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INNOVATIVE PATH OF THE REGIONAL ECONOMY’S DEPARTURE FROM THE PREVIOUS PATH-DEPENDENT DEVELOPMENT TRAJECTORY

The diversification of regions in terms of economic growth rate is largely due to the path dependence: a region’s economy depends on the earlier established industrial structure. Successful regions, formed as an economic "core", now have more reasons for creating a new economy and ensuring further economic growth. Existing institutions and norms, returns to scale, inertial developments are the constraining factors for the path-breaking. The paper shows that the departure from path dependency for the regions is possible through technological innovations and interregional relations. The study aims to develop a method for assessing a region’s path-breaking possibility based on the existing industrial structure and its connection with the economy’s high-tech sector. The proposed assessment method is based on using the localization coefficient for determining the proximity of types of economic activity (that have a comparative advantage in a region) with the economy’s high-tech sub-sectors. The approach has been tested in the regions of Russia. We have shown that certain regions can move further by investing in interregional ties and internal innovations. These two factors contribute to rapid development, reduce dependence on the established industrial structure, allow the maintaining of comparative advantages. The research has practical significance as it offers an analytical tool for making decisions about the possibility and directions of a region's path-breaking. It is important to understand in which direction a region should develop inter-sectoral cooperation for the emergence of the economy’s new sectors.

Keywords: evolutionary economic theory, path dependence, path breaking, technological relatedness, proximity index, transition industries, comparative advantages, high-tech industries, regional institutions and norms, the regions of Russia

Introduction

The regional economy largely depends on the structure of industrial production that has been established earlier. Constituent entities, formed as an economic "core", now have more reasons for creating a new economy and ensuring further growth. Modern tendencies of the social-economic development are conditioned by the path dependence. Path-breaking is possible through technological innovations, the creation and maintenance of which requires significant labour and capital investments.

It was scientifically substantiated that path-breaking through innovations is possible only on the basis of the industrial structures, labour market and institutions already created in the region [1]. If conditions for high-tech types of economic activity development already exist in the region, the transition from the traditional path to the innovative one will be harmonious. Positive effects of innovations are manifested through changes in the leading branches of industry, obtainment of new sources of raw materials and methods for creation and use of energy, upgrade of outdated productions, replacement of technologies [2, 3].

Industrially developed and developing regions have unequal chances for path-breaking. The first group of regions, with a high concentration of industrial production, has more capabilities for transition to new related branches, unlike the second group, which retains its marginality [4].

The aim of this study is to develop a method for assessing a region’s path-breaking possibility based on the existing industrial structure and its connection with the economy’s high-tech sector.

The article has the following structure. The first section covers stages and peculiarities of the evolutionary economic theory development, contains a description of how the previous development ideas relate to the regional economy, and articulates the main concepts in this sphere. The second section proposes a method for assessing technological proximity of types of economic activities. The testing results in the Russian regions with determination of conditions for path breaking are described in the third section of the study. The conclusion section presents the main findings and formulates the recommendations.

Development of evolutionary economic theory, its place in the regional economy and main definitions

The evolutionary economic theory defines what is path dependence. The concept was conceived in 1985–1988 in the works of Paul David [5] and Brian Arthur [6]. Initially, they tried to explain why non-effective standards and technologies are not only dominant, but the only possible ones [7], as well as why economic entities did not develop in the most rational way.

In the practical application, the path-dependence approach makes it possible to explain why the path-breaking attempts are unsuccessful. Expenses for "turnarounds" are sufficiently high, thus, the proposed measures must be scientifically substantiated and assessed. The institutions established in the economic environment will prevent path-breaking, but the longer the region remains inertial, the more expensive such a transition will be [8]. Apart from the institutions, the factors preventing transition are increased returns to scale, self-supporting development and positive feedback [9].

Considering the national economy, it is advisable to carry-out path-breaking at the regional level. The regional path-breaking is possible only through the innovative trajectory. The trajectory includes three stages:

1. Path creation resulting from supplementation or reconstruction of the already existing productions through innovative technologies [10]. If a set of successful branches is already created in the region, its economy will be more flexible and adaptable to external processes [11]. Such regions are characterized by a high degree of openness, competitiveness and efficiency of enterprises.
2. Path development consisting in the growth of enterprises' income.
3. Adaptation to innovative processes, openness for technological solutions and implementation of innovations.

This process reflects the innovative version of a region's development. However, there is also a traditional version, where at the third stage (path rigidification) a loss of development flexibility takes place, as a region is closed to inflow of new technological solutions. The obsolescence of knowledge, relationship and a lack of mechanisms of technological exchange are characteristic for this stage. Further, a region passes a bifurcation point and reaches the fourth stage (path de-locking) or regional restructuring as a result of exogenous shocks [12–14].

We believe that the region's choice between innovative or traditional development trajectory is exclusively a political prerogative. The regional economy will not turn towards a new development path by itself. Creation of a mechanism for close cooperation between regions aimed at constant technological updating becomes a significant task for the regional governing bodies.

The support of innovative development of the regions should be provided in those high-tech sectors, the emergence and development of which already has the required conditions. It was shown that the specializations of cluster is often not taken into account in the process of implementation of its initiatives, which hinders their effective development.

The provisions of the evolutionary economic theory allow to conclude that the regions, in which the high-tech production sectors or those close to them are already being developed, have more chances for path-breaking [15, 16].

Before proceeding to the methodological part of the research, it is necessary to define the following concepts.

1. New and mature branches. New branches will more likely be created in the regions with diversified economies, since diversification facilitates a sharp division of labour. The effectiveness here increases according to Schumpeter (through innovations), not Smith.
2. Related and non-related types of economic activity. A high degree of proximity of the regional branches has a positive effect on the economic development. Firstly, this stimulates the economic growth through localization and agglomeration effects [17]. Secondly, it is the relations between industrial sectors that facilitate the structural changes. Thirdly, the regions with a higher degree of diversification among the related branches will demonstrate more possibilities for training and diffusion of secondary knowledge [18].
3. Technological proximity. The related industrial branches form the cumulative sets. Such branches are close to each other in the industrial field and can be identified as technological clusters.
4. Regional branching is a process through which a new type of economic activity occurs from the economically related branches in the region [19].

5. Cognitive blocking. With a high level of competitiveness between the regional companies operating in the technologically related spheres there can occur a cognitive interlocking, which is the intentional closure of communication, knowledge and technologies.

6. Portfolio effect. The regions with a set of diversified, non-related branches, cope better with unemployment, decline in demand and other adverse external factors.

Branches located in the regions are related to a different extent. Occurrence of a new branch is possible only at a certain distance from the existing ones. Economic development and path-breaking of the region are formed through the technological relation between the branches. In the regions with a high density of industrial production, the transition to related industries is carried out more easily [1, 20].

Research methodology

In order to assess a region's transition to a new development path, it is necessary to determine a factor reflecting the technological proximity between new and existing industries. The factor that assesses the distance is represented by indicators of relatedness or proximity [21, 22]. For this purpose, some works propose to use the revealed comparative advantage (*RCA*) index, which is actually based on the export structure of a region or country [21].

The use of this index has the following disadvantages.

1. The RCA modelling requires that the existing trade barriers do not discriminate the alternative suppliers of similar goods.

2. In the last decades, the value of *RCA* has been significantly distorted under the influence of institutional factors, which start playing a leading role in the international trade.

3. The RCA does not reflect different measures on export stimulation, subsidy assistance of certain types of economic activity.

4. The main disadvantage of the index is the absence (or small amount) of works studying the distribution of the index value in different industries of the country. For example, if for a certain industry the index values, as compared to other countries, are highly concentrated in a range slightly exceeding or less than 1, the country with the most comparative advantage in the industry can have a relatively low value of the *RCA*. On the other hand, if production and export of the second industry are highly concentrated in a relatively small number of countries, it is possible that the country, which does not have the highest comparative advantages (as compared to other countries), can have a very high index value.

5. It is advisable to apply the *RCA* during the analysis of export potential, international economic activity of the region and the degree of its participation in the international trade. Even in this case, it is necessary to distinguish the regions-exporters and the regions-producers. For example, for the Russian regions, the data of the Federal Customs Service are accumulated at the place of the legal address of the company, which can differ from the actual location of production.

It is appropriate to consider why the export by product groups cannot always reflect the comparative advantages of the regions using the example of Russia. Mineral fuel, oil and their derived products in 2017 accounted for 59 % of exports; ferrous metals and steel for 5.22 %, pearl, precious and semiprecious stones and precious metals for 3.08 %, etc. The share of the product groups that can be classified as high-tech in the Russian export is 2.4 %. They are represented in the general export structure as follows: 0.16 % for chemical industry products, 0.04 % for pharmaceuticals, 0.93 % for measuring devices, 0.088 % for computers and office equipment, 0.32 % for electronics and telecommunication equipment, 0.096 % for electric machines, 0.5 % for aircraft, 0.26 % for scientific instrumentation[1].

It is impractical to use the revealed comparative advantage index based on the export indicator in the countries with homogeneous product structure, as well in the countries with deep domestic markets.

A small contribution of tech-intensive products in export does not mean that this sector is not represented in the country's regions. In order to determine the geographic concentration of a given

[1] The high-tech industries were determined according to the OECD methodology for Eurostat (http://wdi.worldbank.org/table/5.13), based on the economic sectors classification SITC Rev. 3. Transfer to classification HS 2012, on the basis of which the export data of International Trade Centre are formed, was carried out using the correspondence tables (https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp). Statistical data were taken for 2017 by products at 4-digits level, International Trade Centre.

segment, as well as to assess a proximity degree of branches, it is advisable to use a localization coefficient, which is an indicator proposed by M. Porter.

Porter has used a ratio indicator of a number of employed in the economic branches at a regional level for determining the related branches. His clusters represent somewhat different methods of economic subdivision than that embodied in traditional systems of industry classification. It is based on the type of product and similarity in production [23].

The methodology of clusters classification of M. Porter meets the set task of determining technological proximity of new and existing industries. In the first stage, the types of economic activity that have a tendency to geographical concentration or have comparative advantages are determined through the localization coefficient calculation [24]:

$$LQ_{ig} = \frac{Emp_{ig}/Emp_g}{Emp_i/Emp} = \frac{Emp_{ig}/Emp_i}{Emp_g/Emp}, \tag{1}$$

where LQ_{ig} — localization coefficient; Emp_{ig} — number of employed in the economic sector i in the region g; Emp_g — total number of employed in the region g; Emp_i — number of employed in the economic sector i; Emp — total number of employed in the country.

The indicator of a number of employed in the economy is considered as traditional for the analysis of geographical concentration, regional specialization and other characteristics of the economic activity distribution in the field. However, taking into account that the structure of industrial production in the Russian regions has been changing due to the beginning of the fourth industrial revolution, development of digital technologies, and automation of production, it is necessary to supplement the analysis with the resulting indicator of activity. This indicator is the volume of the shipped products (works, services) in the current prices of enterprises.

In the second stage of assessment it is necessary to determine the presence of comparative advantage by types of economic activity in the processing industry (localization coefficient is higher than 1). The approach of M. Porter is somewhat simplified; it shows that the branch can be a component of a cluster if it has a localization coefficient higher than 1 and occurs along with the other similar branches in more than 40 % of cases.

The calculation of the proximity index between industrial sectors is based on the estimated conditional probability of the presence of comparative advantage in the first and in the second sector of economy in pairs (third stage). For this purpose, it is appropriate to determine the following for each pair of types of economic activity:

1) number of cases (regions) in which the first branch has a comparative advantage;

2) the same number for the second branch in a pair;

3) a number of cases (regions) in which both the first and the second branches have comparative advantages: plot a triangular matrix $A = \| a_{ij} \|$ in the order of $n \times n$, lower, if $a_{ij} = 0$ with all $i < j$, or upper ($a_{ij} = 0$ with all $i > j$).

In the fourth stage, it is necessary to calculate the index of proximity between two sectors of industry ($\varphi_{i,j}$):

$$\varphi_{i,j} = \min\left\{P(LQ_{ig} > 1 \middle| LQ_{jg} > 1), P(LQ_{jg} > 1 \middle| LQ_{ig} > 1)\right\}. \tag{2}$$

The proximity index between industrial sectors i and j will be calculated as a minimum between a conditional probability of the presence of comparative advantage in sector i, considering that the region g has a comparative advantage in sector j (i.e. $P(LQ_{ig} > 1 \mid LQ_{jg} > 1)$), and a conditional probability of the presence of comparative advantage in sector j, considering the revealed comparative advantage in sector i (i.e. $P(LQ_{jg} > 1 \mid LQ_{ig} > 1)$).

The substantiation of this proximity index is that if two economic sectors are closely related then they, probably, require the creation of similar institutions, infrastructure, factors, and technologies. The potential of their joint occurrence and successful development in the same region is high [25].

Results of the proximity analysis of types of economic activity in the Russian regions

Technological proximity between types of economic activity in the Russian industrial sector. The proximity index between types of industrial activity was calculated according to the number of employed in 2016 obtained from the data of the Federal State Statistics Service. This part of the research focused on the selected 198 types of economic activity in the processing industry (section D) for 83 regions of the Russian Federation.

Figure 1 shows a histogram of proximity indices. According to this figure, the technological proximity index is characterized by the truncated normal distribution.

Slight deviation from the norm is observed in a number of pairs of types of economic activity that are not related (the proximity index is equal to zero). A number of such pairs in the total selection is 1072, or 5.5 %. The maximum number of pairs of types of economic activity have the proximity indices within a range of 0.11–0.14 (2 616 pairs or 13.41 % of the selection). It is traditionally considered that two economic sectors can be characterized as related if their proximity index is equal to or exceeds

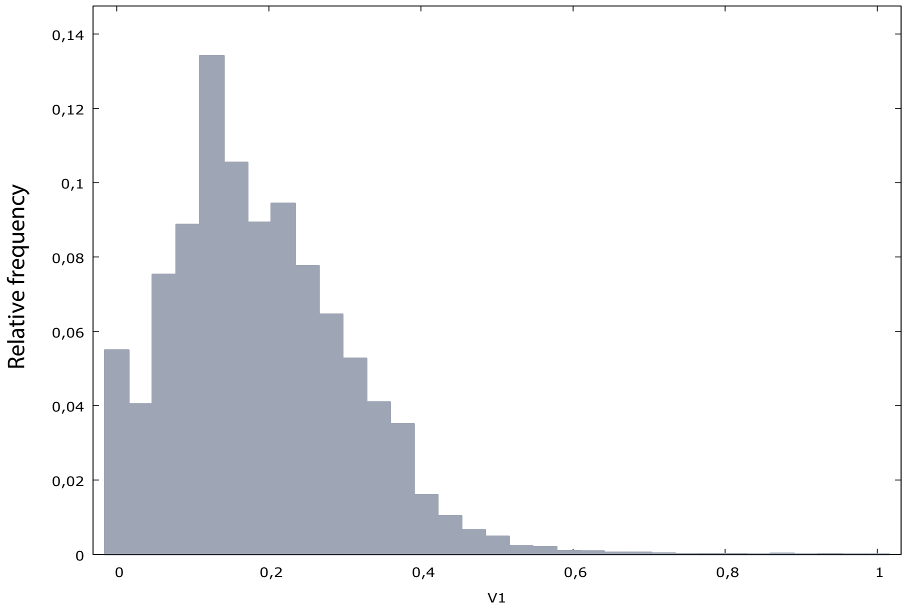

Fig. 1. *Histogram of proximity indices (by a number of employees in the branches)*

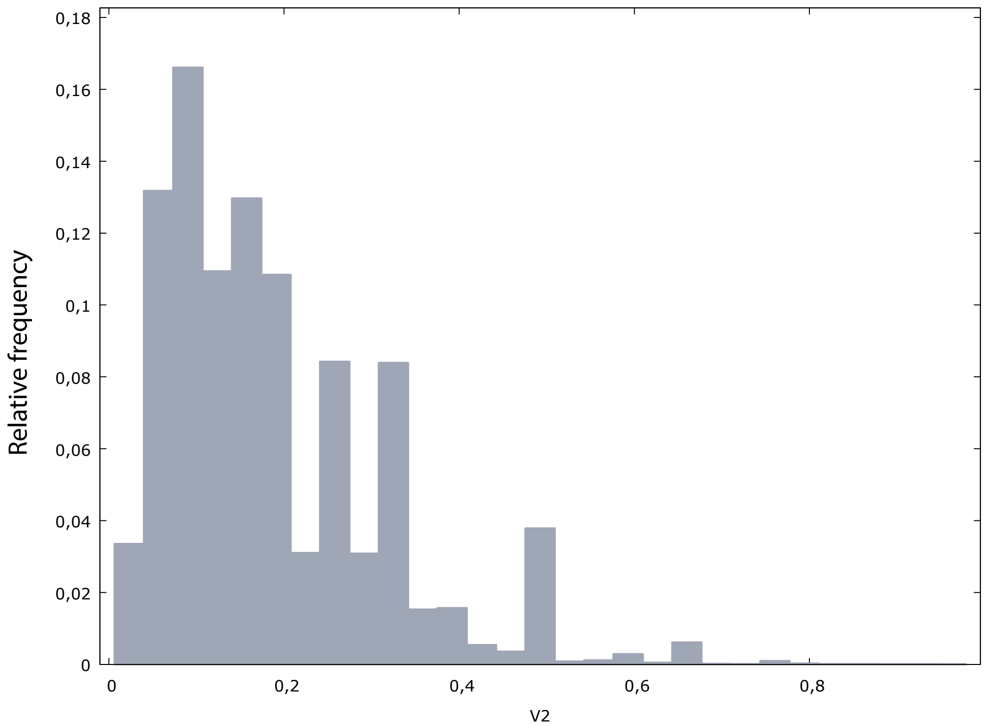

Fig. 2. *Histogram of proximity index (by volume of production in branches)*

0.25. In the obtained selection, 5 690 pairs of economic activity, or 29.2 % of all combinations, meet this condition.

In order to substantiate the use of the localization coefficient for its inclusion in the proximity index between the industry sectors, it is essential to conduct a similar research, taking as a basis not the number of employed in the economic sector, but the volume of production. The selection included 480 sub-branches of the industry (details up to 6 digits); the research period and the constituent entities of the Federation constituents are the same (Figure 2).

It should be noted that the examination of specific details (in fact, 480 sub-branches of industry have formed 114960 pairs) shows that the majority of the branches are not related to each other. The sub-branches related to each other make 26 % (little more than 30,000 pairs). They are distributed in the following way: the values of the index of technological proximity are up to 0.25 for 71 %, from 0.25 to 0.4 for 23 %, over 0.4 for 6 %.

Location of high-tech economic sectors in the Russian regions and assessment of their relation with other types of economic activity in the industry. According to the Organisation for Economic Co-operation and Development (OECD) standard, the high-tech branches of industry include five sub-branches, namely: production of pharmaceutical products, aircraft and spacecraft, electronic and telecommunication equipment, computers and office equipment, medical equipment and instrumentation. We have determined the types of economic activity which can be attributed to high-tech ones according to the classification proposed by the statistical service.

When it comes to the current territorial distribution of high technologies in Russia, the majority of the regions are notable for comparative advantages in production of electric machines and electric equipment (32 regions); ships, aircraft and spacecraft and other transport means (28 regions); electronic components, equipment for radio, television and communication (28 regions); instrumentation and devices for measurement, control, tests, navigation, regulation and other purposes (28 regions). Fewer regions have comparative advantages in production of optical devices, photo- and cine equipment (9 regions) and watches and other horological instruments (10 regions) (Table 1).

It is considered that two types of economic activity are related if their proximity index is equal to or exceeds 0.25. However, analysis of the obtained proximity indices (at the first approach they were calculated by the number of employed in sub-branches) allowed to conclude that only 25 sectors out of 198 have no relation to high technologies (index below 0.25). Thus, after changing the conditions, we considered the branches to be related if the value of the index is over 0.4. Concerning the high-tech production branches, a number of such types of economic activity is 51. The number of types of economic activity connected with high technologies in the industry is represented in Table 2.

Let us make conclusions. Firstly, high-tech branches are related: production of electronic components, equipment for radio, television and communication (serial number in the author's matrix 168) with production of television and radio transmitting equipment, electric communication equipment (number 169) and with production of medical products, means for measurement, control, regulation and tests, optical devices, photo and cine equipment and watches (number 171), etc. Figure 3 represents a graphic chart of proximity of high-tech economic sectors.

We see that if the proximity indices over 0.4 are taken into account, then only the production of devices for control and regulation of technological process (174) and the production of office equipment and computing machinery (160) are not related to other sectors of high technology industry.

Secondly, the location of high technology production in the regions is often accompanied by the logically related branches that are not attributed to the high-tech category (Table 3). For example, the pharmaceutical industry is accompanied by chemical production. Office equipment and computing machinery have comparative advantages in the same regions where the electronic lamps and lighting equipment have comparative advantages. High index of technological proximity is observed between the production of equipment for reception, recording and reproduction of sound and images (170), medical products, devices for measurement, control regulation and tests, optical devices, photo and cine equipment, watches (171), instrumentation and devices for measurement, control, tests, navigation, regulation and other purposes (173) and production of glass and glassware.

Thirdly, it is possible to identify some types of economic activity which are difficult to logically connect with new technologies, but which have a high proximity index with some of them. For instance, the sectors that have relations with high-tech industrial sectors are the production of suitcases, bags and similar articles made of leather and other materials, production of saddlery and other leather

Table 1

Russian regions that have comparative advantages in five and more sectors of high-tech production, 2017

Region	High-tech sectors (serial number in the author's matrix)													
	97	**160**	**161**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**181**	**183**
Moscow	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Saint-Petersburg	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Novosibirsk region	1	0	1	1	1	0	1	1	1	1	1	1	1	1
Vladimir region	1	1	1	1	1	1	1	0	1	0	0	0	0	0
Penza region	1	1	0	1	1	1	1	0	1	1	0	0	0	0
Kaluga region	1	1	1	1	1	1	0	0	1	0	0	0	0	0
Moscow region	1	1	0	1	0	0	1	1	0	0	1	0	0	1
Omsk region	0	0	0	1	1	0	1	0	1	1	0	0	1	1
Republic of Tatarstan	0	0	0	0	1	0	1	1	0	1	1	1	0	1
Yaroslavl region	0	0	1	1	1	0	0	1	0	0	0	1	1	1
Nizhny Novgorod region	0	0	0	0	0	1	1	1	1	0	0	0	1	1
Republic of Dagestan	0	0	0	0	1	1	1	0	1	0	0	0	1	1
Republic of Mari El	1	0	1	1	0	0	1	1	1	0	0	0	0	0
Ryazan region	0	0	0	1	1	1	1	1	1	0	0	0	0	0
Tomsk region	1	0	1	1	1	0	1	0	1	0	0	0	0	0
Khanty-Mansi Autonomous District	0	0	1	0	0	0	1	1	1	0	0	1	0	0
Voronezh region	0	0	0	1	1	1	0	0	0	0	0	0	1	1
Sevastopol	0	0	1	0	1	1	0	1	0	0	0	0	1	0
Kursk region	1	0	1	0	0	0	1	0	1	1	0	0	0	0
Perm Territory	0	0	1	0	0	0	0	0	0	1	1	0	1	1
Primorsky Territory	0	1	0	0	0	0	0	0	1	0	0	1	1	1
Republic of Bashkortostan	1	1	0	0	0	0	0	0	0	1	0	0	1	1
Republic of Mordovia	1	0	1	0	0	0	1	1	1	0	0	0	0	0
Saratov region	0	0	1	1	0	1	1	0	1	0	0	0	0	0

Calculated by the author as per the data from the Federal State Statistics Service.

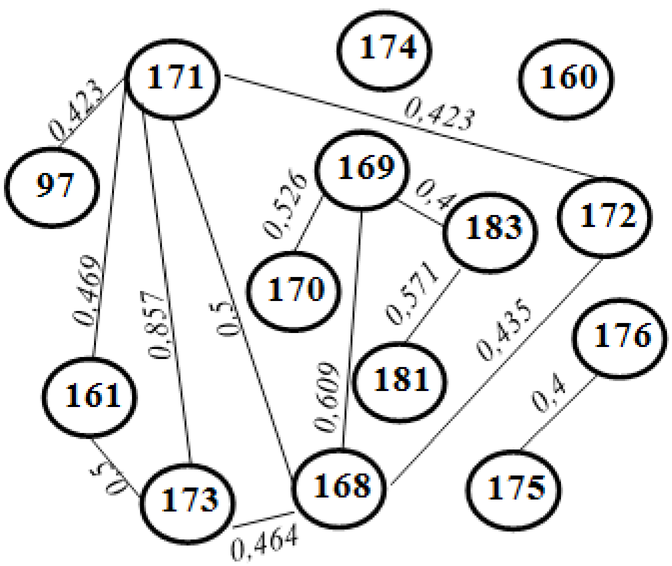

Fig. 3. *Graphic representation of relations between high technology industrial sectors (proximity indices over 0.4)*

Table 2

Number of types of economic activity connected with sectors of high technology industry

No. in matrix	Type of economic activity	Number of types of economic activity the proximity coefficient to which is		
		not equal to 0	over 0.25	over 0.4
97	Production of pharmaceutical products	192	76	6
160	Production of office equipment and computing machinery	185	43	1
161	Production of electric machinery and electric equipment	196	103	25
168	Production of electronic components, equipment for radio, television and communication	196	102	20
169	Production of television and radio transmitting equipment, electric communication equipment	193	80	8
170	Production of equipment for reception, recording and reproduction of sound and image	190	76	9
171	Production of medical products, means for measurement, control and tests, optical devices, photo and cine equipment, watches	193	99	17
172	Production of medical products, including surgical facilities and orthotics	196	90	6
173	Production of instrumentation and devices for measurement, control, tests, navigation, regulation and other purposes	194	105	17
174	Production of devices for control and regulation of technological process	194	63	2
175	Production of optical devices, photo and cine equipment	186	18	2
176	Production of watches and other horological instruments	188	24	1
181	Production of ships, aircraft and spacecraft and other transport means	197	92	7
183	Production of aircraft, including spacecraft	194	86	9

Calculated by the author using the data from the Federal State Statistics Service

articles (on average, the proximity index with the high-tech branches was 0.332), production of leather, leather articles and footwear (0.354), production of glass and glassware (0.309), production of cocoa, chocolate and sugar confectionery (0.319), production of furniture (0.294) (Table 3).

It is necessary to check the obtained results using the second approach (by volume of production) in 480 sub-branches of the industry. In this case, 24 sectors were attributed to high-tech branches (due to the examination of specific details). It was determined that they are also closely related to each other. Among the related and logically allied branches, it is possible to distinguish the production of furniture for trade offices and enterprises, commercial concrete, polymer-based paints and lacquers, footwear and plastic articles for goods packing. The examination of specific details made it possible to show the strong relation of the high-tech sub-branches of the sector with the provision of services in installation, maintenance and repair of equipment and appliances in this segment. Among the types of economic activity, which are difficult to logically connect with high technologies, are the production of perfumery and cosmetic products, soap, washing, cleaning and polishing agents, footwear, ice-cream, cocoa, chocolate and sugar confectionery, jewellery, precious metal and precious stone products.

Largely, the results of the conducted additional analysis have confirmed the data obtained earlier.

Determination of conditions for path-breaking for the Russian regions. It is necessary to consider the regions with concentration of high-tech and those, which have comparative advantaged in the types of economic activity related to the high-tech production.

Figure 4 shows the obtained results, namely, the degree of participation of the Russian regions in the high-tech industrial production in 2016. Predominantly, these economic sectors are concentrated in Moscow, Saint-Petersburg, Moscow region. Kaluga, Saratov, Vladimir, Samara, and Novosibirsk regions have comparative advantages in one third of the high-tech sectors; another 32 regions form

Table 3

Fragment of the proximity index matrix between high-tech sectors and other industry sectors (with an average value equal to or exceeds 0.25)

Type of economic activity / production of goods	97	160	161	168	169	170	171	172	173	174	175	176	181	183
Electric motors, generators and transformers	0.46	0.27	0.63	0.42	0.42	—	0.42	0.27	0.46	0.38	—	—	0.32	0.31
Leather, leather goods and footwear	0.37	0.30	0.53	0.52	0.37	0.37	0.48	0.41	0.54	—	—	—	0.32	—
Cutlery articles, flatware, tools, locks and hardware	0.32	—	0.50	0.44	0.40	0.32	0.54	0.28	0.57	—	—	—	0.29	0.32
Suitcases. bags and similar articles made of leather and other materials, saddlery and other leather articles	0.53	0.42	0.25	0.43	0.47	0.42	0.31	—	0.32	0.37	—	—	0.29	0.30
Industrial refrigerating and ventilation equipment	0.30	0.25	0.25	0.52	0.45	0.35	0.38	0.39	0.32	0.30	0.25	—	0.32	0.30
Footwear	0.35	0.27	0.50	0.46	0.31	0.31	0.42	0.35	0.46	—	—	—	0.32	—
Cocoa, chocolate and sugar confectionery	0.33	—	0.25	0.43	0.33	—	0.50	0.35	0.46	0.29	—	—	0.29	0.43
Other electric equipment	0.32	—	0.56	0.40	0.32	0.28	0.46	0.36	0.46	—	—	—	0.29	—
Glass and glassware	0.30	0.26	0.38	0.41	0.30	0.44	0.48	0.30	0.46	—	—	—	0.36	0.26
Paper and cardboard goods	0.27	—	0.41	0.35	0.31	0.27	0.35	0.35	0.29	0.35	—	—	0.36	0.31
Furniture	0.27	—	0.45	0.42	0.33	0.36	0.39	0.30	0.36	—	—	—	0.36	0.27
Plastics articles	0.26	—	0.34	0.33	0.33	0.37	0.37	0.33	0.36	0.26	—	—	0.39	0.26
Polygraphic activity not included in other categories	0.26	—	0.41	0.35	0.30	0.26	0.35	0.43	0.29	—	0.22	0.30	0.25	0.26
Cocoa, chocolate and sugar confectionery, noodle products, tea and coffee, spices and flavouring, baby food and dietary food, other food products	0.32	—	0.28	0.36	0.36	—	0.46	—	0.43	0.28	—	—	0.32	0.36
Furniture and other products not include in other categories	—	—	0.44	0.43	0.33	0.40	0.37	0.33	0.33	—	—	—	0.30	—
Pumps, compressors and hydraulic systems	—	—	0.28	0.26	0.33	0.29	0.31	—	0.32	0.48	—	—	0.29	0.33
Games and toys	0.39	0.33	0.31	0.35	0.37	—	0.35	0.26	0.29	—	0.27	—	—	0.35
Other food products not included in other categories	0.42	—	0.25	0.42	0.33	0.25	0.38	0.29	0.32	0.25	—	—	0.29	0.33
Ready-made metal products	0.39	—-	0.38	0.39	—	0.30	0.35	0.30	0.36	0.26	—	—	0.25	0.26
Insulated wires and cables	0.44	—	0.47	0.35	0.37	—	0.35	0.26	0.32	—	—	—	—	0.35
Other chemical products	0.26	—	—	0.26	0.26	0.26	0.38	0.35	0.29	0.32	—	—	0.36	0.40
Other ready-made metal products	0.35	0.26	0.25	0.35	—	0.30	0.31	0.26	0.25	0.39	—	—	0.32	0.26
Pipeline valves	0.30	0.30	0.31	0.26	0.35	0.40	0.35	—	0.36	0.35	—	—	0.25	0.25

Translation

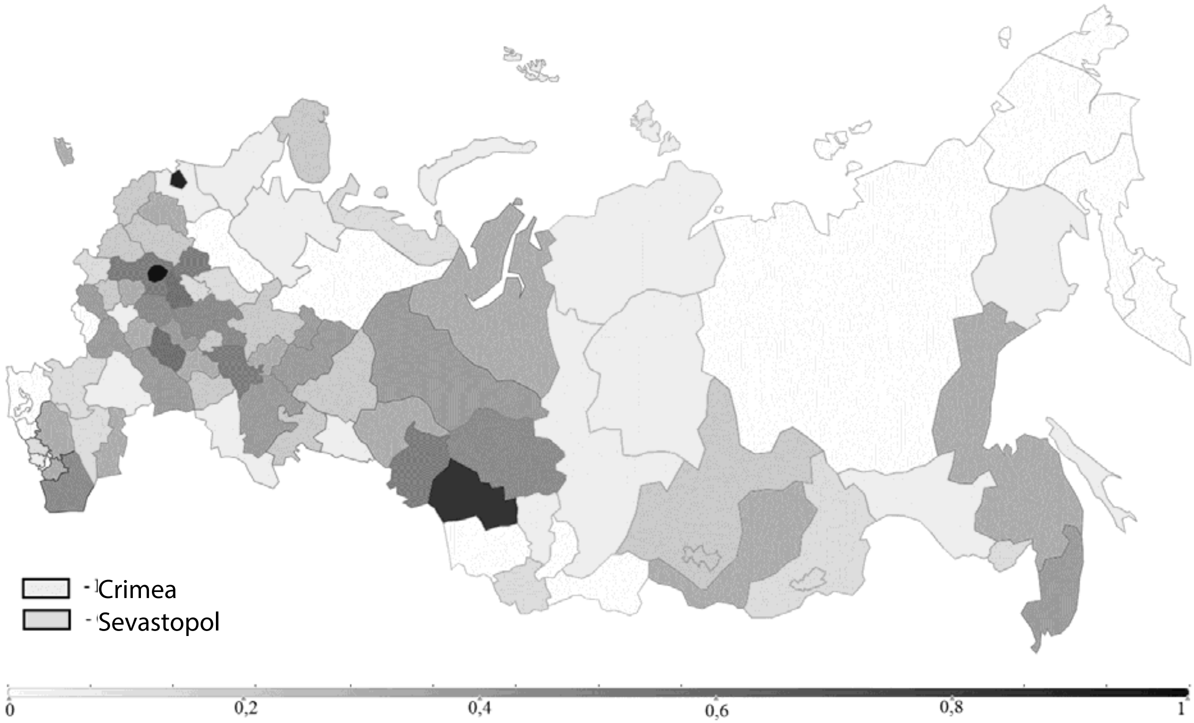

Fig. 4. *Degree of participation of the Russian regions in high-tech industrial production, coefficient*

Fig. 5. *Degree of participation of the Russian regions in industrial production sectors related to the high-tech ones, coefficient*

the comparative advantage in 1–5 sub-branches of new path. In a number of regions, the high-tech production is not represented at all.

Figure 5 shows the degree of participation of the regions in industrial sectors related to high technologies. This figure demonstrates a somewhat different picture. Overall, in 25 regions, over 40 % of close branches have comparative advantage. Only in two regions (Kamchatka Territory and Chukotka Autonomous District) no related branches are observed. A high degree of participation in high-tech sectors and in those close to them is observed in Moscow, Saint-Petersburg, Novosibirsk region, Vladimir region, Penza region, Yaroslavl region and Omsk region, Republic of Tatarstan, Udmurt Republic. A high degree of participation in the related branches is seen in Tver, Tula, Leningrad, Kirov, Tomsk and Rostov regions. We can assume that these regions have conditions for the development of high-tech industrial sectors, and, therefore, for path-breaking.

Thus, the understanding of the relations in the existing branch structure of the regions with certain high-tech sectors should be integrated into the economic strategy of the regional development. The scientifically based approach to the determination of a new trajectory of development and specialization of the regional economy makes it possible to avoid the traditional policy for professional training of labour resources or investment in popular science and technology fields. Instead, the regional governments will facilitate the creation of human capital for new demands in the knowledge, which can adapt and apply these new knowledge and skills in traditional branches.

Conclusion

Works in the field of evolutionary economics prove that regions often develop the branches that correspond to their current industrial structure. The regional governing bodies should focus on supporting the innovative development and creating the inter-regional cooperation mechanism for continuous technological updating.

The paper has proposed a new approach to the assessment of technological proximity in order to determine possible fields of the innovative path-breaking. The approach was tested in the sectors of the processing industry of 83 Russian regions by two indicators, number of employed (198 sectors) and volume of production (480 sectors). The analysis made it possible not only to reveal comparative advantages in the high-tech sectors of individual regions, but also to determine the proximity of sub-branches. These results will allow to develop a reasonable policy regarding the development of high-tech branches based on the existing structure of the economy.

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