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Educational Migration from Arctic Regions of Russia That Do Not Have Independent Universities

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Abstract. One of the main reasons for young people to change their place of residence is the desire to get higher education. In the Arctic zone, where there is a lack of or insufficient level of development of the network of higher education organizations, young people are forced to leave for other regions. The relevance of the study is also conditioned by the fact that educational migration is often irrevocable, which strengthens negative migration processes. The study of educational migration with the help of traditional statistical sources is possible at the regional level, but does not reveal the spatial characteristics of migration processes at the level of municipalities. Therefore, the purpose of this study is to approbate the methodology of studying migration from municipalities on the example of regions where there are no independent higher education institutions. The object of the study is the Arctic regions: Nenets, Chukotka, Yamalo-Nemets Autonomous okrugs. The scientific novelty of the study is determined by the use of new data sources and the application of the method of big data analysis to study migration processes at the municipal level. The database for the study was formed on the basis of the results of uploading data from the digital footprint of users of the social network "VKontakte". The study regions included 15,186 users, the vast majority of whom indicated receiving higher education in other constituent entities of the Russian Federation. Based on the obtained data, the trajectories of educational migration at the municipal level were identified, the coefficients of concentration and uniformity of migration flow were calculated, and a typology of municipalities in the Arctic regions of Russia was carried out. The practical significance of the study lies in the possibility of using the results obtained to adjust migration policy in the Arctic regions, including at the municipal level.

Keywords: *educational migration, internal migration, VKontakte, Nenets Autonomous Okrug, Chukotka Autonomous Okrug, Yamalo-Nenets Autonomous Okrug*

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Introduction

In the modern world, higher education is of great importance when seeking employment and achieving success in professional life. The desire to enter a university often becomes the reason for the relocation of school graduates from Arctic regions, characterized by the absence or insufficient development of a network of higher education organizations. As a result, the northern regions lose a part of human potential that is promising in demographic and labor-resource terms, which subsequently leads to additional costs for the authorities and business structures operating in the North [1].

The land part of the Arctic zone of the Russian Federation includes 75 municipalities (municipal districts, urban and municipal okrugs), belonging to 9 regions. In the subjects of the Russian Federation, which fully or partially belong to the Arctic zone, there are both branches of higher education organizations and independent universities (the latter refers to higher education organizations that are not branches). The regions of the Arctic zone of the Russian Federation can be divided into three groups according to the level of development of the network of higher education institutions and, accordingly, the accessibility of higher education in their constituent entities. The municipalities of the Arctic zone of the Murmansk and Arkhangelsk oblasts, as well as the Krasnoyarsk Krai have both independent higher education institutions and branches. The Republics of Sakha, Karelia, and Komi have independent universities located in the parts of the regions that are not included in the Arctic zone. There are also university branches in Vorkuta and Usinsk.

It is difficult to obtain higher education for school graduates in the Nenets (NAO), Chukotka (ChAO) and Yamalo-Nenets (YaNAO) autonomous okrugs, which entirely are part of the Arctic zone. There are no independent universities in these regions. In Chukotka and the Yamalo-Nenets Autonomous Okrug, the "network" of higher education institutions is represented by branches that provide training primarily through correspondence courses: in Noyabrsk, there is a branch of the Tyumen Industrial University, and in Anadyr — of the North-Eastern (Federal) University named after M.K. Ammosov. The number of full-time students is small: in 2022, it was 8 and 42 students, respectively [1].

Thus, the lack of independent universities, the insignificant number of places and the lack of choice of training areas in single branches have necessitated educational migration from these autonomous okrugs. Interregional educational migration from the Arctic regions can be of a return nature, but for full-time students, temporary migration often turns into irrevocable one.

The subject of this study is migration in the Arctic regions where there is no network of higher education institutions: the Nenets, Chukotka, Yamalo-Nenets Autonomous okrugs. The purpose of the research is to test a methodology for studying migration from municipalities without independent higher education institutions. Migration from Arctic territories can be caused not

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[1] Characteristics of the higher education system. Monitoring 2022. Information and analytical materials based on the results of monitoring the activities of organizations of higher education. URL: https://monitoring.miccedu.ru/?m=vpo&year=2022 (accessed 11 May 2023).

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only by lack of access to education, but also by other factors related to economic development and quality of life. For example, many young people may leave regions with limited career opportunities for more developed regions with a wider range of employment and business opportunities.

Sources of information on educational migration in the Russian Arctic

The study of educational and youth migration, including in the context of the demographic and socio-economic development of the North, is carried out by representatives of various areas of social sciences — demographers, economists, geographers, sociologists, who have different approaches to the object of study and the sources of information. Traditionally, data on population movements are reflected in the materials of population censuses and current statistical records of migration. These sources can be used separately or in combination, reflecting different aspects of population movements in the Arctic regions — migration flows that characterize the resettlement process and the resulting migration stocks [2].

The current accounting of migration since 1997 separately identifies movement in the regions of the Far North and areas equated to them. Currently, Rosstat is compiling tables SPr1_REG "Distribution of migrants aged 14 and older by circumstances that necessitated a change of residence, and regions from which migrants arrived and where they departed to in the Far North and areas equated to them" and SV2_REG "Distribution of migrants by gender, age and regions, where migrants came from and where they are leaving to in the Far North and areas equated to them", which can be used for migration research. Information on the interregional migration of the population aged 14 and older is the basis for the work of I.S. Stepus, V.A. Gurtov, and A.O. Averyanov, who not only estimated the volume of registered interregional migration, but also identified 15 labor surplus regions, from which the largest number of migrants arrive in the Arctic every year [3].

Another administrative source that makes it possible to identify the directions of educational migration is data on the distribution of school graduates provided by regional executive authorities managing education. According to the study by I.S. Stepus and co-authors, conducted on the basis of such information, about 90% of school graduates in the Yamalo-Nenets AO, 75% of the Nenets AO and 71% of the Chukotka AO form their educational trajectory outside their region [1].

Sociological methods are widely used to study youth migration, including educational and postgraduate migration. The main attention is paid to identifying migration attitudes and factors influencing the desire to leave, stay or move to the regions of the Arctic zone of the Russian Federation. Using surveys of northerners, researchers identify the orientation of different groups of young people to move, the reasons for migration, as well as factors of outflow and settling down [4]. The works, the empirical base of which is formed by surveys of students of professional educational institutions of the Arctic regions, analyze the educational plans of young people and their readiness to leave the Arctic regions [5, 6]. Galimullin E.Z. [7] used a survey to identify the atti-

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tudes of young people aged 18 to 33 living outside the Arctic region in order to identify facilitating and hindering factors for a possible move to a place of residence in the regions of the Arctic zone.

In the modern information society, methods based on the use of "big data" are becoming increasingly widespread when studying different types of migration. This kind of information includes data about users, which remain in the form of digital traces in social networks or after calls from mobile phones, queries in search systems, information about payments using bank cards, connection to Wi-Fi networks, information from ticket services, etc. [8] "Big data" or "digital footprints" have emerged as new sources of migration measurement, supplementing "traditional" information from censuses and administrative sources.

The value of digital sources is the ability to identify migration trajectories between municipalities and even localities. The first works using data from the most widespread social network in Russia "VKontakte" were carried out by N.V. Zamyatina and A.N. Pilyasov, who analyzed the relationships between the cities of Yamal and the geographic distribution of young migrants from northern cities (Noyabrsk, Magadan , Norilsk) [9]. In development of these studies, based on downloads from the social network carried out at the beginning of 2015, a web atlas "Virtual population of Russia" was prepared, which provides information about universities of study, age, common names, friendships and other characteristics of users of the social network [10]. This project, being a significant research, is also used as a source of information for work devoted to migration routes of the population of the Arctic regions. Thus, V.V. Fauser and A.V. Smirnov analyzed social network data to identify the migration preferences of residents of the Russian Arctic. The study showed that residents of most territories tend to move to their regional capitals, and among the main centers, St. Petersburg is more attractive for residents of the European Arctic, and Moscow — for the Asian Arctic [11]. It is proposed to track digital traces of the movement of the population of the Arctic zone of the Russian Federation by air and rail transport on the basis of the ticket sales service Tutu.ru [12].

Studies using "big data" can probably include those based on the comparison of the information base on the results of the Unified State Exam (USE) and the results of admission to universities [13]. This approach demonstrates the typology of Russian regions according to the peculiarities of youth migration, in which the Arctic subjects of the Russian Federation that do not have their own universities are categorized as donor regions.

Materials and methods

Data from population censuses and current migration records, with confidence in the quality of the information collected, make it possible to estimate the volume of migration at individual ages, but not the directions of movement at the level of municipalities. In addition, Rosstat do not provide detailed information on the geography of migration of representatives of certain age groups (for example, youth), as well as on the number of those who moved to get higher education.

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The problem of studying interregional and intermunicipal flows of educational migrants can be solved using "big data", including profile data of social network users. To identify places of higher education for natives and school graduates of Arctic regions that do not have independent universities, we used the data download of the digital footprint of users of the social network VKontakte, made in the laboratory of applied analysis of big data at Tomsk State University using the platform "SN Lab" (https://lk.opendata.university) in February 2022. This social network is the most popular in Russia and ranks 8th in the world among social networks [2]. All profiles of users with accounts open for uploading were used; the profiles had the filled in fields "hometown" (if not specified, then the field "school"), "city of university" (if more than one university was specified, the last one was taken into account), "date of birth" (users younger than 17 were excluded). Small centers of higher education with less than 300 students were also excluded.

User information about their "native" settlement was linked to specific municipalities based on the ISRD platform data set (infrastructure for scientific research data) "Settlements of Russia: population and geographic coordinates" [3]. The final database for the whole of Russia covered the profiles of 3.656 million unique VKontakte users, of which the users of the municipalities of Nenets, Chukotka and Yamalo-Nenets okrugs, who indicated their hometown or school graduation place, accounted for 806, 1417 and 12963 people, respectively. Analysis of the data obtained showed that in all other regions of the Russian Federation, the majority of natives and school graduates indicate in their VKontakte profiles that they received higher education in the administrative centers or largest cities of their constituent entities of the Russian Federation.

A typology of municipalities in the Nenets, Chukotka and Yamalo-Nenets okrugs was carried out using the database of VKontakte users. We proposed and calculated the coefficients of concentration and uniformity of migration flow distribution. The coefficients correlate with each other, but the first one reflects the dominance of the leading centers, and the second — the degree of uniformity of the migration flow distribution.

The concentration coefficient of the migration flow (CR) shows the degree of limitation of the distribution of the migration flow; it is calculated as a percentage of the amount of migration to the largest recipient municipalities to the total amount of migration in a given subject (1):

$$CR_n = \sum_{i=1}^{n} S_i,$$

where S_i — share of the recipient municipality in population migration indicators,

n — number of recipient municipalities participating in the coefficient calculations.

The work calculated the concentration coefficient of three leading cities (CR_3), ten leading cities (CR_{10}). By analogy with the analysis of the concentration of market structures, municipalities with a low level of concentration (CR_3 less than 45%), with a moderate level of concentration (CR_3

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from 45 to 70%) and with a high level of concentration (CR_3 more than 70%) of the migration flow were identified.

The coefficient of uniformity of migration flow distribution was calculated as the sum of squares of shares (specific weights) of all municipalities (places) in the total migration flow (2):

$$\text{HHR} = \sum_{i=1}^{n} S_i^2,$$

where S_i — share of a municipality in the total value of migration flow.

Depending on the obtained values, all municipalities were distributed into three groups (by analogy with the grouping based on the Herfindahl−Hirschman index). The first group includes municipalities with an index in the range of 1800 <HHI <10,000 (uneven distribution). The second group is municipalities with an index in the range 1000 <HHI <1800 (relatively even distribution). The third group is municipalities with an even distribution of migration flow (HHI <1000).

Municipalities were classified according to the data on the migration flow concentration coefficient for the three leading municipalities (CR_3) and the data on the coefficient of uniformity of migration flow distribution (HHI). A total of 9 types of municipalities were identified.

Results and discussion

Completion of the educational process, which attaches a person to the institution, forms readiness to change one's territorial status. At this age, young people can move to the next stage of education by entering vocational education institutions, enter the labor market, get married, etc. All these events can be accompanied by a change of permanent residence, which is recorded by statistics. Significant migration loss is registered at the age corresponding to school graduation. Age coefficients of interregional migration growth for the regions under consideration are presented in Fig. 1.
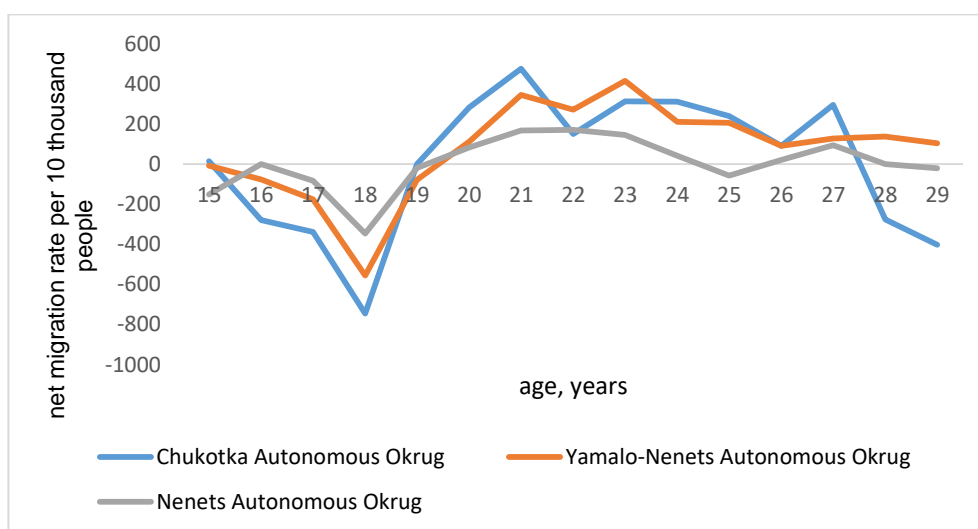

Fig. 1. Age coefficients of interregional migration loss in NAO, ChAO and YaNAO in 2021 [4]

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[4] Calculated by: Table MV2 "Distribution of migrants by gender and age groups for 2021. Urban and rural areas. Interregional migration", Database of indicators of municipalities. URL: https://www.gks.ru/dbscripts/munst/ (accessed 24 May 2023).

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The absolute values of migration loss or gain are variable and do not exceed tens of people in the sparsely populated Nenets and Chukotka Autonomous Okrug, and hundreds in the Yamalo-Nenets Autonomous Okrug in each of the one-year cohorts. For all regions, the maximum migration decline occurs at the age of 18 — the time when most Russian schoolchildren receive complete secondary education. Unfortunately, traditional statistics do not allow us to judge specific areas of migration either in the context of individual age groups (youth) or in relation to the reasons for migration (higher education).

Census data also indicate a decrease in the number of young people in the autonomous okrugs. Despite the fact that the population of the subjects under consideration decreased insignificantly during the inter-census period, a comparison of population censuses demonstrates a reduction in the cohort of 20–24 years old by 2021 compared to the age group 10–14 years old in 2010 (Table 1). Since mortality losses in these age cohorts do not make a significant contribution to changes in the number of young people, it is obvious that the migration plays a decisive role.

Table 1

Changes in the population of NAO, ChAO and YaNAO during the inter-census period [5]

Area	Census-2010			Census-2020		
	population	10–14 years old		population	20–24 years old [6]	
		people	%		people	%
NAO	42 090	2 720	6.5	41 434	1 969	4.8
ChAO	50 526	3 363	6.7	47 490	2 248	4.7
YaNAO	522 904	33 970	6.5	510 490	25 335	5.0
Russia	142 856 536	6 609 822	4.6	147 182 123	7 750 398	5.3

The educational migration trajectories of natives of Chukotka are characterized by the choice of more remote centers, the low attractiveness of universities in Magadan, which rank only 6th, as well as the higher importance of Moscow than St. Petersburg. The third most important center of higher education for natives and school graduates of the Chukotka Autonomous Okrug is Khabarovsk.

The coefficients of concentration (by CR_3 and CR_{10}) and uniformity of the migration flow of municipal entities were calculated for each municipality (Table 2). The ratio of CR_3 and HHR coefficients was used as a basis for the typology of municipalities in NAO, ChAO and YaNAO.

Table 2

Coefficients of uniformity and concentration of migration flow in municipalities of NAO, ChAO and YaNAO

Municipalities entities	Coefficient of uniformity of migration flow	Coefficient of migration flow concentration by three leading centres, CR_3	Coefficient of migration flow concentration by ten leading regions, CR_{10}

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[5] Calculated by: All-Russian Population Census 2020. Volume 2. Age, gender composition and marital status. URL: https://rosstat.gov.ru/vpn_popul; All-Russian Population Census 2010. Vol. 2. Age, gender composition and marital status. URL: https://www.gks.ru/free_doc/new_site/perepis2010/croc/perepis_itogi1612.htm (accessed 24 May 2023).

[6] The age cohorts under consideration do not fully correspond because 11 years have passed between the 2010 and 2020 censuses.

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NAO	2113	72	87
Naryan-Mar	2100	73	87
Zapolyarnyy region	2348	69	90
ChAO	***645***	***39***	***59***
Anadyrskiy region	628	38	61
Anadyr	809	44	65
Bilibinskiy region	610	36	62
Egvekinot	562	35	54
Providenskiy	838	44	71
Pevek	663	37	57
Chukotka region	675	34	59
YaNAO	***774***	***38***	***71***
Gubkinskiy	1004	46	74
Krasnoselkupskiy district	1456	55	78
Labytnangi	947	48	73
Muravlenko	827	40	71
Nadymskiy region	1021	50	75
Novyy Urengoy	1364	57	79
Noyabrsk	1441	61	91
Priuralskiy region	686	37	67
Purovskiy region	1027	46	70
Salekhard	1687	64	88
Tazovskiy region	1145	45	69
Shuryshkarskiy region	1964	61	91
Yamal region	1734	55	82
NAO, CHAO, YaNAO on average	***1160***	***38***	***66***

The study of statistical sources has shown a noticeable outflow of young people from the autonomous okrugs of the Arctic zone. Data on the directions of migration flows by region and municipality were obtained as a result of processing the digital traces of 15,186 users of the VKontakte social network. The migration trajectories of natives and school graduates of the regions under consideration, associated with obtaining higher education, are presented in Fig. 2.

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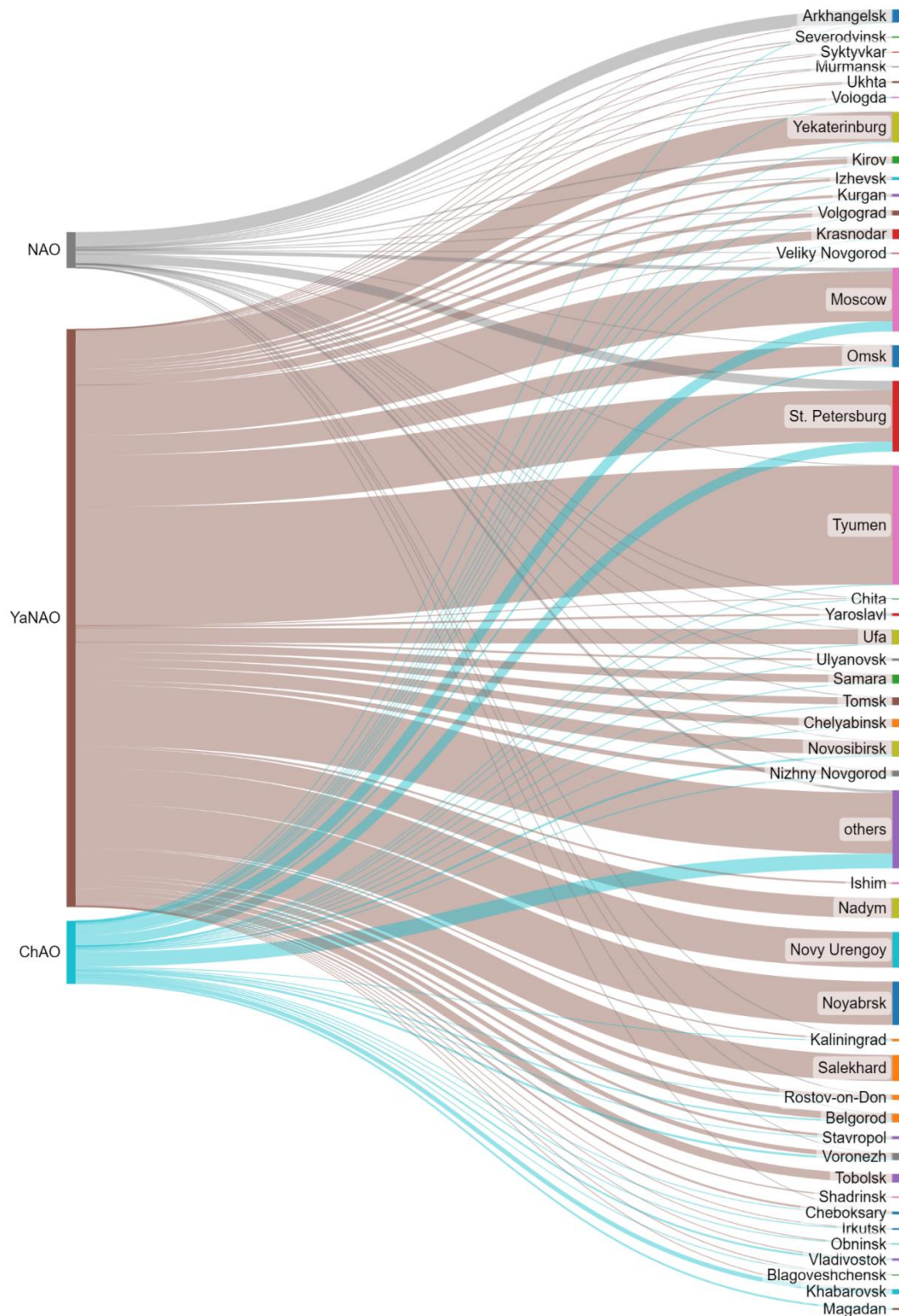
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Fig. 2. Distribution of VKontakte users from NAO, ChAO and YaNAO by centers of higher education.

Natives of the districts that are part of the complex constituent entities of the Russian Federation are traditionally move to the regional centers (Arkhangelsk, Tyumen) to receive higher education. About 18% of natives and school graduates of the Yamal-Nenets Autonomous Okrug indicated in their VKontakte profiles that they were studying at university branches in Noyabrsk, Nadym, Novyy Urengoy, and Salekhard, most of which are closed now. It should be noted that social network users who indicated studying at these centers are most often not educational mi-

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grants, as they were born or graduated from school there. Among the metropolitan centers, residents of Yamal and the Nenets AO give greater preference to universities in St. Petersburg than in Moscow.

Most municipalities belong to types I and V. Type I is characterized by a low level of concentration and even distribution of the migration flow. Among 9 municipalities of type I, 7 ones belong to the Chukotka Autonomous Okrug. There are no clearly defined points of attraction for residents of municipalities belonging to this type. Migration to Moscow and St. Petersburg, although predominant, does not dominate.

Type V includes 8 municipalities. All of them are part of the Yamalo-Nenets Autonomous Okrug. Municipalities of this type are characterized by average levels of concentration and distribution of migration flow. A feature of migration processes is the low values of metropolitan migration. Most often, residents move to Tyumen or stay in the place of permanent residence (Salekhard, Novyy Urengoy, Noyabrsk).

Two municipalities were included in the VIII type. This type is characterized by a moderate level of concentration and significant unevenness of migration flow distribution. At the same time, there is a clear center of attraction of migration flows. Thus, 42% of residents of the Zapolarnyy region of the Nenets Autonomous Okrug move to Arkhangelsk, and approximately 39% of residents of the Shuryshkarskiy municipal district of the Yamalo-Nenets Autonomous Okrug leave for Tyumen.

Types II, IV and IX include one municipality each. Type II is characterized by an even distribution of the migration flow and a moderate level of its concentration. Labytnangi, which is included in this type, is practically on the upper boundary of the two indicators. Therefore, despite the fact that, according to the HHR indicator, the municipality is classified as having an even distribution of migration flow, almost half of the population leaves for only three cities: Tyumen, Moscow and St. Petersburg. The Tazovskiy municipal district (Yamalo-Nenets Autonomous Okrug), included in type IV, is a recipient for Tyumen (30.3%), while the share of other areas does not exceed 8%. Type IX includes the city of Naryan-Mar (Nenets Autonomous Okrug), which is characterized by both one of the highest values of the concentration coefficient and significant unevenness of the migration flow. There are no municipal formations in types III, VI and VII (Fig. 3).
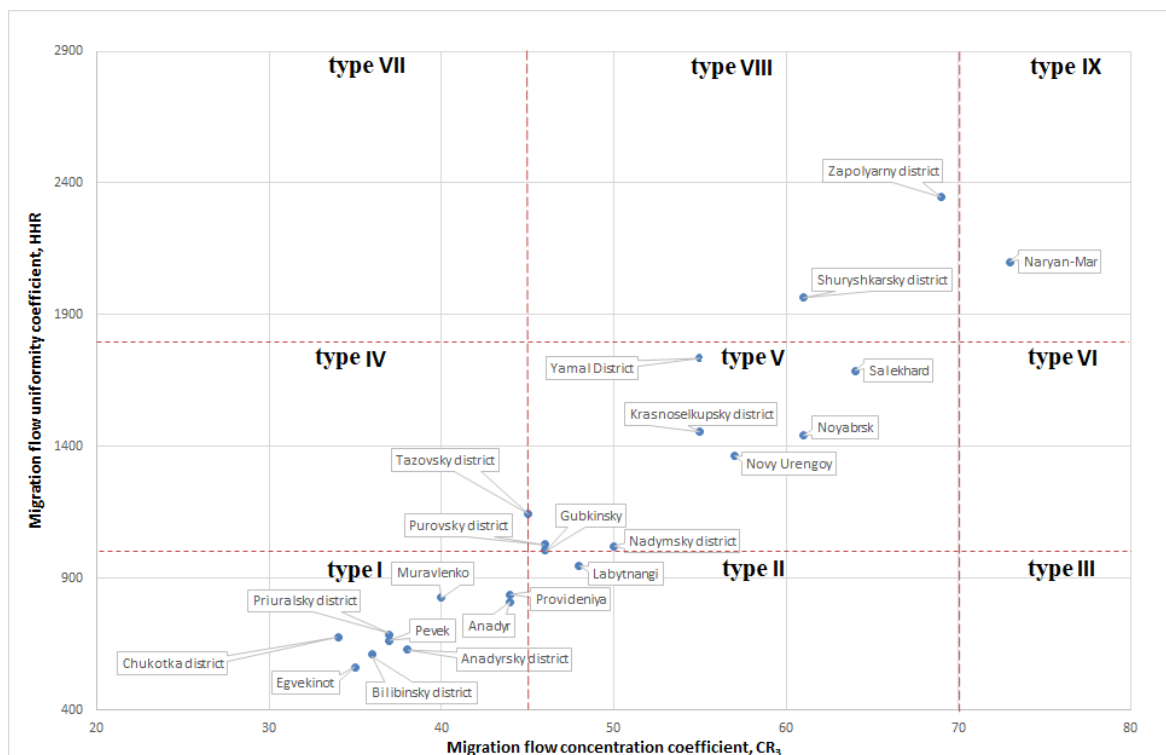
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Fig. 3. Typology of municipalities of the NAO, ChAO, YaNAO according to the coefficients of uniformity and concentration of the migration flow.

Conclusion

A study conducted using population census data, current migration records, as well as information from the social network, showed that the autonomous okrugs belonging to the Arctic zone of the Russian Federation are characterized by a significant migration outflow of the young population. A key role is played by the lack of a network of independent higher education institutions. Educational migration is largely irrevocable, as a result of which the Arctic regions lose part of their human potential, spend additional resources to compensate for losses and adapt personnel who have no experience of living in the North. The territorial structure of educational migration of natives and school graduates of different regions and municipalities of the Arctic zone differs markedly in terms of uniformity and concentration coefficients. The main centers of attraction for people from Chukotka are Moscow and St. Petersburg, and those from the Nenets and Yamal-Nenets Autonomous okrugs are Arkhangelsk and Tyumen, respectively, with a high share of St. Petersburg and Moscow. Migration associated with obtaining higher education will not have a negative impact on the economy and social sphere of the Arctic regions if socio-economic conditions facilitate the return of university graduates.

Further research on Arctic migration based on data from the profiles of social network users can be linked to obtaining more detailed information on the educational and career trajectory of northerners. Not only information about the routes of educational migration, but also about the fields of training, faculties and departments of study chosen by students is of interest. Data on the place of residence after graduation would make it possible to estimate the return migration of people from the Arctic regions. The information can be analyzed taking into account the age or

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year of graduation of VKontakte users. However, the use of such tools raises the question of the sample volumes necessary to ensure representativeness and clarify the criteria for the reliability of the information obtained.

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