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Regional Supply Chain Structure and Centralization of the Economy of Russia

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Abstract- **This paper deals with the influence of the regional supply chain structure of the Russian economy on its evolution towards a market or plan. This influence is analyzed with the help of a two-sector model of the economic system. The logic of the two-sector model presupposes dividing the economy into resource-abundant and resource-insufficient sectors. The movement of the economy towards the market or towards the plan is determined by the proportion between these sectors. If we take the resource-abundant sector as a given, then the growth of the resource-insufficient causes the downturn of market institutions and the actualization of the plan institutions. Using the empirical material, the paper explores such elements of the resource-insufficient sector of Russia's regions as the presence of unprofitable enterprises, the production of social benefits, innovations, armament and investments. It is revealed that the actual distribution of these elements of the resource-insufficient sector by regions of Russia provides structural conditions for the functioning of the Russian economy in the market mode. However, if we consider the selected elements of the resource-insufficient sector not in fact, but in relation to a certain social norm, Russia, in the regional context, features a sharp gap and dispersion in innovation and production of social benefits. If these elements of the regional supply chain structure are brought into line with the norm, then taking into account the specific Russian infrastructure and the capital intensity factor, this will lead to a sharp increase in investments, and consequently a resource-insufficient sector. The growth of the resource-insufficient sector will, in accordance with the theoretical logic of the two-sector model, activate the plan institutes. Given that the Russian economy is the largest in the EEU, this will entail either the drift of the economy of the EEU towards the plan, or activate the processes of disintegration.**

Keywords: *two-sector model, structure, resource-abundant sector, resource-insufficient sector, innovation, investments, supply chain.*

1. Introduction

In 2014 we published a paper "Structure and Institutions: a Regional Perspective of Interaction in the Economic System" [1]. In the past period of time, firstly, the scientific provisions presented in this paper have been further developed and we would like to bring these new provisions to the judgment of the scientific community. Secondly, the ideas outlined in 2014 had a predominantly speculative character, the proposed paper attempts to confirm theoretical provisions with specific statistical data.
Both are based on a two-sector model of the economic system. Therefore, formally, it would be possible not to describe the two-sector model in this text, but simply refer to the previous publication, as well as to sources where it is presented more fully [2]. However, it is unlikely that the reader will look for relevant literature, and without even a brief description of the two-sector model, all the further presentation will be useless. Therefore, we consider it expedient to repeat this brief description again, trying to make it even shorter.

2. Theoretical model

We proceed from that the economy as a system in its initial, simplest definition is the process of production and

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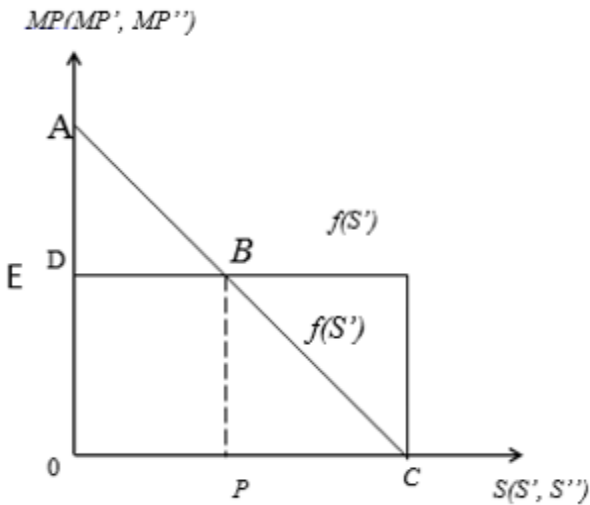consumption of the product. We shall figure production and consumption of the product through Fig. 1.

Fig. 1. The economic system as a single process of production and consumption.

Fig. 1 shows on the abscissa axis the abstract economic subjects (S) serving simultaneously as subjects of consumption (S') and subjects of production (S''). The ordinate shows the marginal products of consumption of these subjects (MP') and the marginal products of their production (MP''). Accordingly, the line DE in Fig. 1 is the consumption function of the specified subjects $MP'= f(S')$, and the whole product consumed by the system is equal to the area of the rectangle ODEC. The line AC is a function of the production of economic subjects $MP''=f(S'')$. The total product produced by the system is equal to the area of the triangle OAC. In Fig. 1 is formed by two sectors. The first sector is a resource-abundant. Here, the value of the produced product (OABP) exceeds the value of the consumed (ODBP). As a result, there is an excess of resources in the amount of DAB. The second sector is resource-insufficient. In this sector, the resource cost (PBEC) is greater than the value of the product produced (PBC) by the amount (BEC). Within the resource-abundant sector, effective subjects operate whose sum of the result is greater than the sum of the costs. Resource-insufficient sector is formed by: a) unfinished business facilities; b) unprofitable, but necessary for the system enterprises, due to the absence of substitutes or the need to maintain economic and social security; c) social and subsidized cultural sphere; d) production of excess luxury goods; and e) production of pioneer products. Produced and consumed products are objectively divided into basic and pioneer. Basic products are life-support products with high productivity. The combination of these two qualities

leads to the fact that the production of these products is characterized by high results and low costs. That is, the resource-abundant sector (Fig. 1) produces these basic products. Pioneer products: a) do not enter into the set of necessary life support, b) due to novelty, their productivity is low. The combination of these qualities leads to the fact that the production of the pioneer products results in lower costs. Therefore, the subjects that produce pioneer products are located in the resource-insufficient sector, forming its core. A pioneer product is a concept that is broader than an innovative one. The innovative product is understood to be pioneer products, first mastered by mankind. The product, first developed by a backward community, but already mastered by other communities, is a pioneer, but not innovative. Let us return to Fig.1. The model shows that a resource-insufficient sector cannot exist without a resource-abundant one. Lack of resources in the resource-insufficient sector (BEC) can be replenished only by the resources of the resource-abundant sector (DAB). The question arises, which economic mechanism will move excess resources into the resource-insufficient sector of the economy?

We shall consider Fig.2. The main difference between Fig. 2 and Fig. 1 is that Fig. 2 shows the model of the economy in which the resource-insufficient sector relative to the resource-abundant sector is small. Can the subjects of the resource-insufficient sector sell their products to the resource-abundant sector subjects and exist using the money obtained with this supply chain structure of the economy? A normal private owner needs a return on the invested capital that would stimulate its activity. Let's assume that in Fig. 2 the rectangle ($OD_1E_1Q_1$) is not just the resources consumed by the system, but the invested capital, which is worn out for one cycle of reproduction; rectangle ($OF_1K_1Q_1$) is revenue from the sale of all products. Then, the rectangle ($D_1F_1K_1E_1$) is the profit received by all economic subjects, and the share of profit attributable to each subject stimulates its entrepreneurial activity.

We see that in Fig. 2, the line (A_1C_1), reflecting the value of products in production, and the line (F_1K_1), reflecting the sale of the same products at market prices, diverged. This happened because some of the participants in the resource-abundant sector sold their products at underpriced prices (segment $F_1 Y_1$), some of the resource-abundant sector actors and all subjects of the resource-insufficient sector sold products at inflated prices (segment Y_1K_1). As a result, excess resources in the amount of ($F_1A_1Y_1$) have moved to the resource-insufficient sector and to those resource-insufficient segments of the resource-abundant sector, which still lack resources ($Y_1K_1C_1 = F_1A_1Y_1$).
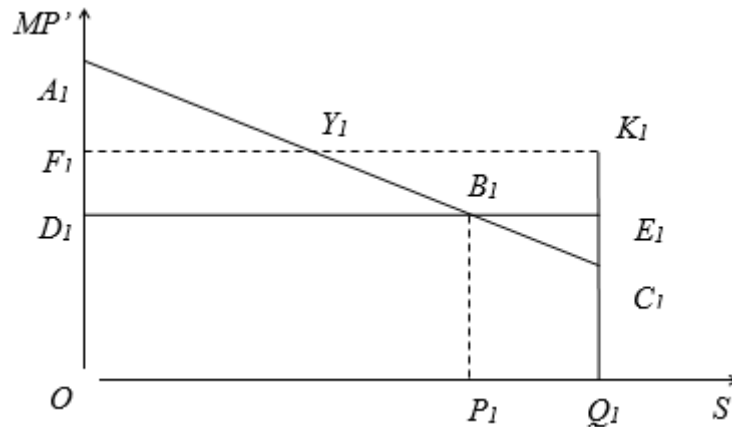
Fig. 2 The supply chain structure of the economy, which assumes market relations between the economic subjects.

However, despite the fact that the resource-abundant sector lost its resources, all its subjects received an acceptable profit. This situation is possible due to the initial condition: the resource-insufficient sector is small relative to the resource-abundant one. Therefore, the excess resources are sufficient to ensure the profit of both the resource-abundant sector and the resource-insecure sector. In other words, the proportion between sectors of the economy allows it to function on a market basis. Now suppose another case: the resource-insufficient sector relative to the resource-abundant is large. This case is presented in Figure 1. Here, the excess of resources is equal to their lack (DAB = BEC). Consequently, provided that the resource-insufficient sector is provided with the necessary resources, market prices will have to be established at the level at which revenue coincides with costs (ODEC). Naturally, the private owner will not conduct a business for a long time, which does not bring profit. Therefore, if we take the supply chain structure of the economy as unchanged, in such an economic system bureaucracy dominates rather than businessmen. The bureaucracy redistributes excess resources in a resource-insufficient sector, using not a market but a planned mechanism. In the previous paper we showed the principle possibility of applying this two-sector model for the study of the regional economy. Therefore, we use a two-sector model to study the relationships of individual regions. Let's start with the situation presented in Fig. 3.
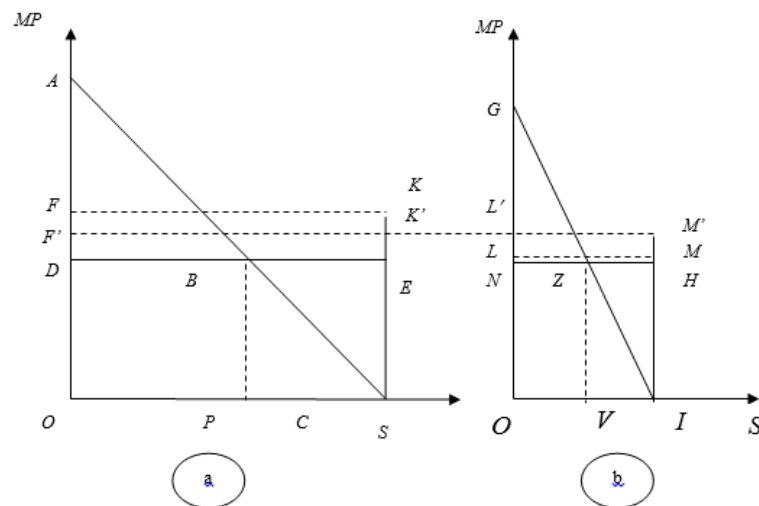

Fig. 3 Interaction of profitable and unprofitable regions on a market basis

Fig. 3 shows the national economy consisting of two regions, each of which is depicted by means of a separate two-sector model (Fig. 3a and Fig. 3b). Figure 3a shows the economy of the region with a relatively large resource-abundant sector (OABP) and a relatively small resource-insufficient sector (PBEC). The proportion between these sectors is such that if the region in Fig. 3a. exchanged products with itself only, then the revenue of all economic

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subjects of this region would be OFKC and they all would have a good profit equal to the value of DFKE. Fig. 3b depicts the second region, which economic structure is significantly different. Here we have a relatively small resource-abundant (OGZV) and relatively large resource-insufficient (VZHI) sectors. If closed, the economic subjects of the region in the process of exchange among themselves would receive the total revenue in the amount of OLMI, that is, that would only cover the costs (ONHI) and provide zero profit. In other words, the region 3a. in a situation of isolation can function only as a planned economy. However, in Fig. 3, Regions 3a and 3b are not isolated, but are in active economic relations. There is no unhindered movement of factors of production between them, but there is free movement of goods.

As a result, a unified system of prices is established, which raises the return on invested capital. This equalization means that the revenue of economic entities in the region 3a has become smaller (OF′K′C), and the profit is lower (DF′K′E). In region 3b, on the contrary, the revenues of the entities increased to the value of OL′M′I and, accordingly, a profit of LL′M′M appeared. Obviously, region 3a sells its products at low prices, and region 3b - at inflated prices. Such an equalization of profit is possible if at least two conditions are met. First, the economy of the region 3a should be large, and the economy of the region 3b - small. Then a significant increase in prices for products of the region 3b is accompanied by an insignificant decrease in prices for products of the region 3a. Secondly, the production of the region 3b, despite its costly unprofitability, should be in demand in the region 3a, that

is, there for some reason should be the region 3a necessary for consumers to sell it at inflated prices. Suppose that in the region 3a, the resource-insufficient sector is represented by innovation production, and in the region 3b, the resource-insufficient sector is rare natural resources that either have absolutely nothing to replace, or the import of such resources from abroad is even more expensive [3, 4].

If all the conditions are as they are in the model in Fig. 3, we get a rather curious case. The region in Fig. 3a is also the center of innovation development of this national economy and at the same time a hidden resource donor to the region in Fig. 3b, the resource provider. Such a strange combination of the economic functions of the development center and simultaneously a resource donor in the region 3a became possible due to a kind of regional effect of scale. The resource-abundant sector in the region 3a is so large that its excess resources are sufficient to ensure profit for its own innovative industries and economic entities of the region 3b. If we reduce the scale of the economy of the region 3a and increase the scale of the economy of the region 3b, then, sooner or later, a situation arises, when it would be necessary either to consistently downturn innovation production in the region 3a, or to strengthen planned mechanisms for redistributing resources throughout the system.

3. Data and methods

Let's see how significant the regional scale effect is for the Russian economy (Table 1). Table 1 shows the regions with the highest GRP. The total GRP of the regions identified in Table 1 is 52.9% of the total GRP of Russia (37,348.5 billion rubles).

Table 1-Regions of Russia with the highest GRP values, 2016

No.	Region	GRP, million rubles	In percentage of total GRP of Russia
	Russia GDP 69,254,1 billion rubles		
1	Moscow	14,299,800.6	20.64
2	St. Petersburg	3,742,182.4	5.4
3	Moscow region	3,565,258.0	5.14
4	Khanty-Mansi Autonomous District – Yugra	3,031,163.3	4.37
5	Sverdlovsk region	1,978,055.7	2.85
6	Yamalo-Nenets Autonomous District	1,963,870.5	2.83
7	Republic of Tatarstan	1,937,637.1	2.8
8	Krasnoyarsk Krai	1,767,908.2	2.55
9	Republic of Bashkortostan	1,344,360.1	1.94
10	Samara region	1,275,063.6	1.84
11	Rostov region	1,270,891.5	1.83
12	Nizhny Novgorod region	1,182,265.0	0.71
	Total:	12,416,270	52.9

Table 2, in contrast, represents nine regions with the lowest GRP values. It can be seen that the gap in production between the regions is huge. The total output in nine regions in Table 2 (189 106.4 million rubles.) is only 1.3% of the GRP of Moscow. This suggests that effect of scale significantly affects the type of the Russian economy. It influences the fact that the type of economy of large regions determines the economy of small ones and the type of the Russian economy is generally determined by the situation in a group of large regions.

Table 2 - Regions of Russia with the lowest GRP values, 2016

No.	Region	GRP, million rubles	In percentage of total GRP of Russia
1	Republic of Adygeya	91,352.4	0.13
2	Karachai-Cherkess Republic	73,151.3	0,10
3	Chukotka Autonomous District	66,146.8	0.095
4	Sevastopol	64,163.2	0.09
5	Republic of Kalmykia	56,045.1	0.08
6	Republic of Tyva	52,221.3	0.075
7	Republic of Ingushetia	50,882.0	0.073
8	Jewish Autonomous Region	46,872.0	0.07
9	Altai Republic	46,128.4	0.067
	Total:	189,106.4	0.066

Source: according to Rosstat

In the model shown in Fig. 3, we proceeded from the assumption that all the subjects of the region are able to sell their products equally and therefore, at least within the region, a uniform rate of profit is formed. However, this is a high degree of simplification. As is known, the rate of profit has only a tendency to equalize [5, 6]. In this regard, in fact, the products of the resource-insufficient sector cannot always be sold at prices higher than the cost.

The prevalence of profitable and unprofitable enterprises in the supply chain structure of the region makes it possible to judge such an indicator as a balanced financial result of business activities (profit minus loss). In 2016, 18 regions of Russia had a negative balanced financial performance of the organization (million rubles), in 2017 - only 7 regions (Table 3).

Table 3- Regions with negative balanced financial performance of the organization, million rubles, 2015-2017

	Balanced financial performance, million rubles			Turnover, mil.			Balanced financial performance to turnover ratio, %		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Tver region	-1952			314,000			0.6		
Ivanovo region	-2797			140,000			2.0		
Kaluga region	-6887			717,000			1.0		
Nenets Autonomous Region	-8928			121,000			7.4		
Republic of Adygeya	-2000			53,000			3.8		
Republic of Dagestan	-9938	-6402	-2106	72,000	552,235.2	112,627	13.8	1.6	1.9
Republic of Ingushetia	-1857	-1586	-1082	6000	27,930.2	17,776.94	31.8	5.7	6.0
Republic of North Ossetia – Alania	-1621	-671	-698	33,000	116,341.5	7655.6	4.9	0.6	9.1
Kabardino-Balkar Republic	-1186	-925	-675	64,000	111,835.0	105,116.9	1.9	0.8	0.6.

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Chechen Republic	-11,059	-7465	-6637	43000	109,677.7	10,899.6	25.7	6.8	60.9
Chuvash Republic	-958			212,000			0.5		
Zabaykalsky Krai	-916			132,000			0.7		
Republic of Tyva	-7941			17,000			46.7		
Kemerovo region	-21,933			1,604,000			1.4		
Khabarovsk Krai	-18,765			668,000			2.8		
Jewish Autonomous Region	-5936	-57		9000	44,509.6		66.0	0.13	
Sevastopol	-1381			27,000			5.1		
Republic of Crimea	-21,114			197,000			10.7		
Republic of Kalmykia			-408			35,418.3			1.2
Altai Republic			-205			4968.8			4.0
Total	-127,169	-17,106	-11,811	4,429,000	962,529.2	294,463.14	226.8	15.63	83.7

Table 3 shows that the total amount of losses in these regions in 2015 is 127,169 million rubles; in 2016 - 25,073 million rubles; and in 2017 - 11,811 million rubles, which is by 167,294 million rubles less than for 2015. This is 1.54% of the total positive value of the balanced financial result for the Russian Federation in 2017, which is 7,502,736 million rubles. If further all these losses are financed from the budget, they do not seem excessive. We have shown in the regional economy the economic subjects unable to sell products at normal prices, but they can still sell them. However, as part of the resource-insufficient sector, there are economic subjects whose products have value, but cannot be sold at any price.

The main products produced in this sub-sector are fundamental research and development, armaments, social goods and services. Obviously, this sub-sector as a whole can exist only with state financial support. The way in which research and development is distributed among regions can be indirectly judged on the basis of the "Rating of Innovative Regions of the Russian Federation", developed and implemented by the Association of Innovative Regions of Russia (AIRR) [7], [8]. The rating uses 23 to 29 indicators in different years. It classifies regions from an innovative point of view, into strong, medium-strong, medium, medium-weak and weak. Without questioning this classification, we want to note that, according to the unanimous opinion of the researchers, "the innovative component of the economy remains weak, and Russia does not fall into the group of countries that compete through the creation of new products and technologies". In 2016, Russia was 27th in the share of expenditures for R&D (1.1%), skipping ahead such countries as the United States (2.8%) and Germany (2.9%), Slovenia (2.2%), Estonia (1.5%) and Malaysia (1.3%) [9]. Based on this, we divide the regions of Russia into two groups only. The *first group* includes eleven innovatively strong regions according to the AIRR classification, the *second group* includes all the others, united under the conventional name "*innovatively weak*". Under the conditions of the general innovation gap in Russia, one can be surer that in the supply chain structure of the economies of these regions a sub-sector with unsold products occupies a prominent place. Let us compare the regions from the point of view of innovation activity, the GRP value and the values of the net financial result of business activity (Table 4).

Table 4- Comparison of regions by their innovation activity, GRP and the values of the net financial result of business activities for 2016

	A region with the highest GRP	Innovatively strong regions	Regions with negative balanced financial performance
1.	Moscow	Moscow	-
2.	Khanty-Mansi Autonomous District – Yugra		-
3.	Moscow region	Moscow region	-

4.	St. Petersburg	St. Petersburg	-
5.	Republic of Tatarstan	Republic of Tatarstan	-
6.	Yamalo-Nenets Autonomous District	-	-
7.	Sverdlovsk region	-	-
8.	Krasnoyarsk Krai	Krasnoyarsk Krai	-
9.	Republic of Bashkortostan	Republic of Bashkortostan	-
10.	Samara region	Samara region	-
11.	Nizhny Novgorod region	Nizhny Novgorod region	-
12.	Rostov region	-	-
13.	-	Tomsk region	-
14.	-	Novosibirsk region	-
15.	-	Kaluga region	Kaluga region

Comparisons made in Table 4 show that the regional supply chain structure of the Russian economy includes a group of eight regions that combine a large scale of the economy, innovative activity and financial success (Moscow, Moscow Region, St. Petersburg, Republic of Tatarstan, Krasnoyarsk Krai, Republic of Bashkortostan, Samara, and Nizhny Novgorod region). These eight regions practically face us with a situation theoretically analyzed through the model in Fig. 3 The scale and financial success of the resource-abundant sectors of these regions allows them to implement relatively large innovative projects and act as resource donors to other regions.

In contrast to expenditures for R&D Russia occupies one of the first places for the specific share of defense expenditures. As to the percentage of defense expenditures in the supply chain structure of state expenditures in 2016 (17.5%), we lag behind Singapore (21.5%) and Mali (21.4%) only, overtaking the USA [10, 11]. The third component of the subsector in question is social goods and services. In this part, the Russian economy is burdened slightly with redistribution (Fig. 4)
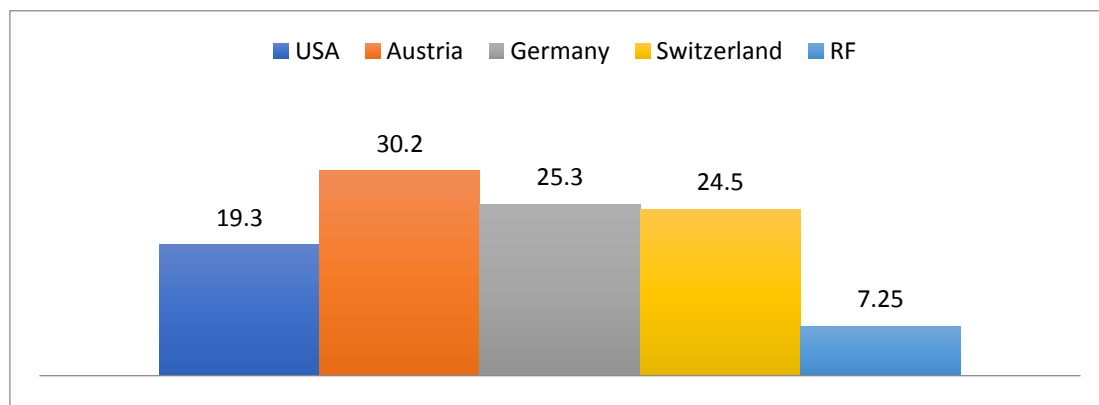

Fig. 4 Social expenditures in % of GDP [12]

The share of social expenditures makes Russia more a market economy than a planned economy. Thus, only military expenditures among the three main expenditure groups that form a subsector with unsold products are a factor that strengthens the planned character of the Russian economy. Unfortunately, it is difficult to link the actions of this factor to the regional supply chain structure of the economy because of the lack of data.

Until now, our analysis has concerned products that are actually produced in the resource-insufficient sector.

However, as noted, the supply chain structure of the resource-insufficient sector includes the construction of new enterprises or a sphere of investment. Consider the impact of this factor on regional reproduction. Let us use the classification of the regions given in Table 4, and look at the investment volumes (Table 5).

Table 5- Investments in fixed assets in the regions of the Russian Federation for 2016, in actual prices [13].

	RF regions	Investments in fixed assets, million rubles
1.	Moscow	1,703,085
2.	Yamalo-Nenets Autonomous District	1,097,131
3.	Republic of Tatarstan	642,494
4.	Moscow region	634,692
5.	St. Petersburg	582,306
6.	Khanty-Mansi Autonomous District – Yugra	491,380
7.	Krasnoyarsk Krai	419,060
8.	Republic of Bashkortostan	360,946
9.	Sverdlovsk region	345,812
10.	Rostov region	287,413
11.	Samara region	256,774
12.	Nizhny Novgorod region	219,658
13.	Novosibirsk region	143,500
14.	Tomsk region	101,575
15.	Kaluga region	80,081

It will be recalled that the first 12 regions in Table 5 are the regions with the highest GRP. These same regions were also the largest investors. The smallest amount of investment among 12 regions is in Nizhny Novgorod region (219,658 million rubles). This lower limit is surpassed only by four regions not included in Table 5: Krasnodar Krai (428,972 million rubles), Voronezh region (270,999 million rubles), Sakhalin region (247,886 million rubles) and Republic of Dagestan (209843 million rubles). Thus, there is a fairly expressed relationship between the GRP and the investment process [14]. At the same time, the previously distinguished group of eight regions that combine the scale of the economy, innovation, financial success, remained the same: all eight regions also demonstrate the high investment activity. However, let us ask ourselves, is this investment activity sufficient from the point of view of the regions themselves and the national economy as a whole? Currently, the rate of capital formation in the Russian economy is 18.9% - 21.9%. This roughly corresponds to the average rate of accumulation in economically developed countries (20.6%). However, the current level of the norm of gross fixed capital formation in Russia is much lower than in France, Germany and the USA [15]. Russia is obviously lagging in this parameter behind not only high-tech countries, but also Canada (23.8%) and Australia (27.3%), whose raw material potential adds value to their comparison with the Russian economy [16, 17].

According to the standards of countries with developing markets, the Russian rate of accumulation is even more modest: on average for this group of countries, the rate of accumulation was 29.9%, including India, 30.8%, and China - 44.3% [18].

4. Results

The previous analysis of the regional supply chain structure of the resource-insufficient sector showed that we face the main problems with the subsector, where unsellable products are produced [19]. These are fundamental research and development, social benefits and services, as well as armament. The latter, in practice, is more or less satisfactory. Although this area is very difficult to assess due to changes in the foreign policy situation. The same applies to R&D and the social sphere; as the previous analysis showed, our lag is obvious and significant. Consequently, either we do nothing and the gap in the innovation and social spheres is growing with all the ensuing consequences, or we are dramatically increasing investments in the social sphere and R&D [20, 21]. If we add to this the need for the development of expensive infrastructure, the environmental problem and the increased capital intensity of any project in the conditions of Russia, we get

an equally sharp increase in its resource-insufficient sector, which is also related to investments. The increase in the resource-insufficient sector in the Russian economy, according to the logic of the two-sector model, leads to an intensification of the plan and the oppression of the market. Under the second scenario, taking into account the scale of the Russian economy in the supply chain structure of the EEU, either the strengthening of the plan will take place in other member countries, or the process of disintegration will begin.

5. Acknowledgements

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