

The Automated Decision-making Support System in the Field of Customs and Tariff Regulation of the Eurasian Economic Union: Methodological Foundations*

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Abstract. The article proposes a methodology for the formation of an automated decision-making support system in the field of customs tariff regulation of the Eurasian Economic Union with the ability to predict the structure of domestic consumption of a particular product. The proposed automated system consists of modules that implement logical models to present databases and their processing to make informed decisions on changing the rates of import customs duties towards the goods imported into the Eurasian Economic Union territory. The methodology, which forms the base software of the automated system, makes it possible to determine the rational level of customs and tariff protection in relation to a specific type of product following the implemented strategy for the development of domestic production of this product and the international obligations of the EACU member states to the WTO. An essential component of the developed methodology is the ability to predict the structure of domestic consumption of goods together with changes in the level of customs and tariff protection. The adoption of the developed methodology ensures the change of the import duty rate within the state's international obligations, which will ultimately ensure an increase in the volume of domestic industrial production of goods without additional costs to the domestic and consumer.

Keywords: Customs and tariff regulation · Import demand · Forecasting production volumes · Decision support system · Eurasian Economic Union

1 Introduction

The turbulence of the modern world manifested in international disputes, contradictions, restrictions, pandemics, and impending crisis testifies the importance of food self-sufficiency. In such conditions, the government regulation measures that stimulate the national industry's development allow minimizing dependence on the external market and successfully resisting the most

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unpredictable influences. In general, state regulation ensures the formation of a system for the population satisfaction of goods that rationally combines the advantages of international trade and the need to develop domestic industrial production. In this regard, decision-making in foreign trade regulation should be justified by assessing the consequences of decisions made based on quantitative information about the industrial production volumes, foreign trade, and qualitative information about the development strategies of domestic industrial production. Therefore, it is advisable to form management decisions on the necessary customs tariff level to protect a particular product. The article proposes a forming methodology for an automated decision-making support system in customs tariff regulation, taking into account the tasks of developing domestic industrial production and ensuring economic security rather than maximizing the federal budget's utility or revenue.

2 Materials and Methods

Many studies, which are part of various foreign trade models (classical, neoclassical, and modern), are devoted to the justification of the application of customs and tariff regulation measures in foreign trade. Based on general and partial equilibrium models, recent works study the characteristics of supply and demand for imported and domestic goods, depending on the price of goods and its elasticity. The study (Lindert, 1992) examines the effect of the tariff on the nation's general welfare, introduces the concept of "optimal tariff", and notes that the introduction of customs and tariff protection reduces the nation's aggregate welfare. However, "it is necessary to know where the limit of the free trade regime lies". It also studies the customs duty rates as a tool that allows us to directly influence the price level of imported and domestic goods (Novikov, 2012). The study (Saurenko, 2013) proposes an assessment of the impact of customs tariff rates on the import volume of domestic consumption in the Customs Union member states, based on maximizing budget revenues. Among the works studying the issues of theoretical and empirical approaches of the import sensitivity to measures of foreign trade regulation, should be mentioned the study of Idrisov G.I. (2010). In work (Hong, 1999), it is indicated that only two parameters directly affect the amount of import demand – income and relative prices, and other factors, such as resource possession, market size, consumer preferences, customs duties, etc., – will be taken into account in the changes of the relative product prices. According to (Knobel, 2011), in addition to the importing country's income, the prices of imported goods, and domestic substitute goods, the factors influencing demand are the Russian ruble's real effective exchange rate.

The proposed methodology is distinguished by the establishment of the import duty rate based on the task of maximizing the volume of domestic production and the ability to predict the structure of domestic demand, and, accordingly, the volume of demand for imported goods, taking into account the chosen strategy for the development of production of goods in the member states of the Eurasian Economic Union.

3 Results

The automated decision-making support system in customs tariff regulation is a system consisting of modules that implement logical models of database presentation and their processing to make informed decisions on changing the import duty rates of the goods imported into the territory of the Eurasian Economic Union. The automated system consists of two modules:

- Data module – an array of information data (statistical information, international obligations, high-quality data on the development strategy of industrial production, etc.);
- Information processing module – data processing algorithm for calculating the coefficient of import dependency and the required import customs duty rate, forecasting the domestic consumption structure.

The data module is a collection of statistical quantitative and qualitative industrial production data, foreign trade, and industrial development priorities. In general, foreign trade statistics, statistics of industrial production volumes, structural vectors, economic security indicators, and international obligations are the information necessary for the informed decision about the amount of the import duty rate towards the specific product code.

Foreign trade statistics of the Russian Federation and the Eurasian Economic Union are provided both for exports and imports in physical and monetary terms. The mentioned statistics are publicly available on the official websites of the EACU member states' statistical agencies.

The statistics of the volumes of industrial production of the Russian Federation and the Eurasian Economic Union are also presented in physical and monetary. The specified statistics are kept following the All-Russian classifier of types of economic activities and other EACU member states' classifiers and are not publicly available. Besides, there is a problem with the simultaneous and single classification of goods of the Commodity Nomenclature of the Eurasian Economic Union's Foreign Economic Activity and with the specified classifiers.

Structural vectors (industrial development strategies) reflect the product development information of a specific product type (or an enlarged group of goods) in the Russian Federation and the Eurasian Economic Union. Such vectors are determined by the analysis of the strategic document on the development of industrial sectors and foreign trade policy of the Russian Federation and the EACU and represent four descriptive meanings:

- Passive development strategy;
- Potential development strategy;
- Protection development strategy;
- Focused development strategy.

Foreign trade security factors and their threshold values represent the critical import share of a specific product type in domestic consumption. Mentioned indicators and their threshold values are developed based on ensuring national security and including only those goods or commodity groups necessary for the population needs.

The Russian Federation and the EACU's international obligations inside the WTO determine the final import customs duty rate for a specific type of goods.

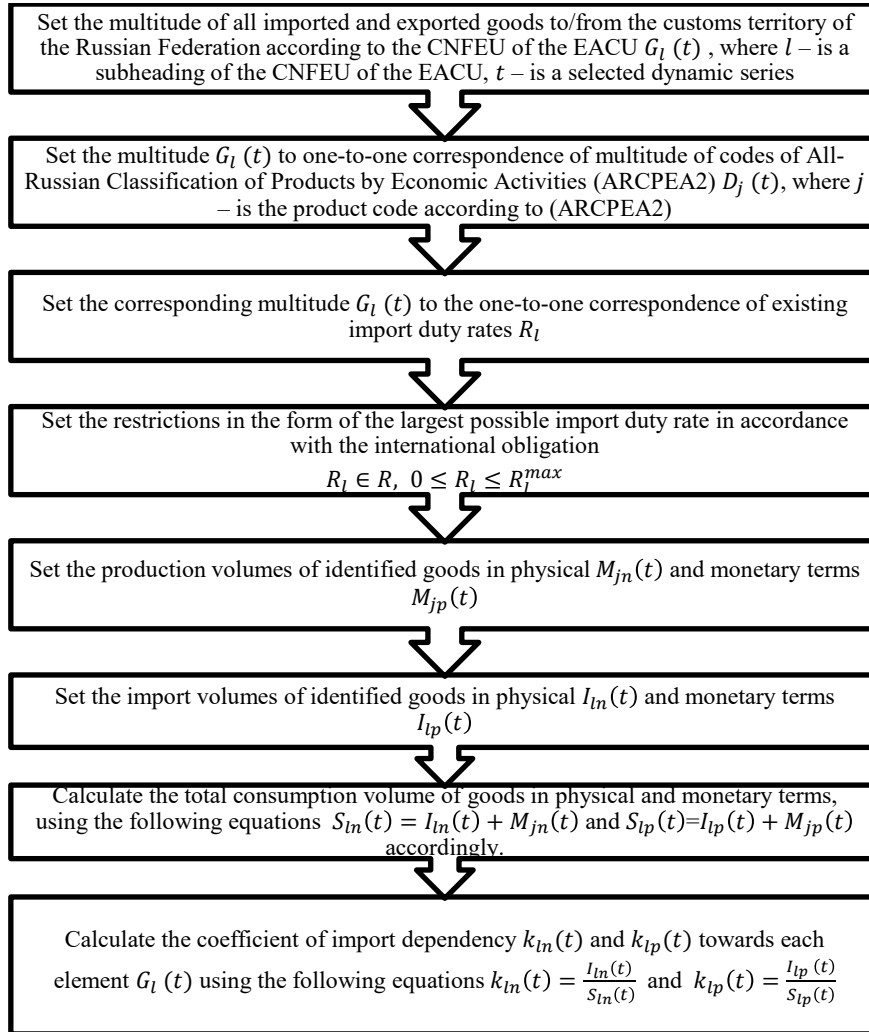
To create an array, it is advisable to make a joint information cloud for custom departments (foreign trade statistics), statistical departments (industrial production statistics), government bodies/authorities that develop strategies and priorities for industrial and foreign trade development of the EACU members (structural vectors, indicators and threshold values of foreign trade security, international obligations), the Eurasian Economic Commission (information integrator).

The data processing module includes calculating a rational amount of the import duty rate and forecasting the domestic consumption structure when the rate changes.

The rational amount of the import duty rate is calculated from the coefficient of import dependency of goods and the customs and tariff protection matrix, built on the domestic production development strategies.

The algorithm shown in Fig. 1. is essential for calculating the coefficient of import dependency.

Table 1. The algorithm of import dependency.



Source: Compiled by the authors.

Next, the obtained value $k_l(t)$ should be correlated with the specified parameters of import dependency's coefficient values and determine the degree of import dependency in relation to the goods.

Table 1. shows the coefficient value and the degree of import dependency ratio.

Table 1. The degree of import dependency.

The coefficient of import dependency	The degree of import dependency
$0 < k_l \leq 0,1$	Zero
$0,1 < k_l \leq 0,3$	Low
$0,3 < k_l \leq 0,6$	Critical
$0,6 < k_l \leq 1$	Absolute

Source: Compiled by the authors.

Since the same amount of purchased goods can have various rates at different time periods, it is crucial to compute the coefficient value of import dependency of the domestic market and quantitative indicators.

The determining degree of import dependency of a product must be compared with a given development strategy for the domestic production of goods:

- Focused development strategy (has a competitive production);
- Protection development strategy (has a lack of competitive production);
- Potential development strategy (has a developing product plan of three years);
- Passive development strategy (has no production and no plans for its development).

Based on the decision-making matrix in the customs and tariff field (Fig. 1.), the comparing degree of import dependency, and the development strategy for the domestic production of goods, it was decided on the rational level of customs and tariff towards the goods of interest.

The degree of import dependency	Development strategy of the production of goods in the Russian Federation			
	Passive development strategy	Potential development strategy	Protection development strategy	Focused development strategy
Absolute	Moderate	Moderate	Peak	Peak
Critical	Moderate	Moderate	Peak	Peak
Low	Minimal	Moderate	Peak	Peak
Zero	Minimal	Minimal	Moderate	Peak

Fig. 1. The customs and tariff protection matrix. Source: Compiled by the authors.

The customs and tariff protection are classified into three levels: peak, moderate, and minimal. The peak level is characterized by setting the largest possible import duty rate in accordance with the international obligation. The

moderate level represents the average values closed to the average amount of the import duty rates from the possible range from zero to the peak value. The minimal one provides the lowest possible or zero import duty rates for imported goods.

Let us construct the domestic demand equations at peak, moderate, and zero levels of customs and tariff protection. To solve these problems, we proceed from the following propositions:

- The volume of demand in physical and monetary terms as constant values $S_m(t) = const, S_{lp}(t) = const$.
- The total expenditure of the purchase of a particular product should not increase in order to minimize the additional burden on the end consumer (e. g., the expectations should be met).

$$T_l = p_l(R_l) * q_l + p_j * q_j = const, (1)$$

T_l – the number of expenses of a domestic consumer for a product l , $p_l(R_l)$ – the price of one unit of imported goods, q_l – the number of imported goods, p_j – the price of one unit of a domestic product, q_j – the number of goods from domestic producers.

1. The elasticity of imports is taken per unit.

Let us introduce the domestic market's total consumption volume and take it as a constant value $N = q_l + q_j = const$. Then the total consumption volume in physical terms will look as follows

$$T_l = p_l(R_l) * q_l + p_j * q_j = p_l(R_l) * (N - q_j) + p_j * q_j = p_l(R_l)N - p_l(R_l)q_j + p_j * q_j (2)$$

Equality (3) is followed from (2), which can derive an equation for calculating the volume of consumed goods by domestic producers in physical terms q_j (4)

$$p_l(R_l)q_j - p_j * q_j = p_l(R_l)N - T_l (3)$$

$$q_j = \frac{p_l(R_l)N - T_l}{p_l(R_l) - p_j} (4)$$

Equality (5) is followed by (2), which makes it possible to derive the equation for the price of imported goods (6)

$$p_l(R_l)q_j + p_l(R_l)N = p_j * q_j - T_l (5)$$

$$p_l(R_l) = \frac{p_j * q_j - T_l}{q_j + N} (6)$$

The peak level of customs and tariff protection ensures maximal benefits for domestic producers by stimulating the demand for domestic goods (e. g., $q_j \rightarrow \max$). At the same time, to avoid an additional burden on the end consumer, the domestic product prices should not increase (e. g., $p_j = const$). Thus, the structure of domestic demand at the peak level of customs and tariff protection is characterized by the following system of equations (7):

$$\begin{cases} q_j = \frac{p_l N - T_l}{p_l - p_j} \rightarrow \max, q_l = N - q_j \rightarrow \min \\ p_l(R_l) = \frac{p_j^* q_j - T_l}{q_j + N} \rightarrow \max, p_j = \text{const} \\ R_l = R_l^{\max} \end{cases} \quad (7)$$

The moderate level of customs and tariff protection creates advantages for domestic producers to increase production volumes $q_j \rightarrow \max$ while minimizing the price of imported goods $p_l(R_l) \rightarrow \min$. The domestic goods price is constant $p_j = \text{const}$. Thus, the structure of domestic demand at the moderate level of customs and tariff protection is characterized by the following system of equations (8):

$$\begin{cases} q_j = \frac{p_l N - T_l}{p_l - p_j} \rightarrow \max, q_l = N - q_j \rightarrow \min \\ p_l(R_l) = \frac{p_j^* q_j - T_l}{q_j + N} \rightarrow \min, p_j = \text{const} \\ R_l \rightarrow \left(\frac{R_l^{\max}}{2}\right) \end{cases} \quad (8)$$

The zero level of customs and tariff protection creates advantages for domestic producers by minimizing its price $p_l(R_l) \rightarrow \min$, reducing the burden on the end consumer, and the possibility of using an additional income to purchase domestic goods.

$$\begin{cases} q_j = \frac{p_l N - T_l}{p_l - p_j} \rightarrow \max, q_l = N - q_j \rightarrow \min \\ p_l(R_l) = \frac{p_j^* q_j - T_l}{q_j + N} \rightarrow \min, p_j = \text{const} \\ R_l \rightarrow 0 \end{cases} \quad (9)$$

Therefore, obtained equation systems let us predict the possible structure of domestic consumption for the selected production development strategies and levels of customs and tariff protection.

4 Conclusion

The developed methodology makes it possible to calculate the coefficient of import dependency in relation to a specific product and, according to the chosen strategy of the domestic industrial production development, to recommend the required level of customs and tariff protection – peak, moderate, or zero. Besides, the suggested equations (7) - (9) allow us to forecast the structure of domestic demand for a specific type of goods in case of the import duty rate change.

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