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Differentiation of Russian Region In Terms of the Agricultural Production

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Abstract: The present article examines the regional inequality of agricultural production. The author gives his assessment to the degree of differentiation of the agricultural production in Russian Federation regions. The author has performed the analysis of decomposition of the regional inequality in the agricultural production. The received results indicate the re-enforcement of inequality of the agricultural goods production, including the separate categories of agricultural producers.

Key words: Decomposition of inequality · Differentiation · Agricultural products · Regions

INTRODUCTION

The process of changes in the already existing structure of agricultural production began as a result of the market transformations in Russia due to fact that the criteria of effectiveness of production concentration and location has significantly differed from the accepted ones in the market economy [1]. The process of the trade liberalization has taken up the matter with agrarians on increase in competitiveness of products they produce which requires the involvement of new resources, development of modern production techniques, creation of new interfarm connections, approaching the new markets for the goods, etc. These have lead to the changes in the space structure of agricultural production, redistribution of resources between the regions of the Russian Federation and change in production specialization of territories.

The support of optimal proportions between the regions of the Russian Federation is the complicated macroeconomical object in both industrial and developing economies. The Russian Federation unites the subjects which differ by the size of territory, number and density of population, natural resources reserve, natural-climatic conditions, national, cultural and historical peculiar properties. All these affect the structure and efficiency of national economy, institutional transformations in it and socio-economical policy of the state.

In the Soviet Union the equalization of economical differences of the regions was the centrepiece of the state policy. Its tools included the central funding of the regions, governmental grants, subsidies, target prices, etc. However, the differences between the regions on the most important socio-economical indicators were considerable.

RESULTS

The differentiation of the regions on the level of their socio-economical development appeared as a result of the market transformations and was exerted even stronger than during the planned economy. This can be explained by their different adaptation to the market which has different economical structure, as well as by the decrease in the regulatory role of the state (which is most significant) reflected in the reduction of the state financial policy and factual inequality of the subjects of the Russian Federation in relationship with the Center.

In our opinion, the Theil index will representatively reflect the differentiation due to fact that, first of all, it is equally sensitive to the value changes on whole distribution scale; secondly, it complies with the requirements to the “good” inequality indicators [2, 3]; and thirdly, it can be divided into components and groups of units in the aggregate.

The Theil index has got its name from Henry Theil who in 1967 has suggested the concept of entropic measures of inequality:

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Table 1: The Theil index weight of agricultural goods production on regions of the Russian Federation in 2000-2010

Nature of household	Agricultural production	Including	
		Crop production	Animal industry
2000			
All nature of household	0.3210	0.3791	0.2825
Agricultural organizations	0.4636	0.6062	0.3994
Citizen's holding	0.2427	0.2636	0.2924
Peasant (farm) holding	0.6526	0.8323	0.4744
2010			
All nature of household	0.3638	0.4765	0.3353
Agricultural organizations	0.5337	0.8246	0.5047
Citizen's holding	0.3163	0.3090	0.4182
Peasant (farm) holding	0.6849	0.9317	0.5129

Note: calculated according to the Rosstat data (www.gks.ru).

$$E_1 = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)\log\left(\frac{y_i}{\bar{y}}\right),$$

where n means a number of units in the aggregate (regions),

y_i is the i value,

$\bar{y}$ is the average quantity of the studied indicator.

To indentify the differentiation of the Russian regions on the level of agricultural goods production we have used the official data of the Rosstat on 77 regions for 2000-2010. The analysis did not include Moscow and St. Petersburg due to the lack of the agricultural production in these cities and the Chechen Republic due to the lack of data for some years. The autonomous districts were included into the subjects the component parts of which they are.

The calculated Theil index weight of agricultural goods production on regions of the Russian Federation is given below in Table 1.

The highest level of differentiation of agricultural products (as, by the way, crop production and animal industry products and goods) on natures of households during the whole studied period is observed in the peasant (farm) holding, while the lowest one – in the citizen's holdings; the agricultural organizations occupy the intermediate level of differentiation. In this regard the differentiation of the citizen's holding products is growing faster compared with the differentiation of products of other agricultural categories, as if "drawing upon" their level.

The level of the products differentiation in the citizen's holdings in 2010 has increased by 30.3% compared with 2000; in the agricultural organizations it has increased by 15.1%, while in the peasant (farm) holdings – only by 4.9%. And if in 2000 the level of the products differentiation in the citizen's holdings was 37.2% from the level of differentiation in the peasant (farm) holdings, then in 2010 it was already 46.2%. In the agricultural organization this correlation was 71.0% and 77.9% respectively. Thus, we can clearly see the step-by-step rapprochement of the levels of agricultural products differentiation on the nature of holdings.

In general, in the crop production we can clearly observe the higher level of the products differentiation than in the animal industry and this disruption continues to increase: in 2010 the correlation of the levels of the products differentiation in the crop production and animal industry was 1.421 versus 1.342 in 2000.

If in the agricultural organizations and peasant (farm) holdings the products differentiation in the crop production is higher than in the animal industry, then in the citizen's holdings we observe the opposite situation which can be explained by the significantly lower mechanization of the crop production in the citizen's holdings.

The received results indicate the increase in the regional inequality of agricultural production, including the inequality on separate categories of agricultural producers. In and on itself the regional volume of production significantly depends on the number of fields involved into the agriculture and, finally, on the number of population of the subject of the Russian Federation. It's quite complicated, for example, to compare the agricultural production in the Krasnodar Territory with the population above 5.1 million people and in the Republic of Mordovia with the population of a little bit more than 830 thousand people. However, at more deep analysis it turns out that these subjects produce approximately the same volume of agricultural products per capita. Let's define how much the transformation to the indicator of agricultural production per citizen of the region will change the complete picture of inequality?

The assessment of inequality will also be performed on the basis of the Theil index. During the calculation the Theil index weighed by the number of population of the regions. This is quite explained for our country as the number of population in the regions of the Russian Federation sometimes differs tens and even hundred times.

The results of the calculations are given below in Table 2.

For the better comparison we performed our calculations with the use of the current prices and the prices for 2000. The analysis in the current prices allowed

Table 2: The Theil index weight of agricultural goods production per citizen in the Russian Federation regions in 2000-2010

Nature of household	2000	2002	2004	2006	2008	2010
In the current prices						
All nature of household	0.0695	0.0714	0.0860	0.0847	0.1126	0.1041
Agricultural organizations	0.1346	0.1361	0.1562	0.1675	0.2064	0.2271
Citizen's holding	0.0608	0.0706	0.0768	0.0800	0.0964	0.0967
Peasant (farm) holding	0.3715	0.4157	0.4692	0.4305	0.4195	0.4779
In prices for 2000						
All nature of household	0.0695	0.0858	0.0896	0.1111	0.1392	0.1441
Agricultural organizations	0.1346	0.1572	0.1519	0.1930	0.2410	0.2785
Citizen's holding	0.0608	0.0768	0.0921	0.1016	0.1336	0.1380
Peasant (farm) holding	0.3715	0.4549	0.4198	0.4559	0.3517	0.4358

Note: calculated according to the Rosstat data (www.gks.ru).

us to define the considerable differences between the regions, their long-term tendency and to estimate the impact of various factors onto the dynamics of differentiation. Another argument in favour of the nominal indicators is the fact that in nominal prices the level of differentiation can be estimated as for the current moment; the use of fixed prices decreases it. In this regard the preference will be given to the analysis of indicators in current prices. From another hand, the estimation of differentiation in the fixed prices and at their corrected level is not meaningless, as it allows us to analyze the structural changes in economy and their impact onto the regional differentiation.

During the examined period the increase in the Theil index of the agricultural products took place in both, in current and in fixed prices. The increase in the inequality was also observed on main agricultural producers – the agricultural organizations and citizen's holdings. The inequality of agricultural production per citizen of the peasant (farm) holding has increased in general. However, for the peasant (farm) holdings the 2004 was the year of change of inequality increase onto its decrease and in 2010 the soar of the Theil index was fixed. The greater growth of inequality in the current prices was observed in the agricultural organizations – on 68.7%; in citizen's holdings the inequality has increased by 59.0%, while in the peasant (farm) holdings – by 28.6%.

The comparison of the achieved results with the conclusions made on the basis of Table 1 concerning the differentiation of agricultural production in regions has shown us that the transformation to the capita level of agricultural goods production has significantly decreased the regional inequality. However, the differentiation of agricultural products per citizen was growing at fast paces. If the differentiation of agricultural products of the regions has increased by 13.3% in 2001-2010, then the growth per citizen of the region was about 49.8%. The relative rates of the Theil index outdistancing in the current prices for 2001-2010 are the following:

- All nature of household – 132.2%
- Agricultural organizations – 146.6%;
- Citizen's holding – 122.1%;
- Peasant (farm) holding – 122.6%.

The disputes about the key features and characteristics of dispatching analysis include the separability of inequality as one of the main features which can be examined under the desktop-oriented approach to the allocation of the studied indicator of, for example, agricultural production. The separability is required not only in virtue of arithmetical reasons, but also in virtue of analytical reasons.

The implementation of decomposing method will help us to estimate the contribution of various components of agricultural production, regions (for example, inside and between the federal districts, or between agrarian and industrial regions) into the total inequality of agricultural production. The decomposing of inequality measures can help us to understand the structure of the inequality and to indentify its key reasons.

According to the method of inequality indicators decomposing suggested by Shorrocks A. [4, 5], the Theil index can be represented as:

$$E_1 = \sum_{k=1}^{K} \frac{1}{n\bar{y}} \sum_{i=1}^{n} \log\left(\frac{y_i}{\bar{y}}\right) y_i^k,$$

the proportional contribution of the resource of the k components of agricultural production can be represented as follows:

$$S_k(\%) = \frac{\sum_{i=1}^{n} y_i^k \log\left(\frac{y_i}{\bar{y}}\right)}{\sum_{i=1}^{n} y_i \log\left(\frac{y_i}{\bar{y}}\right)},$$

Table 3: The decomposition of the Theil index of agricultural goods production per citizen on regions of the Russian Federation for 2000-2010

	Theil index	Share in the total production	Absolute contribution into inequality	Relative contribution into inequality	Elasticity
2000					
Agricultural production:	0.0697	–	–	–	–
Agricultural organizations	0.1034	0.4521	0.0467	0.6704	0.2183
Citizen's holding	0.0386	0.5161	0.0199	0.2856	-0.2305
Peasant (farm) holding	0.0964	0.0318	0.0031	0.0440	0.0122
2010					
Agricultural production:	0.1041	–	–	–	–
Agricultural organizations	0.1534	0.4396	0.0674	0.6481	0.0217
Citizen's holding	0.0478	0.4926	0.0236	0.2264	-0.0277
Peasant (farm) holding	0.1926	0.0678	0.0131	0.1255	0.0060

Note: calculated according to the Rosstat data (www.gks.ru).

Table 4: The estimation of linear regression parameters on nature of household

Nature of household	Constant	Regression coefficient	R^2
Agricultural organizations	-0.097	1.580 (0.017)	0.584
Citizen's holding	-0.503	1.570 (0.000)	0.951
Peasant (farm) holding	-0.016	2.285 (0.000)	0.927

Note: Dependent variable means the relative contribution into inequality of various agricultural producers; independent variable means the share of agricultural producers in the agriculture production per citizen.
The significance values of parameters estimation are given in gaps.

where y_i^k means the k-component (k = 1,...,K) of agricultural production of the i region (i = 1,...,n).

The results of decomposing of the Theil index of agricultural production per citizen are given below in Table 3.

The Table 3 includes the results of analysis only for 2000 and 2010, though the decomposing was performed for each year of the studied period. The greater contribution into the regional inequality of agricultural production per capita for the studied period was made by the agricultural organizations – 56.4-67.9%. The contribution of the citizen's holdings vacillates from 18.6% to 35.6%, while the contribution of the peasant (farm) holdings vacillates from 4.4% to 16.5% and increases permanently. The growth of goods production in the agricultural organizations and peasant (farm) holdings per citizen leads to the Theil index increase which the positive values of elasticity coefficient point onto. The growth of the agricultural production in the citizen's holdings has a quite opposite character aimed at the inequality decrease. Despite the variances on different years the impact of goods production in the agricultural organizations has decreased, while in citizen's holdings and in the peasant (farm) holdings it has increased and notably the greater increase took place in the peasant (farm) holdings.

The preliminary analysis of data provided above in Table 3 allows us to develop a hypothesis concerning the growth of the relative contributions of holdings into the total inequality of agricultural production per capita. To examine this hypothesis we have calculated the coefficients of correlation between the relative contribution into the inequality on nature of holdings and their shares in the agricultural goods production per capita. All coefficients of correlation are valuable at the 5% level and are equal to:

- For agricultural organizations 0.76;
- For citizen's holding 0.98;
- For peasant (farm) holding 0.96.

Thus, the examined hypothesis was proved: we observe a strong direct connection between the share of products of various agricultural producers and their contribution into the total inequality. Let's make a quantitative assessment of the given interrelation. To do this we shall build a regression equation of dependence of the relative contribution into the inequality (Theil index) from the share of agricultural producers in the agricultural production per citizen taking into account the separate categories. The results of estimation of equation in the linear form are given below in Table 4.

The data given above in table 4 certify that the increase by 1 percentage point of specific weight of agricultural organizations in the agricultural production per citizen leads to their contribution increase in the total inequality by 1.58 percentage point, the citizen's holding – by 1.57 percentage point and the peasant (farm) holding – by 2.285 percentage point.

CONCLUSIONS

The results of the performed analysis of the agricultural production differentiation applicable for the Russian regions gave the following results.

Firstly, the dissimilarity of the Russian regions was growing within the time not only on the agricultural production indicator on region in general, but also on the agricultural production indicator per citizen. Notably, the capita inequality of agricultural production increases much quicker.

Secondly, the comparison of the Theil index calculated in the current and fixed prices has shown the bigger growth of inequality in prices for 2000 which can indicate the equalization of the regional differences at the price level.

Thirdly, the performed analysis of the Theil index decomposing allowed us to define the contribution of various agricultural producers into the total inequality of agricultural production per citizen.

Fourthly, we have detached the direct connection between the shares of products of various categories of agricultural producers and their contribution into the inequality of agricultural production per citizen.

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