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REGIONAL PROBLEMS

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## Macroeconomic Assessment of the State of Regional Labor Markets in the Asian Part of the Russian Arctic

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**Abstract**—The article analyzes the current conditions of the sector of employment and labor market in the regions of the Asian part of the Russian Arctic (about employment in the European part of the Russian Arctic see No. 1, 2016). Major changes in the structure of the sources of the formation of the manpower resources and its distribution by sectors of activity have been studied. An inertial assessment of the medium-term dynamics of the basic parameters of the regional labor markets has been given.

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The size and quality of the labor force largely determine the prospects of socioeconomic development of the regions. In this regard, the corresponding analysis and assessment of the future changes of the number and structure of manpower resources of the Arctic regions of Russia are relevant. Previously, we solved the problem thus formulated with regard to the regions included in the European part of the Russian Arctic [11]. This article, which maintains the previously adopted logic of presentation, shows characteristics of the current state of the labor markets of the Asian part of the Russian Arctic<sup>1</sup> and employment problems that exist in this sector.

**Major sources of labor-force formation.** In 2000–2013, in the context of a decrease in the size of the manpower resources in the Arctic regions by 546700 people, there was an increase by 19000 people in the Asian part of the Russian Arctic, during which time their share in the total size of the manpower resources of the Arctic regions increased from 51 to 57% (Table 1). This dynamics was determined by two regions included in the Asian part of the Russian Arctic, i.e., Yamalo-Nenets Autonomous Region and the Republic of Sakha (Yakutia). The size of their manpower resources increased in absolute terms by 116 000 of people by 2013 compared to 2000. If one considered a shorter period (2005–2013), the increase was smaller, i.e., 50000 people, of which 45000 people were in Yamalo-Nenets Autonomous Region.

<sup>1</sup> In accordance with the President's decree No. 296 of May 2, 2014, "On dry land territories of the Arctic zone of the Russian Federation" they include in the Asian part of the Russian Federation the territories of Yamalo-Nenets Autonomous Region, Chukotka Autonomous Region, the Krasnoyarsk Territory and the Republic of Sakha (Yakutia). Taking into account statistical limitations and in regard to the need for inter-regional comparisons the analysis was performed at the level of the region as a whole.

In 2013, the share of these two regions in the size of the manpower resources of the Asian part of the Russian Arctic was 37%. In the other two regions, Krasnoyarsk Territory and Chukotka Autonomous Region, the size of the labor force decreased by 81000 and 16500 people, accordingly, in 2000–2013 due to the decrease in the able-bodied working-age population. In the aggregate balance of the four regions more than 90% (from 92 to 94%) in the structure of labor force by sources of the formation falls on this category.

If, in 2000–2013, the total size of the able-bodied working-age population in the four regions decreased to 95000 people, then during the shorter time frame (2005–2013), it decreased to 102000 people (Table 2). The decrease in the size of the able-bodied working-age population, in its turn, was attributable to the decrease in the working-age population.

The greater decrease in the size of the able-bodied working-age population during the shorter time frame also determines the general tendency of the decrease in the size of the manpower resources in that period, although it is slight (by 1%). In this context, the number of foreign labor migrants grew 1.5 times, from 59000 people in 2005 to 91000 in 2013. The maximal number was recorded in 2008 (120000 people), then gradually decreased. The share of foreign labor migrants in the labor force structure of the regions of the Asian part of the Russian Arctic by sources of formation fluctuated from 2 to 4% over the last 8 years. In the review period, the total increase of persons over working-age and teenagers employed amounted to 41000 people, mostly due to increased of people over working-age employed in the economy. The share of people over working age and teenagers employed in the economy in the regional structure of manpower resources increased insignificantly over time (from 4 to 5%).

**Table 1.** Dynamics of the size of the labor force of the regions of the Asian part of the Russian Arctic, thousand people

Region	2000	2005	2007	2010	2012	2013	2013/2000
Russian Federation, thousand people	89031.2	92250.5	93594.0	92958.8	92847.0	92388.6	103.8
Asian part of the Russian Arctic,	2972.7	3020.4	3057.0	3054.9	3002.7	2991.4	100.6
% to the Russian Federation	3.3	3.3	3.3	3.3	3.2	3.2	–
Yamalo-Nenets Autonomous Region*,	364.6	419.4	439.6	448.2	450.0	463.9	127.2
%	12.3	13.9	14.4	14.7	15.0	15.5	–
Krasnoyarsk Territory,	1928.5	1923.4	1928.5	1924.3	1867.1	1847.6	95.8
%	64.9	63.7	63.1	63.0	62.2	61.8	–
Republic of Sakha (Yakutia)	623.9	635.6	645.9	642.8	646.3	640.6	102.7
%	21.0	21.0	21.1	21.0	21.5	21.4	–
Chukotka Autonomous Region	55.7	42.0	43.0	39.6	39.3	39.3	70.6
%	1.9	1.4	1.4	1.3	1.3	1.3	–

\* The shares of regions of the Russian Federation are given as a percentage of the Asian part of the Russian Arctic.

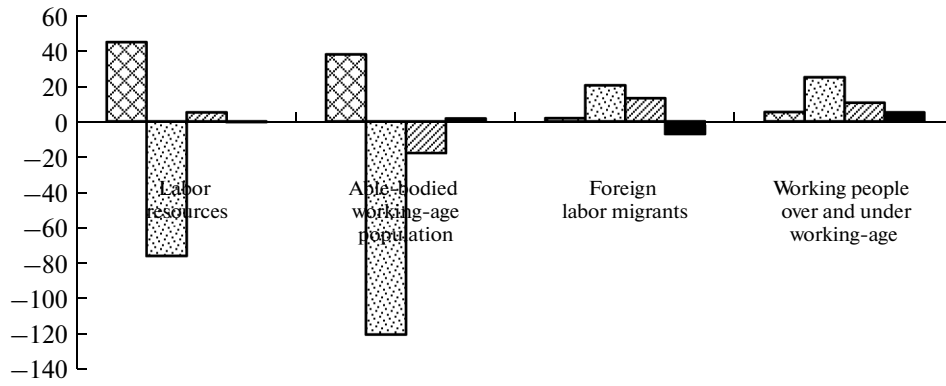
**Table 2.** Changes in manpower resources balance based on sources of formation in the regions of the Asian part of the Russian Arctic through 2005, thousand people

Indicator	2006	2008	2010	2011	2012	2013
Size of the manpower resources	13.1	56.9	34.5	–11.3	–17.7	–29.0
Able-bodied working-age population	3.9	4.1	–9.8	–81.7	–92.9	–101.9
Foreign labor migrants	9.6	60.1	33.8	35.4	34.2	32.0
People over working-age and teenagers employed in the economy	–0.5	–7.5	10.5	34.9	41.0	40.8
including:						
people over working-age	–0.4	–7.6	10.6	35.6	41.6	41.6
teenagers	–0.1	0.1	–0.1	–0.7	–0.6	–0.8

An analysis of the input of certain regions' into the decrease (growth) in indicators of the manpower resources balance based on sources of the formation for 2006–2013 showed that the decrease in the size of the able-bodied working-age population occurred in three regions (Fig. 1), i.e., the Krasnoyarsk Territory (7%), Chukotka Autonomous Region (4%) and in the Republic of Sakha (Yakutia) in spite of the growth in the size of the manpower resources in this region (3%). On the contrary, in Yamalo-Nenets Autonomous Region, the increase in the size of the manpower resources was accompanied by 10% growth in the size of the able-bodied working-age population.

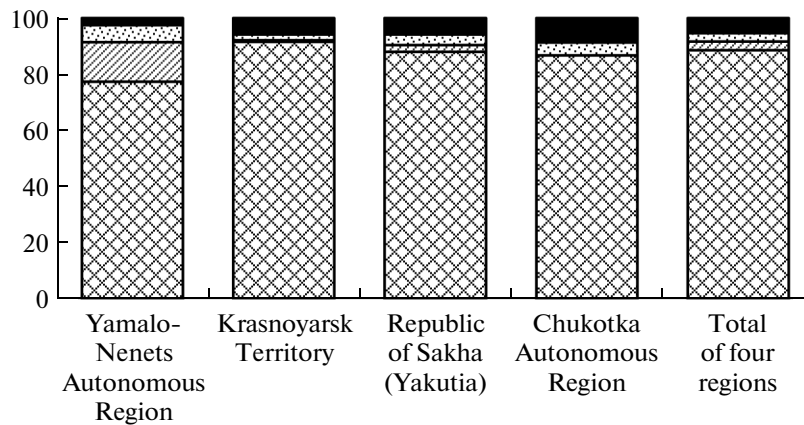
The increase in the number of foreign labor migrants was characteristic of three regions, but not Chukotka Autonomous Region. To some degree, the

greatest increase in their number in the Krasnoyarsk Territory in 2006–2013 offset the decrease in the size of the manpower resources in this region. In the Republic of Sakha, the growth in the number of foreign labor migrants offsets the decrease in the size of the able-bodied working-age population in the region. In Yamalo-Nenets Autonomous Region, the increase in this balance element is close to zero, while in Chukotka Autonomous Region, it is negative. The number of teenagers and people over working-age employed in the economy increased in all four subjects and, in Krasnoyarsk Territory, the growth was more significant. In Chukotka Autonomous Region, this category of manpower resources was the only one that showed growth in the review period.



**Fig. 1.** Changes in the size of the manpower resources by sources of formation in regions of the Asian part of the Russian Arctic in 2006–2013:

■ Yamalo-Nenets Autonomous Region; ▨ Krasnoyarsk Territory; ▤ Republic of Sakha (Yakutia); ■ Chukotka Autonomous Region.



**Fig. 2.** Structure of the manpower resources in regions of the Asian part of the Russian Arctic:

▨ Able-bodied working-age population; ▤ internal labor migrants; ▨ foreign labor migrants; ■ people over working-age and teenagers, employed in the economy.

Constant and temporary internal labor migration is one important sources of the manpower resources in the regions of the Russian Federation due to the deficit of labor force, which is why the regular monitoring of its scale, structure, and dynamics is relevant. The study of the volume, dynamics, and structure of internal labor migration on the territories of the European and Asian part of the Russian Arctic was carried out previously in [7, 10].

In certain periods, the share of labor migration in the structure of incoming domestic migration amounted to more than 60%, for instance, in the Republic of Sakha (Yakutia) and in Yamalo-Nenets Autonomous Region (in the latter, its share reached 80% in 2008–2010). In the years for which information on internal labor migration is available, each of the four regions had positive labor migration balance. In the structure of the manpower resources balance, based on sources of the formation for 2013 (Fig. 2), for

each individually and in total for the four analyzed regions, internal labor migrants occupy the third or fourth place, behind foreign migrants. In Yamalo-Nenets Autonomous Region, the number of internal labor migrants is more than two times higher than the number of foreign migrants. In Chukotka Autonomous Region, the share of internal labor migrants in the manpower resources structure based on the sources of formation is only 3% (in 2013, the share of foreign labor migrants was similar), but it increased by 5.5 times compared to 2005.

The relevance of analyzing the role of labor migration as a source of an additional supply of the labor force in the regional labor markets is greater because the four regions are included in the Arctic zone (Arkhangelsk and Murmansk Regions, Krasnoyarsk Territory, and Chukotka Autonomous Region) are included the list of regions of the Russian Federation relating to the priority areas of attracting labor force

**Table 3.** Distribution of the manpower resources in regions of the Asian part of the Russian Arctic by spheres of activities, 2000–2013, thousand people

Indicator	2000	2005	2007	2009	2011	2013	2013/2000	2013/2005
Manpower resources	2972.7	3020.4	3057.0	3064.5	3009.1	2991.4	100.6	99.0
Average annual number of employed in the economy	2214.6	2292.1	2310.3	2319.1	2325.8	2316.8	104.6	101.1
Working-age day-release students	223.2	259.4	253.2	234.9	221.7	201.7	90.4	77.8
Able-bodied working-age population not employed in the economy and not studying in the educational system	261.1	248.3	327.5	305.1	313.9	337.9	129.4	136.1
Unemployed (ILO)	273.9	220.6	166.1	205.4	147.7	134.9	49.2	61.1

[4]. Attracting foreign workers to the Russian Federation regions based on the visa is carried out if it is impossible to satisfy the demand for the labor force by migrants from the other regions of the Russian Federation [5].

**The main directions of the use of the manpower resources.** The regions of the Asian part of the Russian Arctic have different dynamics of indicators that reflect the elements of the distribution part of manpower resources balances. In 2013, the average annual number of employed in the economy of these regions increased by 4% or by 1%, depending on the frame of reference (2000 and 2005, accordingly) (Table 3). The dynamics of the number of the working-age day-release students can be divided into two periods. Until 2006, there were positive growth rates of the indicator; then, up to 2013, a decrease in the size of this category was observed. Over the 14-year period, the total number of working-age day-release students decreased by 10%. The size of the able-bodied working-age population (military personnel, Russian citizens working abroad, housekeepers, and other categories of population) increased by 77 000 people, i.e., by less than one-third. The number of unemployed individuals decreased by 50%.<sup>2</sup> In the regions included in the Asian part of the Russian Arctic, the unemployment rate was 5.5% in 2013 (in 2000 it amounted to 13%). For comparison, in the regions of the European part of the Russian Arctic, it was 7% in 2013.

In the review period, by 2013, the share of employed individuals in the economy of the regions of the Asian part of the Russian Arctic in the manpower resources increased from 74 to 77%. The share of the second largest category, i.e., the able-bodied working-age population not employed in the economy and not studying in the educational system accounts for 11%.

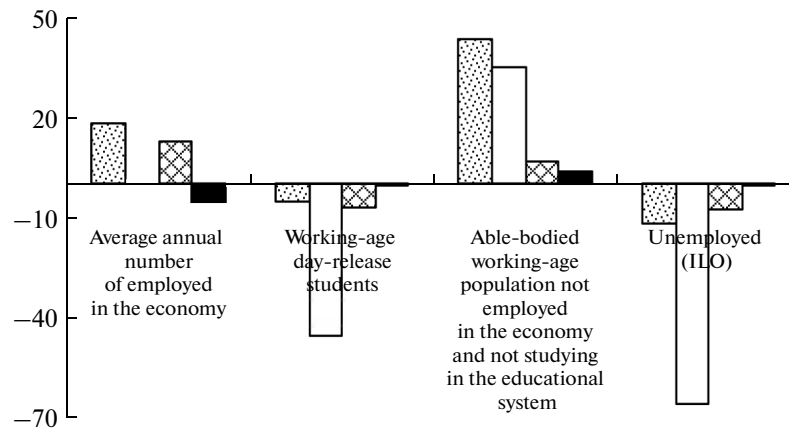
<sup>2</sup> In the article, unemployment is considered to be measured in accordance with the criteria of the International Labor Organization (ILO).

The shares of working-age day-release students and unemployed individuals are 7 and 5%, accordingly.

**Distribution of labor force by spheres of activities at the regional level.** The study of changes in the elements of the aggregate manpower resources balance of the regions of the Asian part of the Russian Arctic in 2006–2013 showed that they generally occurred unidirectionally at the regional level (Fig. 3). In all regions, a simultaneous decrease in the two categories, i.e., working-age day-release students and unemployed individuals, was observed (in Chukotka Autonomous Region their number changed little). Similarly, the size of the able-bodied working-age population not employed in the economy and not studying in the educational system was growing in all regions. The annual average number of employed only decreased in Chukotka Autonomous Region and in the Krasnoyarsk Territory, and the number of employed individuals in the economy only decreased to the level of 2005 in the last year.

In the dynamics of the number of employed individuals in the economy of Yamalo-Nenets Autonomous Region, two years (2006 and 2009) are registered with negative growth rates of the indicator. The rest of the time, the employed population was growing, and the periods of 2002–2003 and 2008 accounted for the largest growth rates. In the last four years, the indicator's growth rates were moderate (100.4–101.1). In this context, the dynamics of the number of unemployed is characterized by negative growth rates, except for the two periods, i.e., 2004–2005 and 2008 (in both cases, a year earlier than the decrease in the number of employed). Moreover, in 2008, the number of unemployed individuals increased more than twofold, but later, the tendency of its decrease was observed.

In 2013, the number of unemployed individuals was 40% compared to 2000, and the rate of unemployment decreased from 8 to 2.5%, which is much less than the average indicators of the country and Urals



**Fig. 3.** Changes in the structure of manpower resources distribution based on spheres of activities in regions of the Asian part of the Russian Arctic in 2006–2013:

▨ Yamalo-Nenets Autonomous Region; □ Krasnoyarsk Territory; ▩ Republic of Sakha (Yakutia); ■ Chukotka Autonomous Region.

Federal District. The dynamics of working-age day-release students can be conventionally divided into two periods, i.e., 2000–2004 and 2005–2013, which were periods of increase and decrease, accordingly. Moreover, the entire increase in the index in the first period was offset by its decrease in subsequent years; thus, total growth in the reviewed period was only 1000 people. In the structure of the manpower resources, based on the directions of use, the number of working-age students holds the third place (2013). The size of the able-bodied working-age population not employed in the economy and not studying in the educational system is described by an increasing trend with short periods of decreasing indicator. In Yamalo-Nenets Autonomous Region, the absolute increase in this indicator was maximal in 2000–2013 compared to other regions under consideration.

Over the review period, the number of employed individuals in the economy of Krasnoyarsk Territory's was growing and, as a result, by 2013, the absolute growth in this category was 15000 people (by 2012, it was 30000 people). The increase in employment in the region was accompanied by a decrease in the number of working-age day-release students (except in 2009). In 2000–2013, the size of the unemployed population decreased by a little more than 100000 people (or 55%) and, as a result, the share of the indicator in the structure of the manpower resources decreased from 10 to 5%, while the share of unemployed decreased from 12 to 6%. In 2000–2005, the dynamics of working-age day-release students is described by systematic growth, which, in 2006–2013, shifted to a decrease. As a result, the number of this category of population decreased by 27000 people by 2013. The tendencies opposite to those considered above are observed in the dynamics of the size of the able-bodied working-age

population not employed in the economy and individuals not studying in the educational system. The change in the number of this category of population is described by increasing trend (with short periods of decrease), and the total increase in the indicator was 35000 people over the review period. In 2013, its ratio in the manpower resources structure by directions of use was 11% (second place). It can be assumed that a part of unemployed population transferred to the employment sector, while the other part refilled the group of the able-bodied working-age population not employed in the economy and not studying in the educational system.

If one considers a shorter period (2006–2013), the result of the change in the distribution part of manpower resource balance in the Republic of Sakha (Yakutia) is similar to that in the Krasnoyarsk Territory (Fig. 3). The increase in employment occurred in the context of a decrease in the number of unemployed and working-age day-release students, and an increase in the size of the able-bodied working-age population not employed in the economy and not studying in educational system. In 2000–2013, the overall growth in the number of employed in the Republic of Sakha (Yakutia) was 22000 people, or 5%. In the dynamics of unemployed, different tendencies are traced, but after 2008, the indicator was gradually decreasing. The rate of unemployment in the region decreased by 3.4 pp (from 10.6 to 7.2%), which is not as much as in the two other regions. It should be noted that changes in the size of the able-bodied working-age population not employed in the economy and not studying in the educational system were differently directed. Up to 2006, the number of working-age day-release students grew, then gradually decreased. In 2013, the region had the following structure of the manpower resources by directions

of use: the employed population was 75%, the able-bodied working-age population not employed and the economy and not studying in the educational system made up 11%, working-age day-release students was 8%, and unemployed individuals were 6%.

The decrease in the size of the manpower resources in Chukotka Autonomous Region (see Table 1) was accompanied by a decrease in all elements of the regional manpower resources balance in the short run and in the longer period as well. The growth in employment in the region in 2000–2005 gave way to a decrease up to 2013. Thus, the increase in the number of employed by 6000 people was completely offset by its decrease in the following years. The unemployment rate altered appreciably from 10 to 3.3%, and the maximal decrease in the number of unemployed occurred in 2000–2005, while during the crisis period the growth in this indicator was recorded. The size of the able-bodied working-age population not employed and the economy and not studying in the educational system decreased by 75%, i.e., from 17500 to 4200 people.

***The structure of employed individuals based on type of economic activity (by OKVED sections).*** In order to assess the changes in the according structure of employment, the aggregate for all regions of the Asian part of the Russian Arctic, the reference rates of growth in the number of employed based on the type of economic activities for 2000–2013 were analyzed (2000 was the reference year). The analysis showed that all types of economic activities could be divided into several groups according to the dynamics of the number of employed in them.<sup>3</sup> In the first group, there are seven OKVED sections in which the number of employed increased significantly (by 20% and more) during the review period, the second group includes five sections with moderate growth rates (less than 20%), and the third group includes three sections characterized by a decrease in the number of employed (Table 4). The classification offered in the table is not multifunctional and could only be used for an integrated analysis of the situation in the four regions. At the same time, certain exceptions to the rule are allowed, and for the Republic of Sakha a quite different classification should apparently be offered.

In each of the four regions, the maximal growth in employed population is registered in Section B Fishery and Aquaculture (235%). However, these high growth rates are initially attributed to the small number of employed individuals in this section in the regions. The second section based on the growth of the employment rate is Section J Financial Activities (156%). The largest contribution to the overall growth in employment in this section is attributed to Krasno-

yarsk Territory, where employment increased by 9000 people (from 11 to 20). In Yamalo-Nenets Autonomous Region and in the Republic of Sakha (Yakutia), this section is also included in the first group, although the growth in the size of the population employed in it was less intense. In this context, Chukotka Autonomous Region shows a decrease in employment in Section J by 16%. A large increase was observed in employment in Section L Public Administration and Defense; Compulsory Social Security in each region provides a place for it in the first group. Aggregate employment in this section increased by 44000 people in the fourth regions, where the Krasnoyarsk Territory accounts for half of it and Yamalo-Nenets Autonomous Region accounts for one-fourth. Section F Construction is also included in the first group with a 30% increase in employment (50000 people in absolute terms). The highest growth was observed in Yamalo-Nenets Autonomous Region (30000 people), and the smallest one in Chukotka Autonomous Region (600 people). In addition to the specified ones, the first group includes three sections with similar growth rates of employment: Section I Transport and Communications (125%); Section E Production and Distribution of Electricity, Gas, and Water (123%); and Section G Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles, Household Goods and Personal Items (120%). Increase in employment in Sections I and G by 50000 and 54000 people was provided by the Krasnoyarsk Territory, which accounts for more than half of its growth (37000 and 49000 people, accordingly). High growth rates in Section E Production and Distribution of Electricity, Gas, and Water was accompanied by growth in employment in this sector in each region. The Republic of Sakha (Yakutia) accounts for half of this total increase (10000 people).

Five sections with moderate growth rates of employment can be included into the second group. In the review period, the highest growth rate was recorded in Section K Real Estate Operations, Renting, and Business Activities (119%). The growth in employment in this section by 30000 people was provided by its growth in the Krasnoyarsk Territory (by 36000 people), which is accompanied by a decrease in other regions. In Section C Mining, the total number of employed individuals increased by 11%, which was accompanied by growth in three regions, except the Krasnoyarsk Territory. Most of the aggregate growth was provided by Yamalo-Nenets Autonomous Region and Chukotka Autonomous Region. The increase in employment in Section H Hotels and Restaurants in two regions, Yamalo-Nenets Autonomous Region and Krasnoyarsk Territory, led to 9% aggregate growth in four regions. However, the share of this section in the overall structure of types of economic activities was only 1.5% in 2013. In Section N Health and Social Services employment increased by 10000 people due to it the Krasnoyarsk Territory (8000 people). In 14 years, the share of this section in the overall structure

<sup>3</sup> When analyzing the structure of employment based on economic activities Section O Other Community, Social, and Personal Services; Other Community, Social, and Personal Services; Section P Provision of Housekeeping Services; Section Q Activities of Extraterritorial Organizations Activities of Extraterritorial Organizations are treated as one aggregate unit (section).

**Table 4.** Changes in the size of the employed population by type of economic activities in regions of the Asian part of the Russian Arctic, 2013, %, through 2000

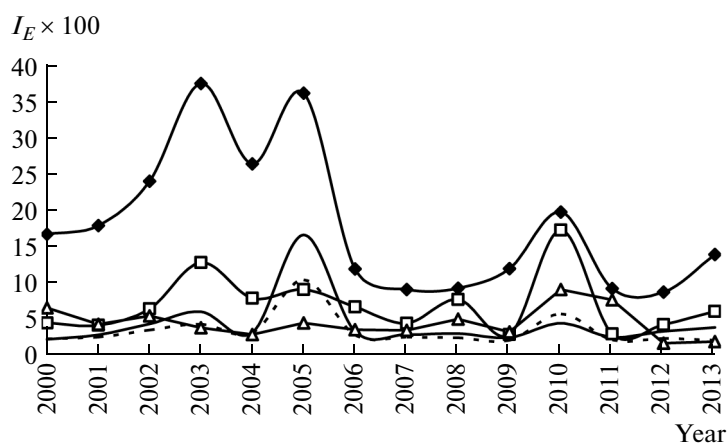
Type of activity	Yamalo-Nenets Autonomous Region	Krasnoyarsk Territory	Republic of Sakha (Yakutia)	Chukotka Autonomous Region	Regions of the Asian part of the Russian Arctic
Employed in the economy, total	120.8	101.1	104.9	98.5	104.6
Group 1 (significant growth)					
Section B Fishery and Aquaculture	204.5	206.1	346.8	389.6	235.0
Section J Financial Activities	123.8	182.2	130.4	84.3	156.7
Section L Public Administration and Defense; Compulsory Social Security	178.2	130.4	130.7	142.6	136.1
Section F Construction	159.8	108.2	148.4	166.9	129.0
Section I Transport and Communications	136.8	134.9	98.6	75.6	124.7
Section E Production and Distribution of Electricity, Gas and Water	147.0	105.8	150.6	110.0	123.5
Section G Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles, Household Goods and Personal Items	93.6	125.2	114.8	115.2	120.1
Group 2 (moderate growth)					
Section K Real Estate Operations, Renting and Business Activities	92.9	141.9	89.4	63.8	119.0
Section C Mining	122.8	82.3	105.3	356.9	111.3
Section H. Hotels and Restaurants	136.7	110.8	75.9	93.9	108.9
Sections O, P, Q Other Community, Social and Personal Services; Provision of Housekeeping Services; Activities of Extraterritorial Organizations	108.1	118.6	88.1	47.4	108.0
Section N. Health and Social Services	106.9	108.2	103.7	89.5	106.7
Group 3 (reduction)					
Section M Education	95.2	94.4	93.0	71.5	93.6
Section A Agriculture, Hunting and Forestry	47.3	64.2	81.7	43.1	67.2
Section D Manufacturing	67.2	66.5	100.6	14.1	68.3

increased slightly to 7% in 2013. Apart from the specified ones, the second group includes sections O, P, Q Other Community, Social, and Personal Services; Provision of Housekeeping Services; Activities of Extraterritorial Organizations, where the total growth in employment was 8% (6500 people) due to its increase in the Krasnoyarsk Territory. In the Republic of Sakha (Yakutia) and in Chukotka Autonomous Region employment in these sections decreased. Over the review period, the aggregate ratio of these sections did not change and was 4% in 2013.

The third group with a decrease in aggregate employment includes the following three sections: Section A Agriculture, Hunting, and Forestry; Section D Manufacturing; and Section M Education. The greatest decrease in each section was observed in Krasnoyarsk Territory. Specifically, employment in Section A decreased by 33% (77000 people), which was accom-

panied by a decrease in all regions. These changes led to a decrease in the share of this section from 11% in 2000 to 7% in 2013 in the rest of the types of economic activities. A similar decrease was recorded in Section D by 32%, or 100000 people; as a result, the share of this section decreased from 14 to 9% by 2013. In Section M Education, the decrease in the employed population amounted to 15000 people, and its share decreased from 11 to 9.6%.

There were no significant changes in the structure of employment based on types of economic activities in the regions of the Asian part of the Russian Arctic. In particular, in the review period, six sections of economic activities did not change their position in the structure of employment. The most significant changes in the number of employed occurred in Section D Manufacturing (in 14 years, this section moved from first to fifth place) and Section A Agriculture,



**Fig. 4.** Dynamics of structural shifts in employment by types of economic activities in the regions of the Asian part of the Russian Arctic,  $I_E$ , 2000–2013:

—□— Yamalo-Nenets Autonomous Region; — Krasnoyarsk Territory; —◆— Chukotka Autonomous Region;  
—△— Republic of Sakha (Yakutia); ---- total of four regions.

Hunting, and Forestry from fourth to the ninth place). The ratio of Sections I Transport and Communications (from the fifth to the second place) and L Public Administration and Defense; Compulsory Social Security (from the tenth to the seventh) increased; thus, their ranges changed significantly.

On the whole, the ratios of the types of economic activities grouped according to the size of the population of the regions of the Asian part of the Russian Arctic employed in them changed as follows. The ratio of the group of sections with high growth rates of the number of employed increased from 40 to 47%; the ratio of the second group of sections with moderate growth rates increased by 2% (from 25 to 27%). The ratio of the third group decreased by 10 pp (from 36 to 26%).

Integral assessment of the intensity of the changes in the structure of employment by types of economic activities was carried out based on the index of structural changes [6], which dynamics is shown in the Fig. 4. The periods of unidirectional changes in the structure of regional employment include 2003, 2005, and 2010, when increase in the intensity of changes in the structure of employment by regions of the Asian part of the Russian Arctic was recorded. In 2003, the upswing of the index was mostly caused by the changed number in Section A Agriculture, Hunting, and Forestry (the number of employed decreased); Section C Mining; and Section E Production and Distribution of Electricity, Gas, and Water (the size of the population employed in them grew compared to the previous year). In 2005, the growth in the index occurred mostly due to the changes in the following sections: Manufacturing (decreased employment); Fishery and Aquaculture and Transport and Communications (increased employment). In 2010, sections I. Transport and Communications; O, P. and Q Other

Community, Social, and Personal Services; Provision of Housekeeping Services; Activities of Extraterritorial Organizations; C Mining had domineering effect on the growth in the index. In the first two types of economic activities the number of employed population was decreasing, in the third of the mentioned sections it was growing. The intensity of structural changes in the regions under consideration is of a different nature and not due, e.g., to merely different growth rates or decreased number of employed population.

The corresponding indexes in the regions are mostly characterized by similar fluctuations, but there are deviations from the general trend due to the regional specifics (which, in this case, refers to the assessment of structural changes calculated by four regions as a whole) (Fig. 4).

The inconsistency of qualitative and quantitative characteristics of demand and supply of labor force leads to structural disparities in the labor markets of the country and its regions. As our studies have shown, the scale of the regional structural unemployment can be calculated based on the data on the number of unemployed and stated by employers' need for employees which contributes greatly to aggregate unemployment (see, e.g., [7–8]). In the 2000s, it amounted to 30–40% of the aggregate unemployment, but since 2008, its share has gradually decreased.

Table 5 presents assessments of the contribution of the analyzed regions' to the all-Russian regional structural unemployment as the difference between the ratio of the number of unemployed in the regional and all-Russian labor markets and the ratio of the number of vacancies in the regional and all-Russian labor markets (the index is 1). Additionally, the table presents assessments of the number of unemployed (ILO), the



**Table 5.** Imbalances in labor markets in regions of the Asian part of the Russian Arctic

Region (version)	2000	2003	2005	2007	2009	2011	2013
<b>Yamalo-Nenets Autonomous Region</b>							
(1)	-0.06	-0.04	0.11	-0.29	-0.30	-0.30	-0.41
(2)	4	2	-6	13	19	15	17
(3)	-0.4	-0.3	0.9	-3.2	-2.1	-3.5	-5.6
<b>Krasnoyarsk Territory</b>							
(1)	2.02	1.32	1.39	1.53	1.20	0.53	0.32
(2)	-156	-79	-73	-70	-76	-27	-13
(3)	15.1	10.6	11.3	17.3	8.7	6.1	4.4
<b>Republic of Sakha</b>							
(1)	0.22	0.37	0.41	0.48	0.21	0.11	-0.06
(2)	-17	-22	-22	-22	-13	-5	2
(3)	1.7	3.0	3.4	5.4	1.5	1.3	-0.8
<b>Chukotka Autonomous Region</b>							
(1)	0.03	-0.07	-0.08	-0.05	-0.07	-0.02	-0.06
(2)	-2	4	4	2	4	1	2
(3)	0.2	-0.6	-0.7	-0.5	-0.5	-0.2	-0.8

transfer of which to the region or out of it should eliminate structural unemployment in the region and lead to it decrease in the Russian Federation while maintaining the current regional structure of vacancies (the index is (2), thousand people), as well as the number of vacancies (the stated need for employees) which it is necessary to transfer (create/close) in the subject with current regional structure of unemployed in order to eliminate structural unemployment (the index is (3), thousand people).

As noted above, in 2000–2013 the number of unemployed population in the four regions of the Asian part of the Russian Arctic decreased by 140 000 people, or by 50%. During that period, the total number of vacancies in these regions increased by 4.8 times (from 10 000 to 47 000); the highest growth rates were observed in the Krasnoyarsk Territory, while the lowest was observed in Yamalo-Nenets Autonomous Region. According to the calculations, two regions, Yamalo-Nenets Autonomous Region and Chukotka Autonomous Region, were labor-deficient over most of the review period. In order to minimize structural unemployment, it is necessary to attract some unemployed individuals from the other regions.

Thus, aggregate additional demand for labor in the two regions will be in the range of 7 000 in 2001 to 19 000 people in 2013 while maintaining the current structure of vacancies. On the contrary, Krasnoyarsk Territory and the Republic of Sakha (Yakutia) are labor-surplus regions, wherein the total number of structural unemployed in them is gradually decreasing from 173 000 people in 2000 to 22 000 people in 2012. Consequently, the total structural unemployment can

be decreased by redistributing the unemployed population between the four regions.

The regulation of the amount and structure of vacancies by opening modern work places and closing obsolete and worn-out work places can be an additional measure of migration policy for decreasing structural unemployment. Thus, in order to minimize structural unemployment in the Krasnoyarsk Territory and the Republic of Sakha (Yakutia), it is important to create (open or relocate) additional vacancies, the assessment of which number is presented in Table 5 (see index 3).

The state and regional authorities can address the objective of reducing structural unemployment by influencing the number and qualitative characteristics both of demand and supply of labor, taking into consideration the interests of each region, which makes the task multicriterial. As noted above, the Krasnoyarsk Territory and Chukotka Autonomous Region are included in the list of the Russian Federation regions, to which attracting labor force is a priority objective, which shall be taken into consideration while regulating internal migration flows. Furthermore, the process of coordinating unsatisfied demand and the labor supply cannot be reduced to quantitative matching. The policy of improving the skills of the employed population, as well as training the unemployed population to be able to satisfy the demand for the labor force in the economy, is equally important. Nevertheless, the derived assessments present benchmarks of the regions' demand for additional labor force in the framework of the policy of increasing labor force mobility [9, 10]. Estimates of the number of vacancies

**Table 6.** Assessment of prospective size of the manpower resources of the Asian part of the Russian Arctic and their distribution by spheres of activities by versions (1) and (2), 2020, in % to 2013

Structure of manpower resources	Yamalo-Nenets Autonomous Region		Krasnoyarsk Territory		Republic of Sakha (Yakutia)		Chukotka Autonomous Region	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Manpower resources	105.5	103.6	103.0	100.2	97.4	95.5	96.0	91.7
Total number of employed population in the economy	105.8	104.2	103.3	102.5	96.8	97.2	98.1	98.3
Working-age day-release students	114.6	90.3	100.2	90.2	105.4	95.7	94.4	93.7
Able-bodied working-age population not employed in the economy and not studying in the educational system	103.1	104.3	111.8	90.2	103.7	80.7	77.4	40.7
Unemployed population	96.5	100.2	82.3	100.2	82.6	101.0	111.8	93.5
Foreign labor migrants	111.0	96.5	102.1	91.5	92.9	108.9	214.3	178.4

may also serve as guidelines for the policy of creation of highly productive work places, including those at the regional level, carried out at the federal and regional levels [13].

**Assessment of prospective dynamics and structure of the main indicators of the regional manpower resources balance.** There are different ways to assess the prospective dynamics of the regional labor markets parameters. The first approach is to study regional problems in the context of the solution of the all-Russia problem of the coordination of labor markets and unemployment parameters in the consideration of regional interactions and key macroeconomic and regional determinants of employment and labor market. Another approach involves solving similar problems at the regional level taking into account the most important indicators of the employment sector and labor market and the effect of the key socioeconomic factors on them.

In turn, in the framework of these approaches (which, generally speaking, are not strictly alternative and can supplement each other to some degree) a factor and persistence forecasts can be developed. In particular, the suggested approaches to analyzing and forecasting the dynamics of regional labor markets can be implemented based on the corresponding forecasting and analytical instruments, namely, single- and multisector models for coordinating the dynamics of demand and supply of labor force. Single-sector models allow one to carry out forecasting and analytical calculations for the economy of Russia or its regions as a whole. Multisector models are used without limitation to study the territorial structure of employment and identify the regional specifics of the coordination of the supply and demand of the labor force. The experience of development of a regional multisector model for the Russian economy is presented, for instance, in the work [8].

It is possible to carry out an inertial assessment of the dynamics of the main indicators of manpower resources balance under the assumption of maintain-

ing the key trends of the retrospective period. In this work, the persistence forecasts of the balances' indicators is made in two versions depending on the length of the reference period: 1998–2013 (version 1) and 2002–2013 (version 2). We repeatedly used this approach to analyze the dynamics of the main indicators of the Russian and regional employment sector and labor market (see, e.g., [5, 15]), as well as to give predictive evaluations for the regions of the European part of the Russian Arctic [11]. As in work [11], the medium version of the demographic forecast of the Federal State Statistic Service is taken as the basis. According to it, in the mid-term, Russia will enter a period of maximal decrease in the working-age population. In 2014–2015, the size of working-age population will decrease by 1 million people a year and, in 2016, it will decrease by 1.1 million people. A significant decrease in the size of the working-age population is also expected in 2017–2018.

As the calculations have shown, in both versions, the size of the manpower resources in Yamalo-Nenets Autonomous Region and the Krasnoyarsk Territory will continue to grow, while in the Republic of Sakha (Yakutia) and in Chukotka Autonomous Region, it will decrease. The difference between the two versions is that the prospective size of the manpower resources and certain categories of it in regions of the Asian part of the Russian Arctic is decreasing less intensely and growing more intensely considering the trends of 1998–2013. This is due to the fact that the effect of the 2008–2009 crisis is more pronounced (for a longer trend, this effect is partially set off by the previous dynamics).

The change in the elements of distribution part of the manpower resources balance by regions in the future is presented in Table 6. In both versions of the calculations, the size of the manpower resources decreases most intensely in Chukotka Autonomous Region due to a 15% decrease in the size of the working-age population according to the medium version

of the demographic forecast for this region by 2020 compared to 2013.

In the same period, the size of the working-age population will decrease in the Republic of Sakha (Yakutia) by 12%, which also explains the decrease in the manpower resources in the region in both versions (by 2.5 and 4.5% in version 1 and (2), accordingly). In Krasnoyarsk Territory, despite the 5% decrease in the size of the working-age population, the size of the manpower resources grows in both versions of the forecast (more intensely, considering the longer retrospective period). In Yamalo-Nenets Autonomous Region, a 10% increase in the size of the working-age population is expected by 2020 and, accordingly, the size of the manpower resources of the region will increase by 6% (or 26 000 people) according to version 1 and by 4% (17 000 people) according to version 2.

The number of employed individuals in the economy of Yamalo-Nenets Autonomous Region will increase by 4–6% depending on the version. The tendency of growth is also characteristic of both versions of the forecast of the size of the able-bodied working-age population not employed in the economy and not studying in educational system. However, in the longer retrospective period, the growth rates of this category are lower than version 2 (93 and 4%, accordingly). The dynamics of the number of other categories of the population under consideration varies depending on the length of the reference period. According to the forecast based on the trends of 1998–2013, the number of working-age day-release students will increase by 14.5% (22 000 people in absolute terms). According to version 2, their number will decrease by 1500 people, which is also due to crisis developments. The situation with foreign labor migrants is similar: according to version 1 of the forecast, their number will increase by 3000 people (to 31 000 people) and, according to version 2, by 1000 people. The versions do not forecast any fundamental changes in the dynamics of unemployed population, it is expected to stabilize at the level of 10 000 people.

The assessment of changes in the structure of employed population shows that in the context of prospective growth in the number of employed in the regional economy its decrease should be expected in five VEDs taking into account the maintenance of longer tendencies and, in seven VEDs, there are shorter tendencies. According to version 1, the highest rates of its decrease are characteristic of sections Agriculture, Hunting, and Forestry (–27%); Real Estate Operations, Renting, and Business Activities (–13%); and Education (–5%). Considering the reference period of 2002–2013, one can also expect significant decrease in the number of employed in the section Manufacturing (–32%). In both versions, the high growth rates of employment are characteristic of Section L Public Administration and Defense; Compulsory Social Security (124 and 116%), Fishery and

Aquaculture (116 and 133%), Construction (109.4 and 118%). Taking into account longer tendencies, the expected increase in the number of employed individuals in the sectors with positive dynamics is offset by 20% in the sectors in which the decrease in employment is forecasted. According to version 2, the sectors with the decreasing trend decrease the forecasted increase in employment nearly by half.

In two versions, the difference in the size of the manpower resources in Krasnoyarsk Territory is 53 000 people in favor of the longer reference period. According to version 1, the forecasted growth in the size of the manpower resources is accompanied by an increase in all other balance elements and a decrease in the number of unemployed individuals. Moreover, this increase is mostly due to the increase in the employed population by 47 000 people. At the same time, the increase in the size of the able-bodied working-age population not employed in the economy and not studying in the educational system by 24 000 people is forecasted, which can occur due to, among other things, an 18% decrease in the number of unemployed individuals (15 000 people). It is forecasted that the number of working-age day-release students according to this version will stay the same. According to version 2, taking into account the trends of 2002–2013, the size of the manpower resources will stabilize at the level of 2013, but their distribution by spheres of activities will change. It can be said that a kind of a mobilization plan will be implemented when the size of the employed population grows due to the decrease in the number of working-age day-release students and able-bodied working-age population not employed in the economy and not studying in the educational system. Furthermore, the number of unemployed individuals is stable, and the number of foreign labor migrants decreases by 3000 people. The types of economic activities with decreasing dynamics include two or four sections depending on the version. In both cases, a significant decrease is forecasted in Section A Agriculture, Hunting, and Forestry and Section D Manufacturing and, in the shorter period, this decrease is greater, i.e., 18 000 and 30 000 people compared to 15 000 and 24 000 people. If the trends of a shorter period are maintained, a decrease in employment is also expected in sections Education (–3%) and Mining (–5.5%), which will decrease the prospective growth in employment in the industries by more than one-half.

In both versions of the forecast, the number of individuals employed in the economy of the Republic of Sakha (Yakutia) will decrease, but in accordance with the trends of 1998–2014, it will decrease faster. The decrease in the number of unemployed individuals is accompanied by growth in the size of two categories, i.e., working-age day-release students and able-bodied working-age population not employed in the economy and not studying in the educational system. According to version 2, the number of these categories will decrease in the context of decreased employment and

**Table 7.** Assessment of the prospective rate of unemployment in regions of the Asian part of the Russian Arctic by versions, %

Region (version)	2014	2016	2017	2018	2019	2020	2020/2013, percentage points
Russian Federation							
(1)	5.5	5.2	5.0	4.9	4.7	4.6	-1.1
(2)	5.7	5.5	5.4	5.3	5.3	5.2	-0.6
Yamalo-Nenets Autonomous Region							
(1)	2.6	2.5	2.5	2.5	2.4	2.4	-0.2
(2)	2.6	2.6	2.6	2.6	2.6	2.5	-0.1
Krasnoyarsk Territory							
(1)	5.5	5.1	5.0	4.8	4.7	4.6	-1.1
(2)	5.7	5.7	5.7	5.6	5.6	5.6	-0.1
Republic of Sakha (Yakutia)							
(1)	7.0	6.7	6.6	6.4	6.3	6.2	-1.0
(2)	7.3	7.4	7.4	7.4	7.4	7.5	0.3
Chukotka Autonomous Region							
(1)	3.4	3.5	3.6	3.6	3.7	3.7	0.4
(2)	3.2	3.2	3.2	3.1	3.1	3.1	-0.2

practically stable unemployment. In accordance with the general dynamics, sections of types of economic activities with decreasing numbers of employed individuals dominate. Growth in employment is only forecasted in five sections. The composition of this group varies depending on the version, growth in the sections Production and Distribution of Electricity, Gas, and Water, Financial Activities and Public Administration and Defense; Compulsory Social Security is expected. The highest rates of decrease are expected in the sections Agriculture, Hunting, and Forestry; Manufacturing; and Hotels and Restaurants.

In Chukotka Autonomous Region, as in the Republic of Sakha (Yakutia), the manpower resources will decrease according to both versions of the forecast. In the shorter retrospective period, these trends will be accompanied by a decrease in the rest of the elements of the manpower resources balance in the shorter retrospective period and, in the longer one, by growth in the unemployed population.

According to the persistence forecast, by 2020, the countrywide rate of unemployment will decrease in both version and, with respect to the reference period of 1998–2013, it will decrease more intensely (by 1 pp) (Table 7). In the future, a similar situation will develop in Yamalo-Nenets Autonomous Region and the Krasnoyarsk Territory. The number and dynamics of the unemployment rate in the Krasnoyarsk Territory practically duplicates the nationwide situation. In the Republic of Sakha, which has the lowest rate of unemployment among the considered regions, growth by 3 pp is expected taking into consideration the shorter

reference period. In Chukotka Autonomous Region, by 2020, in the case of a continuing trend of a longer reference period, prospective growth in the unemployment level by 0.4 pp will be observed.

The analysis of the basic trends of the key indicators on the employment sector and labor market of regions of the Russian Federation under consideration and the problems of managing the Arctic by objectives allows one to draw the following conclusions.

The sector of employment and regional labor market develop in the context of unfavorable demographic trends, which affect the dynamics of the size of the manpower resources of the considered regions. In 2000–2013, the main source of the formation of the manpower resources is the size of the able-bodied working-age population decreased by 95000 people (5%) in Krasnoyarsk Territory and by 84000 people (16%) in Chukotka Autonomous Region. At the same time, in Yamalo-Nenets Autonomous Region, the size of this category increased by 85000 people (24%) and, in the Republic of Sakha (Yakutia), it increased by 4700 people (1%).

Following the dynamics of the size of the able-bodied working-age population, the size of the manpower resources in Krasnoyarsk Territory and Chukotka Autonomous Region decreased by 4 and 30% by 2013, compared to 2000, accordingly, while in the other two regions, the indicator had positive dynamics. Furthermore, the discontinuity of changes in the size of the labor force was observed; one can distinguish periods of the relative stabilization, with a smooth and sharp decrease in their number. In the future, one should not

expect a change in the current trends, either. In the Republic of Sakha (Yakutia) and Chukotka Autonomous Region, the will decrease by rates of 3–8% depending on the version.

Changes took place in the structure of the manpower resources by both the sources of the formation and directions of use. Undoubtedly, the able-bodied working-age population is still the key source of its formation, but another source is workers outside of the working age (6–8% of the size of the manpower resources). Thus, in Yamalo-Nenets Autonomous Region, their share in the structure of the regional manpower resources increased from 1 to 9% in 2009, while in the post-crisis period, it decreased by 5–6%. The greatest effect of foreign labor migrants on the regional labor market was observed in Chukotka Autonomous Region; in certain periods, their share reached 12–13% (2006–2007), but by 2013, it decreased to 4–5%. The effect of the tendencies of labor migration increases on the state of the regional labor markets, including push–pull and rotational tendencies. Push–pull and rotational migrants present the most mobile part of labor force that lives outside the regions of their residence. An analysis of the number and travel directions of this part of labor migrants allows for the further study of the specifics and correlations of the regional labor markets, the sources (actual and potential) of the additional supply of the labor force there, and the directions of its departure. Internal labor migration is an important source of labor force of Yamalo-Nenets Autonomous Region (14.1% in the structure of labor force by sources of formation) and the Republic of Sakha (Yakutia) (2.5%).

The dynamics of the number of employed population in the Asian part of the Russian Arctic is positive except for the Chukotka Autonomous Region. Nevertheless, according to the two versions of the inertial forecast, by 2020, employment will decrease in the Republic of Sakha (Yakutia), apart from Chukotka Autonomous Region.

In most of the studied regions, despite the downward trend, unemployment is a pressing issue in regional labor markets. As in 2013, in the Krasnoyarsk Territory and the Republic of Sakha (Yakutia) the rate of unemployment equals or exceeds the country average, accordingly. The minimum rate of unemployment was recorded in Yamalo-Nenets Autonomous Region. According to the forecast, the rate of unemployment will decrease in the future, except for certain scenarios for the Republic of Sakha (Yakutia) and Chukotka Autonomous Region. However, the assessment of the inertial dynamics of unemployment in the long run is, to a large extent, conventional. In particular, the limits of the decrease in unemployment, like potential growth in employment, are determined not only by demographic limitations, but by the level of infrastructure development of national and regional labor markets, the extent of structural disparities and

possibilities of their mitigation, including, among other things, by the implementation of government employment policy. Thus, an emerging trend of struggle against so-called informal employment is discussed (illegal employment in shadow sector) in the regional labor markets, which restricts the development and modernization of the production sphere. Administrative measures dominate the discussed ones (such as introduction of a prescribed social payment for all the citizens senior 18 who do not work officially and are not registered at the unemployment office [14], monitoring enterprises where wages are lower than average in the industry and others). Meanwhile, the current and future dynamics of employment and unemployment are primarily determined by the economic conditions.

Creating new and/or modernizing old, obsolete jobs as a result of investments in the production sector is a necessary component in the implementation of an integrated approach to solving problems accumulated in the labor market [15]. The development of the Russian Arctic and implementation of large-scale projects in its territory in the future will create economic rationales and conditions to provide the regions included in it with investments into development and modernization of production, including the creation of modern, highly productive jobs.

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