Regional employment quality in the context of Russia's technological development

Olga Kozlova[1], *Mariya* Makarova[1*], and *Lubov* Voronina[1]

[1]Institute of Economics UB RAS, Centre of socioeconomic dynamics research, Ekaterinburg, 620014, Russia

Abstract. The socio-economic inequality of the Russian regions poses a significant threat both to the successful social and technological development of the country. Since employment is one of the crucial highlighters of such inequality, the paper is devoted to assessing regional inequality in terms of employment quality in the context of technological changes. The article presents a system of social and economic indicators to determine the place of each region in the interregional employment inequality. The novelty of the study includes the methodological approaches and methods to estimate regional employment inequality and its components. The authors reveal the employment quality and its main components keeping relatable with the technological development. Based on these points, we developed employment quality coefficient and carried out a typology of Russian regions in terms of the employment quality. The study uses data from the Rosstat on working conditions and economic activity of the population for 2005-2019. The results expand the scientific ideas about the interdependence of employment and technological development. In addition, the research results should be considered when developing the state technical policy, differentiating the employment policy and socio-economic development of the regions.

Keywords: technological development, regional inequality, employment.

1 Introduction

The regional employment system is a complex socio-economic phenomenon. The level of its development depends on many objective (e.g. mineral resources and climate) and subjective (e.g. labour law, working conditions, and salary) factors. All these factors influence the employment quality directly or indirectly conditioning the opportunities and challenges for the technological development of a regional economy.

The current trend of technological progress is the digitalization of economic and social activities. Thus, the papers all over the world discuss the conditions and consequences of digitalization for the different areas of life, including employment. Due to the scope of our research, we should highlight such drivers of employment development in the context of digitalization. They are the challenges of the labour market segmentation; the emergence

* Corresponding author: makarova.mn@uiec.ru

and implication of some flexible employment forms under the digital technologies, the possibility of adapting the employees to the new employment conditions since the introduction of the digital technologies cause significant changes in the personnel search and requirements for the quality characteristics of the employees [1]. In addition, researchers concern about the reducing demand for the professions related to the monotonic production operations; reduction of the professions life cycle due to the rapid change of the technologies; transformation of the competencies of some personnel align with the changes of the working functions; increasing the requirements for the flexibility and adaptability of the personnel, etc.

The challenges listed above are caused by the functional changes of the employment and labour market, and the researchers propose widening the flexibility of the jobs to deal with them [2]. For instance, the response to such a challenge is short-term employment (casual work). Despite it looks like informal employment and has low social security, casual work has become widespread in the developed countries, especially in the jobs related to the digital platforms using [3].

Due to digitalization, the researchers look for how to improve the digital literacy of both employed and unemployed populations for a successful job search. From this point of view, a key issue is digital inequality because of the low accessibility of digital technologies for the population living in poor regions and rural areas [4]. In addition, the papers discuss the methods to estimate how digital technologies influence employment in the various sectors of an economy, especially in the high-tech services sector [5].

A special topic of the research is employment informality and its impact on human capital accumulation [6]. The population accumulates human capital during working life, but loses it when searching for a job. The accumulation of human capital is updated faster in formal than in informal employment. Due to this fact, a significant share of informal employment could become a restriction of the development of both human capital and technological progress. For instance, in Russia, 90% of employees with an informal employment contract have only an informal job to make their earnings. Thus, informal employment entails many socio-economic problems, including the curbing growth of the high-tech industries [7].

Pandemic COVID-19 becomes the new global risk factor for employment. The results of the assessment of the impact of the COVID-19 pandemic on various areas of platform employment, the development of which is closely related to the digitalization of the economy (employment on digital platforms for providing various services), have appeared in the scientific literature. According to the authors, the level and nature of influence are determined by the specifics of these areas of employment, the volume of state support, the speed of adaptation to the processes of development of the social and economic situation. However, the trend is that with the overall increase in the share of platform employment during the pandemic, the supply of both remote and offline services outstrips demand, which leads to a wage-cut of performers[8].

Due to the transition economy times, Russia has some specific challenges about the digitalization of a labour market and employment worsening the possible negative implications of the digitalization, e.g., a weak relationship between wages and skills (qualifications), the insignificant rates of a job renewal, and contradiction of the labour legislation and employment innovations. This discrepancy ultimately leads to a small number of employees with digital skills and deepens the risk to lose a significant part of the existing jobs [9, 10].

Being a key point of technological progress, the digitalization of employment determines a systemic transformation of the social and labour relations at all levels of territorial governing. This trend could affect employment and economic development both positively and negatively. A purely technocratic approach to the introduction of digital

technologies into an economic and social life ignores the social components of economy digitalization, so it ultimately could lead to the strategic miscalculations when choosing the ways of social and economic development. For instance, the survey of Japanese executives of the hospitality industry and the trade union leaders outlines the negative point of view. Digitalization can improve working conditions and contribute to more stable growth of its productivity. At the same time, it greatly contributes to descaling, fragmenting the work functions, intensifying a work process, and forcing control over the workplaces. It represents a further dismantling of the social compromise that underlay an early period of Japan's economic growth [11].

Hence, technological progress greatly contributes to labor relationships, working conditions, and employment patterns, that is the employment quality. Under the concept of the United Nations Economic Commission for Europe, we understand that employment quality is quite a complex concept, and its definition and components depend on a point of view of the assessment (the society, the corporation, or the individual). Employment quality can be defined as the entirety of all aspects of employment that may affect the well-being of an employed person. In other words, employment quality refers to the conditions and ethics of employment, monetary and non-pecuniary benefits, working time arrangements and work-life balance, employment security, and social protection, skills development and training as well as work motivation and employment-related relationships of an individual [12].

Such a definition of employment quality is wide and multi-dimensional. Thus, his study focuses only on such a component of the employment quality as assessing the working conditions quality that could reduce the quality of personal working life. We hypothesize that the employment quality varies significantly in the Russian regions depending on the level of technical development of production, including the digitalization of the production processes. At the same time, being at the beginning of the research, in this publication we present our methodological findings to assess the employment quality and to cluster the Russian regions according to this indicator.

Thus, improving the employment quality is one of the most important factors to achieve the success of the digital economy development, to reduce the negative consequences of digitalization for an employment and labour market. Due to the scope above, this paper makes the first step and develops an estimation of the employment quality in terms of technological progress.

2 Materials and Methods

2.1 Employment quality coefficient

The employment quality coefficient (EQC) is an integral indicator reflecting both the effectiveness of the labour use and the threats to the sustainable employment of a region. To create the EQC we employ four components and aggregate them according to the formula (1):

$$EQC = 1 - \frac{\sum\left(E_1 + E_2 + E_3\right)}{A} \qquad (1)$$

where E_1 is employed in unfavourable working conditions, thousands of people; E_2 is employed in the informal economy, thousands of people; E_3 is unemployed according to the ILO, thousands of people; A is economically active population, thousands of people. EQC varies [0; 1].

The working conditions are a crucial indicator of the employment quality and characterize the level of technological development of production and its safety for the

health of the employed population. Thus, the higher technological development accompanies better working conditions. The people employed in an informal sector or unemployed should be low-skilled, not suit the actual production technologies so they could not fit the employer requirements staying out of a labour market and decreasing the employment quality. Aggregating together in the EQC, the three indicators above reflect the employment quality in correlation with technological development.

To count the EQC we use the data of the Federal State Statistical Service of Russia considering the indicators of the regional development in 2005-2019.

2.2 Regional differentiation of employment quality

Being of an industrial, agricultural, or service nature, Russian regions have considerably different composition of economic development. Thus, the employment quality varies greatly from one region to another. Firstly, to estimate such a differentiation, we recruit the variance analysis using a coefficient of variation to estimate the dynamics of the EQC differentiation. Secondly, to create some clusters of the regions with similar employment quality we determine three levels of EQC such as:

- high level is ($EQC_{average}$ + a mean square deviation);
- the average level is between high and low ones;
- low level is ($EQC_{average}$ - a mean square deviation).

The group of regions with the average level of EQC is divided into three subgroups according to the differentiation of the employed with unfavourable working conditions to eliminate the correlation of the employment quality and technological progress.

3 Results and Discussion

3.1 Trends of employment quality dynamics

Russian economic development is multi-structural and has the components of the 4^{th}, 5^{th}, 6^{th} technological structures, thus the technological progress is obvious and determines the employment conditions. Moreover, having a peculiar production, Russian regions vary greatly in terms of both technological and employment development.

Table 1 shows that the employment quality has been slowly rising at the country level from 0.642 in 2005 to 0.647 in 2019. At the same time, the regional differentiation of the EQC decreased slightly over the same period, and the coefficient of a variation goes down from 14.4% in 2005 to 14.0% in 2019.

Table 1. Dynamics of the EQC components of Russian regions in 2005-2019.

Indicators		**2005**	**2010**	**2015**	**2019**
EQC	Average	0.642	0.656	0.641	0.647
	Coef. of variation, %	*14.5*	*14.7*	*14.4*	*14.0*
Employed in unfavorable working conditions	Average, thous. people	6.731	9.207	7.897	8.178
	Coef. of variation, %	*55.9*	*65.1*	*56.1*	*59.2*
Employed in the informal economy	Average, thous. people	21.783	18.694	23.444	23.293
	Coef. of variation, %	*41.5*	*48.0*	*44.0*	*42.6*
Unemployed according to the ILO	Average, thous. people	8.257	8.073	6.463	5.709
	Coef. of variation, %	*45.8*	*33.8*	*42.5*	*45.9*

Despite the positive dynamics of the EQC, some of its components had negative changes in the period under review. The indicator of the working conditions worsens because a number of the employees in the economic sectors with unfavourable working conditions (such as mineral extraction, construction, transport) was either stable or rising. Being due to the specialization of the regional economies, the regional differences of this indicator deepened over the period, the coefficient of a variation reached 59.2% in 2019 comparing 55.9% in 2005.

The unstable economic situation reproduces the large employment in an informal sector. During the period 2005-2019, the minimum indicator of employment in an informal sector slightly fluctuated. However, the maximum values in 2019 grew considerably from 51.2% in 2005 to 62.1% in 2019. In addition, informal employment varies greatly across the Russian regions, thus the coefficient of a variation remains at 41-44%.

The unemployment rate in turn has a positive tendency, it decreased from 8.3% in 2005 to 5.5% in 2019. Despite the overall decline, the regional differentiation of the unemployment rate stays quite high (from 45.8% in 2005 to 45.9% in 2019). Moreover, each period has one or two regions with outstanding values such as the Republic of Ingushetia with 63.1% of the unemployment rate in 2005 and 26.4% in 2019. In addition, we should notice that the maximum values also go down from 23.9% to 13.5%. Thus, this component of the EQC contributes positively to the aggregate indicator.

Despite the contradictory dynamics of its components, the employment quality is improving in general mainly due to a reduction in unemployment. Thus, we should notice that the employees are the leaders of the changes because they improve their skills and develop the new employment niches according to technological progress. The employers in turn do not struggle to introduce the innovations in labour technics and retain a high number of jobs with the unfavourable working conditions.

3.2 Estimating the regional differentiation of EQC

Based on the criteria above, we divided the Russian regions into three groups according to the values of the EQC. Fig 1 demonstrates that the spacing does not change considerably from 2005 to 2019, but the minimum values dropped especially in 2010.

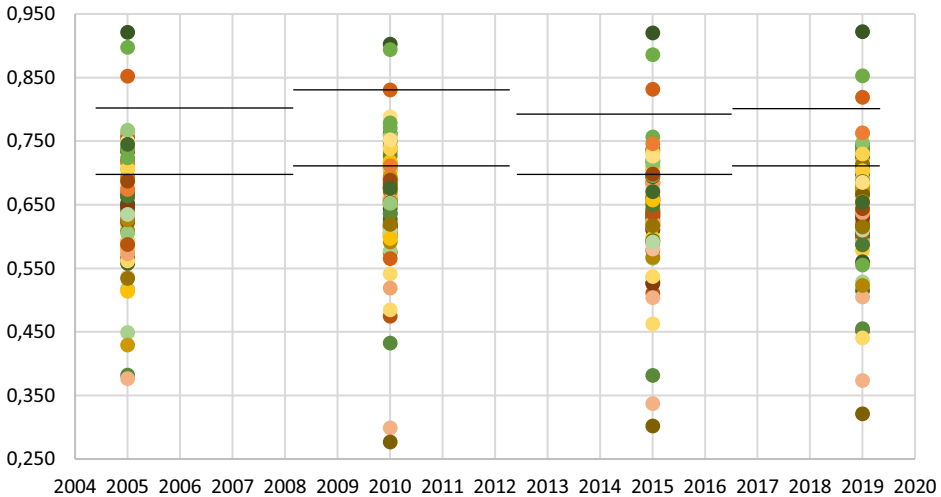

Fig. 1. Differentiation of the EQC of the Russian regions in 2005-2019.

According to the values of the EQL, we divided all Russian regions into 3 groups: with a high, average, and low level of EQC (Table 2). The green cells mark the indicators of a good mode in terms of the employment quality; the yellow cells note the indicators of an average meaning, and the red cells highlight the indicators of a bad mode in terms of the employment quality.

Table 2. Clustering the Russian regions according to the EQC.

Number of regions	EQL	Employed in unfavorable working conditions	Employed in the informal economy	Unemployed according to the ILO
	2005			
11				
14				
42				
7				
9				
	2019			
8				
6				
58				
5				
10				

The group with a *high level of the EQC* contains the regions with an average share of the employed in the unfavourable working conditions and an informal economy but with low unemployment rates. Thus, these regions should expand the technological progress throw updating the working conditions and upskilling the working-age population. Moreover, many such regions slowly go down since 2005, so the regional governments should intensify the progress to keep the leadership.

The group with a *low level of the EQC* contains the regions with extremely high unemployment rates and with a large share of employed in an informal economy. At the same time, these territories have rather favourable working conditions (in a green zone) because a few of the industrial enterprises with outdated technologies are placed there. Thus, these regions should stimulate the different programs of upskilling the working-age population to decrease the unemployment rates and informal employment rates. In addition, a number of such regions slowly goes up since 2005, so the regional governments should pay a special attention to raise the educational level of the population appropriate to the current technological development.

The last but large group with an *average level of the EQC* contains three-quarters of the Russian regions. These regions have so average levels of unemployment and informal employment that the total EQC is average despite the working conditions vary greatly from the worth to the best values. Thus, the regional governments should work hard in the three ways such as developing the working conditions, creating new jobs, and upskilling the working-age population according to the technological progress and innovations. This diverse activity is important due to a degradation of the EQC components since 2005.

4 Discussion

The proposed method of assessing employment quality certainly has a number of limitations. Firstly, we did not have a task to assess the statistical significance of the dynamics of the EQC for the period under review. Moreover, it should be noted that both the coefficient itself and its regional differentiation are mainly stable.

Secondly, the research extremely insignificant displays the relation between the existing employment quality and the digitalization of the economy because a limited set of digitalization indicators are collected, especially in the context of the regions and industries. This requires the development of some additional techniques for evaluating this relationship. At the same time, a logical analysis of the current economic structure of the Russian regions, knowledge about the general level of technological development of the relevant industries allow proposing a preliminary typology of the regions based on the quality of working conditions depending on the technological equipment of production. In the future, the authors intend to continue this study searching for the statistically significant dependencies to explain the phenomenon of differentiation of the EQC through the Russian regions in the context of technological development.

5 Conclusions

The paper discusses the differences in employment quality in the Russian regions in the context of technological progress. To estimate the employment quality we construct a special coefficient that included such components as employed in unfavourable working conditions, employed in the informal economy, unemployed according to the ILO, and economically active population as a base for calculating. Based on the proper estimating technique, the Russian regions were divided into three groups according to the employment quality as a key factor of technological development. This clustering enables to determine the troublesome issues to improve the employment quality in its correlation with technological progress.

Acknowledgments: The paper is processed as one of the outputs of the research on the state task of the Institute of Economics of the Ural Branch of the Russian Academy of Sciences for 2021-2023.

References

1. *What is the digital economy? Trends, competencies, measurement,* in Proceedings of the XX April international Scientific Conference on the problems of economic and social development. Moscow, Russia (2019).
2. P. Bruno. International Social Security Review, **72(3)**, 113-133 (2019).
3. I. Glotova. Tomsk state university journal of law, **39**, 149-158 (2021) doi: 10.17223/22253513/39/12
4. J. A. Jordi, M.M. Luis. Revista Española de Orientación y Psicopedagogía, **30(2)**, 67-82 (2019).
5. M.Z. Nafchi, H. Mohelska. Information, **12(3)**, 120 (2021). doi: 10.3390/info12030120
6. M. Bobba, L. Flabbi, S. Levy, M. Tejada. Journal of Econometrics, **223(2)**, 433-453 (2021). doi: 10.1016/j.jeconom.2019.05.026
7. A.L. Safonov, D.V. Nekipelov. Social and Labor Research, **4**, 28-41 (2018).
8. N.V., Loktyukhina, E.A. Chernykh. Living Standards of the Population in the Regions of Russia, **16(4)**, 80–95(2020). doi: 10.19181/lsprr.2020.16.4.7

9. M. K.Chernyakov, M. M. Chernyakova, K. C. Akberov. *Dynamic model of social risks in the digital economy. Advances in Economics, Business and Management Research*, in Proceedings of the 1st International Science Conference of Modern Management Trends and the Digital Economy: from Regional Development to Global Economic Growth. Moscow, Russia (2019).
10. O. Krutova, P. Koistinen, T. Turja, H. Melin, T. Sarkikoski. International journal of productivity and performance management, **April** (2021) doi: 10.1108/IJPPM-05-2020-0233
11. S. Shibata. Review of International Political Economy, **May** (2021). doi: 10.1080/09692290.2021.1935294
12. United Nations Economic Commission for Europe. *Handbook on Measuring Quality of Employment, A Statistical Framework*, United nations, New York and Geneva (2015)