ANALYSIS OF RUSSIAN ECONOMIC DEVELOPMENT SCENARIOS USING COMPUTABLE GENERAL EQUILIBRIUM MODELS

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Abstract.

Introduction. The paper considers a number of scenarios for the development of the Russian economy using the apparatus of computable general equilibrium models in order to obtain a quantitative assessment of hypothetical economic policy measures.

Purpose: to analyze the possibilities of using the CGE modeling apparatus for describing the national economy and to build a simple CGE model in the RunGTAP environment.

Methods. To build a three-sector model with three factors of production use GTAP 8.1 (free version) containing the statistical database of 2007 is taken.

Results. On the basis of the social accounts matrix data, sectoral disaggregation of GDP was carried out, the share of various production factors in the sectors was shown.

It is shown that subsidizing the manufacturing will positively affect the growth of the national economy. Effects of a 10% output subsidy in Russia manufacturing is an increase in the output of manufactured goods by 5.28%, demand for labor by 5.88%, and GDP by 0.56%

It is calculated that the welfare of Russia will increase by $ 157.85 million if all subsidies and tariffs for domestic agricultural production, as well as export and import duties on agricultural products are canceled.

Discussion. Further development of the research topic can be carried out in at least two directions: through scenario variations of model experiments in various areas of public policy; and also by searching for opportunities for a quantitative assessment of the development of the Russian economy based on current-based statistical data. Text Text

Keywords: Computable general equilibrium models, CGE models, SAM, Russian economy development.

INTRODUCTION

There are many factors affecting the economic development of a country. The multidirectional and sometimes unpredictable nature of their impact on the economy requires state managers to make more thoughtful decisions based on an analysis of the consequences of the reforms being carried out, including using economic-mathematical models that work on the principle of "what happens if … ".

In this connection, studies aimed at systemic modeling of the economy in order to obtain a quantitative assessment of government decisions are of particular relevance.

The variety of existing economic models is enormous. In this paper, a computable general equilibrium model (CGE) is considered. This model describes the motives and behavior of all producers and consumers in the economy and the connections between them.

CGE modeling involves conducting an experiment, that is by changing the exogenous variable ("shock") in the model creates disequilibrium. For example, an increase in import tariffs will change the economy — consumers are likely to buy less imports and more domestic products, and domestic firms are likely to increase their production to meet increased demand.

CGE models are designed to create a numerical basis for empirical analysis and evaluation of economic policy. So, for example, with the help of CGE modeling, it is possible not only to make recommendations

on changes in tax rates, import tariffs, etc., but to quantify these changes.

General equilibrium models allow us to estimate the impact of economic shocks on all sectors of the economy at once. For example, using CGE modeling, one can trace the effect of changes in tax legislation not only on a particular sector, whose products will be taxed in a new way, but also on the economy as a whole.

There is a fairly extensive practical experience in implementing CGE modeling in various countries of the world [1, 2]. This class of models is an effective tool for assessing scenarios of economic development with the change of various economic parameters.

The main hypothesis of the study: Quantitative estimates of the effects of state regulation of the Russian economy can be obtained using the CGE modeling apparatus.

METHODS

To date, the most common software environment for building and analyzing CGE models is a constantly evolving, with current technical and educational support, the GTAP project (Global Trade Analysis Project). GTAP is a comparative static global model of general equilibrium, with the possibility of aggregation and disaggregation of sectors, factors of production, countries. In this work, CGE modeling of the Russian economy was carried out in this package.

RESULTS AND DISCUSSION

In this work, CGE modeling was carried out in several stages.

At the first stage, a matrix of social accounts for Russia was constructed.

For this, 134 countries are grouped into 2 groups: Russia and the Rest of the World, 57 sectors are combined into 3 sectors (agriculture, industry and services), 5 factors of production are grouped into 3 factors (labor, land, capital).

Based on the social accounts matrix (SAM matrix) calculated in the GTAPAgg package, the GDP was calculated (including by industry, production factors), the value of which completely coincided with the data of the Russian Statistical Committee (table 1).

Table 1

GDP structure based on SAM matrix of Russia

	GDP - $US billions		Factor shares in industry cost			Industry shares in factor employment		
	Industry GDP	Industry shares in GDP	Land	Labor	Capital	Land	Labor	Capital
Agriculture	72	6	14	32	9	100	9	3
Manufacturing	462	36	0	11	23	0	21	32
Services	765	59	0	25	32	0	70	65
Total	1 300	100	N/A	N/A	N/A	100	100	100

Source: author's calculation

In table 1 are shown that the predominant sector in the structure of GDP (according to 2007 data) was services (59%), the manufacturing was 36%.

The second stage of the simulation is the construction of a computable general equilibrium model in the RunGTAP software product.

In this work, the modeling of the development scenarios of the Russian economy was carried out in two sectors: manufacturing and agriculture. In manufacturing was considered how the introduction of subsidies for manufactured output will affect the economy as a whole, and in agriculture, and various options for

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changing tax tariffs and export duties are modeled in agriculture.

It is shown that subsidizing the manufacturing will positively affect the growth of the national economy. Effects of a 10% output subsidy in Russia manufacturing is an increase in the output of manufactured goods by 5.28%, demand for labor by 5.88%, and GDP by 0.56%

Anderson and Martin concluded that the full removal of all import tariffs, export subsidies, and domestic agricultural subsidies would boost global welfare by nearly $300 billion [3].

Let us check how the elimination of tariffs for Russia, which represents a small open economy, can change global welfare. In this work, a model experiment was carried out, consisting in decomposing the hypothetical reforms of world trade into 4 blocks:

1. Agricultural Policy Reform: eliminate agricultural domestic production subsidies and tariffs and export subsidies on its agricultural trade with Rest of World (ROW)- *Scenario 1*.

2. Nonagricultural Policy Reform: eliminate tariffs and export subsidies on its manufacturing trade with ROW - *Scenario 2.*

3. ROW Agricultural Policy Reform: eliminate ROW agricultural production subsidies and tariffs and export subsidies on its global agricultural trade - *Scenario 3.*

4. ROW Nonagricultural Policy Reform: eliminate ROW tariffs and export subsidies on its global manufacturing trade.- *Scenario 4.*

The result of the implementation of the 4 scenarios is presented in comparison with the US economy, which is a large open economy (see Figure. № 1).
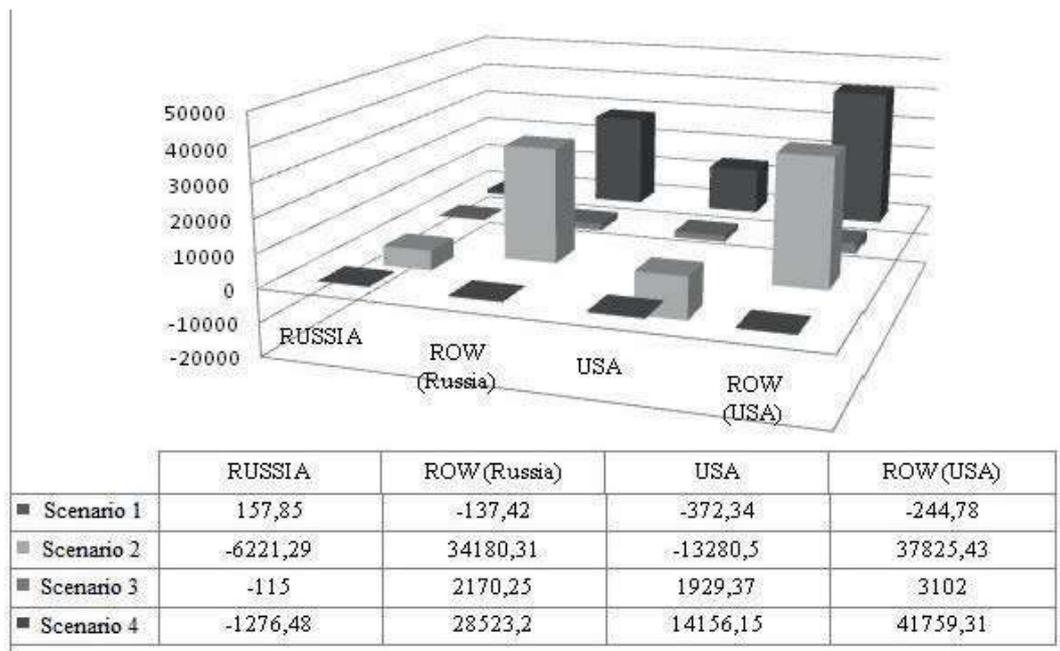

	RUSSIA	ROW (Russia)	USA	ROW (USA)
Scenario 1	157,85	-137,42	-372,34	-244,78
Scenario 2	-6221,29	34180,31	-13280,5	37825,43
Scenario 3	-115	2170,25	1929,37	3102
Scenario 4	-1276,48	28523,2	14156,15	41759,31

Fig. 1 Changing the welfare of the world
Source: author's calculation

For Russia, the most favorable scenario is *Scenario 1*. In this case, Russia's welfare will increase by $ 157.85 million.

CGE modeling in the RunGTAP software product undoubtedly has many undeniable advantages, however, it is not without flaws.

The advantage can be attributed to the fact that CGE modeling in the RunGTAP software product allows to evaluate the effect of changes in various economic parameters. With the help of CGE modeling, it is possible not only to give recommendations on how to change various parameters of a model, but also to quantify the results of these changes. Such a simulation can be carried out for any of the 134 countries included in the model.

The disadvantages include the fact that the freely distributed RunGTAP package

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contains a limited set of options, with a fairly high level of agregistration, which does not allow a detailed study of the consequences of possible changes in the sub-sectors. In addition, the study with 2007-year data loses its relevance and serves only as a basis for further research related to the study of the possibility of constructing and numerically solving the CGE model using updated data.

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