# Constructing the integral index of export specialization of neo-industrial production in region

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#### Abstract

The integral index of export specialization of neo-industrial production of region is offered, taking into account the production of high-tech goods and services. As goods was taken a group of machines, equipment and vehicles. The export intensity of its production and the production of high-tech services is taken into account; the gross production figure of region is also taken into account. The index assesses the orientation of the high-tech sector of regional economy to foreign market. The index was in pilot regime tested on an array of Russian regions, which made it possible to propose identifying groups of regions with a low, average and high index value.

Key words: export specialization, region's neo-industrial production, export intensity of production, integral index, regional comparison JEL Classification: F1, O14

#### Introduction

With increasing global technological and trade competition, the importance of development of manufacturing, including high-tech, industry for countries and their regions is growing. Moreover, in conditions where the well-being of economies largely (due to the international division of labor) depends on export income, the ability of economy to present a competitive supply to the outside world is also important. In this light, it is relevant to measure the level of export specialization of neo-industrial production in region. This makes the following research goal relevant: to offer an indicator that measures the level of orientation of regional neo-industrial production to international market.

## 1. Literature review

Published studies analyze non-primary and high-tech exports. In particular, an analysis of the interregional allocation of the largest non-primary exporters of the country [1, p. 56], an analysis of the commodity structure of exports of the country or a particular region ([2, p. 39-40; for region also [3, p. 48-52]). Including in the case of the country, the commodity structure of growth is considered [4, p. 141]; in the case of a region, production and export for a single item are considered in parallel [5, p. 3-4]. The literature pays attention to the representation in published statistics of data for commodity analysis of exports in regional context, however, it is noted that the forms of data presentation are limited [6, p. 166]. But mainly non-primary exports are analyzed at the level of the national economy; in regional context, even the calculation of the export capacity of production is not often found in the scientific literature. Therefore, the methodological support for measuring the orientation of regional neo-industrial production to international market remains relevant.

### 2. Methodology

To construct an indicator that measures the level of orientation of regional neo-industrial production to international market, it seems advisable to use the method of finding the relations between values: these relations should characterize:

ratio between the volume of export and of production - the export capacity of production);

- ratios between the values of the indicator single for all regions (in order to take into account the absolute scale of regional economies).

It is intended to take into account as the subject of measurement:

- high-tech goods. High-tech products include a large list of products from different product groups (from groups such as machines, equipment and vehicles; chemical (including pharmaceutical) products; metallurgical products; light industry products, etc.). Methodically, for the purpose of measuring the export specialization of neo-industrial production, it seems advisable to take a commodity group consisting entirely of high-tech goods. Among the product groups for which exports are presented in Rosstat statistics, the only one is the group of machines, equipment and vehicles;

- high-tech services. For example, along with the manufacture of turbines for power plants, there are engineering services consisting in the design of power plants according to the needs of the customer, their construction in the customer's territory and commissioning.

The index built is supposed to be tested on an array of Russian regions, taking data from the Federal State Statistics Service of Russia

(Rosstat) (Regions of Russia. Socio-economic indicators (rosstat.gov.ru)). At the same time, it is supposed to group regions by value (highlighting regions with a high, average and low value). To do this, it is supposed to calculate the average for the entire series of regions and the median, where the median is such a number that half of the values of the array exceeds it, and half is inferior to it.

## 3. Results

So, the integral index should include several components.

The extent, to which the production specializes in exports, can be measured by calculating the ratio of exports to production (1).

At that, the volume of production of machines, equipment and vehicles can be calculated by adding: the volume of production of machines, equipment and vehicles; and the volume of production of computers, electronic and optical products and electrical equipment (since the export of machines, equipment and vehicles according to the methodology of the Rosstat includes computers, electronic and electrical products). The Service cites the shares of these macro-industries in the structure of manufacturing industries in region. Accordingly, it seems logical, having added these shares, to multiply them by the volume of manufacturing production of the region.

It is also advisable to take into account the share of region in exports of the country (2).

It is also advisable to take into account the volume of production of region across the whole range of goods (3) (so far it has not been taken into account – only relative values for machine-technical products were taken into account), through finding the relation of a whole export to a whole volume of production.

Finally, as already mentioned, it is advisable to take into account the export orientation of not only goods but also services. The Rosstat publishes an indicator of the export of technologies and services of a technical nature. As regards the production, of published indicators, the volume of innovative goods, works and services is most suitable here (4). It's advisable to calculate the relation of export to the volume of production.

All the components discussed will be linked to each other. The integral index of export specialization of neo-industrial production of region will be calculated as follows: to the ratio of export of machines, equipment and vehicles of the region to their production, will be added the ratio of export of technologies and services of a technical nature of region to the volume of production of innovative goods, works and services of region; then will be calculated the ratio of that amount to the share of region's gross exports in the

region's gross output; the result will be multiplied by the share of region in the country's exports and by 1000.

For pilot testing of the proposed index, the Rosstat data for 2019 can be taken. The calculated values for the Russian regions are presented in table 1.

## Integral index of export specialization of neo-industrial production of Russian regions, 2019

Table 1

Regions	Index	Regions	Index
Moscow	316	Ivanovo region	2
Moscow region	40	Arkhangelsk region	1
Ryazan region	28	Karachay-Cherkess R.	1
St. Petersburg	27	Republic of Mordovia	1
Novosibirsk region	27	Udmurt Republic	1
Sverdlovsk region	25	Kirov region	1
Belgorod region	23	Oryol region	1
Omsk region	21	Republic of Mari El	1
Rep. of Bashkortostan	16	Republic of Karelia	1
Tula region	16	Kurgan region	1
Lipetsk region	15	Bryansk region	1
KhMAO	15	Tver region	1
Krasnodar region	14	Rep. of Sakha (Yakutia)	1
Nizhny Novgorod reg.	14	Pskov region	1
Krasnoyarsk region	11	Astrakhan region	1
Chelyabinsk region	10	Republic of Khakassia	1
Kaliningrad region	9	Magadan region	1
Perm region	7	Republic of Buryatia	1
Rostov region	7	Chuvash Republic	1
Republic of Tatarstan	7	Kostroma region	0
Vologda region	6	Republic of North Ossetia – Alania	0
Tyumen r. without distr.	6	Tambov region	0
Irkutsk region	6	Kabardino-Balkarian Republic	0
Primorsky region	5	YaNAO	0
Smolensk region	5	Republic of Adygea	0

Romanian Statistical Review - Supplement nr. 1 / 2021

Regions	Index	Regions	Index
Kaluga region	5	Sakhalin region	0
Kamchatka region	4	Republic of Komi	0
Samara region	4	Murmansk region	0
Vladimir region	4	Republic of Crimea	0
Leningrad region	4	Khabarovsk region	0
Yaroslavl region	4	Zabaykalsky region	0
Tomsk region	3	Republic of Dagestan	0
Kemerovo region	3	Amur region	0
Altai Krai	3	Jewish autonom. Obl	0
Ulyanovsk region	3	Sevastopol	0
Stavropol region	3	Chukotka autonom. distr.	0
Orenburg region	3	Republic of Ingushetia	0
Saratov region	3	Chechen Republic	0
Penza region	2	Republic of Tuva	0
Volgograd region	2	Altai Republic	0
Novgorod region	2	NAO	0
Voronezh region	2	Republic of Kalmykia	0
Kursk region	2		

*Source:* calculated by: Regions of Russia. Socio-economic indicators. 2020 / stat. coll.: Rosstat. Moscow, 2020. 1242 p. URL: https://rosstat.gov.ru/folder/210/document/13204 (date of referring: 18.01.2020).

Calculations show that the Russian regions differ significantly in the value of the integral index of export specialization of neo-industrial production (Table 1). Moscow has a leading position (316), followed by the Moscow Region (40), then there are a number of regions with values within 21-28 (Ryazan region, St. Petersburg, Novosibirsk, Sverdlovsk, Belgorod, Omsk regions).

The integral index (in decomposition by subindexes) can be considered of several regions included in the top 8 [(1) – Moscow, (2) – Novosibirsk, (3) – Sverdlovsk region, (4) – Belgorod, (5) – Omsk region].

$$I = \frac{0,02+1,32}{1,83} \times 0,43 \times 1000 \tag{1}$$

$$I = \frac{0,009 + 1,51}{0,42} \times 0,08 \times 1000$$
(2)

Revista Română de Statistică - Supliment nr. 1 / 2021

31

$$I = \frac{0,003 + 0,37}{0,26} \times 0,02 \times 1000$$
(3)  
$$I = \frac{10^{-10} + 0,99}{0,33} \times 0,008 \times 1000$$
(4)

$$I = \frac{0,005 + 0,66}{0,08} \times 0,002 \times 1000$$
(5)

The comparison allows to conclude that Moscow has a significantly more developed index, thanks to the higher index of export specialization of neo-industrial producion of commodities (and index by services is also higher); the ratio "index of the region's share in the the country's export / index of the share of region's export in region's production" is also higher. The decisive factor is the share in the country's exports. This share by Moscow is the highest; St. Petersburg takes the 2nd place (0.07), Moscow and Sverdlovsk regions (up to 0.02) are in the top 10. The high value of the capital is due to the fact that many large export-oriented Russian companies are registered in it. Obviously, also thanks to this, Moscow occupies the 6th position by the export capacity of production.

Ryazan (2.59) and Novosibirsk (1.51) regions, Moscow (1.32), Belgorod (0.99) and Omsk (0.66) regions also belong to the regions with the highest  $U_{\text{2CHIIV}}$  (are included in the top 10).

The average value of the integral index of export specialization of neo-industrial production for the analyzed number of regions is 8.88; median -1.69. Accordingly, a low index value can be defined as a value below 1.69; average level – as values in the range beginning with 1.69 and up to 8.88; high level – as values above 8.88. Then 42 regions have a low index value, the average -27, the high -16 regions.

## Conclusion

Thus, the proposed integrated index of export specialization of neo-industrial production of region reflects the degree of competitiveness, international acknowledgment of high-tech production of goods and services of region (using the example of the selected product group). This index takes into account production activities in the field of high-tech goods, as well as of services; in particular, the most high-tech whole product group is taken as goods – a group of machines, equipment and vehicles. The export intensity of its production and of the production of high-tech services is taken into account; the gross (for all goods) production indicator of region is also taken into account. The index allows to select three groups in the array of Russian regions – with low, average and high index value.

#### Acknowledgements

*The article was prepared by financial support of RFBR (Russian Foundation for Basic Research), project number 20-010-00806-A.* 

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