The Main Directions of Basic Industries Modernization Taking Into Account the Genetic Profile of the Region

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Abstract. The positioning of the country in globalization conditions is largely determined by the pace of development of new knowledge, the creation of innovative products and its export. The transition to a new level of innovative development of the region cannot be achieved without identifying its «invariant core», which determines the «genotype». The presented research results consist in the development of a «genetic» approach to the study of regional economy, synthesizing elements of evolutionary theories of regional economic growth, as well as elements of genetic engineering, which are now actively used in biological, medical science, and neuroeconomics. The result of applying methods is the definition of the genetic profile of each Ural region. The author's approach allows a non-traditional way to understand the ongoing industrial and economic processes and to develop new forecasts of economic development, based on the revealed patterns of functioning of a particular territory, and finally to choose main directions of basic regional industries modernization on the example of Ural region.

1. Actuality and basic issue

It is a widely held view that technological development influences socio-economic development and as a result – all spheres of national development including social-labour [1] and demographical spheres [2]. The importance of knowledge has grown dramatically in the modern world [3]. Most notably this happens due to the world's movement into a new development phase based on the knowledge-based economy [4], which growth key factor based on the high-level of science and technology, be-comes the source of national welfare [5]. At present, the priority task facing the Russian Federation and particularly its regions is the transition of the economy to an innovative development model. There is some evidence to suggest that innovative development of the regions is expected to be under the focus of researchers and authorities. Thus, the Decree of the President of the Russian Federation of 07.05.2018 No. 204 «National goals and strategic objectives of the Russian Federation development for the period up to 2024» as one of the national development goals defined the acceleration of the technological development of the Russian Federation, increasing the number of innovations up to 50% of their total number. The same decree defines 12 directions, one of them is «Labor productivity and employment support», the target indicator is an increase of the amount of regions of the Russian Federation involved in the implementation of the national project from 16 regions in 2018 to 85 regions in 2024 [6, 7].

The relevance of the issue of the article is supported by the fact that the existing modern approaches to the study of regional economies have not formed a single direction for solving their problems and

for defining the main directions of basic industries modernization. The transition to a new level of innovative development of the region cannot be achieved without identifying its «invariant core», which determines the «genotype» [8]. Thereafter the aim of this study is to develop the «genetic approach». A valuable contribution to the study of genetic approach has been made by G. Shmoller in the middle of the 19th century, who highlighted that genetic approach allows to establish causal relationships of social phenomena, based on the socio-historical, national, psychological, ethnic and anthropological facts. In this work, we sought to develop the identification of the genetic profile of the region, which is formalized through the prism of the industrial and social code, as well as the code of external interaction of the region.

2. Analysis and Application of Methods for Assigning The Main Directions of Basic Industries Modernization Taking into Account the Genetic Profile of the Region

2.1. Analysis of Existing Approaches for Genetic Profile Formation

Numerous works have been devoted to the issue of genetic profile. It is possible to identify various theoretical and methodological approaches. The first scientists in the middle of the 19th century to define the genetic profile were G. Schmoller, M. Weber, S. Bulgakov, V. Zombart. They identified that country's economic appearance is determined by sociohistorical, national-psychological, ethnic, and even anthropological factors. The authors associated the uniqueness of the national economy with the "economic psychology" of nation and argued that economic policy cannot be universal, suitable for all states and times.

This genetic approach had its own theoretical and methodological development at the beginning of the 21st century in the works of E.Z. Meiminas [9], G.B. Kleiner, V.L. Tambovtsev [10]. Thus, the authors claim that each territory has its own socio-economic genotype, which is an informational mechanism for reproducing the structure, principles of functioning, regulatory processes, based on the public consciousness of various social and ethnic groups. Then it turns out that each territory has its own genetic profile, which depends on the dominant social stratum and determines the possibilities and limits of the implementation of economic decisions.

Another direction in the development of a genetic approach to the study of economics is the study of sociocultural codes that determine behavioral attitudes and view of the world [11]. The authors of this research area are A. Auzan, G. Hovstede, R. Inglehart, J. Almond, M. Weiner and others, who investigate the flow of industrial, innovative, modernization processes through the prism of the influence of individual and public values.

At the same time, we believe that it is impossible to reduce the genetic approach in economic processes only to the study of the sociocultural profile of a territory; it needs to be expanded, since for industrial regions one of the most important parameters is the historically determined production activity of basic industries, their location and performance. For example, this idea can be traced in the works of P. Bogoslovskij, in which he uses the concept of "the Ural mining civilization", explaining it as "a specific system of settling two hundred factory cities in which everything is interconnected: the ability to do business with ancient pagan faiths, people's morals with deaf forests and the inaccessibility of the mountains, smelting iron with the amount of snow in the narrow rocky valleys, etc". [12]. Another expert of the Ural region Russian author Dmitry Mamin-Sibiryak, most famous for his novels and short stories about life in the Ural Mountains, have provided another definition of "the Ural mining civilization": a state within a state, whose economy "... is firmly welded to natural cycles, stitched by roads and tightly linked by rivers, the main of which is Chusovaya" [13].

These points of view indicate that the Ural region is a kind of socio-economic territorial complex with its own unique genetic profile, which is a multi-layer memory of the territory, on the basis of which the structure of economic functioning is built, and the ways of interaction of its members and their relationship are determined.

As was pointed out in the introduction to this paper, the main idea of the author's approach for the study is that each region has its own unique genetic profile, the structure of which consists of industri-

al code, social code and external interaction code. Therefore, the purpose of the study is to identify the structure and develop a method for formalizing the genetic profile of an industrial region. The main tasks are the identification of basic codes of the genetic profile of an industrial region and building a dynamic formula of the genetic profile of an industrial region.

2.2. Method of Identifying the Basic Codes of the Genetic Profile of an Industrial Region

This section provides a brief description of the method of identifying the basic codes of the genetic profile of an industrial region.The industrial code of the region reflects its specialization and is determined by indicators illustrating the structure of the economy of the territory. Therefore, it is proposed to use two indicators to calculate it:

1) the index of specialization in the value of the shipped goods of own production, work performed and services on its own in the context of economic activities (P1),

2) the share of basic industries in the region's GRP (P2).

The industrial code of the region is directly related to the social code. Thus, for example, Marx meant by production, independent of his social form, "the process in which a man mediates, regulates and controls the exchange of substances between himself and nature" by his own activity [14]. Therefore, taking into account the classical genetic approach in the economics study, presented above, we define the structure of the social code as:

1) the index of specialization in the average annual number of employees in the context of economic activities (S1);

2) the proportion of the population with higher education in employed (S2).

After the calculation of these social codes, it is possible to assess the agglomeration effects arising in the region, allowing industrial enterprises to use the common labor market, to attract the most qualified and narrow specialists. At the same time, if a high specialization of a region is revealed, then we can talk about the presence of a certain characteristic genetic code of a region, but the absence of it can be interpreted as the absence of a given code, a kind of "plasticity" of a territory that does not have its own distinct "characteristic face".

In the genetic profile of the industrial region, we also include the code of its external interaction. If a territory has a certain transboundary openness, is not closed on its own economic processes, then there is the potential for a change in the genetic profile of the region. Otherwise, it is not necessary to expect serious dynamics in the socio-economic situation in the region. It is necessary to take into account indicators of the development of international relations in the code structure of the region, since they affect the emergence of new industries in the region, the degree of satisfaction of the vital needs of the population, as well as changes in the territorial structure of labor productivity and employment.

Thus, in the structure of the external interaction code of the region we identify indicators that characterize the region's involvement in foreign economic relations, and also having a structure by economic activities:

1) the index of specialization on the value of goods shipped for export (Iexp);

2) the index of specialization of basic industries in terms of the cost of purchasing imported raw materials, purchased products for the production and for sale of products (goods, works, services) (Iimp).

2.3. Method of Construction of the Dynamic Formula of the Industrial Region Genetic Profile

As a basic calculation method to identify the territorial specialization, we propose to use the method of calculating the Herfindahl-Hirschman Index (HHI) [15, 16], which is widely used in foreign practice and is very rare in the Russian for assessing regions [17, 18]. The boundary conditions for assigning a region to a specific type of specialization according to selected indicators that identify the basic codes of the genetic profile are presented in Table 1.

Table 1. Boundary conditions for typing territory codes.

Code	I type - high	II type - average	III type - low
P1	$1 > HHI > 0,3$	$0,3 > HHI > 0,1$	$0,1 > HHI$
S1	$1 > HHI > 0,06$	$0,06 > HHI > 0,03$	$0,03 > HHI$
Iexp.	$1 > HHI > 0,6$	$0,6 > HHI > 0,4$	$0,4 > HHI$
Iimp	$1 > HHI > 0,5$	$0,5 > HHI > 0,2$	$0,2 > HHI$

Type I ($0.3 < HHI < 1$) means that region has a high level of specialization, also the existence of a monopolistic impact on the economy of the territory;

Type II ($0.1 < HHI < 0.3$) – region where the level of specialization has a sufficient impact on economic processes, but there is no clearly expressed monopolist;

Type III ($HHI < 0.1$) – region has no pronounced specialization.

For a formalized display of the genetic profile of a territory, the formulas for P2 and S2 are:

P2=volume of goods shipped, services by basic industries/GRP   (1)

S2= employed population with higher education /total employment   (2)

The author's formula for formalizing the genetic profile of an industrial region is as follows:

$P1(N)P2^{+/-A}S1(N)S2^{+/-B}Iexp(N)Iimp(N)$ (3)

where P1, P2, S1, S2, Iexp, Iimp - codes of the genetic profile, justified above; (N) - type of specialization, may take on the value: I-II-III, reflecting the type of region, see table 1; A and B are superscripts, reflect the dynamics of change of a specific code, are calculated as the arithmetic average of the corresponding code for the study period (if the dynamics of change are positive, then the "+" sign is placed before the index, if the dynamics is negative, then "-").

3. The Results: Finding the Main Directions of Basic Industries Modernization Taking

The initial data and the genetic profile of the Ural region are presented in Table 2.

Table 2. The initial data and the genetic profile of the Ural region.

Code		2013	2014	2016	2018	Genetic profile
Kurgan region						
Industrial	P1	0,282	0,273	0,281	0,309	
	P2	0,267	0,269	0,289	0,312	
Social	S1	0,066	0,055	0,038	0,037	$P1(I)P2^{+0,284}$
	S2	0,242	0,266	0,304	0,273	$S1(II)S2^{+0,271}Iexp(I)Iimp(II)$
External inter-action	Iexp	0,992	0,992	0,993	0,984	
	Iimp	0,240	0,233	0,298	0,330	
Sverdlovsk region						
Industrial	P1	0,325	0,343	0,389	0,405	
	P2	0,322	0,330	0,357	0,361	
Social	S1	0,069	0,065	0,030	0,031	$P1(I)P2^{+0,343}$
	S2	0,254	0,288	0,287	0,289	$S1(II)S2^{+0,280}Iexp(I)Iimp(II)$
External inter-action	Iexp	0,736	0,952	0,944	0,942	
	Iimp	0,462	0,475	0,445	0,388	
Tyumen region (without autonomous regions)						
Industrial	P1	0,359	0,277	0,346	0,331	
	P2	0,422	0,327	0,322	0,313	$P1(I)P2^{-0,346}$
Social	S1	0,068	0,055	0,034	0,033	$S1(II)S2^{+0,293}Iexp(I)Iimp(III)$

	S2	0,263	0,286	0,308	0,314	
External inter-action	Iexp	0,815	0,595	0,552	0,548	
	Iimp	0,090	0,115	0,028	0,133	
Khanty-Mansi Autonomous Area - Ugra						
Industrial	P1	0,516	0,504	0,536	0,526	
	P2	0,720	0,714	0,725	0,712	
Social	S1	0,064	0,041	0,034	0,033	$P1(I)P2^{-0,718}$
	S2	0,301	0,360	0,375	0,364	$S1(II)S2^{+0,350}Iexp(I)Iimp(I)$
External inter-action	Iexp	0,996	0,994	0,993	0,993	
	Iimp	0,527	0,749	0,748	0,715	
Yamalo-Nenets Autonomous District						
Industrial	P1	0,498	0,540	0,522	0,493	
	P2	0,561	0,532	0,594	0,580	
Social	S1	0,081	0,034	0,043	0,044	$P1(I)P2^{+0,567}$
	S2	0,356	0,398	0,365	0,412	$S1(II)S2^{+0,383}Iexp(I)Iimp(I)$
External inter-action	Iexp	0,902	0,573	0,643	0,454	
	Iimp	0,754	0,380	0,914	0,791	
Chelyabinsk region						
Industrial	P1	0,461	0,459	0,465	0,457	
	P2	0,359	0,386	0,416	0,418	
Social	S1	0,06	0,052	0,027	0,027	$P1(I)P2^{+0,395}$
	S2	0,282	0,318	0,307	0,338	$S1(II)S2^{+0,311}Iexp(I)Iimp(I)$
External inter-action	Iexp	0,992	0,983	0,973	0,996	
	Iimp	0,600	0,608	0,569	0,612	

As pointed out in the introduction to this paper, after the analysis of Genetic profile of each region (see Table 2), it can be possible to understand how to improve the industries modernisation for making the region more prosperous and what directions to choose.

Kurgan region. The genetic profile of the region shows the lack of concentration in the economic sphere, both in terms of indicators characterizing production and the formation of GRP, as well as in terms of employment. The average level of concentration in terms of "shipment of goods and services produced" characterizes the region, with the highest concentration recorded in the manufacturing industry, which in turn does not have a clear concentration in any one industry (P1(I)). The main manufacturing sectors of the region are: food production, metallurgical production with the production of finished metal products, production of vehicles and equipment, as well as chemical production. In recent years, there has been an increase in the importance of all the listed industry complexes, therefore, in the near future there is no predicted significant upward trend in concentration and specialization of regional economy. P2 code during the study period has a positive minor dynamics. The average share of basic industries in the region's GRP is 0.284. By employment, the region has an average concentration, while the employed population is more present in the manufacturing industry, as well as in the wholesale trade (S1 (II)). The S2 code for the studied period has a positive insignificant change dynamics, the average share of employed with higher education is 0.271. The concentration of the export area is high (Iexp (I)), export flows from the region are mainly related to the activities of manufacturing enterprises. Import dependence of production in the region is at an average level and is primarily presented in the chemical industry and the production of vehicles and equipment (Iimp (II)). Consequently, the genetic profile of the region contributes to the further development of manufacturing industries, primarily in the food, chemical and metallurgical industries.

Sverdlovsk region. The genetic profile of the region shows a stronger concentration in the economic sphere of the region than in the Kurgan region, but it is impossible to talk about excess concentration, despite the fact that in certain cities of the region such concentration is present (single-industry towns). he region is characterized by a high level of concentration in terms of "shipment of goods and services produced", with the highest concentration recorded in the manufacturing industry, in which metallurgical production and production of finished metal products (P1 (I)) have the greatest influence. The P2 code for the study period has a weak positive trend, the average share of basic industries in the region's GRP is 0.343. By employment region has a strong concentration, the employed population is present in a greater degree in manufacturing and wholesale trade (S1 (II)). The S2 code for the study period has a weak positive trend, the average share of those with higher education is 0.280. The concentration of the export area is high (Iexp (I)), export flows from the region are mainly related to the activities of manufacturing enterprises. Import dependence of production in the region is strong and is primarily present in metallurgical enterprises, as well as enterprises producing electrical equipment (Iimp (II)). As a result, the genetic profile of the region contributes to the further development of processing industries, including high-tech and knowledge-intensive industries, primarily in the metallurgical industry, as well as in the production of equipment and vehicles.

Tyumen region (without autonomous regions). The genetic profile of the region shows the absence of a pronounced concentration in the economic sphere, both in terms of indicators characterizing production and the formation of GRP, as well as in terms of employment. The region is characterized by an average level of concentration in terms of "shipment of goods and services produced", with the highest concentration recorded in the manufacturing industry (P1(I)). At the same time, in the structure of the industrial complex in the context of the processing industries there is no concentration on this or that industry. The P2 code for the study period has a weak negative trend, the average share of basic industries in the region's GRP is 0.346. By employment, the region has an average level of concentration, with the employed population being more present in the manufacturing industry, construction, and wholesale and retail trade. The S2 code for the study period has a weak positive trend, the average share of employees with higher education is 0.293. The concentration of the export area is high (Iexp (I)), export flows from the region are mainly related to the activities of manufacturing enterprises, and in recent years raw materials exports have increased. Import dependence of the region's industries is insignificant and is primarily present in industries related to the extraction of fuel and energy minerals, as well as from enterprises producing electrical equipment (Iimp (II)). Consequently, the genetic profile of the region contributes to the further development of the processing industries, including high-tech and knowledge-intensive ones. This development may be associated with the processing of fuel and energy minerals, but at the moment the region has no clear specialization.

Khanty-Mansi Autonomous Area – Ugra and Yamalo-Nenets Autonomous District. These territories have similar genetic profiles, which reflect a high concentration of industry in the extraction of mineral resources: fuel and energy (P1 (I)). The P2 code for the study period has a weak negative trend in the Khanty-Mansiysk district, while the average share of basic industries in the region's GRP is very high - 0.718. In the Yamalo-Nenets Autonomous District the average share of basic industries in the region's GRP is 0.567, and there is a growth trend. By employment, the regions have a strong concentration, while the population is mainly engaged in the sectors mining, construction, transport, and trade (S1 (II)). The S2 code for the study period has a weak positive trend in both territories, the average share of employees with higher education is 0.350 and 0.383, respectively. The concentration of export areas is high, while export flows are mainly associated with mining (Iexp (I)). Import dependence of production in the region is significant and is also associated with the extraction of fuel and energy minerals (Iimp (II)). Consequently, the genetic profile of the region indicates the presence of a serious monopoly component, the entire economic system of the region is connected with the functioning of a single branch of economy. Further development of the region is inextricably linked with the processes occurring in this industry, and so far there are no prerequisites for diversifying the economy of the territory.

Chelyabinsk region. The genetic profile reflects a high concentration of territory, with the highest concentration recorded in the manufacturing industry, in which the leader is the metallurgical industry and the production of finished metal products (P1(I)). The P2 code for the study period has a weak positive trend; the average share of basic industries in the region's GRP is 0.395. By employment, the region has a strong concentration, while the employed population is more present in the manufacturing industry, as well as in the wholesale and retail trade (S1 (II)). The S2 code for the study period has a weak positive trend, the average share of employees with higher education is 0.311. The concentration of the export area is high (Iexp (I)), export flows from the region are mainly related to the activities of manufacturing enterprises (steel industry). Import dependence of regional production is also strong and is also associated with the provision of metallurgical production. (Iimp (II)). Consequently, the genetic profile of the region contributes to the further development of the manufacturing industries, primarily the metallurgical industry, and the development of more high-tech and knowledge-intensive industries is possible.

4. Conclusion

In has commonly been assumed that without taking into account the peculiarities of the regions, their interests and capabilities, it is impossible to effectively manage the processes of Russia's socio-economic development [19] in the context of limited resources and hard time limit [20]. The findings from the study are expressed in the appearance of additional forecasting possibilities with a high degree of reliability, in the development and selection of strategies for the economic growth of industrial regions and main directions of basic industries modernization on the example of Ural region. Possible area of future research for better practical result would be to build macromodels on a huge experimental and historical material, which allows to identify code connections of the region in dynamics, which will allow us to further model and manage dynamic codes and processes of any territory with minimal cost.

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