Model for assessing risks and threats to socio-economic development of the region and their impact on economic growth

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Abstract. Modern conditions of functioning of economic systems of various (macro-, meso- and micro-) levels set new tasks, risks and threats to the state, which require their solution, minimization, prevention or leveling of consequences. The purpose of this study is to consider the reaction of economies and state authorities to the current digital transformation of regional economic systems. The study of conditions that positively or negatively affect the meso-economic space of the country will help to establish the most significant of the factors that determine the ability to internalize the potential of current changes and strengthen their own competitive positions with their help. Also, this study helps to identify the “pain” points of the regions, which reflect the problems in the adaptation of the country’s entities to digital dynamics, as well as to determine the directions of their solution and/or minimize the damage from the possible consequences of the implementation of threats. This, in turn, will create opportunities for regional authorities and other economic entities to adjust and coordinate their joint efforts to achieve the necessary indicators of economic growth of the regional economy. Achievement of the necessary values of indicators, in particular, will testify to the effective functioning of economic and institutional aspects of economic management.

1 Introduction

Currently, much attention of academic economists and business representatives is focused on the study of the impact of digitalization on economic systems at all levels of its functioning. Of particular interest are works devoted to the study of the impact of digital transformation on the regional component and the factors that are the most significant in this determination. This, in turn, is significant in the following for determining and systematizing the challenges and threats appearing before regional economic systems and economic entities functioning within them with the aim of their possible overcoming or leveling.

The solution of these problems lies in the field of economic theory, based on a number of methods, some of which have found application in this study, namely: systemic, structural-functional, comparative and institutional analysis, econometric methods, etc.

The last decades of research of economic systems, including regional level, are based on the methods of econometric analysis that contribute to the construction of models of
economic and technical-economic phenomena and processes, in this case related to the realities of digital transformation of economic systems, both macro-, meso- and microscales.

Thus, econometric modeling creates opportunities to determine in the system not only the most significant factors affecting it, but also to identify the challenges and threats faced by the economic (including regional) system, in order to determine subsequently the possibilities of their elimination and/or mitigation of negative effects.

2 Materials and methods

The peculiarities of modern development of meso-level economic systems are associated with a multitude of factors, both socio-economic and institutional, infrastructural, information and communication, as well as challenges and threats arising in each of these systems. It is reasonable to give examples of such studies, building their classification on the following theoretical perception of the difference between the mentioned concepts. "Threat is a direct form of danger, which is a set of negative conditions and factors that contribute to the possibility of reducing the level of efficiency of the economic system" [1]. Risk, in turn, should be understood as "the possibility of causing damage to the economic system in connection with the realization of the threat as such" [1] [1]. Based on this understanding, the ranking of studies devoted to this topic (Table 1).

<table>
<thead>
<tr>
<th>№</th>
<th>Authors</th>
<th>Factors</th>
<th>Threats</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I.A. Sushkova [1]</td>
<td>the cause of impacts on the economic system, reflected in the value of variables in the economic model</td>
<td>a set of negative conditions and factors that reduce the efficiency of the economic system</td>
<td>threat realization</td>
</tr>
<tr>
<td>2</td>
<td>M.A. Nikolaev [2]</td>
<td>not considered by the author</td>
<td>categories into: systemic, structural sectoral</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>O.V. Gudkova [3], M.A. Eskindarov et al. [4]</td>
<td>instability of the economic system; Reduced state control over digital transformation</td>
<td>Digital divide; economic system lagging behind needs</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I.M. Chernenko et al. [5]</td>
<td>not considered by the author</td>
<td>labor market polarization</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>V.N. Makhalin, O.V. Makhalina [6]</td>
<td>divides them into: organizational, technological and financial; considers them as unstable phenomena in the digital economy</td>
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</tr>
<tr>
<td>6</td>
<td>T.V. Zvereva [7]</td>
<td>not considered by the author</td>
<td>information security breach; risk of unemployment; increased inequality</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>V.G. Khalin, G.V. Chernova [8]</td>
<td>not considered by the author</td>
<td>reducing the security level of the region; ensuring human rights in the digital space; lagging behind competitors in digital technologies</td>
<td></td>
</tr>
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</table>
The factors related to the adoption of digital technologies from the perspective of the actors: households, entrepreneurship, public services were considered.

Increasing regional differentiation.

The factors of digitalization are studied and regions are differentiated into groups with respect to changes in their socio-economic positions.

Source: Based on the data in the table, it follows that most of the studies of digital transformation of the economy, exploring the regional cross-section is focused on certain aspects, factors or threats and risks. In the aggregate, these phenomena are not actually considered or are poorly considered.

Synthesizing the above studies we can state the following.

First, the factors of digitalization affecting the development of regional economic systems are a set of causes that influence the economic system of territorial subjects of the country and affect the indicators of economic development and growth rates. These determinants should be considered from the position of all economic entities of the economic space of the region and identify the positive and negative impact of them.

Secondly, when analyzing the threats to the digital transformation of the regional economy, we should take into account their systemic nature and present them as a set of conditions and factors [1], which negatively affect the economic system of the region as a whole and can not only slow down the rate of economic growth, but also bring it to negative values.

The conditional division of threats facing the regions in existing studies is based on three criteria: systemic, structural and sectoral [2].

Among the most significant threats that regional economic systems are currently facing are the following: instability of the economic system within the framework of digital changes before its full adaptation (note that there can be no fully adapted systems in constantly changing conditions); the reduction of state control over digital transformation due to the expansion of cybercrime in the digital space [4].

Another aspect of digital changes in the regional economy is the changes in the labor market generated by digitalization [5]. There is a decrease in demand for a number of professions, which is caused by the introduction of technologies of the Industrial Revolution 4.0, as well as the expansion of demand for new professions needed by modern-oriented enterprises. In this connection, a number of problems become relevant:

Also, part of modern research focuses on the classification of threats to the regional economy in terms of their division into organizational, technological and financial. However, all these threats as noted by a number of authors can manifest themselves unstably in the economic system of the region considers them as unstable phenomena in the digital economy [6].

3 Results and discussion

The peculiarities of modern development of economic systems (macro-, meso- and micro-levels) are associated with a variety of factors, both socio-economic, institutional,
infrastructural, information and communication. The identification of the influence of these determinants on one of the important indicators characterizing economic growth - GRP per capita - is presented in the authors' previous work devoted to this issue. Continuing the study of key determinants of the development of meso-level systems and determining an extended list of risks and threats that arise in front of them it is advisable to supplement the authors' method of correlation and regression analysis with elements of design-projecting the mechanistic nature of regional economic systems in synthesis with the SWOT-analysis method and the construction of design mechanisms and design projects [11].

The authors analyzed the countries mentioned above according to 16 indicators:

- Unemployed, thousand people (this indicator and subsequent indicators are presented as independent variables) – X1;
- Employed, thousand people – X2;
- Real monetary incomes of the population, million rubles – X3;
- The number of enterprises and organizations, pcs. – X4;
- The number of students enrolled in bachelor’s degree, specialist’s degree, and master’s degree programs, thousand people – X5;
- Investments in fixed capital (in actual prices), million rubles – X6;
- Availability of fixed assets, million rubles – X7;
- Industrial production index, in % compared to the previous year – X8.
- Agricultural production index in economies of all categories, % – X9.
- Index of the physical volume of retail trade turnover, % – X10.
- The proportion of households with broadband Internet access in the total number of households, % – X11.
- The proportion of the population using the Internet in the total population, % – X12.
- The inflation rate, % – X13.
- The number of connected mobile subscriber devices per 1000 people of the population (at the end of the year), units – X14.
- Expenses of the consolidated budget, million rubles – X15.
- Revenues of the consolidated budget of the subject, million rubles – X16.

It is more expedient to present the analysis of these indicators tabularly with the help of a tabular design project (Figure 1).

Fig. 1: Design project of the analysis of risks and threats to the economic development of the region.
\[\ln Y = 1.16 - 0.37X_1 + 0.098X_2 + 0.052 \ln X_3 + 0.007X_4 + 0.003 \ln X_7 + 0.385X_8 + 0.239X_{12} - 0.043X_{13} + 0.027 \ln X_{16}\]

The source of the model was statistical data on a number of regional indicators provided by the Federal State Statistics Service.

Let us focus our attention in further analysis on the most significant determinants identified by the model regression equation. Let us study them from the position of comparative analysis and consider not only the factor component, but also the above-mentioned classification of challenges and threats accompanying them.

The list of factors identified above represents a set of indicators that can be divided into several groups:

• socio-economic (number of unemployed, number of employed, real monetary incomes of the population, retail trade volume, agricultural production, consolidated budget revenues, inflation rate; consolidated budget revenues);

• institutional (number of enterprises and organizations);

• infrastructural (the proportion of the population using the Internet in the total population, the inflation rate);

• information and communication (the share of households with broadband access to the Internet in the total number of households; the number of connected cell phone subscriptions per 1,000 people).

This list of factors is not exhaustive and can be supplemented and expanded in the future.

Noting the risks and threats corresponding to the identified factors, it should be emphasized:

• socio-economic (possible increase in unemployment in the realities of digital changes in the regions, decrease in the number of employed people, decline in real monetary incomes of the population, decrease in retail trade volumes, decrease in agricultural production due to lower competitiveness of less digitalized industries, decline in consolidated budget revenues, increase in inflation rate);

• institutional (reduction in the number of enterprises and organizations in the region due to the loss of their competitiveness in the digital space);

• infrastructural (speed of implementation of digital technologies, as well as weak opportunities for their implementation on the part of the subjects);

• information and communication (reducing the availability of digital technologies for business entities).

Each of the groups of factors, during the econometric analysis, was analyzed in terms of identifying the most significant factors from each group. The most significant ones are marked within the design project by a gray shaded area. These factors, as shown by the regression model most affect the volume of gross regional product, and consequently, have an impact on the values of economic growth rates.

It should be especially noted that the analyzed design project can be expanded, and the list of groups of indicators can be subjected to an internal more detailed classification. So within the socio-economic group the following subgroups characterizing the economic system can be studied in more detail, namely: the state of markets, prices, financial capital, investment capital, production capital, intellectual capital, human capital, natural capital.

Within the institutional subgroup the following subgroups are investigated: institutions of state power, entrepreneurship, legal and regulatory field, etc. Within the information and communication subgroup: information capital.

4 Discussions

Today, the scientific community is actively discussing the impact of digital changes on the economic life of society as a whole and the economic component as its constituent part.
Researchers are actively studying various factors that can influence the regional economic system, among these determinants, special importance is given to digital ones.

However, given the complexity of the economic system of the regions, their multidimensionality and multidimensionality.

The division of factors into several groups: socio-economic (number of unemployed, number of employed, real monetary income of the population, volume of retail trade, agricultural production, consolidated budget revenues, inflation rate); institutional (number of enterprises and organizations); information and communication (share of households with broadband Internet access in the total number of households; number of connected mobile communication subscribers per 1,000 people).

Identification of determining factors for the regional economic space is very significant for strategic and tactical decision-making not only by the authorities in the implementation of regional economic policy, but also for business structures.

Based on the above, as well as taking into account the theoretical analysis of existing studies in this area, which focus on the study of opportunities to achieve stable and balanced regional economic growth, relying on the consideration of factors system analysis should be conducted from the position of building econometric models and mechanism-design, which will allow in the future:

• to conduct a large-scale and multidimensional analysis of all factors affecting the socio-economic development of the region;
• take into account the factors, risks and threats that hinder the development of the regional economic system or have a negative impact on it;
• identify opportunities for economic growth by identifying key determinants that stimulate the region’s development in the digital era;
• analyze the region’s indicators in dynamics for the subsequent development of forecast development scenarios or their ongoing adjustment, if necessary;
• to produce and/or test hypotheses of scenarios of the socio-economic situation of the region, which will allow finding the most effective one.

5 Conclusion

Based on the above, the following conclusions can be drawn.

First, the factors of regional economic development are a set of causes that affect the indicators of economic development of meso-level systems and their growth rates. These determinants should be considered from the position of all economic entities of the economic space of the region and identify both positive and negative impact.

Secondly, when analyzing the threats of digital transformation of the regional economy, we should take into account their systemic nature and present them as a set of conditions and factors that can have a significant impact on the economic system of the region and reduce its development potential or offset the positive effects by replacing them with negative ones.

The conditional division of factors, risks and threats facing the territorial subjects of the country should be based on the following criteria: systemic, structural and sectoral, which are already presented in the research field of this topic, but must necessarily include the consideration of institutional, infrastructural, social-economic, information and communication specifics.

Among the most significant threats currently faced by regional economic systems are the following: instability of the economic system within the framework of digital changes before the onset of its full adaptation (note that there can be no fully adapted systems in constantly changing conditions); reduced capacity of state control over digital transformation due to the expanding number of cybercrimes in the digital space. The above theoretically significant factors can be analyzed only indirectly through the analysis of existing indicators of the
Federal State Statistics Service and its regional offices, due to the lack of direct indicators characterizing the adaptation of changes in the economic system to digital realities. This indicator should be of an integral nature and be able to capture changes in the system in a timely manner. However, this is currently beyond the scope of this analysis.

Another aspect of digital changes in the regional economy is changes in the labor market, which also fell into the regression model and were analyzed above. This factor is also significant for the economic system and is in the field of national and regional labor market policy.

The list of the above-mentioned factors is a set of indicators that can be divided into several groups:

• socio-economic (number of unemployed, number of employed, real monetary incomes of the population, retail trade volume, agricultural production, consolidated budget revenues, inflation rate);

• institutional (number of enterprises and organizations);

• infrastructural (the proportion of the population using the Internet in the total population, the inflation rate);

• information and communication (the proportion of households with broadband access to the Internet in the total number of households; the number of connected cell phone subscriptions per 1,000 people; consolidated budget revenues).

The analysis of these factors should be conducted from the position of building econometric models and mechanism-design, which will allow further:

• conduct a large-scale and multidimensional analysis of all factors affecting the socio-economic development of the region;

• take into account the factors, risks and threats that hinder the development of the regional economic system or have a negative impact on it;

• identify opportunities for economic growth by identifying key determinants that stimulate the region's development in the digital era;

• analyze the region's indicators in dynamics for the subsequent development of forecast development scenarios or their ongoing adjustment, if necessary;

• produce and/or test hypotheses of scenarios of the socio-economic situation of the region, which will allow finding the most effective one.

It should also be noted that the groups of indicators can be changed, expanded and supplemented in the future by interested researchers.

These measures will further help to improve regional economic policy and will have an additional impact on the possibilities of economic growth of meso-economic systems of the country as a whole.

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