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Spatial wage inequality and its sectoral determinants: the case of modern Russia

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Keywords: *regional average wage; spatial inequality; sectoral structure of economy; decomposition of inequality; convergence*

Abstract

Research background: We assume that the dynamics of spatial wage inequality can be caused by both shifts in the sectoral structures of regional economies and changes in inter-sectoral and intra-sectoral (inter-regional) wage inequality.
Purpose of the article: The paper is aimed at analysis of the sectoral factors influenced the spatial wage inequality in Russia in 2005–2014.
Methods: The employment-weighted Gini coefficient was applied for assessment of spatial wage inequality; the modified Lerman-Yitzhaki technique allowed to decompose it by main economic activities and their determinants; the mixed methods of factor analysis was used to evaluate the contribution of sectoral determinants to regional wage convergence in Russia.
Findings & Value added: We found a weak and inconsistent convergence of Russian regions in average wage over the period under review and explained it by the opposing forces in the main economic activities. The spatial convergence was basically created by mining, manufacturing, agriculture, construction, and transport and communications activities, while wholesale and retail trade, financial intermediation and real estate operations counteracted it. The convergence was mainly facilitated by a reduction in inter-sectoral differences in wages as well as by rapprochement of the employment structures in some economic activities of Russian regions. In the meanwhile, the migration of labor force from lower wage to higher wage activities negatively affected the smoothing regional differences. Ultimately, intra-sectoral wage inequality and wages correlation in various activities rather preserved inequality. The results are applicable in the management of spatial inequality both at the regional and national levels.

Introduction

In large countries such as Russia, spatial inequality is an important issue. It manifests itself in the inequality of incomes of various economic entities: population, enterprises and state. In Russia, wages are the main part of household income, accounting for about two thirds of it. Spatial wage inequality obviously depends both on purely regional factors (higher prices and the cost of living in some territories) and the sectoral structure of the regional economies. In some regions, profitable industries (such as mining and finance) dominate in the structure of economy, while other territories specialize in low-income agriculture.

The purpose of our study is to assess the influence of both inter-sectoral and intra-sectoral factors on spatial wage inequality in Russia. This also implies subsequent evaluation of the contribution of these factors to the convergence of the Russian regions in average wage in the period under study, which is 2005–2014.

To achieve this purpose, we apply the Lerman-Yitzhaki technique for decomposition of the Gini coefficient of spatial wage inequality by sources (economic activities) and their determinants. We slightly modify this technique, distinguishing the scale effect and the relative effect of spatial inequality in each activity. In our approach, the scale effect embraces the influence of two factors: the share of activity in the total employment and its relative wage level; whereas the relative effect covers the influence of intra-sectoral inequality, overlapping component (interdependence of wages in activities), and inter-sectoral inequality.

The rest of the paper is organized as follows. In “Literature review”, we examine the relevant studies on the topic of spatial income inequality and their determinants. In “Research methodology”, the data involved in the study and the methods chosen for analysis are described in detail. The “Results” section presents our assessments of wage inequality and its decomposition by activities and sectoral determinants across years, as well as the accrued contribution of them to the convergence of the Russian regions in average wage. In the “Discussion” section, we consider the novelty of our findings and link them to the findings of other authors. The “Conclusions” section summarizes the obtained results, indicates their significance and limitations, and identifies possible areas for future research.

Literature review

Previous researchers paid great attention to the study of wage inequality between regions or countries. They investigated how this inequality was affected by uneven distribution of human and capital endowments, labor market institutions, natural resources (Paredes, 2012, pp. 25), as well as technological changes (Senftleben-König & Wielandt, 2014, p. 30).

To explain the origin of spatial income inequality, the researchers used various techniques of its decomposition. Based on them, they assessed the contribution of various population groups (Miyake *et al*, 2009, p. 387–394) and various sources of income (Malkina, 2017, pp. 399–416) to spatial income inequality. They separated the intergroup and intragroup components of spatial inequality, and sometimes added the overlapping component. Some researchers conducted a mixed multi-dimensional decomposition of income inequality. Thus, in the paper by Monastiriotis (2000, pp. 1–23), wage inequality in the UK in 1982–1997 was decomposed into within-group and between-group for four characteristics: region, gender, occupation and education given separately and all together.

Some authors, relying on multiplicative or mixed additive-multiplicative functions of income generation, distinguished functional and structural factors of inequality. For instance, in the cross-country study of thirteen European countries, Behr and Pötter (2010, pp. 101–120) found that the differences in the returns-to-skill functions had the greatest impact on wage inequality, while the differences in labor characteristics contributed to it to a much lesser extent. Based on the developed multiplicative model of GDP per capita, Bracalente and Perugini (2010, pp. 621–645) evidenced that its spatial inequality in European countries was due to differences in productivity and employment rather than industry mix and demographic structure.

A number of researchers pointed out that income inequality factors can act in opposite directions and neutralize each other's influence. Thus, Castellano *et al.* (2018, pp. 1–56) in their study of wage inequality in four European countries found that a change in the structure of employment can both strengthen and alleviate the inequality caused by wage differentiation. In this context, the mobility of factors, both labor and capital, do matter for inequality (see Oda & Stapp, 2009, pp. 63–72).

Using the Granger causality test, Friberg (2007, pp. 161–184) confirmed the mutual influence of wages in various sectors of economy. It can additionally explain the significant differences in wage level in the regions with similar economic structures.

The peculiarities of spatial wage inequality in Russia deserve special attention. In his study, Gimpelson (2016, pp. 186–197) discovered the con-

vergence of sectoral wages in Russia in 2005–2014 and explained it by faster wage growth in the lower-wage sectors (agriculture, education and health care, mainly related to the public sector) and slower wage growth in the higher-wage sectors (mining industry and financial sector). According to his research, shifts in the sectoral structure of employment led to a further reduction in inter-sectoral wage inequality, while a decrease in intra-sectoral wage differentials contributed to a reduction in overall wage inequality in Russia.

Oshchepkov (2015, pp. 65–105) showed that the wage differences in the Russian regions had a compensatory nature. The higher wages in the northern and eastern regions are due to higher prices and worse living conditions (relatively low life expectancy, high air pollution, poor health services, a colder climate and higher unemployment). Ivanova (2018, pp. 1–30) found that the neighborhood had a positive effect on the convergence of real wages in Russian cities in 1996–2013, while the special wage regulations for cities of the Far North had a negative impact on it.

Our current research is in line with these studies and also relies on our previous work (Malkina, 2017, pp. 399–416), which has shown the positive effect of entrepreneurship and informal activities on the convergence of Russian regions in personal income. The new study analyzes regional wage differentials and structurally decomposes spatial wage inequality by economic activities and their determinants.

Research methodology

Our research is based on official information on 83 Russian regions in 2005–2014, provided by the Federal State Statistics Service of Russian Federation (FSSS). The data covers average annual number of employees and average monthly nominal wage, disaggregated by 15 main economic activities, as per the All-Russian Classifier of Types of Economic Activity — 2001.

The spatial wage inequality is evaluated by the Gini coefficient using its version proposed by Lerman & Yitzhaki (1984, pp. 363–368):

$$G = \frac{2}{w} \cdot Cov\left(w_i, F_i(w)\right) = \frac{2}{w} \cdot \sum_{i=1}^{m} \rho_i \cdot \left(w_i - w\right) \cdot \left(\hat{F}_i - \bar{F}\right). \quad (1)$$

In this formula, all regions ($i = \overrightarrow{1, m}$) are ranked in order of increasing average wage per employee — w_i. The nation-wide level of wage is $w = \sum_{i=1}^{n} \rho_i \cdot w_i$, where ρ_i is the share of i-th region in total employment. Further, $F_i(w)$ is a cumulative distribution function of the number of employees in regions, and $\hat{F}_i$ is a mid-interval of this function, which is calculated as follows:

$$\hat{F}_i = \sum_{i=0}^{i-1} \rho_i + \rho_i / 2 . \tag{2}$$

Accordingly, $\bar{F}$ is the weighted country average of these mid-intervals:

$$\bar{F} = \sum_{i=1}^{m} \left(\hat{F}_i \cdot \rho_i \right) = 0.5 . \tag{3}$$

The average wage in each i-th region depends on the average wages in all k-th activities of this region (w_{ki}) and the shares of employed persons in them (ρ_{ki}): $w_i = \sum_{k=1}^{K} w_{ki} \rho_{ki}$.

Now we can apply the method of additive decomposition of the Gini coefficient by sources for weighted functions:

$$G = \sum_{k=1}^{K} G(k) = \sum_{k=1}^{K} \frac{2}{w} \cdot Cov\left(w_{ki} \rho_{ki}, F_i(w)\right), \tag{4}$$

$$G(k) = \frac{2}{w} \cdot \sum_{i=1}^{m} \rho_i \cdot \left(w_{ki} \rho_{ki} - w_k \rho_k\right) \cdot \left(\hat{F}_i - \bar{F} \right), \tag{5}$$

where $G(k)$ is contribution of k-th activity to spatial wage inequality, w_k is average wage in k-th activity, calculated as a weighted average by all

regions: $w_k = \sum_{i=1}^{m} w_{ki} \cdot p_{ik}$, and p_{ik} is the share of i-th region in k-th activity.

The presence of a weighted component prompted us to modify the decomposition method proposed by R. Lerman and S. Yitzhaki. The subsequent alteration brings our equation to the following form:

$$G(k) = 2 \cdot \frac{w_k}{w} \cdot \rho_k \cdot \sum_{i=1}^{m} \rho_i \cdot \left(\frac{w_{ki}\rho_{ki}}{w_k \rho_k} - 1 \right) \cdot \left(\hat{F}_i - \bar{F} \right). \tag{6}$$

This parameter can be decomposed into intra-sectoral (within) and inter-sectoral (between) components:

$$G(k) = G_w(k) + G_b(k). \tag{7}$$

The intra-sectoral Gini coefficient of each particular activity is calculated as follows:

$$g_k = \frac{2}{w_k} \cdot Cov\left(w_{ki}, F_i(w_k)\right) = 2 \cdot \sum_{i=1}^{m} \rho_{ik} \cdot \left(\frac{w_{ki}}{w_k} - 1 \right) \cdot \left(\hat{F}_{ik} - \bar{F}_k \right), \tag{8}$$

which shows the inter-regional differences in the level of average wage within the k-th activity.

Further, following Milanovic & Yitzhaki (2002, pp. 155–178), we incorporate the overlapping component in $G_w(k)$:

$$s_k = Cov\left(w_{ik}, F(w)\right) / Cov\left(w_{ik}, F(w_k)\right). \tag{9}$$

It demonstrates the correlation of the spatial distribution of employees by the average wage in the whole economy with such distribution in the k-th activity.

Therefore, the within component of inequality related to the k-th activity can be represented as a multiplicative model:

$$G_w(k) = \rho_k \cdot \varpi_k \cdot g_k \cdot s_k. \tag{10}$$

Here above: $\varpi_k = w_k / w$ is relative wage level in the k-th industry compared to the country level; $\alpha_k = \rho_k \cdot \varpi_k$ is share of the k-th industry in the total wage fund, representing the scale effect.

The inter-sectoral component of $G(k)$ is determined under the assumption of equality of sectoral wages in all regions:

$$G_b(k) = \frac{2}{w} \cdot \sum_{i=1}^{m} \rho_i \cdot \left(w_k \rho_{ki} - w_k \rho_k\right) \cdot \left(\hat{F}_i - \bar{F}\right), \tag{11}$$

$$G_b(k) = 2 \cdot \frac{w_k}{w} \cdot \rho_k \cdot \sum_{i=1}^{m} \left(\rho_{ik} - \rho_i\right) \cdot \left(\hat{F}_i - \bar{F}\right). \tag{12}$$

In the last equation, we can again single out the component correspondent to the scale effect ($\alpha_k = \rho_k \cdot \varpi_k$). In doing so, we again retreat from the approach of Lerman and Yitzhaki, who did not divide the between component of inequality into parts.

Thus,

$$G_b(k) = \rho_k \cdot \varpi_k \cdot g_b \ , \tag{13}$$

where $g_b = 2 \cdot \sum_{i=1}^{m} \left(\rho_{ik} - \rho_i\right) \cdot \left(\hat{F}_i - \bar{F}\right)$ is structural component of intra-sectoral inequality.

Eventually, the contribution of each activity to the spatial wage inequality can be presented by the following model:

$$G(k) = \underbrace{\rho_k \cdot \varpi_k}_{\textit{scale effect}} \cdot \underbrace{\left(g_k \cdot s_k + g_b\right)}_{\textit{relative effect}}. \tag{14}$$

To assess the contributions of the multiplied components of this model to inequality we used the logarithmic method of factor analysis based on the Divisia index. To evaluate the contributions of the additive components of the model to inequality we applied the proportional method of factor analysis.

The hypothesis of our research is that the dynamics of spatial wage inequality depends on the sectoral structure of economy. The contribution of each particular activity to spatial wage inequality is determined by both its

absolute size, measured by the activity's share in the total wage fund, and its relative influence, depending on inter-sectoral and intra-sectoral wage inequality and wage interdependency in various activities.

Results

The map presented in Figure 1 shows significant disparities of the Russian regions by the average wage in 2014. The highest monthly wage per capita, namely 74,823 rubles, was in the Chukotka Autonomous District (which administrative code is 87), where mining industry dominated in the sectoral structure of the economy. At the same time, the lowest average wage, only 13,440 rubles, was observed in the Republic of Dagestan (code 5), where 27.5% of employees were engaged in low-income agriculture. In other words, the wage gap between the extreme regions was 5.3 times.

In the meantime, the spatial wage inequality in Russia has slightly decreased since 2005. On average, wages in lagging regions grew at a slower pace compared to wages in advanced regions, which generally indicated beta convergence of the Russian regions. Indeed, in 2005 the wage gap between the most advanced region (Yamalo-Nenets Autonomous District, code 89) and the most backward region (the Republic of Dagestan) reached 9.14 times.

Table 1 shows our generalized assessments of the spatial wage inequality in Russia in 2005–2014, based on the calculation of the employment-weighted Gini coefficient (formulas 1–3). The decrease of this coefficient from 0.217 in 2005 to 0.205 in 2014, i.e. by 5.4%, indicates a weak sigma-convergence of the Russian regions in the average wage, in addition to the above-mentioned beta-convergence. However, the change in the spatial wage inequality over the years was rather inconsistent and unstable.

In various economic activities, changes in spatial wage inequality were multidirectional, which is also shown in Table 1. Thus, intra-sectoral wage inequality finally decreased in Agriculture (where the Gini coefficient dropped by 25.2%), Mining and quarrying (-19.7%), Construction (-15.0%), Hotels and restaurants (-14.4%), and Health and social work (-8.2%). At the same time, it grew in Financial intermediation (+16.6%), Real estate and renting (+16.2%), Personal and social activities (+10.9%).

The impact of each activity on the general inequality depended not only on its own inequality, but also on its share in total employment, its relative wage and the correlation of its wages with wages in other activities. To assess the contribution of all these factors, we applied the technique described in the methodological part of our work.

Table 2 presents the results of decomposition of the total Gini coefficient by economic activities for 10 years under consideration. First of all, it evidences that the largest contribution to the spatial wage inequality was made by Real estate and renting (it was 17.7% in 2005 and 22.3% in 2014), Wholesale and retail trade; repair (13.2% in 2005 and 17.8% in 2014), Financial intermediation (7.4% and 11.0%). We should also indicate two other influential sectors whose contribution has meanwhile diminished: Transport and communications (10.4% in 2014 against 12.1% in 2005) and Construction (10.2% in 2014 against 12.0% in 2005). Agriculture was the only activity whose impact on inequality was negative and even more enhanced over time (-6.0% of contribution to total inequality in 2014, against -3.3% in 2005). This was due to the fact that wages in Agriculture negatively correlated with wages in other activities in the regions. It also proves that employment in agriculture contributes to mitigating the spatial differences in wages.

The shares of various activities in total wage payments and wage inequality differed considerably. In particular, the share of Manufacturing in total wages dropped from 18.5% in 2005 to 14.3% in 2014, while its share in spatial wage inequality decreased from 9.2% in 2005 and 5.4% in 2014. This indicates that Manufacturing played the role of a relative inequality damper. A positive difference between the share in total wage payments and wage inequality was also observed in the social sphere (Education, Health care and social work) and in Public administration and defense. In 2014, circa 20.9% of total wages was paid in these activities. However, they were in charge of only 13.4% of spatial wage inequality. By contrast, the largest excess of the share in wage inequality over the share in wage payments was observed in Real estate and renting (it reached 8.2% in 2005 and 11.4% in 2014). Consequently, this activity was a relative enhancer of spatial wage inequality.

As per our methodology, we divided the inequality generated by all the activities into within (intra-sectoral) and between (inter-sectoral) components. The results of this decomposition for 2014 are presented in Figure 2. They indicate the predominance of the intra-sectoral component of spatial wage inequality in the Russian economy as a whole. Moreover, the share of this component in the overall wage inequality increased from 81.8% in 2005 to 86.8% in 2014.

For the activities, the ratio of inequality components differed significantly. Thus, in Agriculture, Manufacturing, Education, Health and social work, Public administration and defense, the inter-sectoral component of inequality was negative and thereby smoothed out the general wage inequality. In other activities, the inter-sectoral inequality, in contrast, exacer-

bated the general inequality. Mining and quarrying was the only activity where the inter-sectoral component of inequality exceeded the intra-sectoral component and accounted for 62.4% in 2014. The proportion of inter-sectoral component was also significant in Financial intermediation (48.0% in 2014) and in Real estate and renting (48.4% in the same year).

Using the mixed method of factor analysis, we evaluated the contribution of all determinants of our model (Formula 14) to the convergence/divergence of the Russian regions by average wage. The summarized results for all activities are presented in Figure 3 on an accrual basis for the years 2005–2014.

Firstly, we see the opposite effect of some factors. Specifically, the changes in the sectoral structure of employment contributed to the growth of spatial wage inequality, and the influence of this factor was permanently increasing. At the same time, the changes in relative wages and inter-sectoral inequality contributed to the reduction in overall wage inequality, and their influence was enhancing over time. Secondly, the impact of intra-sectoral inequality and overlapping component was rather inconsistent and changing sign in time.

Deeper decomposition of the influence of determinants within activities allowed us to shed more light on the processes of regional convergence. Its results are presented in Table 3 and discussed hereinafter.

The first determinant, the relative wages in activities (ϖ_k), had a positive effect on regional convergence. It was due to the negative correlation of its change in activities ($\hat{\varpi}_{k\,2014/2005}$) with their relative contribution to inequality in the basic year ($G(k)_{2005} / \alpha_{k\,2005}$). Indeed, the Pearson coefficient of the two examined parameters was -0.602. The relative wage increased to a greater extent in Agriculture (from 44.6% of the country level in 2005 to 56.1% in 2014), Education (from 69% to 86.9%), Health and social services (from 74.9% to 89.9%). It was these sectors that damped inequality. At the same time, relative wage decreased the most in Mining and quarrying (from 2.573 in 2005 to 1.986 in 2014), which has always been the strongest enhancer of spatial inequality. Indeed, its share in spatial wage inequality even in 2014 exceeded its share in total wages 2.25 times.

The second determinant, the share of activity in employment (ρ_k), has, on contrary, contributed to the divergence of the Russian regions in the average wage. It can be explained by the shift in employment in favor of some higher wage activities, which were relative amplifiers of inequality as well. Thus, in the period under review, we can observe the significant growth of the proportion of employees in Financial intermediation (its

share increased from 1.3% in 2005 to 1.9% in 2014, that is, by 49.6%) and Real estate and renting (which share enlarged from 7.5% to 8.7%). At the same time, there was an outflow of workers from some less affluent activities. For instance, the share of Agriculture in total employment decreased from 11.3% to 9.2%, Education — from 9.1% to 8.1%. Therefore, the migration of employees to more affluent activities had a significant reinforcing effect on spatial wage inequality in Russia.

The third determinant, intra-sectoral inequality, which refers to regional differences in each specific activity, was preliminarily discussed above. This factor most positively influenced the contribution of Construction and Agriculture to spatial wage convergence. However, it generated the greatest negative effect on spatial wage convergence in Real estate and renting. Indeed, in this sector in 2005, the average wage in the richest region (Yamalo-Nenets Autonomous District, code 89) was 7.1 times higher than the average wage in the poorest region (Kabardino-Balkar Republic, code 07). In 2014, the gap between the most affluent region (Yamalo-Nenets Autonomous District) and the most backward region (the Republic of Ingushetia, code 06) amounted to 8.2 times. We can partly explain the growth of spatial wage inequality in Real estate by the concentration of this activity in Moscow (22.4% of total employment in the examined activity in 2005 and 21% in 2014), with the relative wage increase in the capital city from 1.49 to 1.72. Similar processes took place in the financial sector. Moscow's share in the total employment in Financial intermediation enlarged from 28.1 % in 2005 to 30.7% in 2014, and the relative wage in this city increased from 1.61 to 1.75. Thus, the concentration of employment in Real estate and Financial intermediation counteracted the reduction of regional differences occurring in other activities.

The fourth determinant, the overlapping component, demonstrates the interdependence of wages in various activities. In some activities, such as the infrastructural sector (Transport and communications, Electricity, gas and water supply), Construction and Trade, as well as the entire social sphere and Public administration and defense, this correlation was very high. The lowest level of the wages interdependency was observed in Agriculture, Fishing and fish farming, Mining and quarrying. This is quite understandable: the above-mentioned activities are more dependent on natural resources availability than on the performance of other industries. Therefore, their wages may change asynchronously with wages in other industries. Country-wide, the effect of the overlapping component on convergence was insignificant, making up only 5.4% of the total change in inequality.

The fifth determinant, inter-sectoral inequality, contributed to smoothing inter-regional wage differences, as relative wages did. In our model, this factor is associated with the differences in sectoral structures of regional economies. Apparently, in the period under review, these structures converged on average. It was especially noticeable in Manufacturing and Public administration and defense. The contribution of Manufacturing to convergence by more than 60% was due to the reduction of regional differences in the proportion of people employed in this sector. In Public administration, this factor largely compensated for the negative influence of all other factors contributing to divergence.

Summing up the cumulative effect of all determinants, it should be noted that the largest contribution to the rapprochement of the Russian regions on the average wage was made by Mining and quarrying, Manufacturing, Construction, Transport and communications, and Agriculture. The opposing processes in Wholesale and retail trade, Real estate and renting, as well as in Financial intermediation counteracted this convergence. This largely explains the instability and inconsistency of changes in spatial wage inequality, which was highlighted at the beginning of this section.

Discussion

The obtained results clearly indicate the presence of both promoting and opposing forces of the convergence of Russian regions in the average wage. In general, they are consistent with the results of the study by Gimpelson (2016, pp. 186–197), which revealed a similar effect of the sectoral wages convergence in Russia. However, in our study, the structural shifts in employment had an upward impact on inter-regional inequality in wages, whereas in the Gimpelson study, it contributed to a decrease in inter-sectoral inequality.

In this regard, according to one of the explanations of the Kuznets curve (see Kuznets, 1955, pp. 1–28), the migration of the population to more affluent industries or territories first leads to an increase in inequality, and then to its decrease. Thus, we can conclude that the Russian economy is on the upward branch of the Kuznets curve.

According to our findings, the contributing factors of regional convergence were the reduction in inter-sectoral differences in wages and the convergence of sectoral employment structures in the regions. This is partly explained by the state policy aimed at supporting certain sectors (Agriculture and social sphere) and raising public sector wages. It was also due to an increase in the tax burden of the more profitable Mining sector, where

the wages grew at a slower pace than the national average. Probably, the state support of the so-called priority development areas also influenced inter-regional differences in wage level. However, the latter thesis requires a separate study, since the preferential zones vary greatly in the development level.

Conclusions

The paper examines the influence of economic activities and their determinants on the inequality of the Russian regions in average wage and its dynamics in 2005–2014. Spatial wage inequality in Russia was assessed by the employment-weighted Gini coefficient. The application of the modified Lerman-Yitzhaki technique allowed to decompose this inequality by economic activities and their determinants. The proportional and logarithmic methods of factor analysis were used to calculate the contribution of sectoral factors to spatial wage convergence.

Our analysis revealed a weak and inconsistent convergence of Russian regions in average wage, which was explained by multidirectional influence of sectoral factors. Among the activities, Mining, Manufacturing, Agriculture, Construction, Transport and communications had a positive effect on convergence, while Wholesale and retail trade, Financial intermediation and Real estate and renting negatively contributed to it. Among the factors, the narrowing gap in sectoral wages and rapprochement of sectoral employment structures made the largest positive contribution to the convergence. The greatest resistance to it was provided by labor migration from lower wage to higher wage activities. Finally, regional differences in sectoral wages (i.e., intra-sectoral inequality) and wage correlation in various activities rather contributed to the persistence of inequality.

The results obtained are applicable in managing regional wage differentials in Russia at the national and regional levels.

Despite the soundness of our findings, we comprehend their limitations, which are partly due to their sensitivity to the applied technique of decomposition, which still needs to be improved. In particular, the predominant effect of inter-regional differences on spatial wage inequality can be explained by different standards of living in Russian regions. Replacement of nominal wages with real wages in the analysis can significantly change the result. An influence of territorial labor migration on the process of spatial wage convergence/divergence was also beyond our analysis. The deeper specification of data and methods can be a matter of future analysis.

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Annex

Table 1. The employment-weighted Gini coefficients of spatial wage inequality in the Russian economy and its main economic activities in 2005–2014

Activity	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
A	0.211	0.206	0.198	0.180	0.162	0.167	0.162	0.163	0.157	0.157
B	0.331	0.338	0.329	0.319	0.314	0.298	0.304	0.308	0.312	0.341
C	0.296	0.287	0.275	0.267	0.276	0.258	0.243	0.243	0.239	0.238
D	0.160	0.154	0.151	0.151	0.160	0.153	0.156	0.160	0.160	0.161
E	0.174	0.173	0.172	0.170	0.174	0.180	0.180	0.180	0.180	0.180
F	0.208	0.185	0.170	0.181	0.172	0.167	0.178	0.183	0.178	0.176
G	0.207	0.187	0.204	0.199	0.195	0.208	0.216	0.213	0.201	0.210
H	0.231	0.229	0.217	0.206	0.198	0.190	0.203	0.199	0.202	0.198
I	0.194	0.191	0.192	0.193	0.191	0.186	0.188	0.184	0.189	0.189
J	0.230	0.232	0.225	0.227	0.242	0.249	0.254	0.245	0.258	0.268
K	0.204	0.209	0.213	0.212	0.212	0.218	0.240	0.238	0.228	0.237
L	0.144	0.148	0.148	0.149	0.149	0.148	0.149	0.144	0.141	0.145
M	0.204	0.208	0.219	0.220	0.221	0.222	0.218	0.216	0.208	0.208
N	0.210	0.213	0.225	0.235	0.230	0.236	0.228	0.218	0.204	0.193
O	0.223	0.232	0.255	0.263	0.255	0.270	0.266	0.265	0.253	0.247
Total	0.217	0.211	0.212	0.211	0.205	0.198	0.213	0.209	0.203	0.205

Note: hereinafter the codes of economic activities are designated according to the All-Russian Classifier of Types of Economic Activity-2001: A – Agriculture, hunting and forestry; B – Fishing, fish farming; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade, repair; H – Hotels and restaurants; I – Transport and communications; J – Financial intermediation; K – Real estate, renting and business activities; L – Public administration and defense; M – Education; N – Health and social work; O – Other community, social and personal service activities.

Source: author's own calculations based on the FSSS RF data.

Table 2. Decomposition of the Gini coefficients of spatial wage inequality in the Russian economy by main economic activities in 2005–2014

Activity	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
A	-0.007	-0.008	-0.008	-0.010	-0.010	-0.010	-0.011	-0.011	-0.012	-0.012
B	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
C	0.025	0.020	0.018	0.016	0.016	0.013	0.018	0.018	0.017	0.014
D	0.020	0.019	0.018	0.016	0.013	0.012	0.013	0.012	0.011	0.011
E	0.006	0.006	0.005	0.004	0.005	0.004	0.006	0.005	0.005	0.005
F	0.026	0.023	0.023	0.025	0.021	0.021	0.023	0.023	0.022	0.021
G	0.029	0.027	0.033	0.034	0.033	0.038	0.037	0.035	0.032	0.036
H	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002
I	0.026	0.025	0.023	0.023	0.023	0.019	0.022	0.022	0.022	0.021
J	0.016	0.018	0.019	0.019	0.018	0.020	0.021	0.020	0.022	0.023
K	0.038	0.039	0.040	0.040	0.040	0.043	0.044	0.044	0.043	0.046
L	0.007	0.008	0.007	0.007	0.008	0.004	0.007	0.007	0.008	0.008
M	0.010	0.011	0.011	0.010	0.012	0.011	0.011	0.011	0.011	0.011
N	0.008	0.010	0.010	0.010	0.012	0.010	0.010	0.009	0.009	0.009
O	0.008	0.008	0.009	0.010	0.010	0.010	0.009	0.010	0.009	0.009
Total	0.217	0.211	0.212	0.211	0.205	0.198	0.213	0.209	0.203	0.205

Source: author's own calculations based on the FSSS RF data.

Table 3. The contribution of the sectoral determinants to the convergence (+) / divergence (-) of the Russian regions in average wage in 2005–2014, %

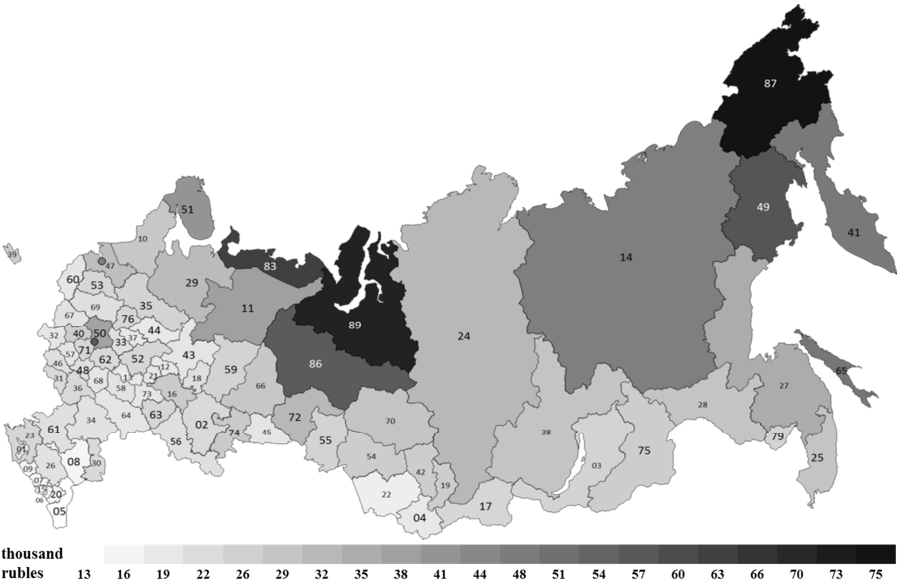
Activity	Relative wage level, ϖ_k	Share in total employment, ρ_k	Intra-sectoral inequality, g_k	Overlapping component, s_k	Intersectoral inequality, g_b	Within component, $G_w(k)$	Between component, $G_b(k)$	Total, $G(k)$
A	18.9	-16.4	14.6	13.0	13.8	25.9	18.0	43.9
B	0.7	0.2	-0.1	0.6	2.1	0.9	2.5	3.4
C	42.8	11.3	14.0	3.7	20.6	38.5	53.8	92.4
D	9.9	22.9	-0.8	-1.6	46.0	48.3	28.1	76.3
E	6.9	0.9	-1.6	-0.7	5.5	6.2	4.9	11.1
F	31.9	-22.0	20.6	-0.9	14.8	25.8	18.4	44.2
G	-14.0	-34.5	-3.5	-2.0	-13.8	-46.3	-21.4	-67.7
H	3.7	-5.1	3.0	1.3	2.8	3.3	2.6	5.8

Table 3. Continued

Activity	Relative wage level, ϖ_k	Share in total employment, ρ_k	Intra-sectoral inequality, g_k	Overlapping component, s_k	Intersectoral inequality, g_b	Within component, $G_w(k)$	Between component, $G_b(k)$	Total, $G(k)$
I	34.9	-2.3	4.4	0.0	6.0	29.7	13.2	43.0
J	32.4	-66.2	-13.0	0.0	-9.0	-30.4	-25.4	-55.8
K	8.6	-55.4	-26.2	-2.6	13.3	-51.7	-10.8	-62.4
L	-1.8	-5.2	-0.8	-2.0	8.6	-12.0	10.7	-1.3
M	-21.2	10.1	-2.3	-1.3	3.9	-17.6	6.8	-10.8
N	-12.7	0.3	7.8	-2.8	1.7	-11.1	5.4	-5.8
O	-10.8	-3.5	-6.2	0.7	3.6	-17.4	1.2	-16.2
Total	130.2	-164.9	9.6	5.4	119.7	-7.8	107.8	100.0

Source: author's own calculations based on the FSSS RF data.

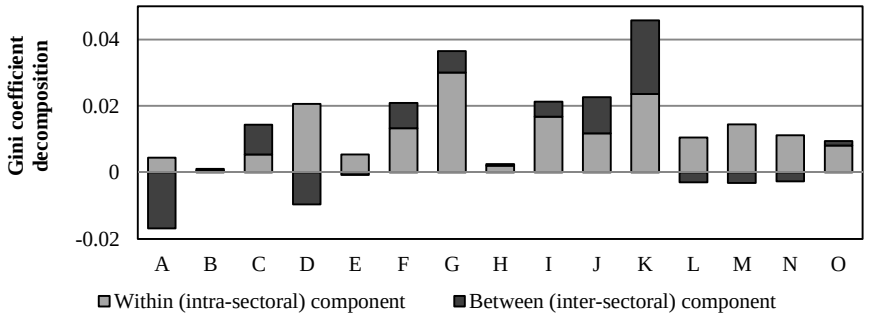
Figure 1. Average monthly wage in the Russian regions in 2014



Note: The subjects of Russian Federation are designated by administrative codes explained in the text.

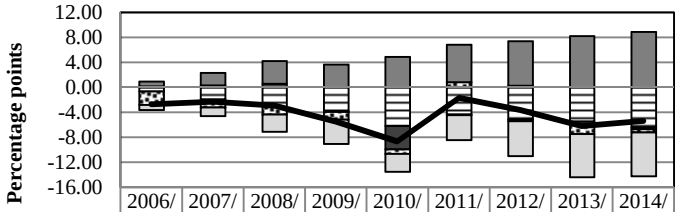
Source: author's own calculations based on the data provided by Federal State Statistics Service of Russian Federation (FSSS RF).

Figure 2. Decomposition of the spatial wage inequality in main economic activities into within and between components in 2014



Source: author's own calculations based on the FSSS RF data.

Figure 3. The contribution of the sectoral determinants to the change in inequality of the Russian regions in average wage estimated on an accrual basis



	2006/ 2005	2007/ 2005	2008/ 2005	2009/ 2005	2010/ 2005	2011/ 2005	2012/ 2005	2013/ 2005	2014/ 2005
Share in total employment	0.80	1.98	3.64	3.62	4.86	5.97	7.13	8.21	8.88
Relative wage level	-0.86	-1.35	-2.77	-3.88	-2.87	-4.00	-5.59	-6.92	-7.00
Intrasectoral inequality	-2.12	-1.31	-1.20	-1.28	-0.73	0.83	0.23	-1.49	-0.52
Overlapping component	0.12	0.32	0.58	-0.13	-3.72	-0.15	-0.31	-0.51	-0.29
Intersectoral inequality	-0.69	-1.95	-3.17	-3.81	-6.24	-4.35	-5.12	-5.50	-6.44
Total	-2.75	-2.31	-2.91	-5.47	-8.70	-1.70	-3.66	-6.20	-5.38

Note: sign «+» indicates a positive contribution to inequality and regional divergence, sign «-» implies a negative contribution to inequality and regional convergence

Source: author's own calculations based on the FSSS RF data.