Convergence Patterns of Regional Income Inequalities in Russia

Gluschenko, Konstantin

Institute of Economics and Industrial Engineering, Novosibirsk State University

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Konstantin Gluschenko

Institute of Economics and Industrial Engineering;
Novosibirsk State University
Novosibirsk, Russia
E-mail: glu@nsu.ru
ORCID: 0000-0003-1209-3809

Abstract. The paper analyzes the evolution of dispersion of regional income inequalities in Russia in 1995-2022. The aim of the study is to reveal the 'anatomy' of regional inequality convergence that took place in 1995-2012, and the divergence that followed it, i.e. the internal structure of these processes. To this end, the paper explores the evolution of the regional Gini indices distribution, namely, that of main distribution statistics and the distribution itself (represented by a histogram). The results obtained suggest that convergence of regional levels of income inequality in Russia in 1995–2012 is almost exclusively due to "catching-up" of low-inequality regions with high-inequality regions. Therefore, this process cannot be considered positive. Divergence of regional inequalities in 2013-2022, on the contrary, was accompanied by a decrease in income inequalities in the regions, improving the situation with spatial inequality in Russia.

Keywords*:* income inequality, convergence, divergence, Gini index, Galton's fallacy, Russian regions

JEL classification: D31, D63, R11

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INTRODUCTION

Analyzing the evolution of income inequalities in regions of Russia in 1995–2020, Polbin and Ivakhnenko (2022) find that regional inequalities have been converging during a significant part of the time span under consideration. Studies of this kind (across both countries and regions of one country) are quite few,[1] and they have not been carried out at all for Russia. There seem to be two explanations for this.

Firstly, there are no theoretical conclusions regarding the dynamics of dispersion of income inequalities between economies (countries or regions of a country). The authors who hypothesize convergence of inequalities, e.g., Bénabou (1996), argue that the convergence of per capita incomes between economies predicted by the neoclassical model of economic growth (the Solow-Swan model) should also entail convergence of income distributions in them, so leading to convergence of inequalities. Of course, such a hypothesis has the right to exist, but it in no way follows from the Solow-Swan model. In fact, only convergence of value added per worker follows from this model, and only under a very strong and unrealistic condition of homogeneity of economies (in which all model parameters, except for initial levels of value added per worker, are the same). Even under this condition, convergence of the distributions of this indicator seems a too bold extrapolation of the implication of the Solow-Swan model. If the economies are heterogeneous, then this model allows for any type dynamics; convergence or divergence or club convergence is equally possible. The method of detecting convergence in heterogeneous economies, the so-called 'conditional beta-convergence,' essentially consists in adjusting the growth rates for differences in economies. Then the result suggests that convergence *would* occur if the economies *were* identical (Glushchenko, 2012). At the same time, the Solow-Swan model is not the only model of economic growth. For instance, convergence of per capita outputs and, all the more, income distributions does not follow at all from models due to Romer (1986) and Azarias and Drazen (1990).

Secondly, it is not clear what policy implications follow from the presence or absence of convergence of regional inequalities. The goal of socio-economic policy with respect to income inequality may be reducing inequality of the country population and regional populations,[2] and not equalizing inequalities between regions. But maybe convergence of regional inequalities is a "side effect" of reducing inequality? It is this explanation that Polbin and Ivakhnenko (2022, p.

[1] Polbin and Ivakhnenko (2022) provide a thorough review of such studies.
[2] However, the target level of inequality is unclear. The question of what income inequality is acceptable remains debatable, although there are attempts to answer it, e.g., Venkatasubramanian et al. (2015), Maslikhina (2017), Saadat (2018), Khatun and Saadat (2022).

89) propose; however, they provide no confirmation of their hypothesis.

The aim of this paper is to analyze the ‘anatomy” of the convergence of regional income inequalities in Russia and, based on this, to find whether it should be viewed as a positive or negative phenomenon.

THE EVOLUTION OF INCOME INEQUALITIES IN THE RUSSIAN REGIONS

The Gini index serves as a measure of income inequality in Regions of Russia.[3] The same spatial sample of 77 regions as in Polbin and Ivakhnenko (2022) is considered for comparability. It does not include regions for which complete data are unavailable, namely, the Chechen Republic, the Jewish Autonomous Oblast, the Republic of Crimea, and Sevastopol, as well as all autonomous *okrugs* (including Chukotka). The period 1995–2020 covered in the above article is extended to 2022 in this paper.

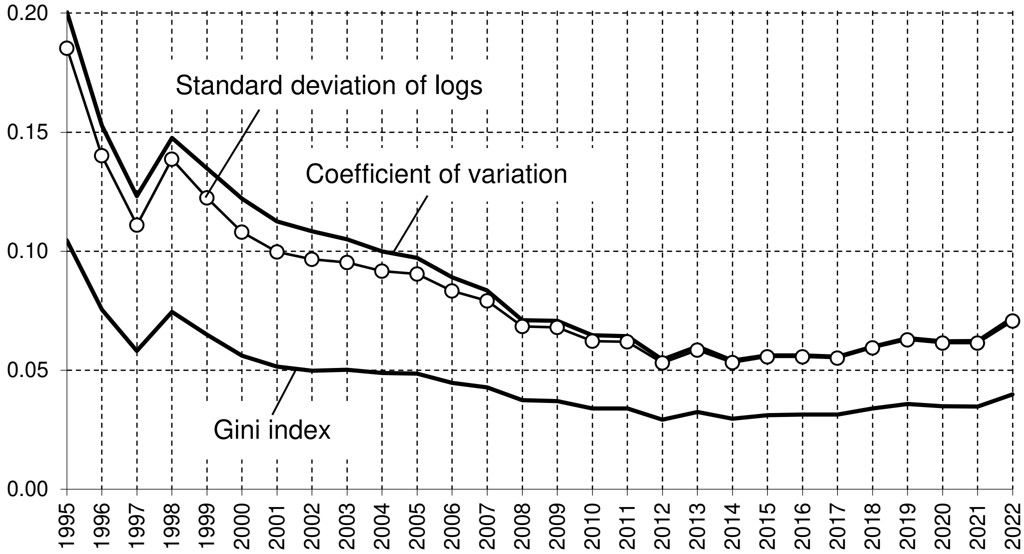

Fig. 1. Dispersion evolution of regional income inequalities

Fig. 1 shows the dispersion evolution of regional income inequalities. Three measures represent the dispersion: the Gini index, coefficient of variation, and standard deviation of the logarithms of regional Gini indices. The graph of the coefficient of variation up to 2020

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[3] The data source used is the Integrated Interagency Informational and Statistical System of Russia (EMISS), https://www.fedstat.ru/indicator/31165 (accessed May 16, 2023).
It should be noted that there are alternative sources of data that can be used to estimate regional inequalities in Russia. These are the results of household budget surveys by the Russian Statistical Agency (Rosstat) and the Russian Longitudinal Monitoring Survey by the Higher School of Economics (RLMS-HSE). These sources are based on interviews of respondents, and they do not cover include the extreme tails of the income distribution (the poorest and the richest). The data in the source used in this paper are based on official estimates that involve extensive information (obtained from firms, government organizations, banks, tax authorities, etc.), and therefore seem much more reliable.

coincides with that in Polbin and Ivakhnenko (2022, Fig. 1).

All dispersion measures in Fig. 1 give a qualitatively similar pattern. Moreover, the standard deviation of logarithms and the coefficient of variation differ insignificantly, practically coinciding in 2008-2022. The evolutions of other measures not shown in the figure – the Theil and Atkinson indices (with parameter 1) and logarithmic mean deviation – are also qualitatively similar. As Fig. 1 suggests, convergence of regional inequalities occurred until 2012. The 1998 crisis caused a deviation from this trend, but it was short-lived; as early as in 2000, the dispersion indicators became lower than in the pre-crisis 1997. Since 2013, a tendency towards divergence (albeit weak) has appeared.

Various measures of dispersion (inequality) of indicator *y* in *N* objects $\{i\}$, differing quantitatively, qualitatively give an adequate pattern of the dispersion evolution. Convergence is the process when objects approach each other, i.e. the average distance between them decreases. The coefficient of variation, Gini and Theil indices, etc. measure (each in its own way) the average distance between objects $\{i\}$ in *y*-space. In the Gini index, it is the average distance between pairs of objects related to the mean, $\bar{y}$: $G = \frac{1}{2N^2\bar{y}}\sum_{i=1}^{N}\sum_{j=1}^{N}|y_i - y_j|$. The coefficient of variation is an average of Euclidian distances between the objects and $\bar{y}$ with normalization by $\bar{y}$: $CV = \frac{1}{\bar{y}}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2/N}$. The variance is the square of the mean Euclidean distances of objects from $\bar{y}$. Thus, a decrease in the dipersion over time unambiguously indicates convergence.

However, many papers on inequality convergence – Bénabou (1996), Solarin et al. (2023), etc. – exploit he following regression for revealing convergence:

$$y_{it} - y_{i,t-\tau} = \alpha + \beta y_{i,t-\tau} + \varepsilon_i, \quad (1)$$

where the dependent variable is a change of the indicator under consideration over time τ, and the regressor is the initial value of the indicator (at $t-\tau$). Often variables are logarithms; then the dependent variable is the growth rate. A negative value of β is interpreted as evidence of convergence.[4] This misinterpretation goes back to the 19th century and is called Galton's fallacy. Applied to convergence in economics, this fallacy has been addressed in Hotelling (1933), Friedman (1992), Quah (1993), Wodon and Yitzhaki (2006), and some other papers.

The essence of the fallacy is as follows. The estimate of the coefficient in the univariate regression (1) is

[4] It is frequently called ‘beta-convergence,” although this term refers only to economic growth in the context of the Solow-Swan model. The general name applied to *y* of any nature is ‘regression toward the mean.’

$$\beta = \frac{\text{cov}(\mathbf{y}_t, \mathbf{y}_{t-\tau})}{\sigma^2(\mathbf{y}_{t-\tau})} - 1, \qquad (2)$$

where $\mathbf{y}_\theta = (y_{1\theta}, \ldots, y_{N\theta})$. Applying simple transformations, it can be represented as

$$\beta = \frac{1}{2}\left(\left(\frac{\sigma^2(\mathbf{y}_t)}{\sigma^2(\mathbf{y}_{t-\tau})} - 1\right) - \frac{\sigma^2(\mathbf{y}_t - \mathbf{y}_{t-\tau})}{\sigma^2(\mathbf{y}_{t-\tau})}\right). \qquad (3)$$

As Formula (3) suggests, if convergence occurs (the variance of y decreases over time, $\sigma^2(\mathbf{y}_t) < \sigma^2(\mathbf{y}_{t-\tau})$), then $\beta < 0$. If $\mathbf{y}_t$ and $\mathbf{y}_{t-\tau}$ are statistically independent, i.e. $\text{cov}(\mathbf{y}_t, \mathbf{y}_{t-\tau}) = 0$, then $\beta = -1$ according to Formula (2). In this case, hence, the estimation of regression (1) always leads to a false conclusion that there is convergence. Equally false conclusion will always be obtained if the dispersion of y does not change, $\sigma^2(\mathbf{y}_t) = \sigma^2(\mathbf{y}_{t-\tau})$. Common sense says that we should then expect $\beta = 0$. However, it follows from formula (3) that $\beta < 0$ in this case (except for $\mathbf{y}_t = \mathbf{y}_{t-\tau}$). Worse yet, it may turn out that $\beta < 0$ even in the case of divergence ($\sigma^2(\mathbf{y}_t) > \sigma^2(\mathbf{y}_{t-\tau})$), if $\sigma^2(\mathbf{y}_t) - \sigma^2(\mathbf{y}_{t-\tau}) < \sigma^2(\mathbf{y}_t - \mathbf{y}_{t-\tau})$.

Thus, if convergence takes place, $\sigma^2(\mathbf{y}_t) < \sigma^2(\mathbf{y}_{t-\tau})$, analyzing regression (1) provides no new information compared to the comparison of any dispersion measure at t and $t-\tau$. And in the case of divergence, $\sigma^2(\mathbf{y}_t) > \sigma^2(\mathbf{y}_{t-\tau})$, it may give a false conclusion about convergence. If the average distances between objects (no matter how they are measured) are increasing, i.e., they are generally moving away from each other, what convergence can we talk about? The same false conclusion will be obtained (and always) with invariant dispersion or statistical independence of $\mathbf{y}_t$ and $\mathbf{y}_{t-\tau}$. The use of panel data analysis – when t in regression (1) is not fixed, but takes values from some set $t_1, \ldots, t_m$ – does not save the situation; all of the above remains true in this case as well.

Note also that the values of some indicator of dispersion (or a graph, as in Fig. 1) for each point in time during the period under consideration provide much richer information about the evolution than the estimate of regression (1) based on data only at the initial and final points in time. The same is true for the panel version of regression (1). Even if it covers all possible points in time (with $\tau = 1$), a sole number – the estimate of β – will characterize the evolution of y. It is seen from Fig. 1 that if we take $t = 2020$ (or even 2022) and $t-\tau = 1995$, the estimate of β is obviously negative (since the dispersion of regional Gini indices in 2020 and 2022 is lower than in 1995). And if we interpret this as evidence of convergence, it turns out to be incorrect, as convergence has stopped since 2013.

An illustration of the above is the false conclusion about the presence of convergence in 2015–2020 in Polbin and Ivakhnenko (2022). Table 1 reports estimates of regressions of regional Gini indices of the form (1) for $t = 2020$ and $t-\tau = 2015$ under different representation of the dependent variable as well as variance appearing in formula (3). $G_{i\theta}$ stands for the Gini index in region i in year θ.

Table 1

Estimates of regression (1) for t = 2020 and τ = 5 as well as variances of the data

Данные	Объясняемая переменная	β	$\sigma^2(\mathbf{y}_{2015})$	$\sigma^2(\mathbf{y}_{2020})$	$\sigma^2(\mathbf{y}_{2020}) - \sigma^2(\mathbf{y}_{2015})$	$\sigma^2(\mathbf{y}_{2020} - \mathbf{y}_{2015})$
$y_{i\theta} = G_{i\theta}$	$G_{i,2020} - G_{i,2015}$	–0,160** (0,075)	0,000447	0,000502	0,000056	0,000199
$y_{i\theta} = \ln(G_{i\theta})$	$\ln(G_{i,2020}/G_{i,2015})$	–0,131* (0,078)	0,003052	0,003720	0,000688	0,001466
$y_{i\theta} = \ln(G_{i\theta})$	$\ln(G_{i,2020}/G_{i,2015})/5$	–0,026* (0,015)	0,003052	0,003720	0,000688	0,001466

Note: standard errors are in parentheses; * means significance at the 10% level, ** means significance at the 5% level.

As can be seen from Table 1, β is negative in all three regressions, which supposedly indicates convergence. However, the variances in 2020 increased as compared to 2015, indicating that divergence actually occurred. Other measures of dispersion depicted in Fig. 1 provide similar evidence: CV_{2015} = 0,056, CV_{2020} = 0,062; G_{2015} = 0,031, G_{2020} = 0,035; $\sigma(\ln(\mathbf{y}_{2015}))$ = 0,056, $\sigma(\ln(\mathbf{y}_{2020}))$ = 0,061. And the reason for negative value of β is that $\sigma^2(\mathbf{y}_{2020}) - \sigma^2(\mathbf{y}_{2015}) < \sigma^2(\mathbf{y}_{2020} - \mathbf{y}_{2015})$. This, as follows from formula (3), is what leads to $\beta < 0$, despite the clear presence of divergence. The variances in the last and penultimate rows of Table 1 coincide. The difference is that the dependent variable in the last row is represented as the average annual rate of change: $\frac{1}{\tau}\ln(\frac{G_{it}}{G_{i,t-\tau}})$. This only reduces the regression coefficient in formula (3) by a factor of τ ($\beta' = \beta/\tau$), everything else remains intact. The data in the last row of Table 1 fully correspond to the regression for 2015–2020 in Polbin and Ivakhnenko (2022, Table 6).

If we estimate regression $\ln(G_{i,2015}/G_{i,2020})/5 = \alpha + \beta\ln(G_{i,2020}) + \varepsilon_i$, swapping the initial and final years, we get β = –0,057 with significance at the 1% level. Thus, it turns out that 'convergence' occurs both forward and backward in time, which contradicts not only the essence of the convergence concept, but also common sense.

'ANATOMY' OF THE EVOLUTION OF REGIONAL INCOME INEQUALITIES

Let us now consider what changes in the distribution of regional Gini indices accompanied their convergence and subsequent divergence. Fig. 2 shows the evolution of some statistics of this distribution.

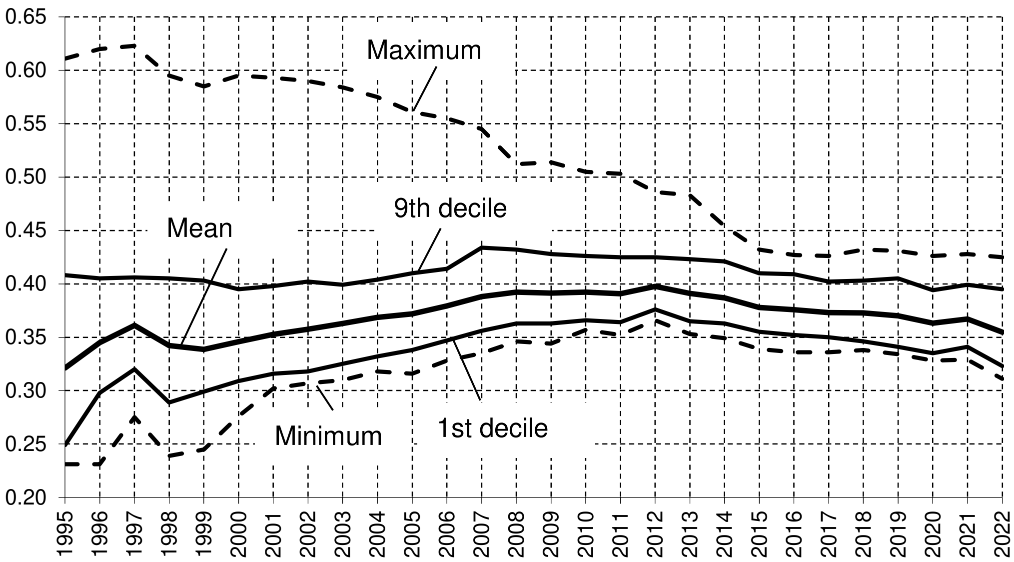

Fig. 2. Statistics of the distribution of regional Gini indices

The spread of distribution (the ratio of the maximum Gini index to the minimum) for a long time, up to 2018, steadily decreased: it was 2.1 times smaller in 2017 than in 1995 and 1996 (decreased from 2.65–2.68 to 1.27). In 1965-2015, the maximum income inequality was peculiar to Moscow. However, it rapidly decreased; and since 2016, the Tyumen Oblast replaced Moscow.[5] The regions with the minimum Gini index were constantly changing, because in the area of relatively low inequality there were many regions with very close Gini indices. In total, 12 regions played this role (interestingly, almost all of them were from the European part of Russia, only once the Altai Republic had the lowest inequality). Most often, 6 times, the lowest inequality was in the Republic of Ingushetia and the Tver Oblast, and 4 times in the Leningrad and Ivanovo *oblasts*. A characteristic feature is the steady (except for 1997) increase of the minimum level of inequality up to and including 2012. Thus, if we consider the extreme points of the distribution of regional Gini indices, in the course of convergence in 1995–2012, it narrowed both by decreasing the maximum value and by increasing the minimum value. Divergence of regional income inequalities in 2013–2022 was accompanied by a change of trends. The maximum inequality continued to decline for some time; and then – since 2016 – it practically stabilized. The minimum level of inequality decreased in 2013–2022.

Certainly, consideration of the extreme points of the distribution is not too informative. The behavior of the lower and upper deciles gives more insight into the dynamics of the

[5] The contribution of Moscow to the dispersion of inequalities was greatest in 2002: it gave 47% of the square of the coefficient of variation. In 2016–2022, this figure was only 5–7%.

distribution. Changes in the lower decile are qualitatively similar to the evolution of the minimum level of inequality (since, as noted, in the area of low inequality the observations are located rather densely). However, the evolution of the upper, 9th decile, differs significantly from the evolution of the maximum of the Gini index. It is relatively stable in 1995–2004; then it increases until 2007, after which it decreases, but very insignificantly, in 2008–2012. Hence, we can assume that convergence of inequalities was mainly due to the growth of income inequality in regions where it was low, while inequality in regions with a high inequality was approximately constant and even growing. In the transition to divergence from 2013, inequality began to decline in both tails of the distribution (with high and low Gini indices).

In general, the convergence of regional income inequalities was accompanied by an increase in average regional inequality. The mean of regional Gini indices during 1995–2012 increased by a quarter, from 0.321 to 0.398. The median (not shown in Fig. 2) increased from 0.309 to 0.392 (i.e., half of the regions had the Gini index above 0.3 in 1995; in 2012, they had it above 0.4). Inequality of the whole population of the country was also growing. The Gini index in Russia increased from 0.387 to 0.420 over this period. Since 2013, when convergence was replaced by divergence, the mean of regional Gini indices began to decrease; in 2022, it was 0.355 (returning to the level of 2001). Inequality of the whole population was also decreasing: the Gini index for Russia in 2022 fell to 0.396 (the level of 2006).

Thus, we can conclude that the convergence of regional income inequalities was mainly due to approaching regions with low inequalities to regions with high inequalities. To get a more detailed idea of this process, let гs consider how the distribution of regional Gini indices itself has been changing. The distribution is represented by a histogram in which the entire range of observed values of the regional Gini indices (0.225–0.625) is divided into 16 intervals with a width of 0.025. Fig. 3 shows the distribution in some years of convergence.

In 1995, the most part of regions had the Gini index in the range of 0.225–0.450 (nine histogram intervals) and there were two outliers: the Republic of Tuva where the Gini index was 0.501 and Moscow where it was 0.611. The largest number of regions (23.4%) was concentrated in the range of 0.301–0.325. However, as early as in 2000, the pattern changes significantly. There are no more regions with the lowest Gini indices, in the range of 0.225–0.275, do not remain; hence, a significant part of convergence in the period 1995–2000 is due to the rise in inequality in regions where it was low. In 2000, the most part of regions had the Gini index in the range of 0.276–0.300 (six intervals). The Tyumen Oblast left them behind because of increased inequality there, becoming another outlier along with Moscow. The highest concentration of regions (36.4%) is observed in the interval 0.326–0.350. It includes the

Republic of Tuva as well, where the Gini index has fallen sharply to 0.333.

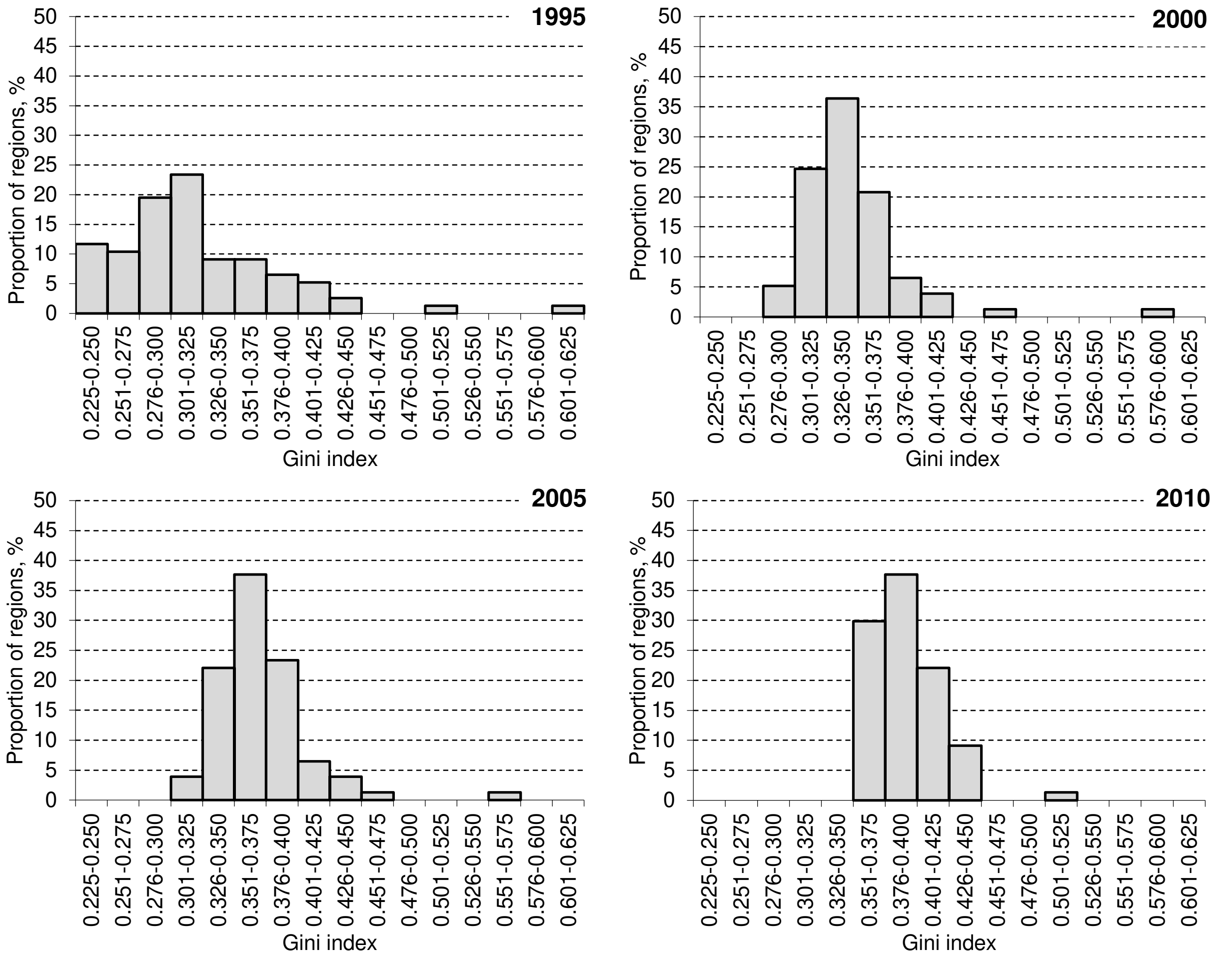

Fig. 3. Evolution of the distribution of regional Gini indices during convergence

So still, part of convergence is partly due to the decrease of inequality: a small part of regions (including Moscow) moved towards lower Gini indices. Subsequently, the process of ‘shrinkage’ of the distribution towards higher values of the Gini index continued. In 2005, no more regions remained with the Gini index less than 0.300; 37.7% of regions were concentrated in the interval 0.351–0.375. In 2010, almost all the regions fit into the range of 0.351–0.450, occupying four intervals of the histogram, except Moscow with the Gini index of 0.505. The maximum number of regions (37.7%) falls into the interval 0.376–0.400.

The ‘apotheosis’ of convergence of regional income inequalities occurred in 2012. Fig. 4 shows the distribution of regional Gini indices for this last year of convergence and for a few years of subsequent divergence. In 2012, the range of regional Gini indices narrowed to 0.351–0.475 (with Moscow merging with the main body of the distribution). Half of the regions

(50.6%) concentrated in the interval of 0.376–0.400, whereas in 2000 only in 10 regions (13%) the Gini index exceeded 0.375.

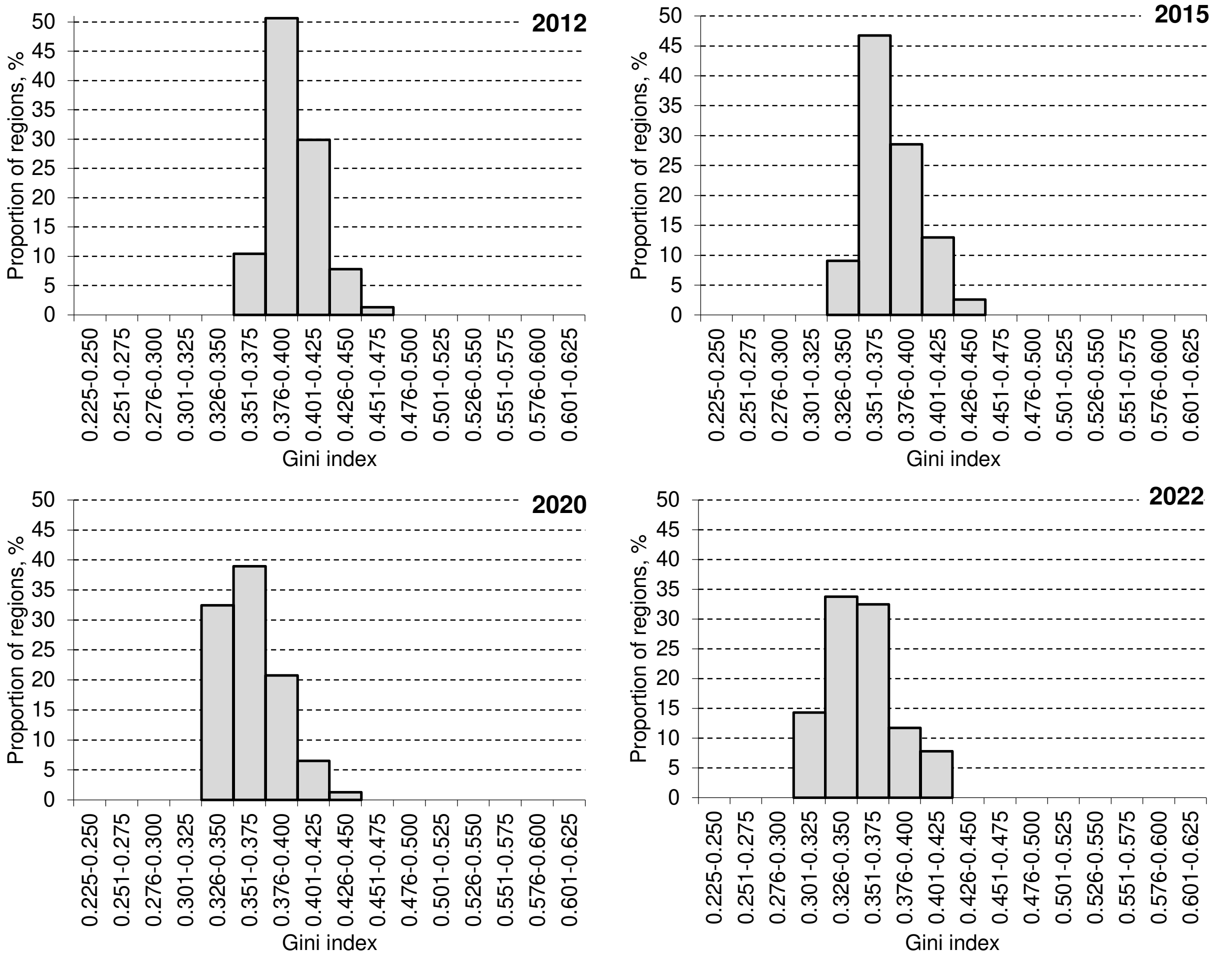

Fig. 4. From convergence to divergence: distribution of regional Gini indices

During the divergence of regional inequalities in 2013–2022, the 'width' of the Gini index distribution (represented by the histogram) did not change: the distribution included five intervals, as in 2012. However, the whole range of Gini indices shifted leftward, towards lower values, and the regions moved to intervals with a lower Gini index within this range. In 2015, the changes in the shape of the distribution compared to 2012 were minor. However, it shifted one interval to the left into the range 0.326–0.450; 46.8% of regions are now concentrated in the interval 0.371–0.375. In 2020, the range of Gini indices remained the same as in 2015, but the inequality decreased in a considerable number of regions. As the histogram suggests, the share of regions in the intervals with relatively high Gini indices decreased markedly as compared to 2015 due to a significant increase in the share of regions in the minimum interval, 0.326–0.350

(from 9.1% to 32.5%). In 2022, the range of Gini indices shifted to the left by one interval, becoming 0.301–0.425. The maximum number of regions (33.8%) concentrated in interval 0.326–0.350.

Both the growth of income inequalities in the regions during the period of convergence and the decrease during the period of divergence were a mass phenomenon. In 2012, inequality increased as compared to 2000 in 75 regions out of 77; the Gini index decreased only in Moscow (from 0.595 to 0.486) and the Tyumen Oblast (from 0.455 to 0.447). In 2022 as compared to 2012, the Gini index increased only in the Republic of Ingushetia (and even then only slightly, from 0.397 to 0.404).

An analysis of the reasons for the considered evolution of regional income inequalities is beyond the scope of this paper. This is a subject of a specific research, which requires, at least, studying the dynamics of income distributions in the regions. Nevertheless, some general considerations are possible. One of explanations may be the Kuznets hypothesis. According to this hypothesis, as per capita income increases, inequality grows, and after reaching a certain income level, it starts to decrease. Glazyrina and Klevakina (2013) find some confirmation of the Kuznets hypothesis for Russian regions (however, they consider gross regional products, GRP, per capita rather than population income. Regression analysis suggests that in 2000–2011 the growth of per capita GRP increased inequalities in almost all regions except Moscow and the Khanty-Mansi Autonomous Okrug, where the dependence was reversed, possibly indicating that they are already on the downward branch of the Kuznets curve.

However, the dynamics of regional income inequalities discussed above raise doubts about the Kuznets hypothesis. Of course, we can assume that the rise in inequality in 1995–2012 is consistent with it. However, it is impossible to agree with that per capita incomes (in almost all regions!) have reached in 2013–2022 values corresponding to the downward branch of the Kuznets curve (where inequality is decreasing).

In 1995–2012, both nominal and real personal incomes per capita mainly grew (with some short-term deviations from this trend). The reason for increasing inequality may be guessed to be an uneven allocation of the results of income growth. Namely, an increase of the average income in a region usually (although not always) results in much less shortening of the left tail of income distribution (the area of low incomes), i.e., the distribution 'stretches.' In other words, most of the income gains go to higher-income groups and less to lower-income groups. The correlation between regional inequalities and per capita incomes is positive and rather strong: the correlation coefficient between them on average for 1995–2022 is 0.688, ranging from 0.552 (1995) to 0.814 (2007).

An interesting case is that of Moscow is. In 1995–1999, personal income per capita there grew faster than the national average. In 1995, it was 3.32 times higher than the Russian average in 1995 and 3.62 times higher in 1999. However, the growth of inequality in Moscow changed in 1998–1999 to its decreasing, which, most likely, is due to the fall in incomes of the high-income groups of the city's population because of the financial crisis that occurred at that time. Since 2000, the growth of per capita income in Moscow has almost constantly lagged behind the growth of per capita income in Russia as a whole. As a result, it exceeded the Russian average by 'only' 2.11 times in 2012 (the average for 2013–2022 is 2.1 times).[6] Most likely, this is due to the processes in the Moscow labor market. A wide choice of jobs in the megacity and high wages attracted a significant number of migrants to Moscow, both internal and from neighboring countries. The increase in labor supply with a very slow increase in demand slowed down the growth of wages and somewhat equalized the distribution of incomes, which was apparently the reason for the decrease in income inequality in Moscow.

As for 2013–2022, it is a period of sluggish crisis. Although nominal incomes grew during this period, real incomes decreased from time to time. As a result, in 2022 they were exactly the same as in 2012.[7] However, it is not clear how this caused a decrease in income inequality in the Russian regions.

CONCLUSION

The convergence of regional income inequalities by itself cannot say anything about the success or failure of the socio-economic policy in the country or economic processes taking place independently of it. This phenomenon can be both positive, when regional inequalities converge to low values, and negative, when they converge to high values.

In Russia, the latter has just happened. The analysis in this paper suggests that the convergence of regional income inequalities in 1995–2012 is almost exclusively due to the 'approaching' of regions with relatively low inequality with regions with high inequality. On the contrary, the divergence of regional inequalities in 2013–2022 was accompanied by decreasing regional income inequalities, improving the situation with spatial inequality in Russia.

[6] Computed using data drawn from EMISS, https://fedstat.ru/indicator/30992 (accessed May 23, 2023).
[7] Computed from Rosstat (2020), p. 232, and https://rosstat.gov.ru/storage/mediabank/urov_11subg-nm.xlsx (accessed May 23, 2023).

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