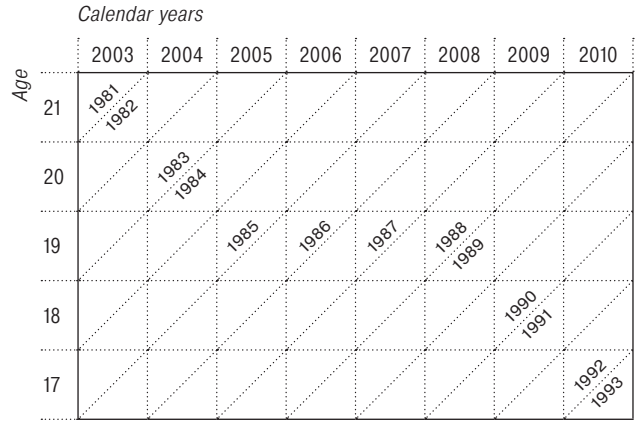
Only 18 of the analyzed regions of Russia were found to be attractive for internal migrants based on the whole intercensal period (Fig. 2). In all other regions the population decreased due to interregional migration. Student migrants also favored 18 regions, mostly the same ones as above, which are prospering in the internal migration market. However, there were remarkable exceptions, too. For example, the most youth-attractive regions included Tomsk Oblast (ranked 7th) with its renowned universities, where the increase in the number of students (17–21 years, only five one-year age groups!) was almost four times higher than the overall increase in population.

A huge polarization of the regions by population outflow is manifest when we present the data of the 2003–2010 common interregional migration balance as relative to the initial size of the population reported by the Census of 2002 (Fig. 3). With such proportional measurements, the influx to St. Petersburg and Leningrad Oblast is only slightly lower than that of Moscow. An analysis based on weighted data reveals clearly the phenomenon of Belgorod Oblast. This generally peripheral region allures migrants more than any region with a million-plus city—except the two capitals, of course. We also identified two thinly populated subjects of the Russian Federation that suffer the most from population outflow: Chukotka Autonomous Okrug and Magadan Oblast.

To compare the youth migration rates, it would be useful to calculate similar relative coefficients for the youth migration balance. However, there is a challenge here: people who made education-induced moves at the age of 17–21 from 2003 to 2010 may belong to thirteen different birth cohorts (from 1981 to 1993) (Fig. 4). Youth population was very unstable throughout the analyzed period due to some structural factors like the sinusoidal birth rate patterns of the 1980–1990s. So, it would be wrong to weight the common youth migration balance over eight calendar years by the size of youth population in 2002 (i. e. the number of people born between 1981 and 1986) or to weight the mean youth population by the last intercensal estimate, i. e. by the mean of the 2002-estimated population born in 1981–1985 and the 2010-estimated population born in 1988–1993. Naturally, the use of the cohort-component method is inevitable.

To compare the regions, we need to find out how interregional youth migration affected the size of the youth population in each of

Figure 4. **Lexis diagram: birth cohorts aged 17–21 in 2003–2010**



the regions in 2003–2010. In other words, we need a comparative index that would demonstrate correctly the rate of youth influx to every region and would be representative of all cohorts that lived in the relevant *temporal rectangle*[2]. Cohort-component analysis allows us to calculate such an index, the *interval coefficient of cohort net migration (ICCNM)* [Kashnitsky, Mkrtchyan (in print)]. This coefficient shows the mean change in the *integral* cohort that is covered fully by the temporal rectangle. According to the ICCNM calculation method that we use, the integral cohort net migration is the age-based average of specific coefficients for real-life cohorts[3].

A cohort-component analysis of youth positive net migration in 2003–2010 (Fig. 5a) and 2011–2013 (Fig. 5b) reveals a sharp increase in internal youth migration rates (or at least in the number of recorded movements of young people) during the latter period, when the methods of migration statistics collection had been reformed. While the increase in youth cohorts varied between –15.5% and +7.8% across regions in the eight years of theintercensal period, the following three years (after the new registration rules came into force) witnessed a variation of –30.2% to +23.3%. The difference in duration of the two periods does not matter because the ICCNM index is averaged by cohorts.

On the whole, the regional distribution of the index appears to be quite stable. Most regions retain their positions in the youth net migration ranking almost unchanged. The Pearson correlation coefficient between regional variables for the two analyzed calendar periods is

[2] We apply the term ***temporal rectangle***to denote the analyzed calendar period covering the analyzed age cohorts.

[3] Coefficients may be averaged by cohorts or periods.

Figure 5. **Interval coefficient of youth cohortpositive net migration** (percentage of change in the cohort) for the periods

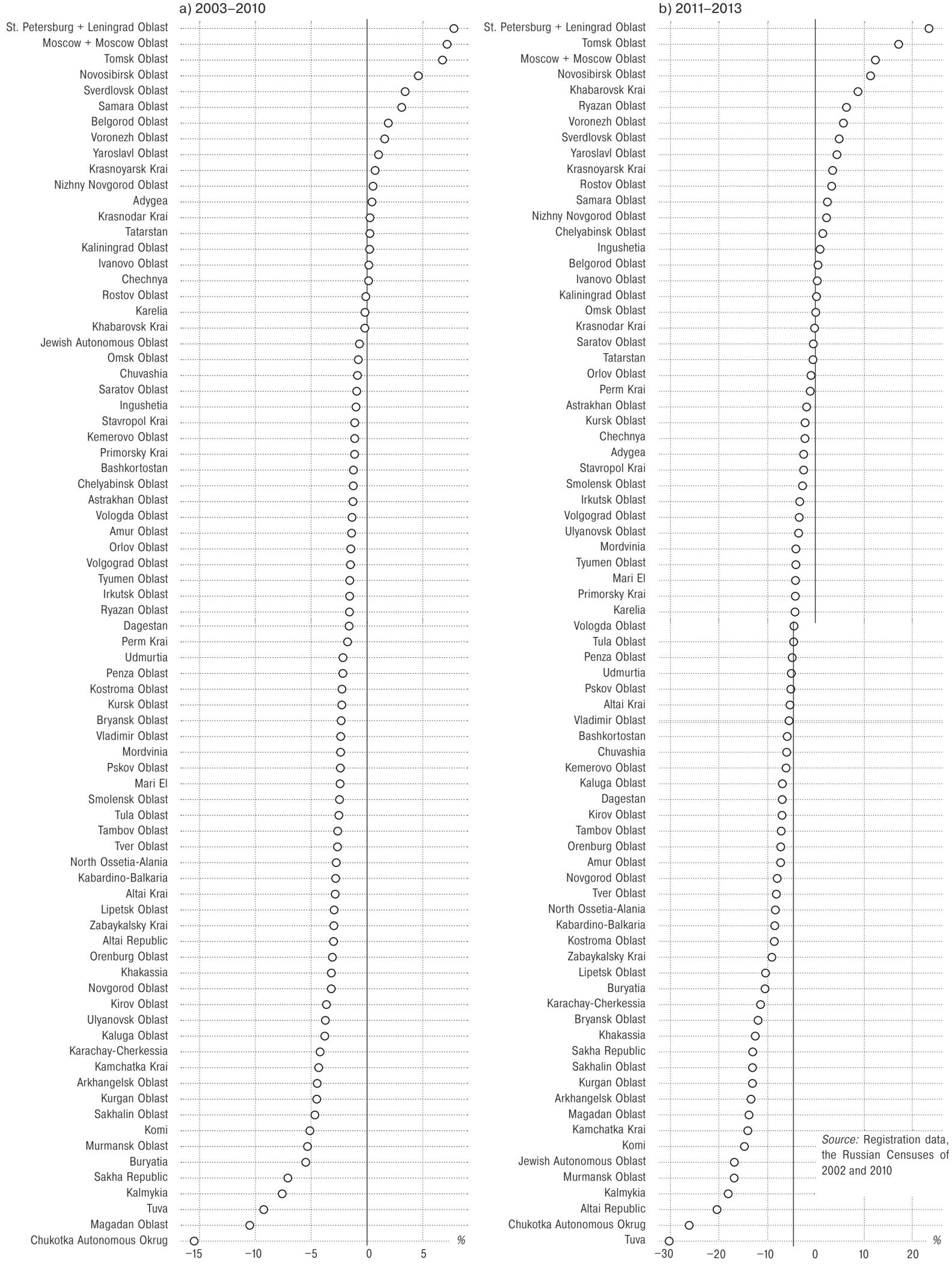
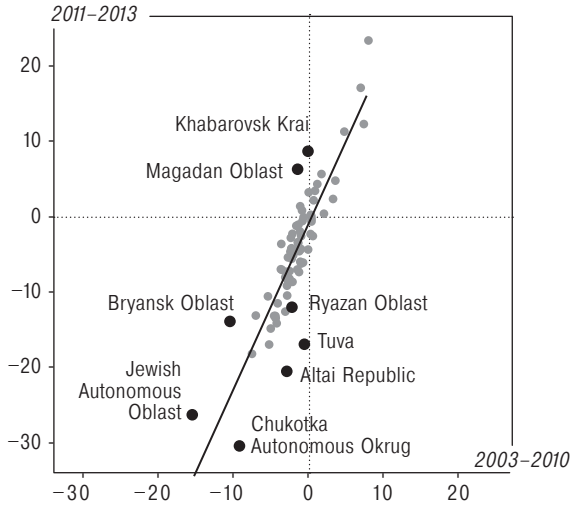


Figure 6. **Regions with the highest change in the rate of youth influx**



Source: Registration data, the Russian Censuses of 2002 and 2010

Note: The figure shows 10% of the regions with the biggest residual error of linear regression.

0.87. However, the rates of youth positive net migration changed notably in some of the regions (Fig. 6).

In contrast to the other leading regions, the increase in the rate of youth influx to Moscow has been rather small over the last few years. Conversely, although youth outflow has increased in the most depressed regions of Chukotka and Magadan, its dynamics have been rather moderate as compared to the changes in other regions.

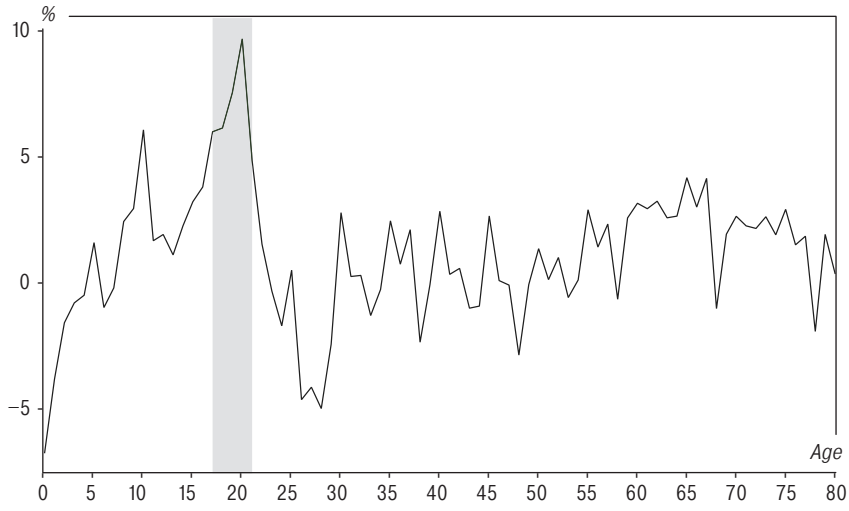
The overall rates of interregional youth migration nearly doubled between 2003–2010 and 2011–2013. However, this growth is mostly explained by the changes in the rules of registration at the place of residence/stay: what used to be latent variables became available for analysis.

Interregional youth migration based on the censuses of 2010 and 2002

Population censuses allow the retrieval of migration data not covered by registration data, which was especially important for the period before the 2011 reform. Comparing census data with registration data is a pretty standard procedure to detect undocumented migrations at various levels of administrative division, including regions. The cohort-component method is used to apply this procedure to specific categories of population (e. g. youth).

The Russian Census of 2010 revealed considerable deviations from registration data in a number of regions. Just as with the census of 2002, Rosstat attributed those deviations to undocumented migration. The population of Russia turned out to be one million bigger than had been estimated based on the registration data. The highest population growths were observed in Moscow, St. Petersburg, Moscow and Len-

Figure 7. **The difference between the 2010 census data and the estimated population as a proportion of the population estimated on the census date** (%)



Source: Our own estimates based on the Russian Census of 2010 and assessments as of this date.

ingrad Oblasts, Krasnodar and Stavropol Krais, Voronezh and Rostov Oblasts [Mkrtchyan 2011]. Internal migration played the key role in providing this positive net migration, which means that the population decreased in many northern and eastern regions, and the macro-regions of Privolzhye and Ural. Hence, the trends in interregional population redistribution observed from registration data are confirmed by census data and include an outflow of population from the east and its concentration in agglomerations like Moscow and St. Petersburg. The census revealed that migration rates in 2003–2010 were actually higher than could be observed from the registration data.

The census of 2010 also brought to light a considerable additional underestimation of youth migration[4] [Andreev 2012]. The deviations between estimates and census data are most conspicuous in youth statistics (Fig. 7) (for more details, see [Mkrtchyan, 2012]). The peak deviation, 9.4% from the estimated youth population, is observed at the age of 20, which has to do with, among other things, *age heap-*

[4] Deviations in census data are interpreted as undocumented migration, pursuant to the statistical procedure accepted by Rosstat and generally supported by experts. This is dictated by the major problems of assessing migration during the intercensal period with relatively accurate birth and death rate statistics. The challenges of this approach include underestimation of inaccuracies and errors of the last two censuses on which calculations are based. In this work, we use the information provided by Evgeny Andreev (New Economic School) and base our calculations on 2002 and 2010 census data (using the cohort-component method) and registration data obtained in the intercensal period.

ing that clumps the population's ages at values ending in 0. Nevertheless, the deviations at the neighboring ages (19 and 21) were also quite significant.

It would be wrong to attribute these deviations to international migration alone. First of all, international immigrants move to Russia most actively at older ages. Besides, most of them were not covered by the censuses, which can be seen from the summary data on citizenship and ethnic composition. The overall deviation in the size of the Russian youth population was 615,000 people, or 5.7% of the cohort. A considerable role was probably played by double counting, which is primarily made possible as a result of registering internal student migrants at the place of their study in addition to their home registration. Double counting deteriorates a lot the value of this data for the analysis of student migration rates, but it is still useful for exploring the spatial regularities.

Deviations in the youth cohorts of specific regions are different not only in their degree but also in their sign (Fig. 8). Positive deviations in the size of the youth population were observed in 37 of the 78 regions and negative ones in 41 regions. Thus, even overestimated cohort values show that half of the regions had an additional migration-induced outflow of youth that was not covered by statistics.

In some regions, changes in the number of young people may also be explained by the so-called special contingent. It mostly includes army conscripts (they are not covered by migration statistics but are captured by censuses in the region of their conscription), the majority of whom fit into the analyzed age limits. If the military base is located in the region of residence, no deviations will occur, as these are only possible in the case of military service in other regions.

Using the 2010 Census data, we compare the population of men and women aged 18–19 (the age of most conscripts). On the whole, the number of males is 3.8% larger than that of females, which is determined by purely demographic reasons, namely the higher frequencies of male births. However, the ratio is largely disturbed in some of the regions, where the population of men is more than 15% greater than that of women (Table 1). With few exceptions, these are the regions showing a consistent population outflow, but such imbalance cannot be explained by regular migration in Kaliningrad, Leningrad and Moscow Oblasts [Mkrtchyan, Karachurina, 2014]. The sharp increase in the male population over the female population at this age may be attributed to the big military (=men's) schools, like those in Kaliningrad Oblast.

It appears that youth population should be adjusted for the population of conscripts. To do this, we subtract the redundant number of males for the regions with the ratio of 18–19-year old men to women exceeding the national average, i. e. the number of men aged 18–19 exceeding that of women by more than 3.8%. The cumulative reduction in the youth cohorts of these regions was 156,000 people. Follow-

Table 1. **Population of men and women aged 18 and 19 in some of the regions of Russia, 2010.**

	Men (thousands)	Women (thousands)	Ratio of men to women (%)
Russian Federation	1911.3	1840.9	103.8
Arkhangelsk Oblast	15.0	13.0	115.2
Komi Republic	11.4	9.8	116.7
Vladimir Oblast	19.0	15.8	119.9
North Ossetia-Alania	12.3	10.2	120.3
Republic of Buryatia	16.2	13.2	122.8
Moscow Oblast	96.8	74.8	129.4
Zabaykalsky Krai	20.4	15.5	131.7
Pskov Oblast	9.8	7.3	133.5
Jewish Autonomous Oblast	3.0	2.3	134.7
Leningrad Oblast	22.9	17.0	135.1
Primorsky Krai	33.9	23.9	141.9
Kaliningrad Oblast	16.9	11.6	145.6
Sakhalin Oblast	7.1	4.9	146.1
Kamchatka Krai	5.0	3.3	150.1
Khabarovsky Krai	27.0	18.0	150.1
Murmansk Oblast	12.0	7.5	159.6

Source: Estimates based on the Russian Census of 2010.

ing the adjustment of the data specified in Table 1, Vladimir, Moscow, Kaliningrad and Pskov Oblasts, as well as the Republic of Buryatia, Primorsky and Khabarovsk Krais turn from youth-host to youth-donor regions, and the youth outflow rates in other regions turn out to be considerably higher. These adjustments are appliedin Figure 8.

If we proceed from the hypothesis of youth cohort double counting when interpreting the data on the regions whose net migration rates became more positive following the census, we will find that regions showing positive migration rates do not in fact always have them. It means that the rates of youth influx must have been assessed adequately for the most part. However, the outflow rates are most probably underestimated.

Our previous works show that the North Caucasian Federal District republics were the most controversial regions in the censuses of both 2002 and 2010. For example, where did the additional influx of 45,000 young people to Dagestan (a 14.9% increase in the youth

cohort) come from? The degree of this deviation is comparable to St. Petersburg. In reality, Dagestan must be losing young people, as confirmed by the statistics of the recent years mentioned above. The 55,300 (23.4%) deviation in Stavropol Krai is also rather questionable. Of course, Stavropol Krai universities attract students from North Caucasian republics, but there is also an outflow of youth to other regions, in particular to Moscow and St. Petersburg. Besides, the overall influx of youth to the North Caucasian Federal District is 79,000 people, or 8.5%. Where could it possibly ariginate? It is hard to argue with the sign of youth migration rate in Stavropol Krai, but the size of positive net migration is more than doubtful. Additional youth migration to Kabardino-Balkaria and Karachay-Cherkessia also seems debatable. The Southern Federal District demonstrates a high additional rate of influx to Rostov Oblast, which is 46,700 people, or 15%. It is also probable that the regions with small deviations in fact did not attract additional student migrants. These include Lipetsk Oblast (0.4%), Tambov Oblast (0.8%), the Republic of Khakassia (0.9%), etc.

According to the censuses, the rest of the regions received a sizeable or even a very substantial additional inflow of youth. These are, primarily, Moscow with Moscow Oblast and St. Petersburg with Leningrad Oblast, which accepted a total of 283,000 additional students, thus increasing their youth cohorts by 18.3% and 15.8%, respectively. Other regions include Tomsk (+23%), Voronezh (+12%), Novosibirsk and Ivanovo (+11%), Volgograd (+10%) Oblasts, Krasnodar Krai and Nizhny Novgorod Oblast (+9%), Ryazan (+8%), Smolensk and Penza Oblasts (+7%). We can probably also include Stavropol Krai and Rostov Oblast to this category, but these two regions showed much more humble youth inflow rates.

Another 18 regions increased their youth population by 2–7%. With the exception of the Sakha Republic (we have certain doubts about the appropriateness of including it), these are the regions in the sufficiently developed part of the country. Eleven regions had their youth cohorts almost unchanged (from +2% to –3%) or, rather, insignificantly reduced if we remember the challenges associated with censuses of the youth population. Another two groups of regions faced a 3–10% and a more than 10% reduction in youth population. The most significant reduction was observed in the northern and eastern regions with a consistent outflow of population in general. Youth cohorts shrunk by over 20% in Chukotka and Kamchatka Krais, Murmansk and Sakhalin Oblasts, Jewish Autonomous Oblast, and the Tuva and Altai Republics. Apart from the overall population outflow, these regions also have a relatively low potential of universities as additional student migration factor.

Some estimate results look paradoxical, like the outflow (though small) of youth from Perm and Krasnoyarsk Krais and Irkutsk Oblast with rather high historical standards of university education. However, the 2010 census also witnessed an additional outflow of the over-

all population in the abovementioned regions. At the same time, the Sakha Republic had an additional influx of youth. It is also odd that the youth influx rate in Yaroslavl Oblast is lower than in Ivanovo, Tula or Penza Oblasts.

Therefore, there is a pronounced correlation between census-added youth migration and the overall patterns of trans-regional population migration. However, the results of migration depend not only on the economic situation in a region but also on the level of university development.

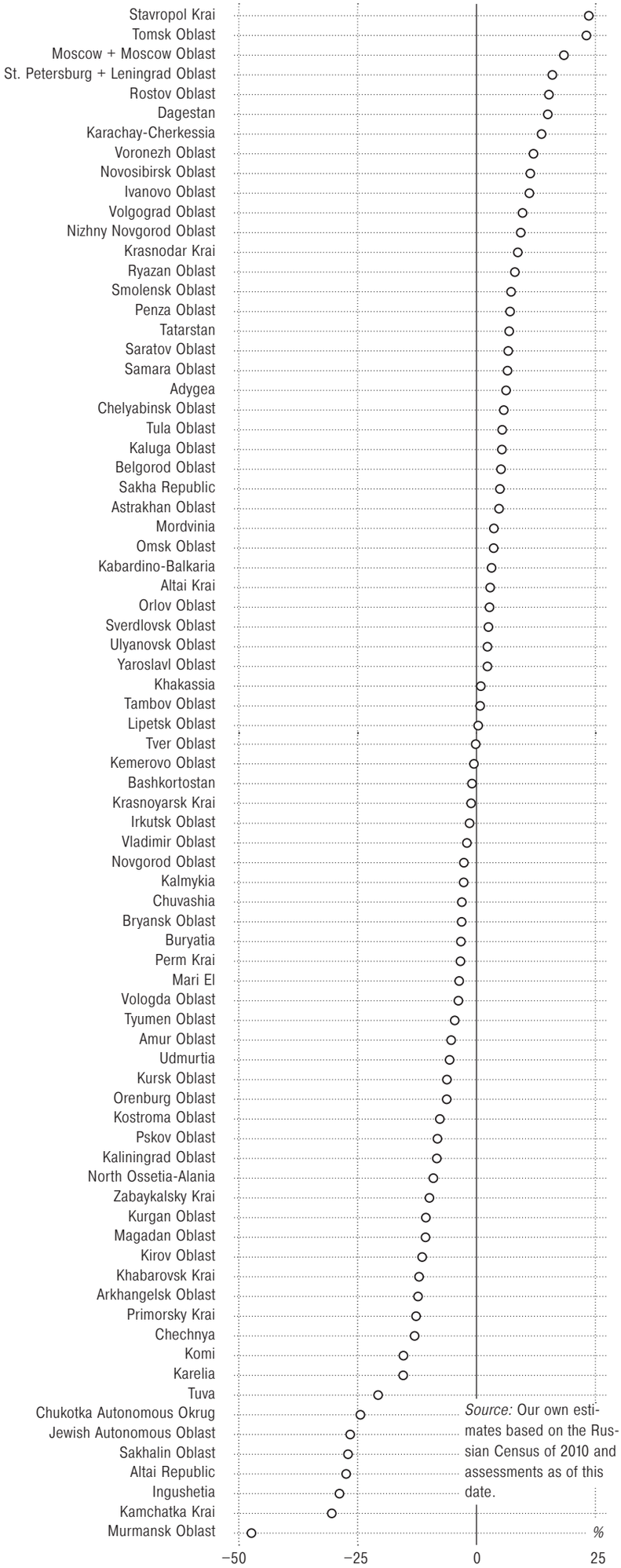
The youth migration data obtained from the censuses do not allow us to assess migration trends as we can only estimate the time of migration approximately. When we compare the data of two censuses, the whole eight-year intercensal period is the time unit. This is quite a lot for any specific cohort, especially that of young people, and it can be inherently heterogeneous in terms of migration intensity. For instance, a large influx of 18-year-olds in 2003 may be followed by an even larger outflow of 24-year-olds in 2009. In such a case, comparing two censuses, we will only see is the resulting balanceof the cohort's size, but the temporal student influx will be overlooked.

The ratio of university enrolments to the number of high school graduates as an indicator of student migration in the region

We can also assess the region-specific rates and trajectories of youth migration through comparing the number of students admitted to Bachelor's and Specialist's degree programs on a full-time basis (both in state-owned or private universities) to the number of high school graduates. To do this, we use the Rosstat data for the academic years 2012/13 and 2013/14. The logic is quite simple: if the number of new university students in the region was considerably lower than that of university-oriented high school graduates, we can suggest that "excessive" graduates set off to conquer universities outside their home region. And vice versa, if the number of first-year students was much higher than that of local school graduates, it means that "excessive" freshmen must have come from other regions.

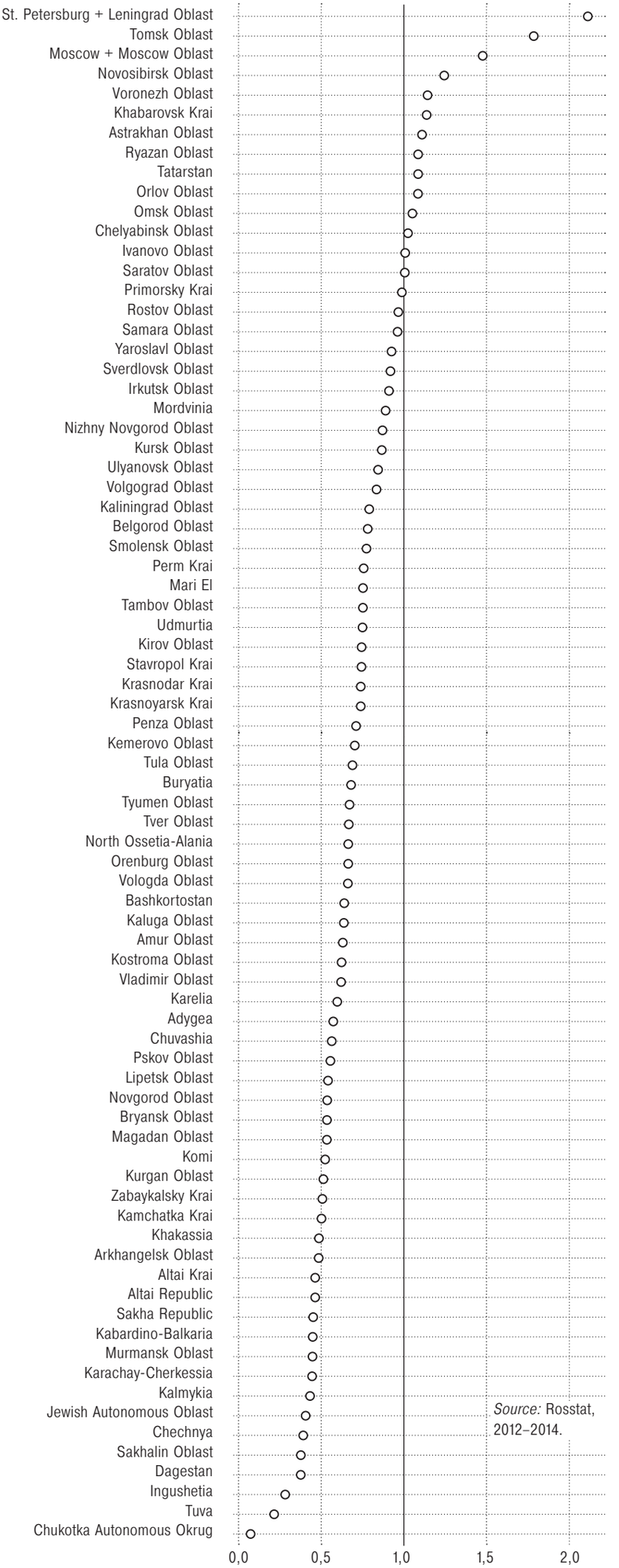
We performed some preliminary calculations to ensure the adequacy of comparison. First, not all high school graduates head for university, although the percentage is very high. Some of them take vocational training, others enter the military, the labor market, etc. This is why we only use the proportion of high school graduates who pursue higher education in the same reference year, which was 78% in the academic year 2013/14, according to our estimates. Very similar results can be found in the article by Tatyana Klyachko [2016]. Therefore, the data on the number of high school graduates was adjusted for this proportion. Second, not all university candidates are fresh high school graduates. Entrants to Bachelor's and Specialist's degree programs also include people who did not graduate from school earlier the same year: repeat applicants, service leavers, fresh vocational school graduates and labor market participants [Shugal, 2010].

Figure 8. **Deviation of the 1989–1993-born cohort (aged 17–21 in 2010) estimates from the actual size over the 2003–2010 intercensal period** (%)



Source: Our own estimates based on the Russian Census of 2010 and assessments as of this date.

Figure 9. **The ratio of full-time university enrolments to the number of high school graduates**



Source: Rosstat, 2012–2014.

The proportion of fresh high school graduates among students admitted to Bachelor's and Specialist's degree programs on a full-time basis was 87% in 2013. We rely upon full-time education programs because they suggest a constant proximity to the educational institution, while part-time student statistics may distort the migration estimates. With due regard for these adjustments, we obtain the number of first-year Bachelor's or Specialist's degree students who graduated from high school the same year. After comparing the total number of freshmen with the total number of university-oriented high school graduates, we get the values describing the redistribution of student flows among the regions. For each region, a positive deviation of the ratio from 1 indicates migration attractiveness for young people, while a negative deviation indicates an outflow of youth to universities in other regions.

The national average ratio is 0.74, which means that Russia has more "outflow regions" than those with large educational centers. Only 14 out of 78 regions were found to be migrationally attractive based on this index in 2012–2014. These include, first of all, St. Petersburg and Leningrad Oblast, Moscow and Moscow Oblast, Tomsk, Novosibirsk and Voronezh Oblasts and Khabarovsk Krai, i. e. the regions where the biggest universities are concentrated (Fig. 9). If the ratio of first-year students to the total number of high school graduates is significantly higher than 1, we can safely suggest that the region had an influx of students from other parts of the country. Most regions witnessed youth outflows of different rates. In many of them, the local universities enrolled less than half of all school graduates, the proportion plummeting to under 10% in Chukotka. The ratios of university enrolments to high school graduates show that universities in the North Caucasus receive much fewer students than the local schools produce. A similar trend is observed in many northern and eastern regions of Russia.

The comparison of the ratios of first-year students to high school graduates with the census and current youth migration statistics shows that the list of the most migrationally attractive regions remains the same, irrespective of the ranking method.

The final ranking of regions based on student migration rates

Our analysis shows that different data sources mostly provide a pretty common picture of youth migration in Russia. The categories of regions based on specific indicators and the degrees of their attractiveness to students are quite closefor the four indicators, which is confirmed by rather high correlations between the indicators (Table 2).

Similar results obtained by analyzing youth migration based on different sources prove that the four estimated indicators can be used to develop a composite synthetic indicator that will allow the most trustworthy ranking of the regions of Russia by youth migration attractiveness.

Table 2. **Pearson correlation coefficients between the estimated indicators**

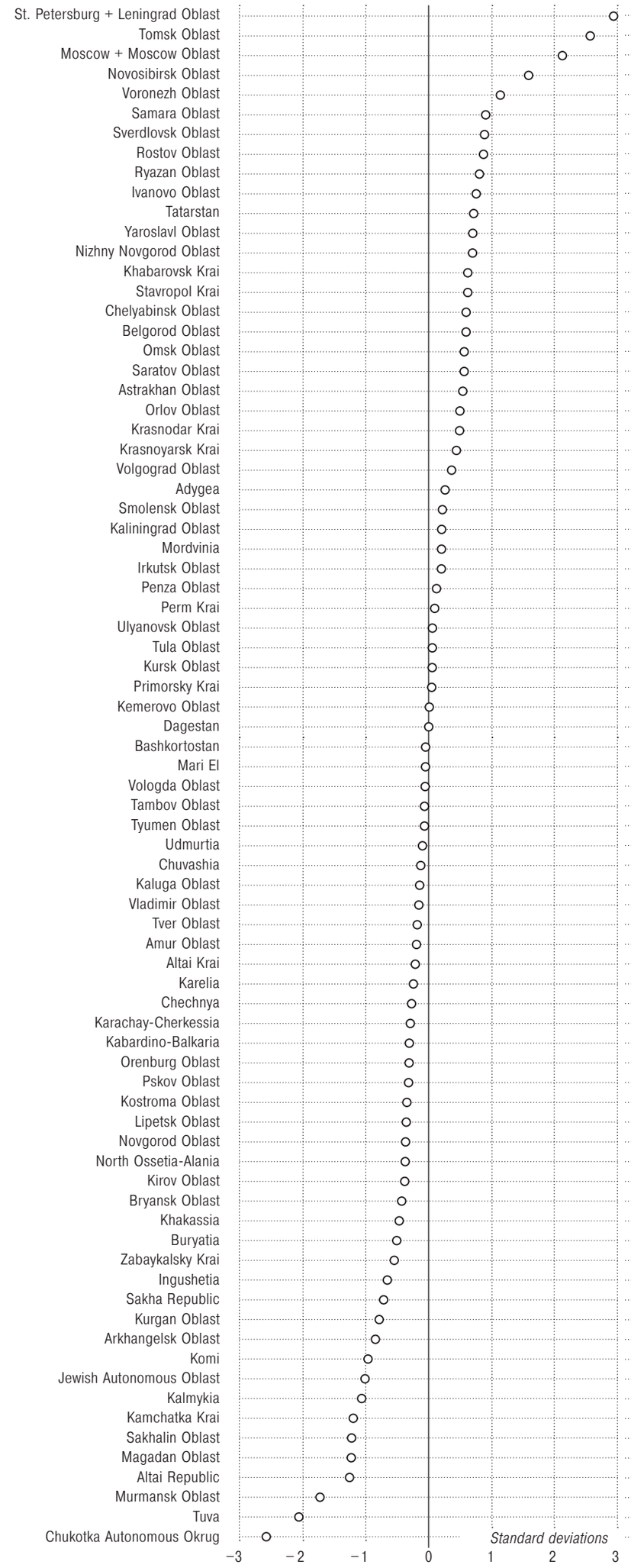
Indicator	No.	(1)	(2)	(3)	(4)
Change in the size of the 1989–1993 cohort for the 2003–2010 intercensal period (%)	(1)	1	0.53	0.62	0.63
Registration data, ICPCNM of the 1981–1993-born, 2003–2010	(2)	0.53	1	0.88	0.72
Registration data, ICPCNM of the 1989–1996-born, 2011–2013	(3)	0.62	0.88	1	0.8
Ratio of students admitted to Bachelor's and Specialist's degree programs on a full-time basis to the number of high school graduates, academic year 2012/14	(4)	0.63	0.72	0.8	1

As soon as these four indicators differ in both calculation methods and final measurement units, we convert them to a common scale using z-scores (standardized values). Z-standardization consists in subtracting the sample mean from each indicator value and dividing the difference by sample standard deviation. This way, the original measurement units are converted to a common scale (standard deviation units), enabling a comparison of standardized values. We standardize all the four student migration rate indicators and average the data for each region. The resultant indicator of a specific region shows the number of standard deviations by which the regional value differs from the national four-indicator-based average. The resultant ranking is shown in Figure 10. Zero values indicate average regional indicators, not the boundary between the influx and outflow of youth.

The absolute leaders are Moscow and St. Petersburg (with oblasts), Novosibirsk, Tomsk and Voronezh Oblasts. Their leadership was provided by the evolution of the Soviet higher education system (and by the administrative status in case of the capitals), which developed a powerful education potential in these regions to meet the requirements of the planned economy [Kuzminov, Semenov, Froumin 2013]. They are followed by the regions which are also close in leadership. Many of them have million-plus administrative centers: Yekaterinburg, Rostov-on-Don, Samara, Nizhny Novgorod, Kazan, Omsk. However, the category of "almost leaders" also includes some "ordinary" regions, such as Yaroslavl, Ryazan or Ivanovo Oblasts, which do not have any administrative or population advantages over their neighbors.

Relatively high positions in the ranking are occupied by many central and southern regions of the European part of the country, demonstrating a certain advantage of their geographic location. However, the student-attracting regions also include Krasnoyarsk and Khabarovsk Krais, which suffer the full negative effects of the "western drift", finding it much more difficult to attract student migrants. As the statistics shows, having just started to decline, the population outflow from the East to the West has rebounded recently following the migration statistics reform [Zakharov, Vishnevsky, 2015]. Yet, the eastern regions

Figure 10. **Ranking of the regions of Russia based on the 2003–2013 student migration rates (higher values for an influx of youth or student migrants, lower values for an outflow)**



	Mean z-score	ICMIIC 2003–2010	ICMIIC 2011–2013	Census estimate	Enrolment/ graduate ratio
St. Petersburg + Leningrad Oblast	2,94	7,8	23,3	15,8	2,11
Tomsk Oblast	2,57	6,8	17,1	22,9	1,78
Moscow + Moscow Oblast	2,13	7,2	12,3	18,3	1,48
Novosibirsk Oblast	1,59	4,6	11,3	11,2	1,24
Voronezh Oblast	1,14	1,6	5,7	11,9	1,14
Samara Oblast	0,91	3,1	2,4	6,5	0,96
Sverdlovsk Oblast	0,89	3,4	4,8	2,5	0,92
Rostov Oblast	0,87	−0,1	3,3	15,1	0,97
Ryazan Oblast	0,81	−1,6	6,3	8,0	1,09
Ivanovo Oblast	0,76	0,2	0,3	11,0	1,01
Tatarstan	0,72	0,3	−0,6	6,8	1,09
Yaroslavl Oblast	0,70	1,0	4,4	2,3	0,93
Nizhny Novgorod Oblast	0,70	0,5	2,2	9,2	0,87
Khabarovsk Krai	0,62	−0,2	8,7	−12,0	1,14
Stavropol Krai	0,62	−1,1	−2,5	23,4	0,74
Chelyabinsk Oblast	0,60	−1,2	1,5	5,7	1,02
Belgorod Oblast	0,60	1,9	0,5	5,1	0,78
Omsk Oblast	0,57	−0,8	0,0	3,6	1,05
Saratov Oblast	0,57	−0,9	−0,5	6,6	1,01
Astrakhan Oblast	0,54	−1,3	−1,9	4,7	1,11
Orlov Oblast	0,50	−1,5	−1,0	2,7	1,09
Krasnodar Krai	0,49	0,3	−0,2	8,6	0,74
Krasnoyarsk Krai	0,44	0,7	3,5	−1,1	0,74
Volgograd Oblast	0,37	−1,5	−3,4	9,6	0,83
Adygea	0,26	0,4	−2,5	6,2	0,57
Smolensk Oblast	0,22	−2,5	−2,7	7,2	0,77
Kaliningrad Oblast	0,21	0,2	0,2	−8,3	0,79
Mordvinia	0,21	−2,4	−4,1	3,6	0,89
Irkutsk Oblast	0,20	−1,6	−3,3	−1,4	0,91
Penza Oblast	0,13	−2,2	−4,8	7,0	0,71
Perm Krai	0,10	−1,7	−1,1	−3,3	0,76
Ulyanovsk Oblast	0,06	−3,7	−3,5	2,3	0,84
Tula Oblast	0,06	−2,5	−4,5	5,4	0,69
Kursk Oblast	0,06	−2,3	−2,2	−6,2	0,87
Primorsky Krai	0,05	−1,1	−4,2	−12,6	0,99
Kemerovo Oblast	0,01	−1,1	−6,1	−0,5	0,70
Dagestan	0,00	−1,6	−6,9	14,9	0,38
Bashkortostan	−0,05	−1,2	−5,9	−0,9	0,64
Mari El	−0,05	−2,4	−4,2	−3,6	0,75
Vologda Oblast	−0,05	−1,3	−4,5	−3,8	0,66
Tambov Oblast	−0,07	−2,6	−7,1	0,8	0,75
Tyumen Oblast	−0,07	−1,5	−4,1	−4,5	0,67
Udmurtia	−0,10	−2,2	−5,0	−5,6	0,75
Chuvashia	−0,12	−0,9	−6,0	−3,1	0,56
Kaluga Oblast	−0,14	−3,8	−6,9	5,3	0,64
Vladimir Oblast	−0,15	−2,4	−5,5	−2,0	0,62
Tver Oblast	−0,18	−2,6	−8,1	−0,2	0,67
Amur Oblast	−0,19	−1,4	−7,2	−5,3	0,63
Altai Krai	−0,21	−2,8	−5,3	2,9	0,46
Karelia	−0,24	−0,2	−4,3	−15,3	0,60
Chechnya	−0,27	0,1	−2,2	−12,9	0,39
Karachay-Cherkessia	−0,29	−4,2	−11,4	13,6	0,45
Kabardino-Balkaria	−0,31	−2,8	−8,4	3,2	0,45
Orenburg Oblast	−0,31	−3,1	−7,2	−6,2	0,66
Pskov Oblast	−0,32	−2,4	−5,1	−8,1	0,56
Kostroma Oblast	−0,35	−2,2	−8,5	−7,6	0,62
Lipetsk Oblast	−0,35	−2,9	−10,3	0,4	0,54
Novgorod Oblast	−0,37	−3,2	−7,9	−2,6	0,54
North Ossetia-Alania	−0,37	−2,8	−8,3	−9,0	0,66
Kirov Oblast	−0,38	−3,6	−6,9	−11,3	0,74
Bryansk Oblast	−0,43	−2,3	−11,9	−3,1	0,54
Khakassia	−0,47	−3,2	−12,5	0,9	0,49
Buryatia	−0,51	−5,5	−10,4	−3,2	0,68
Zabaykalsky Krai	−0,55	−3,0	−9,0	−9,8	0,51
Ingushetia	−0,66	−1,0	0,9	−28,6	0,28
Sakha Republic	−0,71	−7,1	−13,0	4,9	0,45
Kurgan Oblast	−0,78	−4,5	−13,0	−10,6	0,51
Arkhangelsk Oblast	−0,84	−4,5	−13,3	−12,2	0,49
Komi	−0,96	−5,1	−14,7	−15,2	0,52
Jewish Autonomous Oblast	−1,01	−0,7	−16,8	−26,3	0,41
Kalmykia	−1,06	−7,6	−18,0	−2,7	0,43
Kamchatka Krai	−1,20	−4,3	−14,0	−30,2	0,50
Sakhalin Oblast	−1,22	−4,7	−13,0	−26,8	0,38
Magadan Oblast	−1,23	−10,5	−13,7	−10,6	0,53
Altai Republic	−1,26	−3,0	−20,3	−27,2	0,46
Murmansk Oblast	−1,73	−5,3	−16,8	−46,9	0,45
Tuva	−2,06	−9,2	−30,2	−20,5	0,22
Chukotka Autonomous Okrug	−2,58	−15,5	−26,1	−24,2	0,07

of Russia still cannot hope for a youth influx increase; their universities will have to make strenuous efforts to attract additional students. Few of these regions make it to the top of the ranking.

The lower part of the ranking covers not only the eastern regions but also almost all the republics of the Northern Caucasus, where low levels of higher education are exacerbated by the traditional outflow of population due to the lack of jobs, relatively backward economies and domestic political instability. Young people are also leaving many of the regions in the European part: Bryansk, Orenburg, Lipetsk, Kostroma, Pskov, Novgorod, Vladimir, Kaluga, Tver Oblasts, and the Republics of Karelia and Udmurtia. Clearly, these regions lose to their neighbors. Yet, the failure in this competition is not predetermined as we can see from the examples of Voronezh, Yaroslavl, Ryazan, Orlov and some other Oblasts.

As we have mentioned before, the attractiveness of a region for student migrants is also greatly affected by the size of the administrative center population: the regions with million-plus cities have more chance of getting to the top. Meanwhile, middle-ranked Perm Krai and Volgograd Oblast as well as bottom-ranked Bashkortostan obviously lose the struggle for youth to the more successful neighbors and the giants like Moscow and St. Petersburg, and neither geographic location nor large regional centerscan help them.

Conclusion

Having analyzed the youth migration patterns based on the data for different periods obtained from different sources (census data, registration data, the ratio of full-time university enrolments to the number of high school graduates), we can assess migration attractiveness of regions and regional higher education systems for young people. We have produced a ranking of regions that reflects the years-long evolution of their education systems and the summary of decisions made by young people (and, maybe, their parents) regarding the preferred destinations for higher education.

Despite all the pitfalls of each specific youth migration indicator that we have described in this article, the findings are in line with our expectations based on the overview of foreign studies. Quite naturally [Baryla Jr, Dotterweich, 2001; McHugh, Morgan, 1984], the most youth-attracting regions are largely represented by the most economically powerful cities housing the top universities: St. Petersburg, Moscow, Samara, Yekaterinburg and Rostov-on-Don. Migration to these administrative centers helps young people to kill two birds with one stone: get an education and, later, find a job in the same region, thus reducing the costs of migration (both economic and social). The top positions of such largely university-based centers as Tomsk, Novosibirsk and Voronezh proves that the quality of university plays a key role in shaping youth migration flows [Abbott, Schmid, 1975; Agasisti, Dal Bianco, 2007; Ciriaci, 2014].

All the indicators used in this article provide an adequate assessment of youth migration trajectories. We believe that this integrated assessment allows leveling random fluctuations of certain indicators caused by the estimation methods and the specific features of the analyzed time period. Just as with the development of education systems, migration trajectories are rather inert, which has been proven by the estimates in this work.

The choice that young people make about the destination of their higher education studies depends not only on the potential of university centers but also on the overall migration tendencies in the country and the socioeconomic situation in the regions. For many, obtaining a higher education is an opportunity to make this move with lower costs and gain their first important migration experience at an early age. This is why different regions and youth-attracting centers have unequal opportunities: Moscow and St. Petersburg universities enjoy a huge competitive edge due to the overall migration attractiveness of the largest cities. Close attention should be paid to the increase in youth influx to certain regions of the Asian part of Russia: here we have important "second-tier" attraction centers that resist the prevailing migration trends effectively.

The above analysis of youth migration trajectories may serve as a benchmark in strategic planning designed to advance the national and regional education systems. The possibility of attracting student migrants from other regions offers a crucial advantage to universities and is a powerful factor in their socioeconomic development.

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