

Development of Methodological Approaches to Assessing the Effectiveness of Import Substitution in Russia*



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Abstract. The relevance of the study is due to the fact that the process of import substitution, which is on the rise in the country, requires a reliable and accurate quantitative assessment of its effectiveness. The main idea of the study is to assess the effectiveness of import substitution as a complex multidimensional phenomenon characterized by multidirectional and contradictory dynamics of its processes in their unity, relationship and mutual influence. The goal of the study is to develop a method for integrated assessment of import substitution effectiveness on the basis of theoretical substantiation of its principles and provisions. To achieve the goal we use such methods as analysis and generalization of existing methodological approaches to its assessment. The hypothesis of the study is based on the fact that the method we have developed allows us not only to make a reliable assessment of the effectiveness of import substitution, but also to predict the directions of its increase. Our research develops the works of other authors in the field of integrated assessment of import substitution effectiveness: we elaborate a comprehensive system of target performance indicators (the system has not been used before) and assess the trends in the development of import substitution processes structured in the context of domestic production, export and import of goods subject to import substitution, according to the degree of achievement of these indicators. The study was carried out with the use of methods such as factor determinant and structural-dynamic analysis, and multi-criteria optimization method. The technique was tested on the example of food products – the flagship of domestic import substitution. We reveal the processes that hinder import substitution in the food industry and some positive trends in import substitution that confirm its effectiveness. We calculate an optimal structure of commodity resources, which ensures the achievement of import substitution effectiveness in the food industry to the fullest extent. It is advisable to apply our technique in the field of import substitution in individual commodity groups, each of which has its own features in the formation of imports, exports, domestic production and their specifics in the context of research tasks. We plan to continue our research in the development of methods for a comprehensive assessment of the impact of import substitution on economic growth in the country.

Key words: import substitution; efficiency, import substitution effectiveness; assessing import substitution effectiveness; sanctions; food products.

Introduction

The external restrictions and threats of recent years and the unfavorable world market situation for the domestic economy have once again demonstrated the irrationality of Russia's foreign trade balance and the failure of its raw materials exporting model. The policy of boosting import substitution in an extremely difficult period for the country, on the one hand, indicates the awareness of the extreme importance of this problem and the need for its accelerated solution; on the other hand, it gives the country another chance to reach the forefront of world economic progress. At the

same time, a reliable quantitative assessment of the effectiveness of import substitution implemented in the country is of paramount importance, since it helps unambiguously interpret the state of import substitution at any time, identify its problems, priorities and targets, forecast further development in accordance with the real situation in the country's economy and the state of resource support for its economic growth.

The relevance and significance of quantitative assessment of import substitution effectiveness makes it necessary to find a solution to several problems. The most

important of them are as follows: studying the information database of import substitution; critical analysis of existing methodological approaches of domestic and foreign scientists to assessing the impact of import substitution; rationale and development of our own technique for a comprehensive assessment of import substitution effectiveness and its testing on the example of commodity resources undergoing an active process of import substitution at the present stage; identification of ways to improve the effectiveness of import substitution in Russia.

The source of reliable information on the effectiveness of import substitution can be found in the official statistics, which widely cover the structure and content of foreign trade turnover of Russia, its domestic production and consumption as a whole in the country and in the context of individual product groups and commodity items.

The composition and nature of the use of these indicators in the scientific works of various authors is determined by the goals and objectives of their research. At the same time, we can clearly trace two types of work. The first type involves indicators that are not subject to economic-statistical processing and (or) are analyzed using the simplest of methods like measurement, comparison, grouping, etc. For example, O.A. Mironova [1] evaluates the effectiveness of import substitution in various economic sectors on the basis of studying the dynamics of absolute and relative indicators of imports and exports of the Russian Federation. R. Connolly and Ph. Hanson [2] assess the effectiveness of import substitution by analyzing energy prices, imports and exports, gross domestic product, investment activity in the country, etc. O.A. Chernova and V.V. Klimuk [3] build their assessment of the effectiveness of import substitution on the analysis of statistical

data on the share of exports and imports in Russia's GDP in comparison with the leading countries of the world. K. Ullrich [4] assesses the effectiveness of import substitution in Russia by analyzing the dynamics of such indicators as gross domestic product, exports, imports, the ruble exchange rate, cost of import substitution programs, etc.

Despite the fact that these studies do not contain new solutions in assessing the effectiveness of import substitution, their conclusions are quite reliable and substantiated, since they are based on official statistics. However, given the complex multidimensional nature of import substitution and its contradictory and multidirectional dynamics expressed by different units of measurement, we can note that the use of individual indicators makes it difficult to assess the overall effectiveness of import substitution and obtain the answers to three basic questions: 1) is there a real process of import substitution in the country? 2) what impact do the sanctions imposed on the country's economy have on import substitution? 3) what trends hinder the process of import substitution? Clear answers to these questions are given in studies based on a comprehensive assessment of the effectiveness of import substitution. Such an assessment is based on a system-wide study of cause-effect relationships in the processes of import substitution, their maximum detail, and the development of various ways to systematize indicators expressing these processes.

Analysis of studies of various authors in the field of integrated assessment of the effectiveness of import substitution primarily demonstrates their diversity. Thus, the methodological tools for assessment are used in the context of import dependence of the national economy on its trading partners [3], the state industrial policy [5; 6], innovation

activities carried out in high-tech industries [7], the regional strategy for import substitution [8], evaluation of the multiplicative effects of the implementation of the state program for import substitution [9], etc.

In the vast majority of studies, a comprehensive assessment of the effectiveness of import substitution is carried out by calculating a wide range of relative values based on the absolute indicators presented in the official statistics. As a rule, their authors calculate various coefficients [6; 7; 10; 11]. A number of studies use relative values in the form of indices. For example, O.A. Chernova and V.V. Klimuk [3] assess the performance of import substitution using the index of import dependence, the index of the country's economic integration in globalization process and the foreign trade balance index per 1 km of transportation from the exporting to importing country. K.A. Kolotov in his dissertation research [12, pp. 80-85] proposes a method for calculating the aggregate index of import substitution effectiveness as the ratio of the aggregate index of the quality of import substitution (measured by the ratio of the values of domestic production in the current period relative to the base one) to the time of the structural shift in the economy, measured from the beginning of the implementation of import substitution measures and up to the analyzed period.

In a number of studies, a comprehensive assessment of the effectiveness of import substitution is based not only on the calculation of private coefficients, but also on the definition of integrated performance indicators. Thus, I.G. Ershova and A.Yu. Ershov [5] have developed an integral indicator of import substitution effectiveness, which helps group regions of the country into the leading (high efficiency), median (average efficiency) and

stagnant (low efficiency). V.A. Borovkova and M.O. Tikhanovich [8] calculate the integral effectiveness indicator as the sum of partial indicators of performance (coefficient of import dependence, the share of innovative products, coefficient of import coverage by export, etc.) and weighting factors characterizing the degree of influence of each criterion on the final indicator.

A separate group of studies consists of scientific works, the authors of which use a matrix model for assessing the effectiveness of import substitution. In particular, this model, which is based on the system of national accounts using the input-output method of analysis is implemented in the works of D.A. Tatarkin, E.N. Sidorov, A.V. Trynov [9] and L.A. Strizhkova [13]. In assessing the effectiveness of import substitution, the balance method was also used. For example, the technique used by A.A. Losev, V.I. Soloviev, A.M. Sunchalin [14] is based on the comparison of two sets of indicators – the volume of production and import of goods and the volume of consumption of goods on the domestic market and their export.

According to the analysis of the works of different authors we reveal of a number of problems related to assessing the effectiveness of import substitution.

First, in our view, ratio analysis does not correspond to the purpose of evaluating the effectiveness (efficiency) of import substitution, because such an analysis simplifies the assessment and does not ensure the reliability of the results due to lack of validity and, in some cases, the arbitrary nature of indicators calculated. Moreover, the combination of a set of coefficients into integral indicators observed in a number of works further reduces the reliability of assessment of import substitution effectiveness.

Second, most works substitute the term “effectiveness” with “efficiency”. Given the complex and multifaceted nature of import substitution, the traditional approach to understanding its efficiency as a ratio of the result obtained to the cost of achieving it is hardly applicable. This coincides with the point of view of A.M. Vyzhitovich and P.A. Yershov [15, p. 57], who conclude that it is virtually impossible to calculate the efficiency of import substitution from such positions with mathematical precision in comparable units. The vast majority of studies estimated the effectiveness rather than the efficiency of import substitution, because the proposed techniques for its assessment consider the results of development of this process rather than its effects. The study of O.A. Chernova [10] is an example of a few works, the authors of which made an attempt to calculate the actual effects of import substitution.

In our opinion, the solution to the above-mentioned problems can be found in the development of such methodological approaches to the assessment of the effectiveness of import substitution, which are based primarily on identifying the trends in the development of its absolute and therefore reliable indicators in their unity and structural interaction; besides, the approaches should focus on determining the extent to which these indicators achieve their target values in accordance with the country’s development priorities.

The development of methodological approaches to assessing the effectiveness (efficiency) of import substitution can be traced in the works of foreign scientists. In particular, Y. Kiliçaslan, I. Temurov [16] assess the effectiveness of import substitution in the context of identifying the correlation between import substitution, labor productivity and competitiveness on the example of

manufacturing industries in South Korea and Turkey.

In the work of R.A. Aregbeshola [17], the effectiveness of import substitution is studied from the standpoint of its impact on economic growth in the BRICS countries with the use of econometric methods.

Ko M.L., Plasmans J. and Song-ken H. [18] propose to evaluate the effectiveness of import substitution using an aggregate coefficient of import substitution, which is a sum of weighted coefficients for the import of industries or groups of industries in which the relative sizes of the industry are the measure of weight.

H.G. Abhyankar, S. Dharmadhikari [19] assess the effectiveness of import substitution on the basis of indicators of balance of payments, the overall level of prices and price elasticity of the demand for goods on the example of India.

Foreign [20; 21] and Russian [22; 23] studies on the effectiveness of import substitution in conjunction with the sanctions imposed on the economy are also relevant. All research in this area is united by one common conclusion: sanctions have a significant impact on the economy and the processes of import substitution. That is why the assessment of the effectiveness of import substitution must be carried out taking into account the sanctions regime under which the economy is functioning.

Having reviewed the existing methodological approaches to the assessment of the effectiveness (efficiency) of import substitution presented in the studies of domestic and foreign authors, we point out their diversity and the corresponding wide coverage of evaluation methods. Their authors tested them the example of different countries, industries, enterprises, and commodity groups. The works of domestic scientists clearly show

a positive vector of development of import substitution and its effectiveness. Foreign scientists give more cautious assessments of the effectiveness of import substitution in Russia; nevertheless, they recognize that the process of import substitution in the country is carried out and some progress has been achieved in its implementation. All of the above makes the problem of reliable assessment of the effectiveness of import substitution in Russia even more relevant.

Research methods

In the method we propose, the effectiveness of substitution is understood as the degree of compliance of the scale and dynamics of its processes (that are structured in terms of imports, domestic production, and exports of commodity resources subject to import substitution) with the target indicators that reflect the priorities of import substitution in Russia at the present stage.

Import substitution is recognized as effective provided that the values and dynamics of indicators characterizing the trends in the development of the structural components of the model correspond to the target indicators.

Our technique for estimating the effectiveness of import substitution is based on the following principles: 1) complexity that takes into account the complex multidimensional nature of import substitution and the contradictory dynamics of the processes described by a wide range of statistical indicators; 2) structural arrangement, which is manifested in grouping commodity resources subject to import substitution in the form of three structural blocks (import, domestic production, exports) that are monitored simultaneously in their interrelations and mutual influence; 3) reliability, which is provided by the use of official statistical information and the lack of integrated

indicators that can distort the results of the assessment; 4) relevance, expressed in the focus on the priorities of import substitution, the observance of which meets the economic interests of the country.

We identify the composition of import substitution priorities, structure its processes and assess the degree of achievement of performance indicators with the use of the following provisions.

The priorities of import substitution at the present stage of development of the domestic economy are as follows:

1) to reduce the share of imports in the total volume of foreign trade turnover (or in the total volume of commodity resources of the domestic market) to the level at which economic security of the country is fully achieved;

3) to increase exports while reducing the share of raw materials exports in total exports;

2) to displace foreign goods from the domestic market, replacing them with highly competitive (safe, high-quality and innovative) analogues of domestic production;

4) to increase domestic production of high-tech goods (with a high share of value added) and their share in total exports.

In the economy of any country in which domestic production of goods is carried out and which has export-import operations, the total volume of commodity resources of this type is expressed by an additive factor model, which includes three main components: 1) the volume of imported goods; 2) the volume of goods produced domestically; 3) the volume of goods produced domestically and intended for export

$$V_{CR} = V_I + V_{DP} + V_E,$$

where V_{CR} – the volume of commodity resources of this type;

V_I – the volume of import of the goods consumed in the domestic market;

V_{DC} – the volume of domestically produced goods consumed within the country (excluding goods exported);

V_E – the volume of domestically produced goods intended for export.

All variables in this model are single indicators, the absolute values of which (import, export – in US dollars, domestic production – in rubles) are widely represented in the official statistical information. At first glance, the effectiveness of import substitution can be easily monitored if we look at the dynamics of the total volume of commodity resources and their components produced in the country. However, many multidirectional options of behavior of the same variables and the outcome indicator of the model can be considered effective.

The application of a structural approach to the model of formation of commodity resources of this type allows us to assume that the total amount of these resources is equal to 100%, and to express its components in shares and, thus, to abandon the consideration of the changing trend of the final indicator in the model. The components of the resulting structural model, represented by the shares of imports, domestic production and exports in the total volume of commodity resources, are interconnected and affect each other. Simultaneous identification of trends in the development of each structural part of the total volume of goods subject to import substitution of this type in their interdependence and mutual influence provides a reliable assessment of the effectiveness of import substitution. In addition, only in the structural approach it is possible to decompose the variables of import, domestic production and export into their most important components and at the same time identify the features of their dynamics.

In this context, the model for assessing the effectiveness of import substitution takes the following form:

$$V_{CR} = D_I + D_{DP} + D_E ,$$

where V_{CR} – the volume of commodity resources of this type, taken as 100%;

D_I – the share of imports of goods in the total volume of resources of these goods;

D_{DP} – the share of domestic production of goods in the total volume of resources of these goods (excluding goods sent for export);

D_E – the share of the volume of domestic products intended for export, in the total amount of resources of these goods.

Under the influence of the sanctions in the foreign economic activity of the country caused by both external and internal effects, the indicators D_I and D_E should be formed taking into account the share of imports (exports) subject to the sanctions:

$$D_I = D_{NSI} + D_{SI} ,$$

where D_{NSI} – the share of imports that do not fall under the sanctions restrictions; D_{SI} – the share of imports that fall under the sanctions regime;

$$D_E = D_{NSE} + D_{SE} ,$$

where D_{NSE} – the share of exports that do not fall under the sanctions restrictions; D_{SE} – the share of exports that fall under the sanctions.

It should be noted that the sanctions regime of the country's foreign trade can have both positive and negative impact on its economy. An example of the positive impact of the sanctions is the embargo imposed by the Russian Government in August 2014 on the import of food products from a number of countries (EU, USA, Canada, etc.)¹, which created prerequisites for the growth of domestic food production.

¹ On the measures for the implementation of the decrees of the President of the Russian Federation: Resolution of the Government of the Russian Federation of August 7, 2014 No. 778.

Taking into account the fact that the main priority of exports of goods is the growth of volumes and share of high-tech (innovative) goods produced within the country, the indicator D_E is detailed as follows:

$$D_E = D_{NSE} + D_{SE},$$

where D_{LTE} – the share of low-technology goods in export composition; D_{HTE} – the share of high-tech products in export composition.

In addition, from the point of view of import substitution priorities at the present stage, the level of high-tech goods should also be taken into account in the composition of D_I to make comparisons with their value in the composition of exports:

$$D_E = D_{LTE} + D_{HTE},$$

where D_{LTI} is the share of low-tech goods in the composition of imports; D_{HTI} is the share of high-tech goods in the composition of imports.

The effectiveness of import substitution can be achieved if the following conditions are met.

1. The market niche that is released after the goods under sanctions have been excluded from the total volume of imports is filled with domestically produced goods, i.e. the increase in domestic production of goods is proportional to the reduction of sanctioned imports before and after the imposition of sanctions:

$$\Delta D_{CH} \leq \Delta D_{BII}.$$

$$\Delta D_{SI} = D_{SI\ BS} - D_{SI\ AS},$$

where $D_{SI\ BS}$ is the share of imports from the countries subject to sanctions restrictions before the sanctions are imposed;

$D_{SI\ AS}$ is the share of imports from the countries subject to sanctions restrictions after the imposition of the sanctions.

$$\Delta D_{DP} = D_{DP\ AS} - D_{DP\ BS},$$

where $D_{DP\ AS}$ is the share of domestic production in the total volume of commodity resources after the imposition of sanctions;

$D_{DP\ BS}$ is the share of domestic production in the total volume of commodity resources before the imposition of sanctions.

The similar situation should occur in the case of export sanctions.

2. The share of imports of goods in the total amount of resources of these products has a decreasing trend ($\downarrow D_I$) and is limited to the value of the target identifier for each type of goods (industry); at the same time the share of imports not affected by the sanctions and the proportion of imports under sanctions in total imports do not increase; moreover, they tend to decrease: $\downarrow D_{NSI}$, $\downarrow D_{SI}$; the share of high-tech goods in the composition of imports also decreases ($\downarrow D_{HTI}$).

3. The following items show a positive trend:

- the share of the volume of domestic goods in total resources of these goods ($\uparrow D_{DP}$);
- the share of the volume of domestic goods that are sent to export ($\uparrow D_E$);
- the share of high-tech products in export composition: $\uparrow D_{HTE}$; the rate of growth of the share of high-tech goods in the composition of export has outpaced that of the export itself: $G_R D_{HTE} > G_R D_E$.

The assigned criteria reflect the state of the economy of the country in which there is an active process of import substitution; the country has import operations in the framework of its foreign trade turnover, but the priority is given to the development of domestic production of competitive goods and their exports, mainly the exports of high-tech goods.

The condition for assessing the effectiveness of import substitution is the expression of exports, imports and domestic production of goods in the same units of measurement.

Domestic production is mainly expressed in the national currency of Russia – in rubles. Being expressed in US dollars (by analogy with exports and imports), the indicator of domestic production of goods becomes comparable with the indicators of export-import operations of the country and reflects the real impact of the ruble on the prices of domestic goods in terms of their import component, income and profits of Russian producers.

The model for assessing the effectiveness of import substitution was tested on the example of food products – the flagship of domestic import substitution in recent years. Most of the individual indicators characterizing import substitution in this area are presented in the official statistical information of Rosstat, but some related aspects of the implementation of the model require explanation.

In deciding on the range of values of the share of imports of goods in the total volume of these goods consumed in the domestic market of the country, we proceeded from the fact that the threshold values of indicators characterizing the state of food security of the country for certain types of goods can serve as target indicators of the share of food imports².

If we assess the effectiveness of import substitution of food products in the whole country without differentiating by separate types of goods, we can assume that the target indicator of the minimum percentage of replaceable import can be its value, above which there is a real threat to the food security of the state and which, according to various estimates, is more than 25% [24, p. 47], 30% [25, p. 77], and more than 40% [25, p. 12] [26, p. 12]. We conditionally accept that the share of imports of goods in the total volume of these

goods consumed in the domestic market of the country is $D_i < 35\%$.

The value of the market niche that is released due to the sanctions restrictions in food imports, and the consequent condition on the proportional increase in domestic food production in relation to the import of these products affected by the embargo was calculated according to the total share of the following countries: first, those on the list of the countries, food imports from which were banned in 2014; second, those countries on which we have reliable statistical information; third, those countries, whose imports clearly prevailed in the import of food in the pre-crisis period. Therefore, the value of the released market niche in the domestic market of the country was estimated according to the total share of the EU, USA and Ukraine. At the end of 2014, the share of these countries in imports ($D_{CI SI}$) amounted to 47.8% and decreased in 2015 to 22.9%. Since 2016, there has been a growing trend in the share of EU, US and Ukraine in Russian imports (in 2016 it amounted to 23.1%, in 2017 – 24.0%, in 2018 – 25.1%).

Research results

The results of the study are presented by the data on the changes in the structure of food resources of the country for 2007–2017 in the context of three structural blocks (the volume of imports of goods; the volume of domestic production; the volume of exported domestic goods), detailed in accordance with the priorities of import substitution at the present stage.

Table 1 shows the values and dynamics of the absolute (volume of resources) and relative (proportion of the volumes in total resources) indicators used in the technique. First of all, attention is drawn to the trend of changes in the total volume of food resources. Until

² On the approval of the Food Security Doctrine of the Russian Federation: Decree of the President of the Russian Federation of 30.01.2010 No. 120

Table 1. Dynamics of the indicators used in the technique for assessing the effectiveness of import substitution of food products

Indicator	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Volume of commodity resources, V_{CR} , mln USD	103154	142070	118925	143807	165144	169387	177468	166032	126354	121464	137666
Volume of imports, V_r , mln USD	27626	35189	30015	36398	42544	40655	43255	39957	26650	25072	28924
Volumes of food products produced domestically, V_{DP} , mln USD	66438	97603	78943	98654	109276	111963	117951	107093	83489	79317	88043
Volume of domestic food products sent for export, V_E , mln USD	9090	9278	9967	8755	13324	16769	16262	18982	16215	17075	20699
Volume of imports of food products that do not fall under the sanctions restrictions, V_{ISP} , mln USD	10942	13583	13117	17216	19953	19392	20416	20858	20547	19280	21982
Volume of imports of food products from countries subjected to embargo, V_{SP} , mln USD	16684	21606	16898	19182	22591	21263	22839	19099	6103	5792	6942
Volume of imported high-tech food products, V_{HTP} , mln USD	5035.0	6532.4	4500.8	6013.1	6903.3	6924.1	7494.1	7022.2	4394.9	3760.2	5781.9
Volume of exported high-tech food products, V_{HTE} , mln USD	1163	1210	1037	1100	1239	1507	2343	2301	1821	2151	2782
Volume of exported low-tech food products, V_{LTE} , mln USD	7927	8068	8930	7655	12085	15262	13919	16681	14394	14924	17917
The share of imports of food products in the total volume of resources of these goods, D_r , %	26.8	24.8	25.2	25.3	25.8	24.0	24.4	24.1	21.1	20.6	21.0
The share of domestic production of food products in the total volume of resources of these goods, D_{DP} , %	64.4	68.7	66.4	68.6	66.2	66.1	66.5	64.5	66.1	65.3	64.0
The share of the volume of domestic products intended for export, in the total amount of resources of these goods, D_E , %	8.8	6.5	8.4	6.1	8.1	9.9	9.2	11.4	12.8	14.1	15.0
The share of imports of food products that do not fall under the sanctions restrictions, D_{ISP} , %	10.6	9.6	11.0	12.0	12.1	11.4	11.5	12.6	16.3	15.9	16.0
The share of imports of food products from embargoed countries in the total volume of resources of these goods, D_{SP} , %	16.2	15.2	14.2	13.3	13.7	12.6	12.9	11.5	4.8	4.8	5.0
The share of imported high-tech food products in the total volume of resources of these goods, D_{HTP} , %	4.9	4.6	3.8	4.2	4.2	4.1	4.2	4.2	3.5	3.1	4.2
The share of high-tech food products sent for export, in the total volume of resources of these goods, D_{HTE} , %	1.1	0.9	0.9	0.8	0.8	0.9	1.3	1.4	1.4	1.8	2.0
The share of low-tech food products sent for export, in the total volume of resources of these goods, D_{LTE} , %	7.7	5.7	7.5	5.3	7.3	9.0	7.8	10.0	11.4	12.3	13.0

Sources: own compilation with the use of: Russian Statistical Yearbook. 2008–2018; Statistics Collection. Rosstat. Available at: <http://www.gks.ru/>; Socio-Economic Situation in Russia. 2015–2018. Statistics Collection. Rosstat. Available at: <http://www.gks.ru/>; Statistical Bulletin of the Bank of Russia. 2008–2018. Available at: <http://www.cbr.ru/>.

2012, there was a positive dynamics of their growth, which was subsequently replaced by a downward trend (an average of 10,466 million US dollars per year). Only in 2017 there was a tendency toward the growth of the values of this indicator.

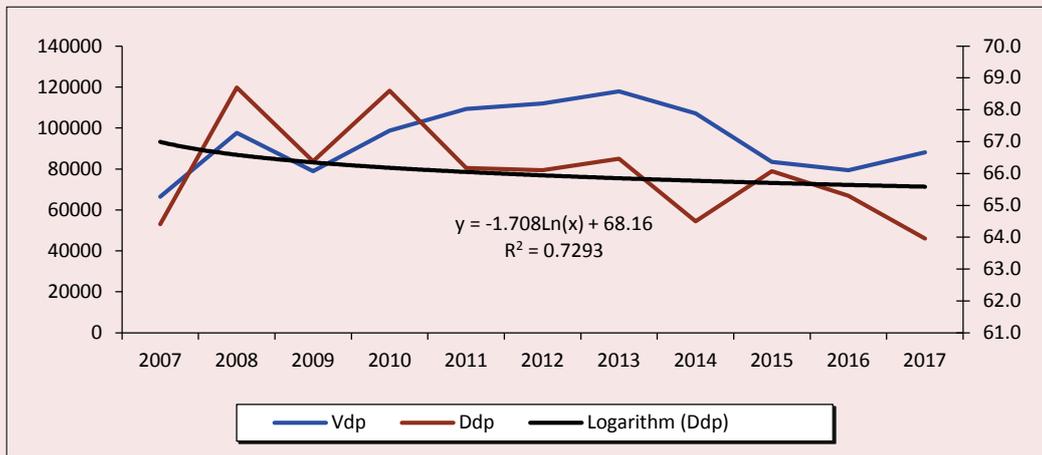
The following trends are observed in the structure of commodity resources:

- the dynamics of the share of domestic goods in total resources of these products for 2007–2017 are unsteady, but since 2010 we observe negative dynamics in the share of

domestic goods in total resources of these products against the backdrop of their decelerating decline (*Fig. 1*);

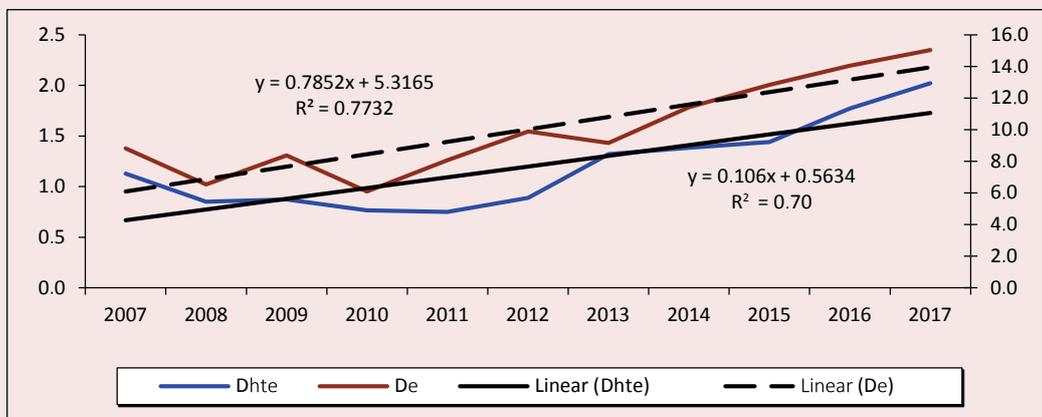
- there is an increase in the proportion of domestic goods intended for export (average for the year – by 0.79%) (*Fig. 2*), including the share of high-tech goods (on average for the year – by 0.11%); we note that the average annual decline in the share of imports in the composition of commodity resources is slower (0.56%) than the average annual growth of exports (0.79%) (*Fig. 3*);

Figure 1. Dynamics of the volume of domestic goods and their share in the total volume of food resources for 2007–2017, million USD, %



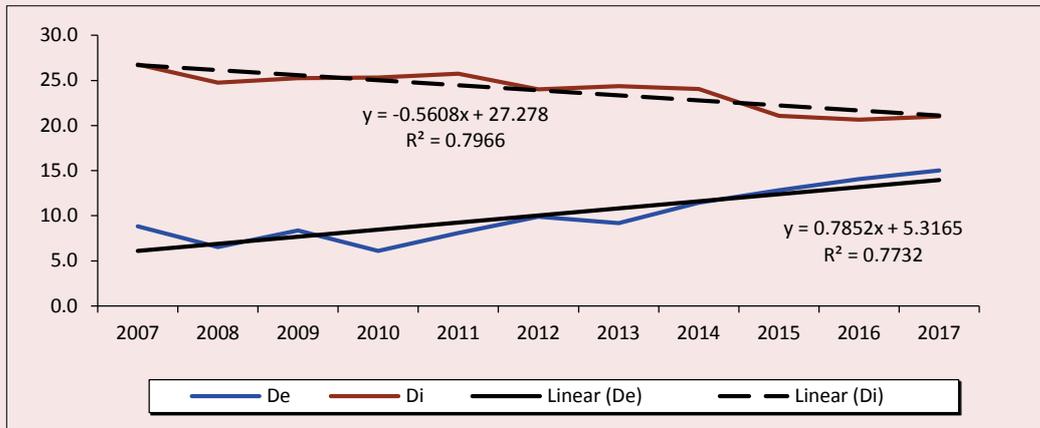
Source: own compilation.

Figure 2. Dynamics of the share of exports and the share of high-tech exports in the total volume of food resources for 2007–2017, %



Source: own compilation.

Figure 3. Dynamics of the share of exports and imports of food products for 2007–2017, %

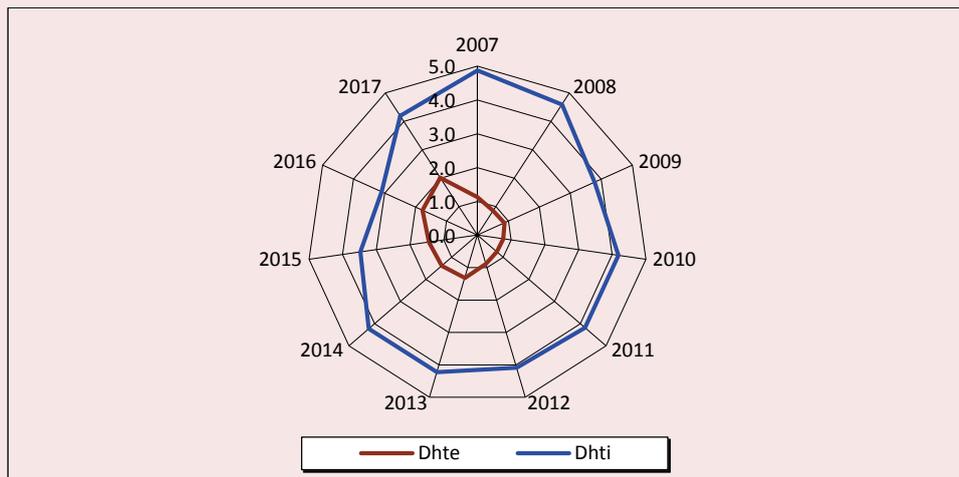


Source: own compilation.

– we observe an increase in the volume and export share of goods (see Tab. 1), and the maximum values of indicators were achieved in 2017 – 2,782 million US dollars and 2% accordingly. The comparison of the volume and share of exports and imports of such goods in

the structure of the total volume of commodity resources shows an accelerating decline in the ratio of imports and exports of high-tech food products, as well as a decreasing difference in their share values, the minimum value of which (1.3%) was achieved in 2016 (Fig. 4);

Figure 4. Dynamics of the share of exports and imports of high-tech food products in the structure of commodity resources for 2007–2017, %

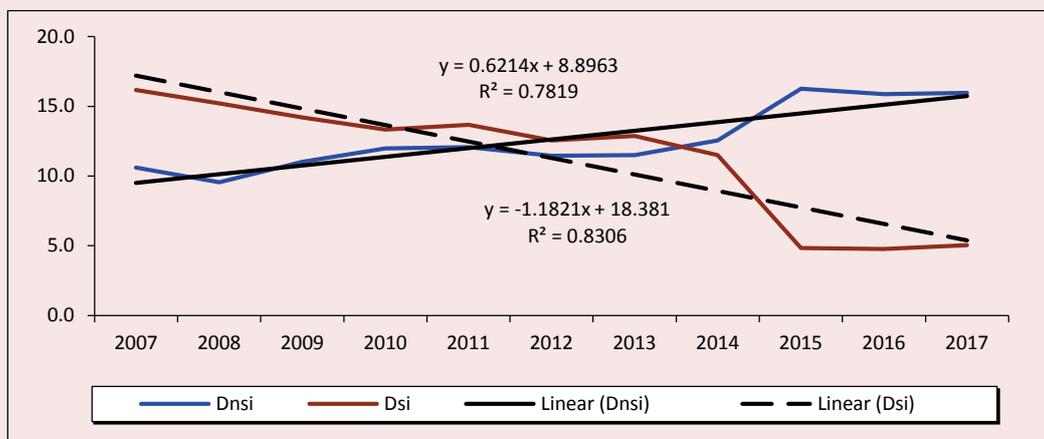


Source: own compilation.

– if we look at the dynamics of the structure of food imports in the context of those not falling under the sanctions restrictions and those subject to the sanctions regime, we see that there is a growth in the share of imports from the countries not subjected to sanctions (per year on average by 0.62%) (Fig. 5).

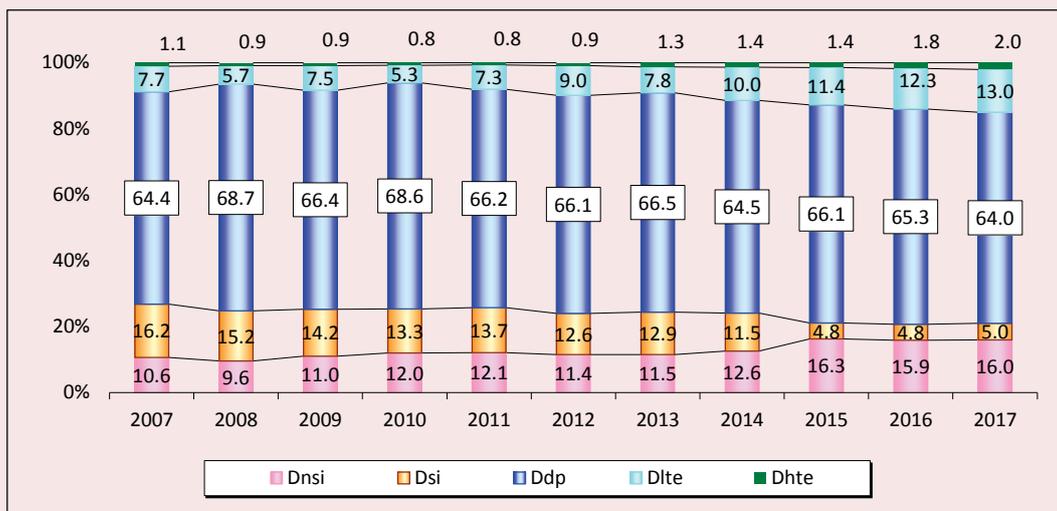
The general picture of the changes in the structure of commodity resources for 2007–2017, if we consider separately the import of food products not subject to sanctions restrictions and the import of food products under the sanctions regime, is shown in Figure 6. There is a decrease in the volume of domestic

Figure 5. Dynamics of the share of imports not subject to the sanctions restrictions and imports coming under the sanctions regime for 2007–2017, %



Source: own compilation.

Figure 6. Dynamics of the structure of commodity resources for 2007–2017 (the imports of food products not covered by sanctions restrictions and those under the sanctions regime are considered separately), %



Source: own compilation.

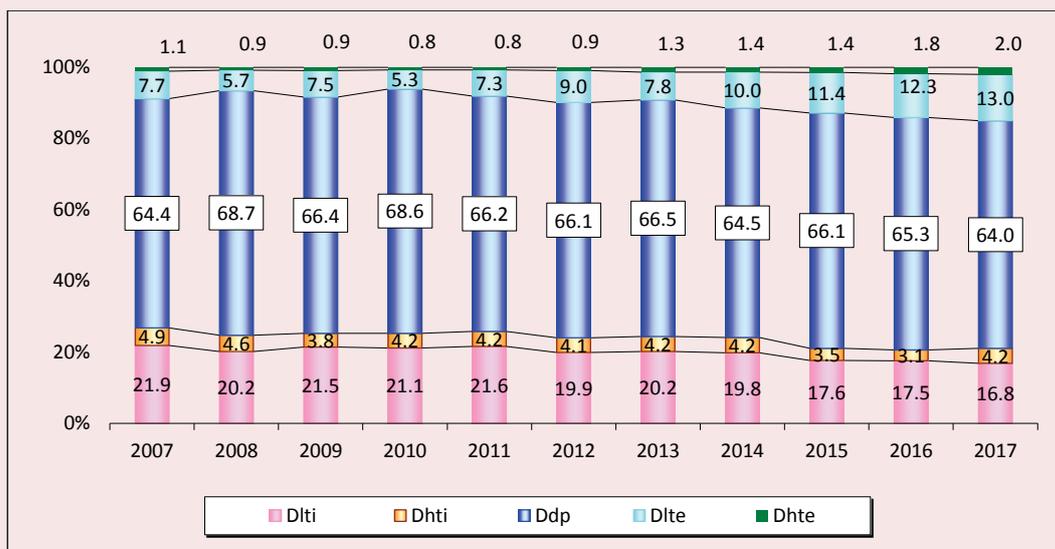
goods while the share of these goods for export is increasing, and the share of imports is decreasing. At the same time, the share of exported high-tech goods is growing.

The final form of the structure of commodity resources, if we group food imports into high-tech and low-tech is shown in *Figure 7*. There is a declining trend in the dynamics of the shares of both high-tech and low-tech imports in the total volume of food resources.

The criterion $\Delta D_{SI} \leq \Delta D_{DP}$ (if $D_{SI} > 0$) is not fulfilled in the sanctions period, i.e. the niche released after the goods that enter the country under the sanctions regime have been excluded from the total volume of import has not been filled with domestic goods to the fullest extent. In 2015, a more than twofold decrease in the share of imports was accompanied by a decrease in the share of domestic goods by 1.6%. Even with a 1.4% increase in the share of food exports, the released part of the resources was not fully filled with domestically produced

goods. A similar situation can be observed in 2016 – the share of domestic goods decreased by 0.8% compared to the level of 2015, and the share of exported food products increased by 1.3%. In 2017, the decrease in the share of domestic goods and the increase in the share of exported goods were supplemented by the positive dynamics of the share of imports in the structure of commodity resources. The increase in imports by 15.4% in 2017 was achieved largely by the growth of imports not covered by sanctions (19.9% vs. 14.0%, reflecting the increase in imports under sanctions). This increase is greater than the increase in domestic production, which amounted to 11% compared to the level of 2016. Such changes have led to a decrease in the share of domestic production volumes to a value below the level of 2014 and they indicate that in 2017 there was a reorientation of sanctions imports to the imports from countries that did not fall under the embargo.

Figure 7. Dynamics of the structure of commodity resources for 2007–2017 (if we group the imports of food products into high-tech and low-tech), %



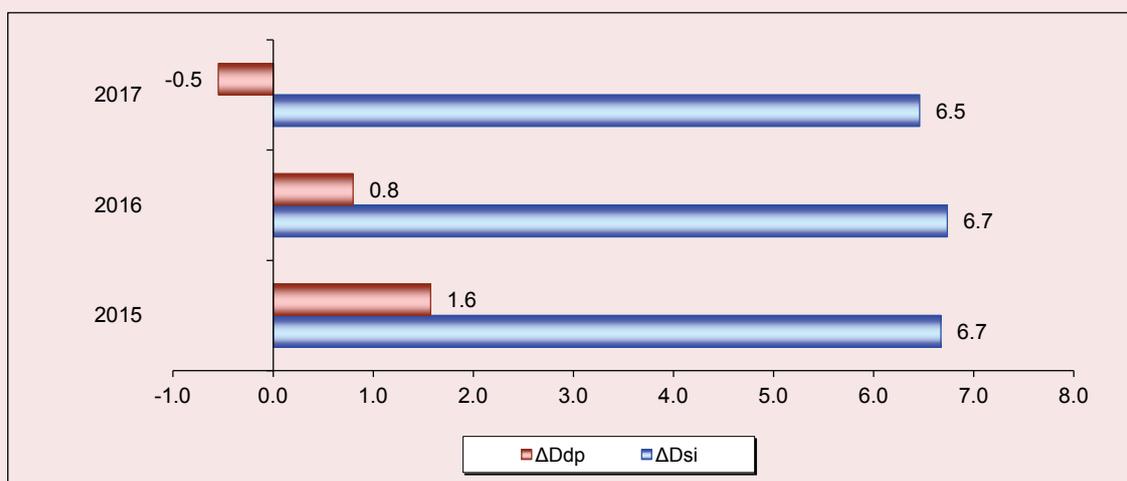
Source: own compilation.

According to the calculations, in 2015, the released niche in the amount of 6.7% of the volume of commodity resources was filled with domestic goods by 3% and with imported goods by 3.7%; in 2016 – by 3.4 and 3.3%, in 2017 – by 3.1 and 3.4%, respectively (Fig. 8). If we assume that the size of the released niche is 100%, then in 2015 domestic goods accounted for 44.8%, imported goods

– 55.2%; in 2016 – 50.7 and 49.3%, in 2017 – 47.7 and 52.3%, respectively; i.e., domestic food products fill only about half of the released market space.

Russia’s food security criteria in the period from 2010 to 2017 are fulfilled for almost all food products, the discrepancy was observed only with regard to meat products and meat in 2010 and 2012 (Tab. 2).

Figure 8. Comparison of changes in the share of sanctions imports before and after the introduction of sanctions with the changes in the share of domestic production of food products for 2015–2017, %



Source: own compilation.

Table 2. Dynamics of the share of imported food products in the total volume of their commodity resources in 2010–2017

Type of goods	Value of the share of imports ensuring food security of the country	2010	2011	2012	2013	2014	2015	2016	2017
Vegetable oil	< 20%	2.96	2.86	2.49	2.20	2.32	3.16	0.00	3.33
Meat and meat products	< 15%	16.04	14.80	16.10	13.91	13.16	10.95	8.87	8.69
Milk and dairy products	< 10%	3.17	2.59	2.20	3.44	3.50	2.88	3.63	3.67
Fish products	< 20%	5.20	5.03	5.37	5.79	5.58	4.56	4.19	4.74
Sugar	< 20%	3.77	4.51	0.85	0.70	1.15	1.32	1.01	0.44
Potato	< 5%	0.80	1.75	0.97	1.30	0.96	0.96	1.44	0.76
Grain	< 5%	0.64	0.55	0.57	0.54	0.58	0.87	0.93	0.80

Compiled with the use of the following sources: On the approval of the Food Security Doctrine of the Russian Federation: Decree of the President of the Russian Federation of 30.01.2010 No. 120; Russian Statistics Yearbook. 2005–2018. Statistics Collection Rosstat. Available at: <http://www.gks.ru/>; Indicators of import substitution in Russia. Share of imports of individual goods in their commodity resources. Available at: <http://www.gks.ru/>.

The general picture of compliance with the target criteria in our technique for assessing the effectiveness of import substitution, tested on the example of food products, is presented in *Table 3*.

The results of the assessment show that of the ten targets criteria only six ($\downarrow D_{HTI}$, $\uparrow D_E$, $\uparrow D_{HTE}$, $\downarrow D_I$, $\downarrow D_{SI}$, $D_I < 35\%$) are fulfilled, one ($\downarrow D_{NSI}$) is not fulfilled, the criterion $\uparrow D_{DP}$ is also not fulfilled, but its decline is slowing down.

All of the above allows us to draw the following main conclusions. The positive dynamics of import substitution of food products is provided by a reduction in the share of imports in their total amount, including the share of imports under the sanctions restrictions and the share of imports of high-tech goods; moreover, the share of imports in the total resources of these products corresponded to the values of the country's food security throughout the period under consideration. There is an increase in the share of domestic food products intended for export, including high-tech goods. Negative structural changes

are reflected in a decelerating reduction in the share of domestic food products and an increase in the share of food imports not subject to sanctions. Embargoed food imports have largely been reoriented toward imports from other countries. As a result, the niche that was released in 2015–2017 in the domestic market after the imported goods that enter the country under the sanctions regime were excluded from the total volume of imports, is filled with domestic food products only by half.

The fulfillment of all the criteria of import substitution effectiveness will be possible if there is a change in the structural components of the total volume of goods formed in the country – their import, domestic production, and export. The calculations performed in the process of solving the multi-criteria optimization problem, based on the composition of the criteria used in our technique (by the method of uniform search for the optimal alternative solutions), show (*Tab. 4*) that, based on the results of import substitution achieved in 2017, the increase in

Table 3. Compliance with the target indicators for assessing the effectiveness of import substitution of food products

No.	Indicator	Target value of the indicator	Fulfillment of the target indicator
1.	Ratio of the increase in domestic production of goods ΔD_{DP} to the reduction of sanctioned imports ΔD_{SI} before and after the imposition of sanctions	$\Delta D_{SI} \leq \Delta D_{DP}$	Is not fulfilled in 2015–2017
2.	Proportion of imports, D_I	$\downarrow D_I$	Is fulfilled
3.	Compliance of the share of imports D_I with the target indicator of food security	$D_I < 35\%$	Is fulfilled
4.	Proportion of imports that fall under the sanctions regime, D_{SI}	$\downarrow D_{SI}$	Is fulfilled
5.	Proportion of imports that do not fall under the sanctions restrictions, D_{NSI}	$\downarrow D_{NSI}$	Is not fulfilled
6.	Proportion of high-tech goods in the composition of imports, D_{HTI}	$\downarrow D_{HTI}$	Is fulfilled
7.	Proportion of the goods of domestic production, D_{DP}	$\uparrow D_{DP}$	Is not fulfilled, but the decline is slowing down
8.	Proportion of domestic goods that are sent to export, D_E	$\uparrow D_E$	Is fulfilled
9.	Proportion of high-tech goods that are sent to export, D_{HTE}	$\uparrow D_{HTE}$	Is fulfilled
10.	Ratio of the growth rate of the share of high-tech exports D_{HTE} to the growth rate of the share of exported goods D_E	$G_R D_{HTE} > G_R D_E$	Is not fulfilled in 2009, 2011–2012, 2014–2015 Is fulfilled in 2007–2008, 2010, 2013, 2016–2017

Source: own compilation.

Table 4. Forecasted structure of resources of food products, %

Indicators	Structure of commodity resources in the last year of observations	Forecast structure of commodity resources
The share of imports that fall under the sanctions regime, D_{SI}	5.0	4.6
The share of imports that do not fall under the sanctions restrictions, D_{NSI}	16.0	8.9
The share of domestic production in the total volume of commodity resources, D_{DP}	64.0	71.4
The share of high-tech imports, D_{HTI}	2.0	2.1
The share of low-tech exports, D_{LTE}	13.0	13.0
Source: own compilation.		

the share of domestic production by 7.4 p. p. will help fill the niche released as a result of counter-sanctions only with domestic goods. In addition, this will ensure a 7.1 p.p. decrease in the imports not subject to sanctions and, accordingly, will increase the share of exports in the total volume of commodity resources by 0.1 p.p.

Conclusion

The significance of the scientific research conducted and reflected in the work is due to the development of scientific ideas about the target priorities, directions of implementation and methods of assessing the effectiveness of import substitution at the present stage of development of the Russian economy, characterized by market instability, adverse influence of geopolitical factors and external constraints. The method we have developed to assess the effectiveness of import substitution allows us not only to simulate the real processes of import substitution, but also to forecast their development from the standpoint of the need to achieve the target indicators that ensure the effectiveness of import substitution.

Approbation of the method on the example of food products has shown that the process of import substitution in this group of commodity resources is actively developing, but not all the target criteria of import substitution are fulfilled. The obvious set of measures developed in numerous studies to intensify import substitution in the agro-industrial complex

of the country must necessarily be based on scientifically substantiated quantitative guidelines of the processes taking place in it. On the basis of the results that we have obtained, the optimal structure of commodity resources was calculated, which helps ensure the full achievement of the effectiveness of import substitution of food products.

The results obtained in this work can be used in further research on the reasons that reduce the effectiveness of import substitution in Russia, and can also be used by public authorities in the development of economic policies, federal and regional programs in the field of import substitution. The proposed method is universal and suitable for any kind of commodity resources emerging in the country, which develops its domestic production and at the same time actively participates in global economic processes. However, the processes of import substitution as part of various commodity resources have their own specifics. In particular, while assessing the effectiveness of import substitution of food products their import was discussed from the positions of counter-sanctions introduced by Russia; they have divided foreign goods consumed in the country into those free from the restrictions and those the import of which from a number of countries is banned. Breaking down the import of food products, taking into account this circumstance, we have calculated the size of the released niche intended to be filled with

domestic goods based on the target settings of import substitution. If restrictions (both external and internal) are applied to the export of any goods, then within the framework of our technique this export can be considered in appropriate detail. The most preferred area of research in this case is the import substitution processes in certain product groups, for which the adopted and implemented import substitution programs set limits on the share of imports in the total volume of these goods.

In addition, it is necessary to take into account the evidence that the process of import substitution is manifested not only in structural changes in the foreign trade balance of the

country and its domestic production, but also in positive trends in the socio-economic sphere in terms of the increase in employment and income of the population and its standard of living as a whole. The increase in the number of indicators involved in the methodology makes it necessary to improve the approaches to assessing the effectiveness of import substitution. At the same time, it is extremely important to assess the impact of import substitution on economic growth in the country and the prospects for its further development. It is in this direction that we will continue further research in the field of assessing the effectiveness of import substitution.

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