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Abstract. The article examines the state of migration processes in the regional labor markets of Russia. Using correlation and regression analysis revealed the relationship between the share of foreign labor force and indicators of St. Petersburg economic security. On the basis of official statistics, a tendency of growth in the need of the city for highly skilled workers has been determined. The features of the employment new forms impact (telework and virtual employment), related to digital technologies, on the regional labor market and the situation in the field of migration are considered. Recommendations on the development of employment forms, using digital technologies, are proposed.

Keywords: Digital technologies, Labor force, Distance employment, Telework, Virtual employment, Migration, labor Market

1 Introduction

Digital technologies significantly influence on many aspects of our life over the past decades, without having left aside the sphere of employment and the labor market. New forms of employment are emerging, closely related to the use of information and telecommunication systems: distance employment (telework, tele-labor) and employment in virtual enterprises. Telework is an activity that is organized remotely from the employer and is performed using information and telecommunication systems (digital technologies). A number of publications by domestic and foreign researchers [1, 2, 3, 4, 5, 6, 7, 8] are devoted to the specifics of labor organization in the framework of telework, its advantages and disadvantages. However employment in a virtual enterprise remains little explored. There are almost no publications on this

topic in the domestic literature. In the western specifics of labor organization in the framework of telework, its advantages and disadvantages. However employment in a virtual enterprise remains little explored. There are almost no publications on this topic in the domestic literature. In the western literature concrete examples of the activities of virtual enterprises are mainly described [9, 10]. Sometimes authors do not distinguish between the terms “telework” and “virtual employment”, using them as synonyms, although telework and virtual employment differ significantly from each other, having their own specific characteristics [11].

Usually a virtual enterprise is a voluntary form of cooperation between individuals and organizational structures. They operate independently and geographically separated, but have common goals, ready to pool any resources and use mainly electronic means of communication. Such an enterprise either has no buildings and facilities at all, or there is a small office with a very small number of jobs. Employees either work at home, or use satellite office and communicate with each other using telecommunication systems. Virtual enterprises are created and operate in various sectors of the economy, but most often in the field of information technologies and industry.

In our opinion, the differences between telework and employment in virtual enterprises are follows:

- employment on a virtual enterprise involves communicating exclusively in the virtual space, while telework in most cases supposes partial performance of labor functions in the enterprise. However, traditional communication within the company’s territory is necessarily required for a certain period of time;

- the organization of labor when, using telework, is more traditional: the enterprise, where the employees work, has its own building, facilities, etc., although geographically it can be located remotely from the actual places of the employees work;

- the programs, which are used for work and transfer of the labour results in distance employment, are more specialized, designed for certain professional groups, or for using in a particular sector of the economy, while programs, used in a virtual enterprise, are more universal and are mainly intended to provide good communication between participants of labor processes; - teleworkers are usually employees of one company, cooperation takes place within the same enterprise. Virtual employment implies that cooperation can take place not only between individual employees, but also between various structural departments, that have economic independence.

Work in the virtual space has led to the fact, that the labor process has ceased to be tied to the certain area. Due to online platforms, workforce teams are created, that work on the same task or one project, but are located in different countries and in different enterprises.

2 Formulation of the problem.

Telework and employment in virtual enterprises have particular interest for those, who want to find employment in another country or in a region other than the region of residence. The modern globalization processes not only have strengthened the development of the digital economy, but also the intensity of migration flows throughout the world. Migration influences on the world economic system and the economy

of individual countries seriously. A large number of publications by Russian and foreign scientists are devoted to labor migration issues. Researchers, studying the economic aspects of migration, most often focus on:

- the main trends in the field of migration and migration flows direction (S. Aslakhanova, O. Rybakovsky, S. Martynenko, S. Chantavanich, P. Vungsiriphisal) [12, 13, 14];
- the impact of migration on the economic situation of the donor country (S. Chantavanich, P. Vungsiriphisal) [14];
- causes of migration, poverty and income inequality of migrants and the indigenous population of the recipient country, as well as migrants' vulnerability from labor laws (H.Esser, V. Milanovic) [15];
- the influence of migration on the labor market and the economic situation of the recipient country, as well as problems of migrant integration (J. Huguet, A. Chamrathirong, C. Natali, L. Salaris, N. Tedesco) [16, 17].

But it should be noted that external migration directly affects on not only the economy of the country as a whole, but also on the economic security of the state. Russia is a migrant recipient, that is, the number of arrivals in the country is much higher than the number of people, who left the country. So, in 2016, the migration increase in the country amounted to 261948 people, in 2017 - 211878 people [18]. The migration processes, occurring in the country in recent decades, are different from those, took place at the beginning of the twenty-first century. Internal migration is characterized by the fact, that there is a return of people from the oil and gas producing northern regions of Russia to Moscow and St. Petersburg, as well as to the Southern Federal District. They are differentiated by favorable climatic conditions, outflow of population from Siberia and the Far East, reducing of migration from village to the city. External migration is characterized by intensive migration flows to Russia from the CIS countries and the People's Republic of China, by the emigration of highly skilled Russians to countries with developed economies.

The direction and intensity of migration flows and the degree of their influence in different regions of the country varies (table 1).

Table 1. Population size (PS) and migration growth coefficient (MGC) on districts of Russia in 2016-2017*

Region of Russia	2016		2017	
	PS, thousand people	MGC, %	PS, thousand people	MGC, %
Central region	39209	45.0	39311	50.6
North-Western region	13899	40.5	13952	54.7
Southern Region	16429	48.3	16442	26.9
North Caucasus region	9776	- 21.3	9823	- 25.9
Volga region	29637	- 4.8	29543	11.7
Ural region	12345	12.4	12356	0.3
Siberian region	19326	- 6.5	19288	- 15.7
Far Eastern region	6183	- 28.1	6165	- 27.7

* The table was compiled by the authors on the basis of Rosstat data [18].

Intensive migration processes in modern conditions led to the transformation of the demographic structure in the country and the emergence of problems in the economic sphere that affect the security of the state or its individual regions:

- the population in Siberia and the Far East is decreasing, the process of replacement of the region's indigenous population by the migrants is taking place;
- population density in the southern regions of Russia is increasing, there is an overabundance of labor force in the labor market;
- the average wage level in sectors, where a large number of migrants are employed, is declining, as people from lower-income countries agree to work for lower wages;
- employment opportunities for the indigenous population are decreasing in sectors, where a large number of migrants works;
- there is an influx of predominantly low-skilled labour force, while the country needs highly skilled workers and specialists to build an innovative type of economy;
- the level of education, received in another country, does not always satisfy Russian requirements

3 Analysis of the migration processes impact on the labor market of St. Petersburg

The increased concentration of migrants in individual regions has an impact on regional labor markets. The North-Western Federal District is a developed region of Russia and plays an important role in the economic development of the country. The center of foreign labor force attraction in it is St. Petersburg - the second largest city in Russia. In this case, we are interested in the situation with the influx of foreign labor force to St. Petersburg, and how it impacts on the economic security of the Russian Federation subject. Here the quality parameters of migrants should be assessed and taken into account for improving the efficiency of measures to regulate labor migration. Table 2 shows the number of foreign workers, who came from the CIS countries to St. Petersburg over the past 5 years.

Table 2. Dynamics of change in the number of foreign workers from the CIS countries in St. Petersburg in 2013-2017, pers.*

Country	2013	2014	2015	2016	2017	
	A/D	A/D	A/D	A/D	A/D	MG
Azerbaijan	1525/567	1572/1285	1135/894	901/748	1048/821	227
Armenia	884/314	973/631	1076/676	771/721	2797/624	2173
Belarus	3829/2926	4246/3393	3347/3584	2142/2697	3841/1550	2291
Kazakhstan	2878/989	3149/2207	3189/2504	2653/2285	3318/1900	1418
Kyrgyzstan	2348/873	2491/2227	1870/2045	1630/1569	10140/1634	8506
Moldova	3312/1628	4080/2971	2795/3023	2511/1723	2559/1650	909

Tajikistan	9034/2778	9585/ 9886	2200/8461	1359/ 1427	1498/1034	464
Turkmenistan	902/ 532	1163/ 793	776/ 1121	589/ 637	542/ 543	- 1
Uzbekistan	27867/9316	28355/ 31100	4435/25032	1472/ 2236	1474/1118	356
Ukraine	3918/1428	6506/ 3090	5506/4165	4728/2998	4969/3555	1414

Symbols:

A/D - The number of migrants arrivals and migrants departures;

MG - Migration growth: $MG = A - D$.

* Data are collected by the authors on the materials of Petrostat [19].

As can be seen from the data of table 2, the number of foreign workers, who arrived in the Russian Federation from almost all CIS countries, with the exception of Turkmenistan, is higher, than the number of those, who left the country. At the moment the largest suppliers of labor force are Kyrgyzstan, Ukraine and Belarus. More than half of all labor migrants arrives from there (58.87 %). Also the main suppliers of labor force are Armenia and Moldova. Analysis of the region need for employees and citizens of foreign countries, working in certain types of activity, showed, that the largest number of vacancies was noted in construction, agriculture, wholesale and retail trade. At the same time a significant part of foreign workers occupies jobs, that are unattractive for the local population.

But a surplus of low-skilled foreign labor force in certain sectors of the economy creates tension in the labor market in the same sector. It connects with a large number of illegal migrants, who do not have work permits and the necessary documents. Their number is not taken into account by official statistics, because they are very difficult to estimate. To identify illegal migration and attract foreign workers to work without documents, law enforcement officers systematically conduct raids to prevent and combat offenses in the field of migration. The prosecutor's office in this matter also does not stand aside. In 2017 prosecutors managed to identify violations of immigration legislation in the amount of 31 thousand cases. As a result of such checks the number of migrants from other countries, who were sent back to their homeland, was reduced.

In order to determine the impact of the foreign labor force use on the indicators of St. Petersburg economic security a correlation and regression analysis was conducted. The indicator of the foreign labor force share among the employed population was used as a factor indicator, and indicators of economic security (GRP — gross regional product, investments, budget revenues) were taken as result indicators (table 3).

Table 3. The pair correlation coefficients of the economic security indicators dependence on the share of foreign labor force in the number of St. Petersburg employed, %

Factor indicator	Result indicator						
	R1	R2	R3	R4	R5	R6	R7
The share of							

foreign labor force in the number of employees	0.27	0.32	0.6	0.74	0.75	0.82	0.4
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Symbols:

R1 - GRP growth rate to the previous year (in comparable prices);

R2 - Industry volume index to previous year;

R3 - Retail turnover to GRP;

R4 - Volume index of agricultural output to the previous year;

R5 - Investment in fixed assets to GRP;

R6 - Revenues of the consolidated budget to GRP;

R7 - The scope of work for type of activity "Construction", divided by GRP.

In August 2018 there were 3012.4 thousand employees in St. Petersburg, among them the share of foreign labor force was 32186 people from the CIS countries, 3033 people - from countries far abroad. The coefficients in the table 3 were calculated on the basis of St. Petersburg statistical data by the main economic indicators for the period 2011-2018. Analysis of the results showed, that there is a link between the share of foreign labor force in the number of employees and indicators of the region's economic security (the value of the pair correlation coefficients with a sign "+").

There is an influence on:

- revenues of the consolidated budget (correlation coefficient 0.82);

- investment in fixed assets (correlation coefficient 0.75).

This is explained by the activities of enterprises with 100 % foreign capital in St. Petersburg.

According to V. Milanovic, poverty and lack of employability are the driving force of labor migration. The key motives, that determined the intention of migrants to leave their homeland, were: lower inflation level and higher earnings in Russia; lack of suitable vacancies in the homeland. In addition, the orientation towards the Russian Federation, including St. Petersburg, was formed as a result of the transparency of interstate borders, the territorial proximity of countries, the preservation of ties with Russian enterprises, and the knowledge of the Russian language. Statistical data shows that migration from the former Soviet republics mainly covers people with secondary and secondary special education. One of almost ten migrants has incomplete higher and higher education.

So, in 2017 in St. Petersburg the need for unskilled workers decreased on 82.8 % from the needs of 2016, as well as for machinists and drivers - on 83.7%. First of all, this is caused by the introduction of a ban on the labor activity of persons, who do not have driving licenses of the Russian sample, what can now be easily controlled, using digital technologies.

In 2018 2904 employers declared about the need for them to fill vacant jobs in St. Petersburg. At the same time, from the 42 thousand people, required by the city's economy, 11500 people accounted for the construction and transport, and 9400 people were required to fill the vacancies of specialists with a high level of qualification in various fields of activity [20].

An analysis of the migrants professional composition indicates, that workers, associated with the construction sector, mainly come to St. Petersburg. Among them: crane operators, building decorators, tilers, bricklayers, joiners, carpenters, plasterers, electrical installers, although their share from 2015 to 2017 decreased by 2 times. Similar trends can be traced both for low-skilled and high-skilled workers (table 4).

Table 4. Quotas for work permits of foreigners in St. Petersburg during the period 2015-2017 (fragment)

Migrants professions	2015	2016	2017
1. Employees of low qualification, including:	14891	11411	6026
1.1. workers, employed in the mining, mining and construction, construction and installation, repair and construction works	8913	6883	4411
1.2. unskilled workers, common for all sectors of the economy	3023	2446	421
1.3. employees of the sphere of individual services, protection of citizens, property	1645	905	822
1.4. workers of metalworking and machine-building industries	877	574	274
1.5. drivers and machinists of mobile equipment	433	603	98
2. Employees of medium and high qualification, including:	8838	6366	4420
2.1. heads of institutions, organizations and enterprises and their structural departments	2691	1537	901
2.2. other personnel's groups	2079	918	889
2.3. operators, machinists, mechanics, fixed equipment assemblers	1864	1598	862
2.4. other professions of skilled workers	1168	1507	1489
2.5. specialists in the field of natural and engineering sciences	711	492	168
2.6. middle-level specialists of physical and engineering directions of activity	325	314	111
Total	23729	17777	10446

On the number of issued quotas a group of unskilled workers in various sectors of the economy in 2015-2016 took a second place. In 2017 they seriously lost their positions (in 7.2 times), giving up their place to skilled workers. Quotas for work permits of qualified workers during the period 2015-2017 increased by almost 28 %. The

smallest number of quotas falls on the groups of drivers and machinists of mobile equipment, middle-level specialists of physical and engineering directions of activity.

The identified trends of the increase demand for skilled foreign labor force are also confirmed by the data from the site headhunter.ru. As at 12 March 2019 there it was placed:

- 8276 vacancies in the field of information technology and telecommunications (primarily programmers, Java developers, software testing engineers, interface designers);

- 2220 vacancies in medicine and pharmaceutical field (engineers, technologists on production of liquid and soft pharmaceutical forms, chemists, pharmacists, biologists, genetics, bioinformatics, general practitioners, plastic surgeons, dentists, ophthalmologists);

- 1813 engineer vacancies (design engineers of electric power supply systems, circuit design engineers, gas analysis and metrology equipment developers).

In St. Petersburg the shortage of qualified personnel will remain in the next three years. This is most acute in health care, education, and IT. The sphere of information technologies remains one of the key ones, regarding the positive dynamics of employment in St. Petersburg. As of 2017 the share of this type of activity accounted for 3.03 % of all employed in the regional economy, while by 2021 the proportion of employed will reach 3.7 %. Employment growth is projected in almost all specialties, however, significant growth is predicted in cloud technologies, design, database analytics. In the next five years the demand for IT specialists and managers of such departments will increase. Another growing segment will be the educational services market. Demand will be observed across all levels of education. Employment growth is also expected in the segment of additional education. Already today there is a need for teachers in the visual arts, music, computer literacy and a foreign language [21].

Thus, the analysis shows, that among migrants people with a low level of education and qualification still dominate (their share is about 60 %). But the need for them in St. Petersburg and the North-Western Federal District is decreasing (for the period 2015-2017 it reduced by 5 %). At the same time there remains an unmet need for highly skilled employees, especially engineering and technical profile, requiring knowledge, skills of work with digital technologies.

4 Proposals for the use of digital technologies to regulate employment and the level of migration in the regions of the Russian Federation

The situation in the employment sector of St. Petersburg and the North-Western Federal District is not an exception for the developed regions of Russia. In other federal districts, where there is an influx of migrants, similar trends in the direction of increasing the highly skilled employees share are observed.

Therefore, it is appropriate to spread telework and virtual employment in developing regions, in which the level of remuneration is quite high in comparison with depressed regions of Russia, from which there is an outflow of migrants. This will help

attract highly qualified employees from depressed regions of Russia (Siberia, the Far East), as well as from foreign countries, such as China, India, countries of Southeast Asia without migratory movements, which will lead to:

- employment growth in depressed regions of the Russian Federation and developing countries with high unemployment rates;
- raising the standard of people living with a high level of education, but a low income;
- the development of the regional economy in which there are many jobs for highly skilled employees.

Undoubtedly, telework and virtual employment are not suitable for all professions and specialties, but they can be successfully applied to engineers, programmers, designers, translators and scientists (exactly in the prospective areas) [22].

For the development of such forms of employment, using digital technologies, it is necessary:

- 1) development of the regulatory framework, that determines the use of distance employment and employment in virtual enterprises;
- 2) the formation of a system for monitoring the state of these employment forms in Russia and its individual regions and a system of statistical accounting, involving the collection of information about the number of employed teleworkers and vacant workplaces, where distance employment can be applied; as well as about the number of virtual enterprises in the context of economic activity types and the number of vacant jobs for them;
- 3) creation of conditions for information accessibility of monitoring results for persons, wishing to find a job in a virtual enterprise or distance employment (for example, posting information on the website of the Ministry of Labor and Social Development of the Russian Federation).

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