Factors and Routes of Interregional Migration of University Graduates in Russia

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Abstract

Data from Russia's Federal Monitoring of University Graduate Employment portal is used to analyze migration of youths between 2013 and 2015. Interregional mobility of human resources stems, in particular, from uneven distribution of universities across the country and socioeconomic disparities between regions. Migration of university graduates may deprive some regions of much of their skilled workforce. The largest migration flows are observed between Moscow, St. Petersburg, and Moscow Oblast. Apart from federal cities, graduates are also attracted by industrial regions of the Russian North.

This study makes use of a modified gravity model that includes various socioeconomic indicators of home and recipient regions in addition to the basic gravity model factors. Gravity modelling allows identifying a number of migration factors associated with the areas of origin and destination. "Push" factors (the ones that repel graduates out of the region) include low wages and high rates of poverty and unemployment. "Pull" factors (the ones that attract graduates into the region) are represented by high wages and high levels of cultural development and innovative activities. Most often, university graduates migrate from south to north and from east to west. Federal subjects of Russia differ essentially by the demand for graduates in regional labor markets. Analysis reveals which regions of Russia attract or repel recent graduates. Territories with consistently diminishing populations of skilled professionals are in urgent need for dedicated programs to attract recent graduates from other regions, new high-performance jobs, and improvements in the quality of life.

Keywords

graduate employment, migration, modified gravity model, regions of Russia, university graduates.

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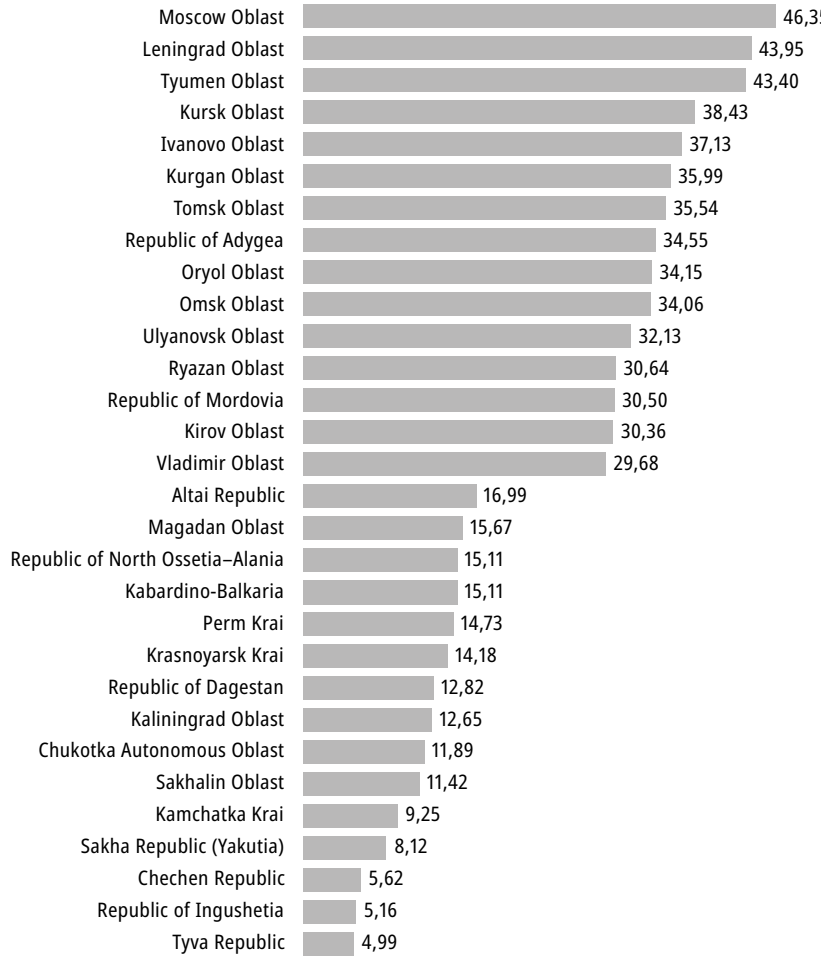
Figure 1. **Average interregional out-migration rates for university graduates in 2013–201.,** %



Source: Complied based on the data from the FMUGE portal: http://vo.graduate.edu.ru

Employability of university graduates in the labor market is a major predictor of regional and national development. It serves as an indicator of efficiency of investments in education, which are heavy at both private and public funding levels.

The territory of Russia is extremely heterogeneous in terms of the distribution of universities and, consequently, university graduates. Apart from Moscow and St. Petersburg, the highest number of students per 10,000 population is observed in Tomsk, Tyumen, and Omsk Oblasts and the Republic of Tatarstan.[1] Job opportunities for university

Translated from Russian by I. Zhuchkova.

[1] Federal State Statistics Service (Rosstat) (2017) *Sotsial'no-ekonomicheskie pokazateli* [Socioeconomic Indicators], Moscow: Rosstat.

graduates and the level of regional labor market development also differ a lot from region to region, promoting interregional youth migration. According to the Federal Monitoring of University Graduate Employment (FMUGE) portal,[2] over 25% of Russian university graduates migrate within one year after graduation. In 2014, graduate migration rates varied from 8 to 57% across regions [Kozlov, Platonova, Leshukov 2017]. Over 35% of all graduates of universities in Moscow, Leningrad, Kursk, Ivanovo, Kurgan, and Tomsk Oblasts migrate to another region. Figure 1 shows regions with the highest and lowest out-migration rates for university graduates.

The main problem of post-graduation migration is that regions may lose much of their skilled workforce. Between 2013 and 2015, the number of regions with negative net migration (the difference between immigration and emigration) increased from 42 to 48 out of 83 regions (according to the 2013–2015 statistics from the FMUGE portal). Therefore, most regions are losing well-educated youth. The drain of recent graduates is expected to increase interregional disparities in economic development. This study seeks to analyze the factors and routes of migration of Russian university graduates.

The article is structured as follows: Section 1 offers a review of literature on migration processes; Section 2 describes research data and methods; Section 3 examines the results of assessing the factors of youth migration in Russia; Section 4 provides an analysis of university graduates' migration routes; and the final section sums up the findings and draws conclusions.

1. Factors of Migration

According to classical theory of migration, migration flows are affected by a number of factors associated with the area of origin or destination [Lee 1966]. Factors of origin, or "push" factors, are dominated by the economic (high unemployment, low wages, heavy taxation), social (high poverty rate), political (instability), and climatic (unattractive climate) motives. Immigrants are attracted by countries and regions with high levels of economic development, high wages, and accessible labor markets. Within the framework of the microeconomic model of individual choices [Todaro, Maruszko 1987], migration decisions are based on the analysis of costs and benefits associated with migration.

Individual migration propensity is largely contingent on the individual's phase of life: migration trends differ essentially between young adults [Winters 2011; Sage, Evandrou, Falkingham 2013] and older generations [Raymer, Abel, Smith 2007; Stockdale, MacLeod 2013]. In Russia, economically active population migrates to regions with high wages and strong industrial sectors: Northwest Russia, Siberia, and Far East. Senior citizens prefer regions with an attractive climate and a low cost of living [Mkrtchyan, Vakulenko 2019].

[2] http://vo.graduate.edu.ru

In a number of countries including Russia, youth migrants comprise a significant proportion of migration flows. Youth migrants can be divided into two key groups differing in the factors and routes of migration: school graduates and university graduates. A recent study found that university students (age 17–21) prefer to migrate to Moscow and Moscow Oblast, St. Petersburg and Leningrad Oblast, as well as Novosibirsk, Tomsk, and Voronezh Oblasts [Kashnitsky, Mkrtchyan, Leshukov 2016]. Central and southern regions of European Russia as well as Khabarovsk and Krasnoyarsk Krais also rank high on the scale of attractiveness to academic migrants.

Analyzing the factors of youth migration, researchers usually underline the role of regional economic development [Ciriaci 2014] and labor market conditions [Varshavskaya, Chudinovskikh 2014; Buenstorf, Geissler, Krabel 2016; Kozlov, Platonova, Leshukov 2017]. High unemployment and low wages encourage recent graduates to move to other regions. As high-skilled workers, university graduates attach a lot of importance to regional innovative activities [Marinelli 2013]. Quality of life and cultural development can also matter a lot when making migration decisions [Ciriaci 2014; Varshavskaya, Chudinovskikh 2014; Weisser 2018].

Job mobility patterns of university graduates in Russia are analyzed using the data on the FMUGE portal. In particular, this data was used to assess the demand for regional universities and examine the geography of university graduate employment in 2014 [Kozlov, Platonova, Leshukov 2017] as well as to model migration of Russian university graduates while taking into consideration the impact of neighboring regions [Antosik, Ivashina 2019]. The latter study zeroed in on the economic characteristics of regions, leaving social, infrastructural, and other factors of migration beyond the scope of analysis.

Research on the relationship between higher education and regional labor markets is most often based on university graduate surveys conducted by the Federal State Statistics Service (Rosstat) [Varshavskaya, Kotyrlo 2019; Cherednichenko 2020]. Parameters analyzed include the dynamics of supply of and demand for graduate labor, general characteristics of graduate employment, the dynamics of graduates' wages, and industry-specific differences in labor remuneration [Lopatina et al. 2020].

Therefore, the available literature pays little attention to analysis of the routes and factors of migration of recent graduates in Russia, and Rosstat statistics do now allow analyzing the migration flows of population with university degrees. These are the aspects that the present study focuses on in a quest to fill the gap in youth migration research.

2. Research Data and Methods

Analysis of graduate migration flows is based on the results of the FMUGE, published on a dedicated portal and representing aggregate data from universities, the Federal Service for Supervision in Educa-

tion and Science (Rosobrnadzor), and the Pension Fund of the Russian Federation. There are a number of limitations to this data. First, it provides no information on international and intraregional migration, so this study deals with interregional migration of graduates only. Second, this database features only registered addresses of employers, which may result in overstated migration rates for some regions, first of all Moscow, Moscow Oblast, and St. Petersburg. Third, graduate employment rates may be underreported in some career fields, such as law, due to specific aspects of employer affiliation practices. Fourth, the available data contains no information on graduates' actual place of residence, restricting analysis to migration from the region of graduation to the region of employment. However, there are no other databases reflecting university graduate migration and employment during the period analyzed.

Matrices of interregional youth migration were constructed using the FMUGE data. Migration statistics on the portal are only available for the 2013–2015 graduates who got employed within a year after graduation. Additionally, Rosstat data[3] on regional socioeconomic development was analyzed. The sample comprised 83 regions of the Russian Federation.[4]

The following regional indicators reflecting graduate migration were calculated:

- Ratio of graduate in-migration to economically active population (per 1,000 population);
- Graduate net migration, i. e. the difference between graduate in-migration and out-migration (persons) (Figure 2);
- Ratio of graduate net migration to economically active population (per 1,000 population);
- Proportion of graduate out-migrants in total graduate population (%);
- Ratio of graduate out-migration to economically active population (per 1,000 population);
- Migration flow from home region *i* to recipient region *j* (persons).

Judging by net migration rates, university graduates are attracted the most to federal cities, Moscow Oblast, and industrial regions. Negative net migration is typical of the southern regions of European Russia, Siberia, and Far East. Table 1 displays the leading and outsider regions by graduate migration indicators.

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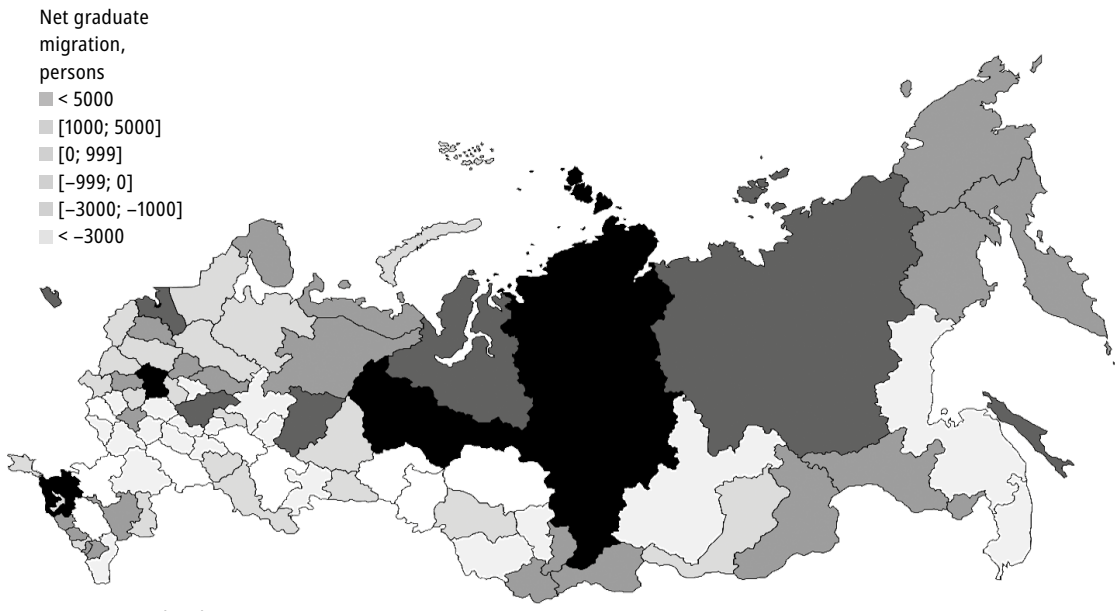
[3] Rosstat (2017) *Regiony Rossii. Sotsial'no-ekonomicheskie pokazateli* [Regions of Russia: Socioeconomic Indicators], Moscow: Rosstat.

[4] Federal cities are analyzed separately from their regions; Yamalo-Nenets and Khanty-Mansi Autonomous Okrugs, from Tyumen Oblast; and Nenets Autonomous Okrug, from Arkhangelsk Oblast. Crimea and Sevastopol are excluded from analysis due to the lack of data.

Figure 2. **Migration attractiveness of Russia's regions to university graduates, calculated on the basis of 2013–2015 net migration rates.**



Source: Created with mapchart.net using the data from the Federal Monitoring of University Graduate Employment (FMUGE) portal (http://vo.graduate.edu.ru).

Note: Data on the Republic of Crimea for 2013–2015 is not available.

Regions attractive to university graduates include Moscow, Khanty-Mansi Autonomous Okrug–Yugra, and Krasnoyarsk Krai, while Tyumen, Tomsk, Omsk, Kursk, and Ivanovo Oblasts turned out to be losing young adults with higher education degrees (Table 1). Descriptive statistics for graduate migration variables are given in the Appendix.

Quite expectedly, the largest migration flows are observed between Moscow, St. Petersburg, and Moscow Oblast (Table 2).

On the macrolevel, migration process modelling is based on gravity models (for specific aspects of evaluation of gravity models and an overview of their advantages and disadvantages, see [Shumilov 2017]). Gravity modelling implies that intensity of the migration flow between two regions is related positively to the size of both regions and negatively to the distance between them. Gravity models have already been used for analysis of migration processes in Russia (e. g. in [Vakulenko 2015; Moskvina 2019]).

A review of Russian and international literature on youth migration shows that significant factors considered when making migration decisions include regional economic and cultural development, labor market situation, innovative activities, and quality of life.

The method used in this study has already been applied to measure interregional mobility in Russia [Andrienko, Guriev 2004]. In addition to the basic gravity model factors (region size and distance between regions), the modified gravity model used here includes various

Table 1. **Leading and outsider regions of Russia by graduate migration indicators.**

	Ratio of graduate in-migration to economically active population	Ratio of graduate net migration to economically active population	Proportion of graduate out-migrants in total graduate population	Ratio of graduate out-migration to economically active population
Leaders	Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug–Yugra, Moscow, Krasnoyarsk Krai	Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug–Yugra, Krasnoyarsk Krai, Chukotka Autonomous Okrug	Tyumen, Kursk, Moscow, Leningrad, and Tomsk Oblasts	Tyumen, Kursk, Tomsk, Oryol, and Ivanovo Oblasts
Outsiders	Ivanovo, Kursk, and Omsk Oblasts, Primorsky Krai, Republics of Mordovia and Dagestan, Altai Krai	Tomsk, Tyumen, Kursk, Ivanovo, and Oryol Oblasts	Kaliningrad Oblast, Sakha Republic (Yakutia), Kamchatka Krai	Sakha Republic (Yakutia), Sakhalin Oblast, Kamchatka Krai

Source: Based on the data from http://vo.graduate.edu.ru

Table 2. **The largest graduate migration flows in Russia** (graduates per year).

Route	2013	2014	2015
From Moscow to Moscow Oblast	18,187	15,361	14,043
From Moscow Oblast to Moscow	7,422	8,413	9,014
From St. Petersburg to Moscow	5,072	4,567	4,736
From Tyumen Oblast to Khanty-Mansi Autonomous Okrug	4,210	3,538	2,517
From St. Petersburg to Leningrad Oblast	3,894	3,268	3,489
From Moscow to St. Petersburg	3,514	4,353	4,470
From Rostov Oblast to Krasnoyarsk Krai	2,677	2,540	2,645

Source: Compiled using the data from http://vo.graduate.edu.ru.

socioeconomic indicators of home and recipient regions, such as levels of economic, entrepreneurial, cultural, and ICT development, situation in the labor market, healthcare, and innovative activities (Table 3). Region size is expressed in the model through graduate population as the main source of migration. Descriptive statistics for the indicators analyzed are given in the Appendix. Migration flow from home region (*i*) to recipient region (*j*) is used as the dependent variable in the models. Regressions are based on cross-sectional and panel data on 83 regions for the period from 2013 to 2015.

Model specification for cross-sectional data is described by equation (1); for panel data, by equation (2):

Table 3. **Socioeconomic characteristics of regions.**

Factor	Indicator
Regional economic development	Gross Regional Product (GRP) per capita, rubles
	Poverty rate (the proportion of population living below the poverty line), %
Labor market situation	Ratio of average wages to the cost of the minimum expenditure basket (hereinafter "wages"), fraction
	Unemployment rate,%
	Average time to find a job, months
Entrepreneurial development	Small businesses per 10,000 population
Environmental conditions	Air pollutant emissions by stationary sources, thousand metric tons
Cultural development	Annual theater attendance per 1,000 population
Living conditions	Floor area per person, m^2
Healthcare	Infant mortality rate (the number of deaths per 1,000 live births of children under one year of age)
Innovative activities	Business innovation activities,%
ICT development	Personal computers per 100 employed people

$$(1)\quad \ln M_{ij} = \alpha + \beta \ln Vyp_i + \theta \ln Vyp_j + \sum_{k=1}^{R} \gamma_k \ln X_{ki} + \sum_{k=1}^{R} \delta_k \ln X_{kj} - \mu \ln D_{ij} + \varepsilon_{ij};$$

$$(2)\quad \ln M_{ijt} = \alpha_{ij} + \beta \ln Vyp_{it} + \theta \ln Vyp_{jt} + \sum_{k=1}^{R} \gamma_k \ln X_{kit} + \sum_{k=1}^{R} \delta_k \ln X_{kjt} + \varepsilon_{ijt}.$$

where M_{ij} is migration flow from region i to region j, Vyp_i, Vyp_j is the number of university graduates in home/recipient region, X_{ki}, X_{kj} is socioeconomic factors of home/recipient region, D_{ij} is straight line distance (km) between the administrative centers of regions i and j, γ_k and δ_k are coefficients for the explanatory variable "socioeconomic factors of the home/recipient region", β and θ are coefficients for the variable "the number of university graduates in home/recipient region", μ is the coefficient for the variable "straight line distance (km) between the administrative centers of regions i and j", ε_{ijt} is random error, α_{ij} is the intercept of the regression equation, and R is the number of regional characteristics.

All the variables were log-transformed and the fixed-effects method was used to estimate the gravity model. Since migration flows from some regions are zero (about 35% of all observations), models with non-zero observations were estimated additionally. Zero migration flows, i. e. the absence of interregional graduate mobility, are characteristic of poor and/or mutually remote regions.

3. Results of Migration Factor Assessment

Because there is interaction between regional economic development (GRP per capita and poverty rate) and labor market parameters (average wages, unemployment rate, and average time to find a job) as possible explanatory variables, different versions of models were assessed. Distance between regions is a time-constant factor, and fixed-effects models do not allow identifying the coefficients for such variables. For this reason, cross-sectional data was used to measure the impact of this factor on graduate migration flows. The coefficient for the variable "distance between regions" is negative (–0.9) and statistically significant (at the level of 1%), which is quite consistent with the gravity model assumption that migration flows reduce as the distance between regions increases.

Table 4 presents the results of panel data modelling. The final choice of model was made using the within R-squared value, the Akaike Information Criterion (AIC), and the Bayesian Information Criterion (BIC).

The population of university graduates in home region has a significantly positive impact on migration flow. This is a basic factor of the gravity model. Among the "push" factors, high levels of significance are observed for average wages (the lower the wages, the higher out-migration) and poverty and unemployment rates (the higher the rates, the more graduates leave the region). Recent graduates are "attracted" by high average wages, low levels of entrepreneurial development, and high levels of cultural development. Healthcare, environmental conditions, innovative activities, and the level of ICT development are insignificant for the total sample (Models 1 and 2 in Table 4).

When zero observations are excluded from analysis (Models 3 and 4 in Table 4), it becomes clear that ICT development and innovative activities enhance region attractiveness. However, the impact of average wages and rates of poverty and unemployment on migration flows remains unchanged.

GRP per capita and average time to find a job are statistically insignificant in all the models. Moreover, these factors decrease model quality, so they are not included in the final version.

To rank the model factors by their influence on migration flows, standardized coefficients are calculated by multiplying the regression coefficients by the standard deviation of the relevant factor and by dividing it by the standard deviation of the dependent variable. Ranking of indicators by their standardized coefficients (from high to low) yields the following order:

1) Basic factors (distance between regions and population of graduates in home region);
2) Regional economic development (average wages and poverty rate);
3) Labor market situation (unemployment rate in home region);
4) Cultural development;

Table 4. **Results of panel data modelling. Dependent variable: migration flow of university graduates from home region *i* to recipient region *j* (persons)**

Variable	All regions		Non-zero observations	
Model	(1)	(2)	(3)	(4)
Population of graduates *i*	0.35*** (0.025)	0.34*** (0.025)	0.77*** (0.04)	0.74*** (0.04)
Population of graduates *j*	–0.005 (0.025)	–0.02 (0.025)	–0.04 (0.03)	–0.05* (0.03)
Average wages *i*	–0.59*** (0.13)		–0.78*** (0.17)	
Average wages *j*	0.30** (0.13)		0.37** (0.17)	
Poverty rate *i*		0.27*** (0.07)		0.26*** (0.09)
Poverty rate *j*		0.01 (0.07)		0.03 (0.09)
Unemployment rate *i*	0.19*** (0.04)	0.15*** (0.04)	0.12** (0.06)	0.06 (0.06)
Unemployment rate *j*	–0.06 (0.04)	–0.07 (0.04)	0.03 (0.05)	0.03 (0.05)
Cultural development *i*	0.05 (0.04)	0.11*** (0.04)	0.006 (0.06)	0.06 (0.06)
Cultural development *j*	0.11*** (0.04)	0.09** (0.04)	0.21*** (0.05)	0.21*** (0.06)
Small businesses *i*	0.04 (0.03)	0.05* (0.03)	0.05 (0.04)	0.06 (0.04)
Small businesses *j*	–0.08** (0.03)	–0.09*** (0.03)	–0.09** (0.04)	–0.11*** (0.03)
Living conditions *i*	0.07 (0.23)	0.04 (0.22)	0.12 (0.26)	0.21 (0.25)
Living conditions *j*	–0.56** (0.23)	–0.60*** (0.22)	–1.08*** (0.24)	–1.06*** (0.24)
Innovative activities *i*	–0.01 (0.01)	–0.02 (0.015)	–0.009 (0.02)	–0.01 (0.02)
Innovative activities *j*	0.02 (0.01)	0.02 (0.015)	0.05** (0.02)	0.04** (0.02)
Healthcare *i*	–0.01 (0.03)	0.009 (0.03)	–0.01 (0.04)	0.006 (0.04)
Healthcare *j*	0.03 (0.03)	0.02 (0.03)	0.03 (0.04)	0.01 (0.04)
ICT development *i*	–0.04 (0.08)	–0.004 (0.08)	0.13 (0.10)	0.15 (0.10)
ICT development *j*	0.04 (0.08)	0.02 (0.08)	0.17* (0.10)	0.19* (0.10)
Number of observations	20,667	20,667	13,350	13,350
R-squared(within)	0.02	0.02	0.05	0.05
AIC	15,966	15,971	6,148	6,163
BIC	16,117	16,122	6,290	6,291

Note: *, **, and *** indicate significance at levels 10%, 5%, and 1%, respectively. The fixed-effects model was estimated using the generalized least squares method.

http://vo.hse.ru/en/ 77

5) Entrepreneurial development;
6) Innovative activities and ICT development.

Thus, migration flows of university graduates are affected most of all by the basic gravity model factors, followed by regional economic development and labor market situation.

4. Routes of Graduate Migration

To analyze routes of university graduate migration, migration matrices are constructed for every federal district using interregional migration statistics (Table 5).

It follows from Table 5 that in Central Federal District (FD), 58.8% of graduates who leave the region of their graduation migrate within their home district, 12.3% move to regions of Northwestern FD, and about 10% migrate to regions of Volga FD. Graduates of Northwestern FD universities are attracted by regions within their home federal district (41%) and Central FD (40.5%). Most graduates of Volga FD universities find jobs in Central FD (46.3%), while 25.7% migrate within their federal district, and slightly under 11% move to Northwestern FD regions. Central and Northwestern Federal Districts are also preferred by university graduates from Southern FD (45.2 and 10.3%, respectively) and Far Eastern FD (30.7 and 10.6%, respectively).

The largest migration flow from North Caucasian FD goes to Central FD (37.5%), which is followed by Southern FD (25.4%). Ural FD graduates prefer to migrate within their home district (46.2%), followed by Central FD (28.2%) and the neighboring Volga FD (11.9%). Graduates of Siberian FD universities are most likely to move to Central FD (30.9%) and Ural FD (11.2%).

Similar matrices were constructed for 2013 and 2014. It turned out that migration preferences of university graduates did not change essentially in 2015 as compared to previous years, except for growing migration from all regions to Central FD.

To summarize, graduates are most attracted by regions of Central and Northwestern Federal Districts as well as regions neighboring their home region. Analysis of migration flows reveals two major routes of migration: from south to north and from east to west.

5. Conclusions and Discussion

Employability of and demand for university graduates in the labor market have been a subject of heavy public scrutiny. Migration processes reflect the labor market situation and living conditions in regions. Negative net migration rates of high-skilled youth are typical of most regions of Russia (48 out of 83 in 2015). The drain of recent graduates is expected to increase interregional disparities in economic development. Regions that keep losing their university graduates while not attracting workforce from other regions include Tomsk, Tyumen, Kursk, Ivanovo, and Oryol Oblasts. Expectedly, the most attractive regions

Table 5. **Migration flows of university graduates in 2015: a breakdown by federal districts** (%).

From	To							
	Central FD	Northwestern FD	Volga FD	Southern FD	Ural FD	North Caucasian FD	Siberian FD	Far Eastern FD
Central FD	58.8	12.3	9.97	5.9	3.6	2.5	4.4	2.5
Northwestern FD	40.5	41.1	5.1	2.9	3.4	1.1	3.4	2.5
Volga FD	46.3	10.9	25.7	4.2	8.3	0.5	3.3	0.8
Southern FD	45.2	10.3	5.9	27.5	3.5	5.6	1.1	0.9
Ural FD	28.2	7.1	11.9	2.4	46.2	0.2	3.1	0.7
North Caucasian FD	37.5	9.1	2.7	25.4	4	19.2	1.6	0.6
Siberian FD	30.9	7.9	2.6	2.2	11.2	0.16	39.4	5.6
Far Eastern FD	30.7	10.6	0.9	2.3	1.2	0.1	7.6	46.7

Note: Rows correspond to home regions, and columns to recipient regions. Row total is 100%.

for graduate migration include Moscow, St. Petersburg, and northern industrial regions (Khanty-Mansi Autonomous Okrug–Yugra, Krasnoyarsk Krai), which is consistent with earlier findings on migration of economically active population [Mkrtchyan, Vakulenko 2019]. Most often, university graduates migrate to regions of Central and Northwestern Federal Districts as well as the most economically advantaged neighboring regions.

The study performed revealed factors affecting interregional migration of recent university graduates in Russia. "Push" factors repelling graduates out of regions include low wages and high rates of poverty and unemployment. A dynamic labor market is the main "pull" factor attracting graduates, which is in line with Lee's theory of migration [Lee 1966] as well as with other research findings [Varshavskaya, Chudinovskikh 2014; Buenstorf, Geissler, Krabel 2016; Kozlov, Platonova, Leshukov 2017]. Innovative activities and ICT development are related positively to migration flows, yet the coefficients are insignificant in some models.

As we can see, migration of university graduates is largely influenced by regional economic development and labor market situation. The drain of young skilled workers may indicate a low demand for them as well as unattractive labor market conditions in their home region. Therefore, regional economic development agencies need to improve the quality of life and create new jobs, while universities need to adjust their education models to the structure and specific aspects of regional economies.

Appendix Descriptive Statistics for Variables

Description	Year	Min	Max	Median	Mean	SD
Migration flow from home region to recipient region	2013	0	18,187	2	42.99	302.06
	2014	0	15,361	1	43.20	286.33
	2015	0	14,043	2	42.61	277.63
Graduate net migration = in-migration — out-migration (persons)	2013	–6,166	17,650	–18	80.7	1,753.3
	2014	–535	18,174	–206	68.2	2,047.3
	2015	–5,597	33,978	–369	64.1	2,346.7
Graduate migration growth rate = net migration / graduate population (%)	2013	–31.63	1,013.4	–0.53	23.77	45.41
	2014	–31.65	1,063.1	–3.01	23.93	49.41
	2015	–37.16	470.99	–6.79	14.43	36.57
Population of university graduates in the region (persons)	2013	166	231,508	7,466	14,429	11,698
	2014	83,	216,938	7,244	13,381	11,183
	2015	76	199,115	6,879	13,626	11,062
Graduate in-migration (persons)	2013	301	70,962	1,541	3,641.5	3,519.4
	2014	213	82,809	1,433	3,610.2	3,678.6
	2015	238	87,327	1,298	3,558.5	3,750
Graduate out-migration (persons)	2013	16	70,947	2,046	3,560.9	3,108.3
	2014	10	64,635	2,018	3,542.0	3,081.1
	2015	11	53,349	2,096	3,494.5	2,929.7
Proportion of graduate out-migration in total graduate population (%)	2013	0.04	0.74	0.24	0.23	0.07
	2014	0.05	0.49	0.26	0.25	0.07
	2015	0.06	0.47	0.26	0.25	0.07
Ratio of graduate in-migration to economically active population (per 1,000 population)	2013	0.6	16.3	2.7	3.7	2.0
	2014	0.6	15.0	2.5	3.4	1.8
	2015	0.6	15.9	2.3	3.3	1.9
Ratio of graduate out-migration to economically active population (per 1,000 population)	2013	0.20	12.8	2.7	3.2	1.6
	2014	0.30	11.4	3.1	3.2	1.4
	2015	0.34	10.9	3.1	3.3	1.4
Ratio of graduate net migration to economically active population (per 1,000 population)	2013	–8.9	16.1	–0.02	0.51	2.66
	2014	–7.7	15.0	–0.3	0.24	2.60
	2015	–9.8	14.6	–0.9	0.05	2.76
Ratio of graduate population in the region to economically active population (per 1,000 population)	2013	0	33.7	12.9	13.1	3.8
	2014	0	30.6	11.6	12.1	3.8
	2015	0	28.2	12.6	12.8	3.7

Description	Year	Min	Max	Median	Mean	SD
Ratio of average wages in the region to the cost of the minimum expenditure basket	2013	1.8	4.8	2.3	2.5	0.4
	2014	1.7	4.6	2.2	2.4	0.4
	2015	1.6	4.4	2.1	2.2	0.4
GRP per capita (rubles)	2013	91,641	4,035,943	262,578	387,621	245,635
	2014	109,649.0	4,329,031	296,058	429,256	272,612
	2015	116,007.9	4,990,260	326,480	476,974	307,552
Unemployment rate (%)	2013	1.5	43.7	5.7	6.84	2.61
	2014	1.4	29.8	5.4	6.39	2.34
	2015	1.8	30.5	6.0	6.74	2.25
Average time to find a job (months)	2013	3.9	12.2	7.6	7.8	1.08
	2014	4.9	11.9	7.2	7.48	0.98
	2015	5.4	12.3	7.2	7.44	0.94
Poverty rate (%)	2013	6.6	35.4	12.5	13.4	3.3
	2014	6.9	34.7	12.6	13.5	3.4
	2015	7.2	38.2	14	15	3.8
Small businesses per 10,000 population	2013	26	414	123	129.1	37.3
	2014	23	419	126	129.1	37.1
	2015	15.4	316.9	128.8	133.4	39.7
Air pollutant emissions by stationary sources, thousand metric tons	2013	0.6	2,497	99	222.3	222.9
	2014	0.4	2,356	95	210.0	204.1
	2015	0.4	2,476	96	208.1	203.2
Annual theater attendance per 1,000 population	2013	0	655	189	197.1	76.8
	2014	0	726	195	204.2	75.5
	2015	0	780	191	208.0	76.5
Floor area per person (m^2)	2013	12.9	29	24	23.6	2.4
	2014	13.1	29.4	24.5	24.1	2.5
	2015	13.5	33.4	25	24.7	2.5
Infant mortality rate (the number of deaths per 1,000 live births of children under one year of age)	2013	4.4	23.9	8.2	8.7	2.0
	2014	4.3	23.4	7.3	7.9	1.8
	2015	3.3	16	6.6	7.0	1.5
Business innovation activities (%)	2013	1.0	25	9	9.8	3.5
	2014	0.5	29.2	8.7	9.7	3.5
	2015	1.6	24	8	8.8	3.4

Description	Year	Min	Max	Median	Mean	SD
Personal computers per 100 employed people	2013	20.4	78	38.9	40.1	6.4
	2014	20.9	71.9	39.1	39.2	6.2
	2015	28.7	72.8	40.8	41.4	6.0

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