

LABOR MOVEMENT FORECAST ON THE BASE OF I-O APPROACH

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Abstract

The labor force movement is one of the economic growth factors associated both with the changing situation in the economy's sectors and in the regions. The use of an intersectoral approach is one of the ways to improve the reflection quality of this interrelation. The modern interregional migration contributes to the uneven population and labor force distribution among regions. The population and labor force are concentrated in a small number of regions, primarily in megacities. The Russia development is impossible without the gradual elimination of the most acute imbalances in the regions development. One of the conditions for regional balance is meeting the regions labor force needs. A forecasting multi-regional/sectoral model of interregional labour migration is proposed in the paper.

Keywords: interregional migration, labour force, input-output coefficients, Russian economy, spatial development

Overview

The intensification of economic growth rates is the most important task facing Russia. For a country as large as Russia, the harmonious spatial development is a prerequisite for economic growth. By harmonious spatial development in a broad sense, one can understand the creation of conditions for reducing differentiations in the regions level of socio-economic development and ensuring their sustainable economic growth.

Russia's development is impossible without the gradual elimination of the most acute imbalances in the development of its regions.

In this regard, at present, an important role in the forecasting system is assigned to the development of forecasting comprehensive models of economic dynamics, taking into account the spatial factor. Comprehensiveness in these models means interconnection between the most important economic indicators at the country and regional levels.

In IEF RAS such models, such interrelated models are the RIM and CONTO models and the NORM model. The first two models are intersectoral macroeconomic models of the

Russian economy. On their basis a forecast of economic dynamics at the macro level in the context of economic activities is built. Both of them based on the Leontief model of interindustry balance and the price model of interindustry balance. The model of economic development of the Russian Federation in a regional context NORM (regional model of economic development) describes the main relationships between the most important indicators at the macrostructural, intersectoral and regional levels. The level of its construction is the federal districts and regions of RF. The results of the NORM model are based on the development scenarios that are incorporated in the intersectoral model of the Russian economy. The calculations are arranged in such a way that the transition to calculations using a lower level model (NORM) is carried out only after the completion of calculations within the top level model (RIM and CONTO).

Despite the large dimension of the task, there are directions for the development of these models to find answers to current challenges facing the Russian Federation and its regions.

One of these challenges is the labor force shortage in Russia. The pace and quality of economic growth in Russia must be above current levels in order for Russia to become one of the five largest economies in the world. In order to intensify the pace of economic dynamics, we need a labour force with relevant knowledge and skill level. Large centers of economic growth in the Russian Federation have such a resource. However, most of the regions are experiencing a massive population outflow, which causes a labor force shortage in regional labor markets. In addition, there are processes of population general aging and a decrease in the number of people in working age in Russia. It should also be said that the labor market in Russia is characterized by structural imbalance: at the same time there are over-employment in sectors of some regions and a shortage of labor force in other sectors and regions.

Despite this, there are still no comprehensive forecast calculations to determine the scale of the labor force shortage and its regional structure. There are also no calculations capable of assessing various options for reducing this deficit due to both in-country reserves and foreign migrants in Russia.

The study proposes an approach to the creation of a calculation system that allows filling this information gap. An important element of this calculation system is the forecast of the scale and structure of interregional labor migration. Interregional migration is the main source of meeting the region's sectoral needs in the short and medium term.

Analysis of the employment and interregional labor migration in Russia

The employment dynamics in Russia has been subordinated to economic dynamics over the past 30 years. During the years 1990-1998 employment declined under the influence of economic conditions and a reduction in GDP during this period (Figure 1).

Economic growth period 1999-2008 contributed to the employment growth in the same period. World crisis of 2008-2009 reflected a decrease in employment in the Russian labor market. The last ten years have been characterized by a small systematic employment increase; a reduction in GDP in 2015-2016 did not reflect a corresponding employment reduction in country. The jump in employment in 2016 is due to Russian statistics of the population of Crimea. However, the number of employed people by 2017 did not reach its 1990 level.

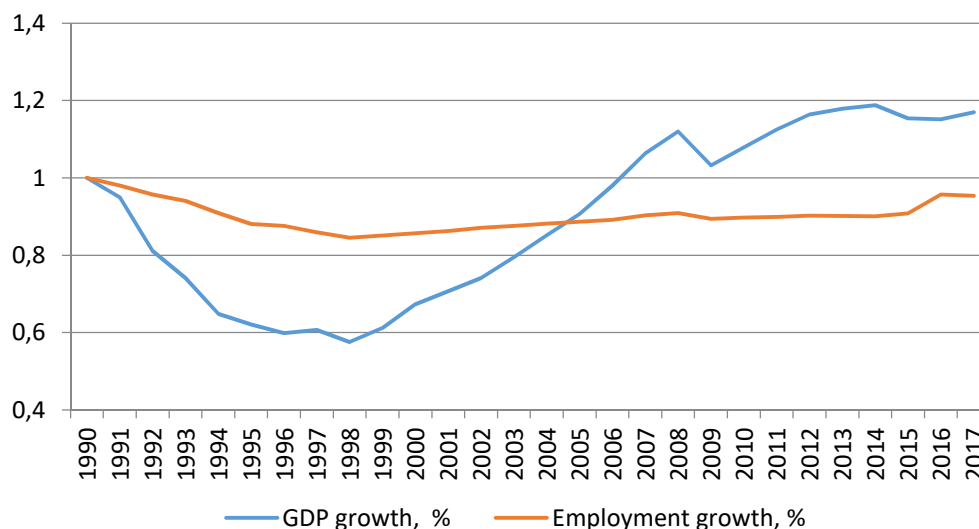


Figure 1. The dynamic of employment and GDP in Russia, 1990-2017

Large differences between socio-economic development of regions, which can be observed in Russia, arise because of their unequal access to various resources, including labor force.

So, in 1990, the last decile group of regions accounted for almost 30% of the population. By 2018, the population concentration in 10% of the regions with the largest population increased: they accounted for 32% of the population. The situation is similar with the regional distribution of the employed population. Over the past 30 years, the disparity of regions in terms of the number and quality of labor force has increased. In 1990, the last decile group of regions accounted for 29% of the employed population. In 2016, the same composition of the regions accounted for 35.5% of the employed population, and, within this group, the share of Moscow, the Moscow Region, St. Petersburg and the Krasnodar Territory increased. Regions with access to highly qualified labor force show high rates of economic growth. This is primarily Moscow, St. Petersburg and other large cities, which attract the population and highly qualified labor force from all over the country. In contrast, low growth rates are observed in regions with low-skilled labor.

Interregional population and labor force migration in Russia does not change its size in the country, however, for individual regional labor markets, its influence is quite large. Interregional population and labor force migration makes a significant contribution to the regional inequality growth in the number and quality of labor force. We observe a long-

term population and labor force interregional migration outflow from most of the northern and eastern regions towards the western and southern regions (Figure 2¹).

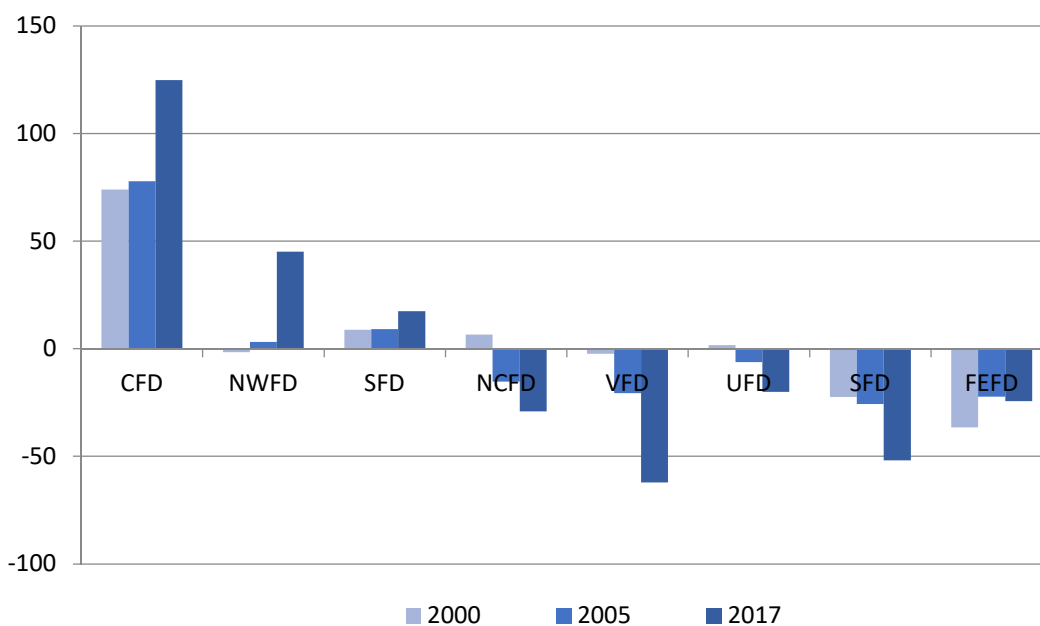


Figure 2. The structure of population interregional migration

Attractive for internal migrants are the Central Federal Districts, the Northwestern Federal District and the South Federal District. The remaining federal districts are losing population in the internal migration exchange. Over time, the influx into attractive federal districts increased, and the rest federal districts began to lose even more population because of migration outflow (with the exception of Eastern Federal Districts). Within the federal districts, population and labor force are concentrated in a small number of regions, primarily in megacities. These processes are a consequence of the spatial and sectoral structure of the Russian economy that has taken shape in the past two decades.

The scale of interregional labor migration is growing. By 2018, its volume amounted to 3 million people, and the intensity - more than 4% of the employed population (Figure 3). However, these data characterize the scale of temporary labor migration, when a person working in one region lives in another. These data do not reflect the labor force migration associated with the change of the residence region.

¹Used notation: CFD – Central Federal Districts, NWFD – Northwestern Federal District, SFD - South Federal District, NSFD - North Caucasus Federal District, VFD – Volga Federal District, UFD – Ural Federal District, SFD - Siberian Federal District, FEFD - Far Eastern Federal District.

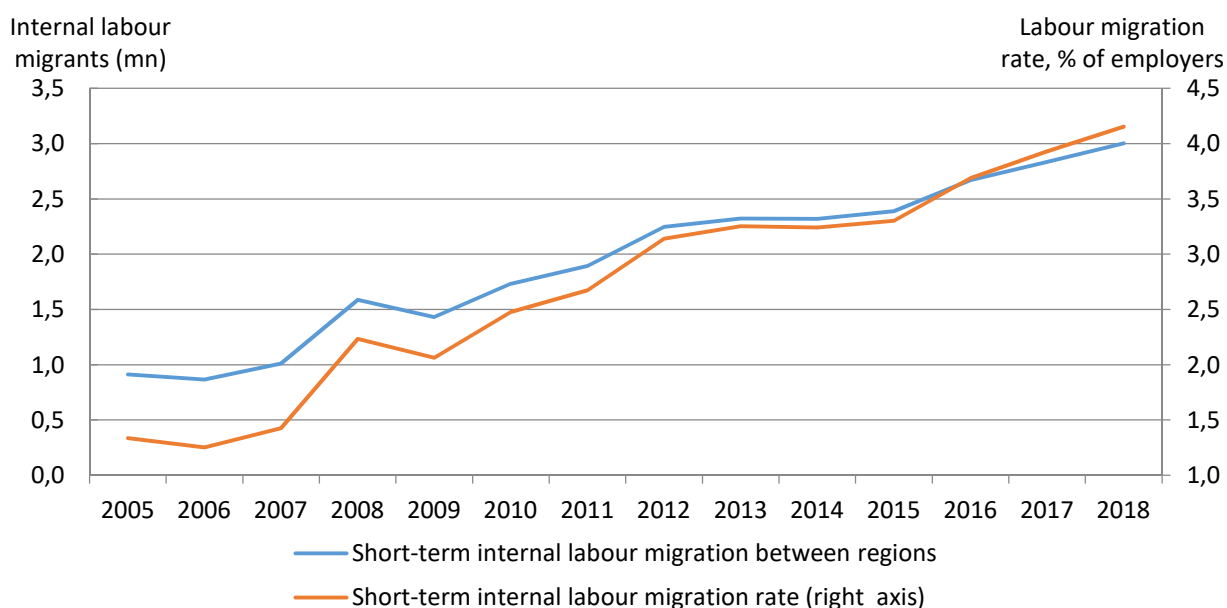


Figure 3. Interregional temporary labor force migration dynamics

Thus, the real scale of interregional labor migration in Russia is even higher, but they are not recorded by Russian statistics.

In 2018, 21.1% of interregional temporary labor migrants were employed in construction, 11.8% - in trade, 13.7% - in transportation and storage, 8.8% - in mining, 8,3% - in the manufacturing industry. For some regions activities the influence of interregional labor migration is quite significant, but the sectoral structure of internal labor migration in the regional context is not fixed.

For an adequate understanding of the situation developing in the regional labor market, calculations that 1) partially fill the information gaps in Russian statistics 2) predict the sectoral labor force needs of the regions at a given rate of economic growth 3) satisfaction of the needs of the regions in the workforce with their internal reserves and through migration (internal and foreign) are necessary.

Such a calculation system will be called forecasting multi-regional/sectoral model of interregional labour migration.

Methods

Below we describe the logic and main stages of the proposed calculations.

Internal labor force is projected for each regional labor market. These include: able-bodied population of working age, people older than working age and adolescents employed in the economy, domestic and foreign labor migrants. The sum of these categories of population will be called the labor force supply in the region. These are region resources that can be involved in the production process in each forecast year.

Besides, labor force demand by industry, providing predictable economic growth rates for regional industries is projected for each regional labor market. This value can be called

the regions labor force demand. In addition, the number of economically inactive population is projected, as well as the number of working age non-working students. The elements sum is called labor resources demand, and its structure will be called the labor resources distribution in the region.

For each forecast period in each region, a comparison of supply and demand for labor resources is carried out.

If there is a need for additional labor force in the region, then several possible options to attract labor to the region are considered. This need can be met by unused internal reserves in the region (reducing the unemployed or the economically inactive population) or expense of labor migrants from other regions, at the expense of labor migrants from other regions or foreign labor migrants.

In this case, the potential scale of attracting labor force to the region from the above sources is simulated, taking into account the industries. First, the potential of the region's internal resources is assessed. How much can be reduced the number of unemployed and economically inactive population in the current economic conditions?

If this labor force influx is not enough to cover the deficit, then the remaining vacancies in industries can take migrants from other regions, given the attractiveness of these vacancies. If internal migrants did not fill all vacancies, then the remaining part of them will be filled with foreign labor migrants. If there is a surplus of labor force in the region, then it may affect the growth of the unemployed or economically inactive population in the region, as well as an increase in the outflow of labor force from the region.

In a simplified version, the prospective amount of labor force supply in the region can be determined on the basis of a demographic forecast. According to reported statistical data, it is the able-bodied population of working age is the main source of satisfaction of the region's labor needs.

We describe a methodology for forecasting the labour force demand of industries in the regions. It is known that using the coefficients of total costs, one can measure the effects of exogenous changes in final demand not only for output, but also for employment, fixed capital, the level of environmental pollution, energy consumption, etc. For such estimates, in addition to the coefficients of total costs, the unit costs of the considered indicators per unit of sectoral issues are also required. For example, the coefficients of labor costs per unit of output, capital intensity, indicators of pollution per unit of output, energy intensity, etc.

To calculate the labor demand by industry in each forecast year, we will use the following notation. $Z = (z_1, z_2, \dots, z_n)$ - employment in the economy by industry, $T = (t_1, t_2, \dots, t_n)$ - coefficients of labor costs per unit of output by industry, $X = (x_1, x_2, \dots, x_n)$ - industries issues, $L = (l_{ij})_{i,j=1,n}$ - total cost coefficient matrix, $Y = (y_i)_{i=1,n}$ - final demand vector, n - number of industries.

The vector TL is the total labor intensity factor. Element τ_j of this vector reflects how much should be employed in all industries of the economy, to ensure the unit of final demand of the industry j . Element k_{ij} of matrix $\hat{T}L$, where is \hat{T} – diagonal matrix with sectoral labor intensity factors, reflects the labour force demand in industry i to provide the final demand unit of the industry j . Thus, the employment by industry of the reporting year can be obtained on the basis of the following ratio

$$Z = \hat{T}LY \quad (1)$$

On the basis of the predicted coefficients of direct costs of industry i per unit of industry j output and the forecast vector of final demand Y industry labor demand for each forecast year can be calculated on the basis of the ratio (1). It is possible to assume that the industry coefficients of labor intensity are constant over time, which is true only for a short period of time. In the long run period it is necessary to take into account the factors that determine the change in industry labor intensity coefficients over time. These factors can be the growth of capital-labor ratio, the increase in labor productivity due to the growth of investment in production, etc.

Thus, in the forecast period, the elements of the two vectors $\hat{T}LY$ and TL will differ, and the sum will be the same. The element j of the vector $\hat{T}LY$ reflects the labor force demand in industry j to ensure the production of a unit of final demand of all industries. The element j of the vector TL reflects the labor force demand in all economy's industries for the production of a unit of final demand of industry j .

The number of economically inactive population, working age non-working students, unemployed can also be predicted on the basis of a demographic forecast.

In case of labor force shortage in the region, its internal reserves are determined. They represent the amount by which the population of these categories of population can be reduced. In addition, in the RF, recently, within the framework of official statistics, the magnitude of the potential labor force is recorded. It is defined as unoccupied persons who are interested in getting a job, but they are not looking for work or not ready to start work. But for 2018, their value was just over 1 million people, which is not a large reserve for the Russian Federation. The opportunity to reduce unemployment is also not great, because according to some expert estimates, the current unemployment rate (4.8% in 2018) is close to the natural rate. In this regard, internal labor migration for individual regional labor markets is of great importance.

The interregional migration forecast is simultaneously built into several models. This makes it possible to link the macroeconomic forecast of the Russia development in the RIM and CONTO models with the current needs of regional labor markets. The interregional labor migration volume is projected in the RIM model and depends on the population dynamics, growth in real wages, and changes in employment in certain individual economy industries. On the base of hypotheses, the total value of interregional

labor migration is distributed across regions and industries. This takes into account the relative attractiveness of regions and industries. For each region, the corresponding value is an additional labor force in the labor market. The remaining, unmet labor demand in the region represents the region's demand for foreign migrants.

Some results

To calculate the labor force demand, a long-term forecast of the Russian economy development until 2035, made on the basis of the I-O model, was used. The model takes into account 48 industries classification. The basis of these calculations is the baseline scenario of Russian economic development.

On the basis of relation (1), taking into account the predicted coefficients of direct costs, the demand vector Y and the output vector X , the forecast labor demand in the industries are calculated. It is assumed that the labor intensity by industry gradually decreases due to introduction of new technologies and an increase in the capital-labor ratio level. The scenario used in the calculations assumes that by 2025 the output will increase by 38% compared with 2018, final demand - by 36%. Taking into account the hypothesis of the labor intensity dynamics, the labor demand will increase by 12% compared to 2018 (Figure 4).

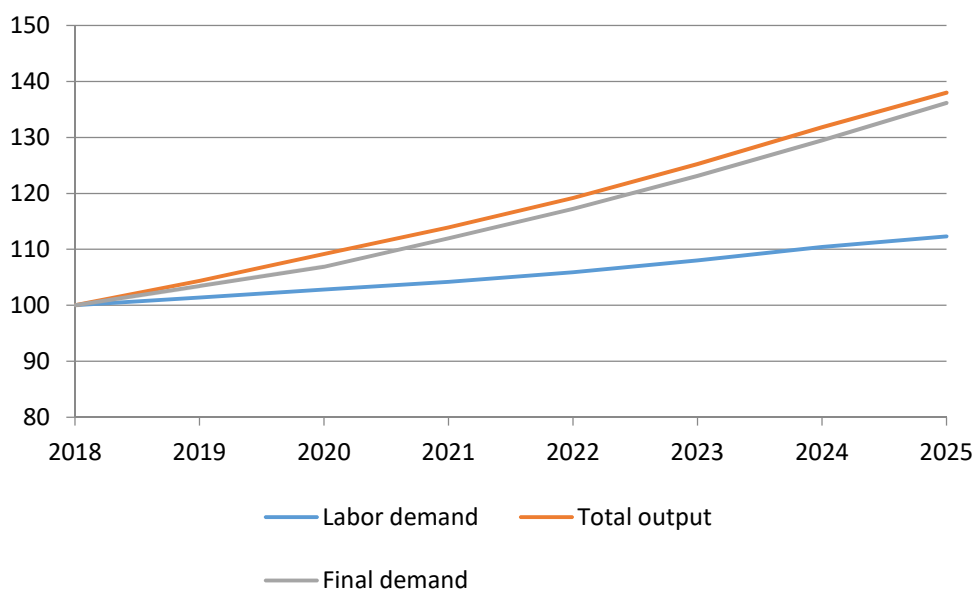
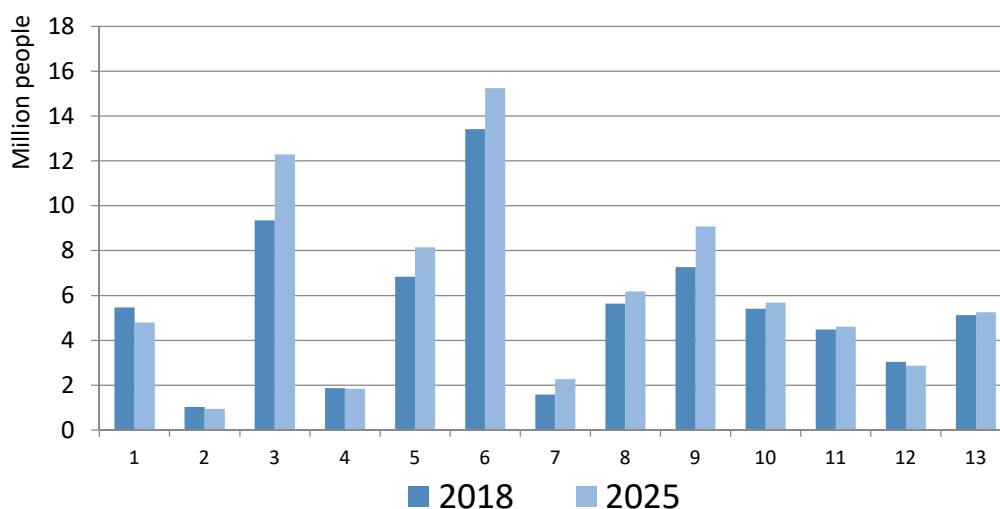


Figure 4. Forecast dynamics of output, final demand and labour demand, %

In such industries as manufacturing, construction, wholesale and retail trade, hotels and restaurants, transport and communications, real estate operations, education and health care, the demand for labor demand will increase. In agriculture the labour demand will decrease (picture 5). In mining, production and distribution of electricity, gas and water labour demand will remain at the level of 2018.



Picture 5. Labor demand forecast by industry:

1. Agriculture, hunting and forestry; fishing, fish farming
2. Mining
3. Manufacturing industries
4. Production and distribution of electricity, gas and water
5. Building
6. Wholesale and retail trade; repair of motor vehicles, motorcycles, household goods and personal items
7. Hotels and restaurants
8. Transport and communication
9. Real estate transactions, rental and provision of services
10. Education
11. Health and social services
12. Provision of other community, social and personal services
13. Other industries

The forecasted labor demand by industry will be distributed by regions industry in accordance with the dynamics of labor productivity in industries.

On the base of multi-regional/sectoral model of interregional labour migration can be solved actual economic tasks for Russia and its regions. Among them:

1. Assessment of labor shortages in the RF regions and industries.
2. Estimation of deficit reduction at the expense of internal regional reserves, labor migrants from other regions or foreign labor migrants.
3. Justification of the necessary socio-economic measures to attract in region labour market labor migrants from other regions.
4. Assessment of attracting migrants effects to regions with labor shortages for the remaining regions.

5. Assessment of labor migration impact on the ratio of money incomes and expenditures in the regions.
6. Assessment of the internal labor migration contribution in the formation of the revenue part of regional budgets.