Strategic Supply Chain Planning of Regional Development in Increased External Instability Conditions

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***Abstract*- A major factor in the development of a long-term supply chain strategy for social and economic development is the reduction of the shadow economy volume with the aim to increase the promising incomes of the budgetary system for most Russian Federation subjects, which have low economic potential, a small local market and limited opportunities for economic growth on their own resource base. In this regard, the regional strategic supply chain planning, taking into account the influence of the shadow economy, requires the development of adequate forecast models that take into account the specifics of the territorial processes and ensure the achievement of the target condition for the balance of socio-economic development and the achievement of the planned indicators. Two scenarios are considered in the proposed development strategy of the Russian Federation subject. Conservative scenario presupposes the development of a region on the basis of existing competitive advantage use and supply chain planning. The second scenario is based on the shadow economy negative impact reduction. General scenario conditions are formed depending on the opportunities of investment activity growth by ensuring the transparency of business rules, tax legislation stabilization and economic and investment activity increase at the expense of legal entrepreneurs. The results of the modeling show that the growth of the economy legal segment in the short term based on supply chain will lead to the reduction of employed number, but it will ensure the growth rate of labor productivity at the level of 7% per year, while the level of investment activity will grow by about 10% per year additionally.**

Keywords: *strategic supply chain planning, shadow economy, economic growth, state regulation, regional development.*

1. Introduction

One of the basic criteria for the development of a region by supply chain planning strategic is its multi-variant stochastic character. The lack of balance in sectoral and interbranch economics, as well as a long-term integrated state economic policy, led to the structural changes in the gross regional product and the shadow economy growth. Each Russian Federation subject has its own resources, the use of which must correspond to the national interests and reflect the overall strategy of the state development. A region as a socio-economic system has a necessary potential that can ensure its competitiveness. However, the lack of qualitative changes predetermined a slowdown in economic growth, the decrease of economic subject financial stability, and the increase of informal economic activity. Recently, there has been the shift of emphasis in favor of the program-targeted forecasting, taking into account the allocation of economic activity basic types in a region, allowing the executive authorities to conduct regional socio-economic policy based on scientific justification and an independent decision-making.

The complexity and the peculiarities of the shadow economy have proved the need for research on the basis of integrated and systematic approaches, elemental structural and structural-functional analysis of the shadow economy, as well as the mechanisms of functioning, the accounting for the sectoral specifics of informal economic activity, statistical and market surveys, and the analysis of regional development programs. Besides, a detailed study of the phenomena, the forms and the methods of the shadow economy negative consequence are necessary, as well as the provision of economic development high and sustainable rates, taking into account the social responsibility of business and the state.

Specificity of socio-economic forecasting in meso-level systems

The development of effective systems for the prediction of socio-economic processes and phenomena in meso-level systems requires an active use of economic and mathematical models, on the basis of which it is possible to create adequate forecasts of territory socio-economic development that are the basis for the development of an adaptive state policy.

Two basic approaches are singled out in the economic literature devoted to the problems of macroeconomic prognosis [4], [15]. The first is a statistical approach, the

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use of which implies the determination of the initial economic-statistical model in which a certain number of unknown parameters is given. The main requirement for this model is that it must reproduce the change of the observed factors with a given level of reliability, on the basis of which a correct estimation of the parameters is possible that are used subsequently to develop forecasts [11]. The merits of this approach is that the use of the study statistical methods does not impose additional restrictions on the parameters of the model describing the impact of macroeconomic indicators on the targets. The natural limiting factor in such models is the approximation method, which estimates the change of factors using the model that simplifies the initial assumptions considerably and that contains a limited number of parameters. The second approach is called structural. Its use is based on a relatively high detail level of the economy structural description, which allows to take into account the specific features of the system individual component development [5], as well as to analyze the specifics of the relationship development process between economic agents based on the determination of balance relationships. The use of the second type of models allows to take into account the institutional specifics of RF. Thus, their use makes it possible to take into account the influence of the shadow economy on the dynamics of the socioeconomic development among RF subjects. Table 1 shows a comparative analysis of the instrumental unit.

Table 1 – Extended characteristics of socio-economic forecasting key methods

Method	Implementation degree by criteria			
	Adaptability	Practicality	Reliability	Reasonableness
Expert assessments	Average	High	Low	Low
Theories of games	High	Average	Low	Low
Formalization	Low	Average	High	High
Scenario models	High	Low	Average	Average
Extrapolation	Low	Average	High	Low
Simulation modeling	High	High	Average	High
ARIMA	Average	High	Low	Average
Indicator balance	Low	High	Average	Low

The unification of the data in the regional context makes it possible to apply in practice such methods of forecasting that make it possible to analyze perfectly the prospects for the development of territories such as [2], [3]:

- Scenario approach, which makes it possible to assess the development of a region in actual conditions with the definition of priority trends at the moment, while the calculation of quantitative indicators is carried out with the greatest likelihood of their implementation;
- The method of an imitation model development, which is used primarily in crisis conditions, unusual conditions, and in unfavorable situations.
- The method of situational forecasting based on the models that work out functional and deterministic relations, and each factor feature has an effective value.

Taking into account the considered methods and tools, which can be successfully used now to analyze and evaluate the development of spatial socio-economic systems, a universal organizational and economic model of program-target supply chain planning is proposed. Carrying out the studies of regional social and economic development system characteristics, it is necessary to note that the methodological aspects must be constantly updated taking into account the changes in the economic and political situation of the world, a country, and a region [7], and each region can apply those methods, which allow more realistic approximation of the forecast indicators to the actual state of affairs on a studied territory. The analysis of all trends of the regional economic activity shows positive and negative moments that provide for the advancement and the deterrence of the economy and social sphere development, while monitoring provides an opportunity to identify those problems that prevent a regional development in a given regime. Proceeding from the fact that the study of problems is ongoing, there is always the opportunity to update the strategy, to make adjustments to the plans of measures to implement the strategy for a regional development.

2. Methodology

A particular attention in the development of the regional forecast is given to its territorial section [9]. For the territorial forecasts, the municipal entities of the regions are provided with the developed materials, such as: scenario conditions; the main parameters of the forecast for a regional development with price and tariff indices; software and guidelines.

The presence of targets provides a qualitative content of the forecasting process in accordance with the identified directions of movement and the possibilities of evaluation at each stage of the trajectory development adequacy, which includes supply chain planning (a plan). The indicative plan is a list of the main indices

(indicators) of development [12], for which the target landmarks are determined on the forecast horizon [0, t] in the form of trajectories or intervals:

$$x_i^{min}(t) \le z_i(t) \le z_i^{max}(t). \quad i=1,2,...,n \qquad (1)$$

Where z_i is the area of the most necessary values [z^{min}, z^{max}], developed inside the indicator limits. The minimum and the maximum values of indicators are established on the basis of the economic development targets. At the same time, in order to simulate macroeconomic and regional processes, it is necessary to provide the conditions for a target state (indicative plan) balance, which corresponds to the condition of its theoretical availability. In this regard, there are increased requirements for the accuracy of socio-economic development prediction calculation in the regions [10]. The forecasts of socio-economic development are used in the process of municipal budget formation, as well as during specific decision making for the management of the economy and the social sphere of a particular region in accordance with the approved concept of long-term RF socio-economic development [1]. In the content aspect, the task of target achievement evaluation is an inverse problem of situational forecasting, in which the trajectories of indicators are calculated by a macroeconomic model of any RF subject according to a given development scenario U(t):

$$Z(t) = M(U(t)),\ U(t) \subset U\boldsymbol{o},\ t \in [0,T], \qquad (2)$$

Where M is the macroeconomic model of RF subject;
U – The given scenario of RF subject development;
Z – Trajectory of indicators;
t – The time period.

The achievement evaluation procedure is reduced to the predetermined sequence of situational prediction problem solution [13], the result of their solution, according to the specified indicative plan, is the calculation of regulator adequate values (the best development scenario U*(t)) which ensure the inclusion of indicators in the desired boundaries. In particular, in accordance with this procedure, during the process of modeling, the target level of gross regional product can be set at the end of the forecasting horizon, the values of the regulators for a whole horizon that must be ensured for its achievement can be defined. The peculiarity of the evaluation task concerning the degree of target orientation achievement in modeling is represented by the fact that the target benchmarks of the region socio-economic development are very contradictory [6], and the provision of conditions for their inclusion in the given boundaries of all indicators is mathematically insoluble in the totality of development. It looks, for example, like this in the most relevant aspects of modeling:

- The increase of tax burden leads to the activation of tax evasion processes;
- The introduction of tax benefits contradicts the goals of the budget provision increase [16], [17] etc.

However, in real practice, such solutions are implemented within the framework of restriction softening on indicators. Therefore, taking into account the impossibility of the whole set of indicators placement within the given limits, it is proposed to form an appropriate solution in the conditions of "non-rigid" boundaries, which have the least error calculated during the development of forecasts. For these purposes, the quality criterion of the resulting solution Q is introduced in the applied model, characterizing the overall error due to the available deviations of the indicator values from the desired values obtained during the scenario use:
Where,

$$Q = \sum_{i=1}^{n} Q_i$$

$$Q_i = \begin{cases} 0, \text{если } z_{minj} \le z_{maxj} \\ (z_{minj} - \dfrac{z_i(T))^p g_{1i}}{m_i}, \text{если } z_{minj} > z_i(T) \\ (z_i(T) - \dfrac{z_{maxj})^p g_{2i}}{m_i}, \text{если } z_i(T) > z_{maxj} \end{cases} \qquad (3)$$

Where Q_i – are the losses resulting from the indicator deviation from the range of permissible values at the end of the forecast horizon;
g_{1i}, g_{2i} – the significance of the i-th indicator;
p – Degree indicator (usually p = 1 or p = 2);
m_i – scale factor used to bring indicators to a comparable scale.

If the target value is exceeded, the value of the significant coefficient g_i is approved and equated to 0. In order to implement high-quality forecasts at the regional level, let's determine the main forecasting functions that correspond to the Concept of Social and Economic Development Strategy in Russian Federation regions [8]:

- The development of forecasting and supply chain planning system based on two levels (regional and municipal one), which are used in the development of the regional and municipal budget;

- The monitoring of region social and economic development, which is called upon to solve the problems arising under the impact of the crisis promptly. The forecasting process includes the processing of available information by certain methods and with the approximate accuracy expressed by the indicators, which should be oriented in the regions, supply chain planning socio-economic development.

The model of the Stavropol Territory strategic development taking into account the shadow economy

The analysis of indicator performance and the adjustment of their performance in the Stavropol Territory shows that the growth will occur in the following basic types of activities due to the reduction of the shadow economy: industrial, agro-industrial production of the construction industry, as well as service sector. The prospects of the Stavropol Territory development are assessed within two scenarios: a conservative scenario and the scenario that calls for the intensification of the fight against the shadow economy sector (the scenario of shadow economy reduction). Conservative scenario presupposes the economic development based on the use of existing competitive advantages of Russia and it is based on the established trends. The scenario does not imply a comprehensive implementation of tools and methods that minimize the scale of the shadow economy. The scenario of shadow economy reduction demands a closer interaction between state authorities and entrepreneurs, the provision of additional tax preferences, which will lead to the budget system revenue fall in a short term. Scenario conditions for the Stavropol Territory within the first and the second scenarios will be formed depending on the opportunities for investment activity growth due to the emergence of entrepreneurs from the shadow, whose volumes can vary significantly for the Stavropol Territory within the framework of both the conservative scenario and the scenario of removal from shadow policy, tax policy, implemented at the national level, which determines the tax burden on entrepreneurs and the policy of population incomes.

Scenario forks are also determined by development alternatives of province sector specialization, the minimization of the shadow economy scale, suggesting the increase of business rule transparency, the stabilization of tax legislation and the growth of economic and investment activity at the expense of entrepreneurs emerging from the shadow economy. These scenario developments include the forecast of socio-economic development main indicators at the Stavropol Territory for the period until 2030, which was developed in the framework of the hypotheses and the prerequisites characterizing the scenarios presented above. The conservative scenario assumes that by 2030 the average per capita incomes in the province will be 70% of the average Russian level, the second variant supposes to change the trends of economic activity development. The result of the outstripping growth of the basic industries with the increase of the declared payroll level, assumes that the average per capita incomes of the Territory population will reach the average level in the country within real terms.

The forecast of investments into the economy of the Stavropol Territory was calculated on the basis of investment projects and investment programs of large enterprises expected in the future and the estimates of investment activity prospective growth due to the growth of law-abiding economic entities in the Stavropol Territory, the coordination of investment activity projections of RF subjects in the framework of the North Caucasus Federal District development strategy. The main quantitative characteristics of the Stavropol Territory development options up to 2030 are presented in Table 2. The GRP dynamics produced during the forecast period in the Stavropol Territory roughly corresponds to the all-Russian trends, since social and economic processes in the province are under the determining influence nationwide trends. During the implementation of conservative option prerequisites, the dynamics of production are formed due to changes in intraregional demand, external demand will be changed initially. The growth rate of GRP in the province will be determined mainly by the dynamics of household consumption, the development of the social service sphere, agriculture and processing industry.

Table 2 – Macroeconomic parameters of socio-economic development options in the Stavropol Territory (2030, in times by 2015)

Indicators	Development option	
	Conservative	Shadow economy
GRP	1,8	2,8
Investments in the basic capital from all sources of financing	1,7	3,8
Real incomes of population	2,0	3,3
GRP per capita	2,0	2,9
Labor efficiency	1,9	2,8

The second option is based on high growth rates of investment in fixed assets and the reduction of economy informal sector. High growth rates of investments in the strategy of shadow economy reduction are maintained throughout the forecast period. Thus, the investment in fixed assets will be increased in 2025 by 2.6 times as compared to 2015 in the modernization and by 3.8 times in the innovation option.

The forecast assumes that the industry of the region will be developed relatively fast. The differences in the rates of industrial dynamics according to the forecast variants will be formed under the influence of the program implementation minimizing the negative impact of the shadow economy, which involves administrative pressure reduction on entrepreneurs, the regulatory framework improvement, the optimization of tax control procedures, and a simultaneous provision of tax preferences to law-abiding taxpayers. In the variant of shadow economy reduction, the processing sector becomes an essential factor of industrial growth, which will be provided mainly through the emergence of a significant number of entrepreneurs out of the shadow, as well as by the growth of energy production. The prospective implementation of investment projects and programs, as well as the growth of legal investment activity, will cause high rates in construction, the growth of population incomes, which will serve as the factor of outstripping development in the sphere of wholesale and retail trade. Thus, the difference between these scenarios refers to the quality of the institutional environment, and not just by its quantitative parameters. The variant of shadow economy reduction provides the highest rates of average per capita GRP indicator growth (Table 3); however, it requires more stringent conditions for its implementation to improve institutional conditions and provide legal and regulatory support for its growth. The growth of the legal segment of the economy in a short term will lead to the number of employed ones reduction in the economy, but it will ensure the growth rate of labor productivity at the level of 7% per year, while the level of investment activity will grow by about 10% per year additionally.

Table 3 – Stavropol Territory production efficiency growth indicators in terms of forecast options

Indicator	2015	Forecast option	2020	2025	2030
GRP per capita (thousand rubles in prices of 2015)	130,9	Conservative	171,7	208,7	258,0
		Shadow economy reduction	178,6	252,5	380,4
Labor efficiency (thousand rubles in prices of 2015)	293,6	Conservative	375,5	456,4	564,1
		Shadow economy reduction	390,5	552,0	831,8

The level of labor productivity by 2030 should exceed the corresponding indicator in the conservative variant by 14% and in the variant of shadow economy reduction by 47%. The transition to the variant of the Stavropol Territory development within the shadow economy reduction makes it possible to realize the competitive advantages of the region and to strengthen its positions in the Russian economy. Due to a low economic potential, the changes in the specific indicators of the Stavropol Territory are insignificant, but they unambiguously characterize a positive dynamics of the territory development against the background of other regions.

3. Conclusions

Thus, assessing the prospects of the Stavropol Territory development in the framework of two scenarios (conservative and shadow economy reduction) which characterize alternative models for Russian Federation development, it should be noted that they make it possible to forecast the basic indicators of the region socio-economic development, as well as the evaluation of the economy informal sector changes, which allows us to analyze the quality of economic growth. In the Stavropol Territory with a low economic potential, a small local market and limited opportunities for economic growth on its own resource base, the most important factor in the formation of a long-term strategy for social and economic development is the reduction of the shadow economy scale with the aim of budget system prospective income increase. In this regard, the implementation of the program counteracting the expansion of the shadow economy in the North Caucasus Federal District can create incentives for the development of the Stavropol Territory economy and set the trajectory of future development. A productive solution to each of these tasks can be achieved only by a system of concrete measures for economic policy, after a preliminary determination of these measures priority in terms of their effectiveness [14]. It is necessary to use the result of regional development's strategic supply chain planning for this, considered in the first chapter of the study. Proceeding from this, we obtain a vertically structured system of RF economic policy measures with respect to the shadow economy. The counteraction to the shadow economy in the real sector should be carried out by creating the conditions for shadow economy reduction by the decrease of business costs and the improvement of the state regulation system. In this regard, it is necessary to adopt the following measures by federal and regional authorities:

1) The improvement of the methods predicting the scale of the shadow economy in order to develop an adequate mechanism of its negative impact neutralization;
2) The analysis of the risk management system in respect of their openness and closure;
3) The development of proposals for a conceptual revision of approaches to the system of state regulation with in order to weaken the administrative pressure of controlling bodies on economic entities;
4) The fight against corruption, bureaucracy and the development of population legal culture and literacy.

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