The Economic Impact of Public Investment and Russian Import Ban on Russian Economy: A CGE Analysis

by

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ABSTRACT

In this study, we estimate the impact of Russian import ban and change in public investment on the economy of Russia, mainly on the sectoral production. We apply the recursive dynamic computable general equilibrium model (CGE) that we developed for Russian economy. The model is calibrated for 2011 and provides scenario development up to 2030. We develop scenarios that tackle public investment and Russian import ban to examine their effects on the economy of Russia. The results suggest that increase in public investments positively affects production and total sales in all sectors of the economy, but mostly in the capital-intensive ones. The imposition of import ban negatively affects both exports and imports of Russia. Another finding is that GDP growth rises significantly as public investment increases.

Keywords: CGE modelling, public investment, sanctions, Russia

1. INTRODUCTION

Our paper provides an analysis and scenario development for a large economy, largely dependent on crude oil resources and hence susceptible to crude oil prices changes, such as Russian economy up to 2030. Russia has plentiful energy resources as well as natural resources. It was one of the fastest growing economies in the beginning of the 21st century. In the first seven consecutive years, the economy on average was growing at annual rate of 8%. The data from the World Bank (2019) suggest that the share of natural resource rents in the economy of Russia in that period was roughly 20%, and also oil and oil products are the most exported goods. The given facts point toward the dependency of the Russian economy on commodity prices. Thus, such high rates of growth could be explained partly by increase in oil prices. The evaluation of the economy of Russia and prediction of future developments may play a vital role in policy decisions of the country. One of the key determinants of economic performance could be the level of investments in the country and various external shocks, such as commodity price shocks. Especially for resource dependent countries like Russia, the volatility in oil prices may have significant effects on the economic growth. Since 2018, the Government of the Russian Federation has introduced a new element of the management system in the implementation of state policy - national projects, which are funded from public budget (National projects, 2019). Public investment could be one of the government policy aimed to decrease the dependency on crude oil prices and to ensure sustainable and inclusive growth.

On the other hand Russian economy faces sanctions due to the annexation of Crimea in 2014. The USA and some European countries imposed economic and political sanctions against Russia. As a responsive measure for these sanctions Russian government initiated anti-sanction measures. One of them is the imposition of an import ban for some agricultural products from those countries (Kutlina-Dimitrova, 2017). The implications of the latter two policies is uncertain and some of them are studied in the literature.

Most of the literature on sanctions are policy oriented and argue on the efficiency of use of economic sanctions instead of military conflict. The literature shows that sanctions, especially an import ban, are not so effective to weaken the economy of the aimed country (Kirshner, 1997; Mack and Khan, 2000). On the other hand, the study done by Tuzova and Qayum (2015) found that the effect on the Russian economy of both oil price shock and economic sanctions is significant. The forecast for the next two years suggested that the GDP would reduce by 19% in case of continuation of sanctions. Only a few studies estimated the impact of Russian import ban on the economy (Kutlina-Dimitrova, 2017; Boulanger et al. 2015). They used static CGE model and found that Russia experienced high costs from this ban. The authors cover only the short-run impact and consider higher crude oil prices.

Interest in estimating effectiveness of public investment policies in achieving the macroeconomic goals increased in the last two decades. The literature mainly covers the effect of public infrastructure projects on GDP growth (Lall, 2006; Devarajan et al. 2006; Canning and Pedroni, 2008;) and job creation (Ianchovichina et al. 2012; Karaalp, 2014) using different methodologies. Although they found a positive impact of public investments, it is limited to the short run effects and no studies are done on the economy of Russia, which is a net oil exporter and a transition economy.

In view of the above mentioned, this paper examines the impact of changes in public investment at low crude oil prices as well as the effect of import ban on the sectoral production and other macroeconomic variables of Russia. Predictions of economic development of Russia are also studied in this paper. The study contributes by presenting a numerical macroeconomic framework, which could be used to analyze the impact of economic sanctions and investment policies at prevailing oil prices. Identifying and estimating the effects of import ban and increase in public investments together is important because it would assist to evaluate the impact on economic growth and sectoral outputs and potentially implement better policies to avoid upcoming recessions in the economy. For this purpose, we apply a recursive dynamic computable general equilibrium (CGE) model, which is well known as an applicable tool in predicting economic development and simulating different scenarios since it considers all the mutual links in the economy. We calibrate the model to the 2011 data. The given year was taken because of the availability of data and that 2011 was considered as the beginning of stable period in the economy of Russia, which had just recovered after recession. The results show that increase in public investment by 1 billion rubles each year has a significant impact on the economic growth rate, nearly 1 percentage point higher growth in the next 6 years, while the imposition of import ban on agricultural products does not affect much the GDP growth rate, but it has a negative impact on exports and imports.

The structure of our paper is as follows Section 2 presents the review of literature on the topic and application of CGE models and other studies in this field. Section 3 provides a general overview of the Russian economy. Section 4 and 5 discuss the data and methodology used for our analysis. Section 6 presents simulations and preliminary results. Section 7 provides with conclusions.

2. LITERATURE REVIEW.

Implications of the oil price shocks and public investment on the economic growth are widely studied in the literature, especially on oil-dependent economies (Mehrara, 2006; Mork et al. 1994; Bjornland, 2000; Abeysinghe, 2001; Aliyu, 2009; Beguy et al. 2015; Sangare and Maisonnave, 2018). Studies apply a various host of methodologies to study the relationship between key macroeconomic variables and commodity prices or public investment. Literature on commodity prices impact often evolves using structural or multivariate VAR approach, VAR-based cointegration technique, stochastic and CGE models. Charnavoki (2014) found that an increase in the price of commodities has positive effect on the external balances and a commodity currency effect in case of Canada. While non-commodity supply shocks result in the Dutch disease, a positive global demand shock results in the improvement of the real output and expenditures. For the analysis, he uses recursive structural dynamic factor model with world economy and small commodity exporting economy (SCEE) common factors blocks. Similar research was done by Fornero et al. (2014), where Dynamic Stochastic General Equilibrium (DSGE) model for Chile was used to analyze the effects of metal price shocks on sectoral investment in SCEE. The results suggest that increase in commodity prices causes expansionary effects, partly because of resulting increase in the investment in commodity sectors and possible spillovers in non-commodity sectors.

Interest in estimating effectiveness of investment policies in achieving the macroeconomic goals increased in the last two decades. Lall (2006) analyzes the impact of public infrastructure on different Indian states. Findings suggest that regional development is significantly affected by the public investments in transportation and communications. Investment in neighboring states also positively influences the regional growth. This is in contrast with the results of previous study by Devarajan et al. (1996), where the relationship between development and public investment on transportation and communication infrastructure was found to be significantly negative. The explanation for this could be that overinvestment in these types of infrastructure leads to inefficiency. Cross-country regression analysis shows the lack of long run effects of infrastructure investment on the economic growth of countries (Canning and Pedroni, 2008), but the results become positive if instead of government expenditures on infrastructure the amount of public infrastructure stocks is being used as an explanatory variable (Sanchez-Robles, 1998).

The study by Ianchovichina et al. (2012) investigates the effect of investment, mostly coming from the public budget, in the infrastructure on sectoral outputs and jobs in the developing countries. They took into account two effects of investment on the job creation, one is direct through employment in construction and maintaining of the infrastructure, the second is using infrastructure as an input of the growth process that consequently provides creation of the new job places in different sectors of the economy. To measure the impact of investment, authors derived and calculated elasticity of output to infrastructure, job elasticity with respect to economic growth and the elasticity of jobs to investment for eight developing geographical regions. Results of the study showed that investment in infrastructure has a direct and indirect effect on the job creation in the industries related to infrastructure, as well as in other industries. Investing in infrastructure cannot reduce unemployment solely.

A panel data analysis made by Karaalp (2014) investigates the impact of two public policies, on the job creation in Turkey for the period of 10 years. The first policy is public investment in infrastructure and education, which leads to increase in employment in the private sector. The second policy introduced are the investment incentives to the private firms to make contribution to the development of the less developed provinces of Turkey. To measure the effect of policies Karaalp (2014) used a simple panel regression. Estimation results show a positive relationship between both policies and employment. The positive impact of public investment in education and infrastructure can be explained by the attraction of private firms in the places with a better infrastructure system and more productive high-skilled labor. Apart from direct impact on the employment, it also pushes the regional development, which leads to increase in production and creation of new jobs. The study also showed that investment incentives were more effective in creating employment in the less developed provinces.

Our study also estimates the effect of Russian import ban on the economy of Russia. The literature shows that sanctions, especially an import ban, are not so effective to weaken the economy of the aimed country (Kirshner, 1997; Mack and Khan, 2000). On the other hand, the study done by Tuzova and Qayum (2015) found that the effect of oil price shock on the Russian economy and the impact of economic sanctions is significant. The forecast for the next two years suggested that the GDP would reduce by 19% in case of continuation of sanctions. They run vector auto-regression (VAR) model on nine key macroeconomic variables taking sanctions as an exogenous dummy variable and oil price shocks as endogenous.

Different from the above mentioned studies this paper aims to analyze the effect of increase in public investment, import ban and change in oil prices on the key macroeconomic variables and sectoral production and make predictions for the next 10 years. For this reason we use a dynamic recursive CGE model, as an effective approach for estimating the changes in the economy of Russia caused by investment, import policies or price shocks. CGE models have become one of the effective methods for evaluating policy consequences as they can deal with various fields at the same time: structural adjustment, international trade, public finance, income distribution, and energy and environmental policy (Devarajan and Robinson, 2002). One of the key benefits of CGE models is that they are able to rigorously capture interrelationships between production and factor markets as well as potential indirect effects, which have a significant effect on results (Parry and Oates, 2000).

An abundant literature exists on the studies evaluating the effects of different shocks and the implications of the role of public investment policies on structural adjustments and economic performance using CGE modelling. For analyzing the impact of commodity prices static CGE models are widely used, as in the study done by Orlov (2015) on the assessment of the optimal domestic gas price for Russia. He found that the increase in domestic gas price overall has a positive effect on the welfare of the economy, and given the price elasticity of export demand the optimal price would be 55% of the export netback price. This would lead to increase in the government revenues and structural shift of the economy towards non-oil and gas sectors. In his other study, Orlov (2015) uses the same multi-sector static model to analyze the economic impact of reducing export taxes on oil and oil products. Findings suggest that even though lower export taxes provides economic efficiency gains, it leads to the appreciation of the currency and as a result, to the lower competitiveness of domestic producers in the domestic market.

Zhang et al. (2017) in their study on the effect of changes in natural gas price on the macroeconomic variables of the Chinese economy use CGE model and social accounting matrix (SAM). The results imply that increase in price of natural gas by 40% leads to higher inflation and lower GDP. The most affected sector by price shock is the chemical industry sector. This type of approach has been selected also by Mcdonald (2005), who uses the PROVIDE CGE model calibrated by SAM to analyze the effect of fluctuations in oil prices on the economy of South Africa. Results predicts that GDP reduces by 1 % as the price for oil increases by 20%.

Barry (2009) in his paper explores the impact of FDI on the economy of Central Asian countries using GTAP (Global Trade Analysis Project) multi-regional CGE model. He aggregates the number of sectors to 10 economic activities and introduces FDI in natural gas sector as a shock. Finding suggests that the most beneficial sector for foreign investment is natural gas sector because of the better total efficiency in production. On the other hand, such investment policies cause decrease in the production and exports of non-resource-based industries.

Mbanda et al. (2018) investigate the effect of public economic infrastructure on the economy overall and particularly on labor employment in South Africa by using 2005 Social Accounting Matrix (SAM) data. Results from CGE modelling suggest that investment in public economic infrastructure positively affects the economy as a whole, leading to the growth in GDP and incomes (labor, government and household). Among other sectors, public economic sector has the highest multipliers for output, GDP and income. The SAM analysis was used by the authors to see the interdependency between different sectors through Structural Path Analyses (SPA). They found that compared to other sectors manufacturing and financial sectors are affected the most by public economic sector. The similar SAM analysis was used by Nakamura (2004) to assess the behavior of oil and gas companies in Russia to invest domestically, but the findings were that almost all industries tend to invest abroad. Non-oil and gas companies were less competitive in the international market, so they have less incentives to invest in production assets, implying that investing in foreign financial assets is more profitable.

Even though CGE models are often used to evaluate the effects of investment projects on the economy, Beguy et al. (2015) constructed their own model to measure the impact of Dam project in Niger on the key macroeconomic variables. They reported in the results that total costs of the project would be around 10 percent of the GDP in 2013, but at the same time the construction of the dam would lead to rise in GDP and fiscal revenues by 0.25 and 0.45 percentage points respectively through increase in domestic production. Another study by Sangare and Maisonnave (2018) investigating the impact of investment in road infrastructure on the economy of Niger found out positive relationship between the economic performance and road investments. The construction of roads led to fall in unemployment in the short run and relatively small growth in GDP in the long run. Arman et al. (2015), studying the effect of investment in railways on the economy of Iran, obtained same results. For this purpose, he used SAM data for Iran and estimated the effect of investment in different types of transportation on economic growth and employment. Schurenberg-Frosch (2014) did similar research on the African road investments. CGE simulations showed that better roads have a positive effect on production and consumption in the economy, while labor and capital demand for transport are affected negatively. However, extremely high costs of investment made the effects insignificant.

CGE modelling is also effective in estimating the impact of economic sanctions on the economy. The study done by Kutlina-Dimitrova (2017) examines how ban imposed by Russian government in August 2014 on the import of several agricultural products from the USA and European countries influenced the economy of Russia. She uses multi-region CGE model focusing on the bilateral trade and sectoral production. In respect to other studies, the author identifies the prohibited tariff rates through various swap in the GTAP model, which leads to decline in exports from the banned countries to zero. The estimations also allowed comparing with the real data patterns. The findings suggest that there is no substantial impact on total exports of the US and EU countries, except for some agricultural sectors that faced a sharp fall in their production. For the Russian consumers the welfare loss is much more significant. Similar research was done by Boulanger et al. (2015) on estimation of the short-run impact of the embargo imposed by Russia on agricultural and food products for the EU in reply for the sanctions imposed on Russia. The analysis used specific factors' CGE model. Different from the previous study, the authors found the total loss for both sides, and expectedly Russia experienced the highest cost from this ban. The EU countries recovered their loss by exporting to other markets.

Another study by Timilsina (2015) applies a recursive dynamic model to study the effect of increase in oil prices on the global economy. She used a multi-country, recursive dynamic CGE model. She analyzed the impact on key macroeconomic variables under different scenarios of increase of oil prices by 25%, 50%, and 100% by 2020. As a result of such price shocks global GDP reduces, mainly in China, India and Thailand, while oil exporting countries of MENA region benefits the most. Another study by (Aydin and Acar, 2011) also apply a dynamic CGE model to estimate the impact of oil price shocks on the economy of Turkey. They simulated three different scenarios with reference, high and low oil prices and found large effect on Turkey's GDP, inflation, tax revenues, trade balance and carbon emissions.

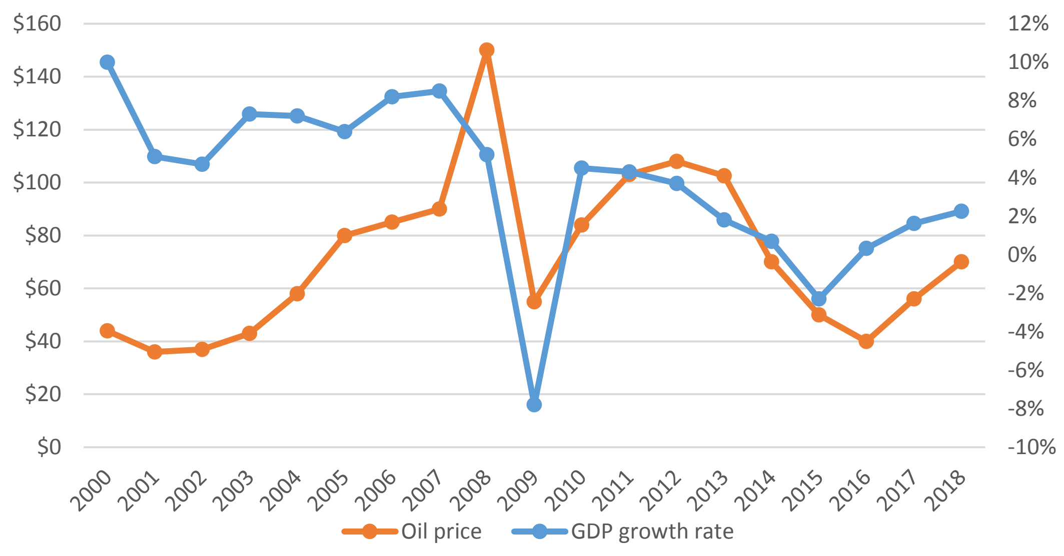
In sum, there is a wide range of studies estimating the impact of public investment, price shocks and economic sanctions like an import ban using different methodologies. CGE modelling is one of the widely used methods to estimate the effectiveness of public investment and other changes in the improving of economic performance. In general, findings suggest that investments, especially in infrastructure, positively affect the economic indicators such as employment and growth rate.

3. OVERVIEW OF THE RUSSIAN ECONOMY

Russia was one of the fastest growing economies in the beginning of the 21st century. In the first seven consecutive years, the economy on average was growing at an annual rate of 8%. The data from the World Bank (2019) suggest that the share of natural resource rents in the economy of Russia in that period was roughly 20%, and also oil and oil products are the most exported goods. The given facts point toward the dependency of the Russian economy on oil exports and commodity prices. Thus, such high rates of growth could be explained partly by increase in oil prices.

Figure 1 illustrates trends in GDP growth rate and crude oil price. Prices reach the peak value of $164 in June, 2008, and then sharply drop to $50 in just 6 months. As a result of the 2008 financial crisis and commodity price falls the Russian economy shrinks, showing negative rate of growth in 2009.

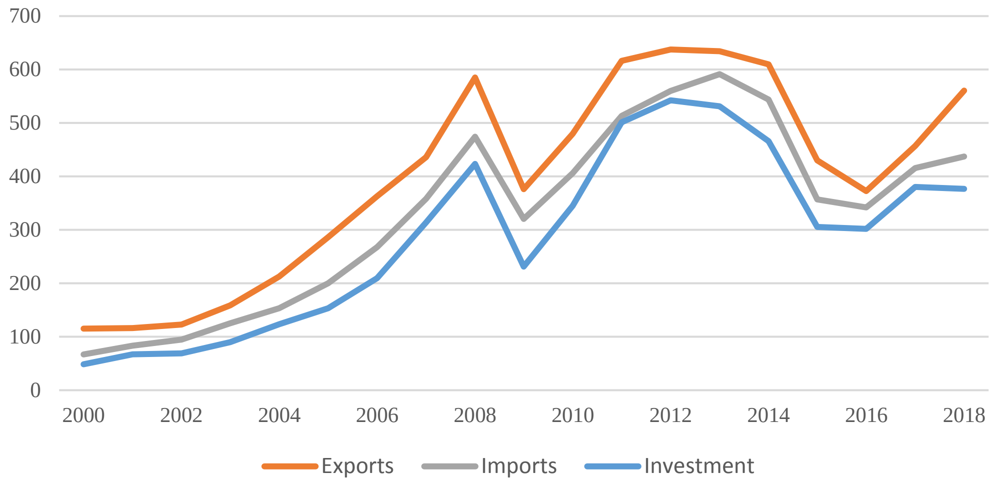
Fig-1. GDP growth rate (annual % on the right axis) and Crude oil price (WTI) in US$ on the left axis.



Source: World Bank, macrotrends.net

Russia was one of the most negatively affected countries by the 2008 financial crisis, but the economy quickly recovered and started to grow from 2010 on with an average rate of 4% in the following three years (figure 1). In the next two years growth has slowed down due to firstly the fall in oil price almost by half by the end of 2014, and secondly, the economic sanctions imposed by western countries as a result of geopolitical tensions. This caused the outflow of investments from the economy, high inflation and decline in industrial output.

Fig-2. Export, Imports and Investment in Russia in current US$ bln



Source: World Bank, 2019

The capital outflows in the private sector increased by more than twice from 2013 to 2014. Looking to the international trade we observe the peaks for export and imports in Russia to be USD 637 billion in 2012 and USD 591 billion in 2013 respectively. By the middle of 2015 these figures drastically fell to USD 372.0 billion for exports and USD 342 billion for imports. The trade surplus was also dramatically shrinking in this period, reaching the lowest value of in the last 10 years, less than USD 5 billion (see figure 2).

Overall, comparing the graphs on figure 1 and 2 we observe that the data on exports, imports and investment for the last 18 years are consistent with the oil price patterns. Higher oil prices lead to increase in investment inflows, amounts of exported and imported goods as well. On the other hand, decline in the hydrocarbon prices negatively influence these indicators and the economy as a whole. (World Bank, 2019).

According to the Ministry of Economic Development of Russia (2019) in the beginning of 2018, the situation on global commodity markets was positive. The price of Urals crude oil in the first half of the year showed an upward trend, mainly due to the occurrence and expected decrease in supply from a number of large oil exporters. In July-August, oil prices remained at high levels amid interruptions in supplies from Canada and Libya, the continued decline in production in Venezuela, as well as the expected resumption of US sanctions against Iran in connection with the nuclear program. In early October, Urals oil prices reached a four-year high (nearly $ 85 per barrel), after which they began to decline. By mid-November, the price of Urals crude fell to levels around $ 65 per barrel (Ministry of Economic Development, 2019).

The slowdown in global economic growth has led to both a deterioration in the pricing environment of commodity markets and a decrease in demand for Russian exports. Under these conditions, the growth in the physical volume of export of goods is estimated by the Ministry of Economic Development of Russia in 2019 at the level of -0.1% compared with 4.2% in 2018. At the same time, against the background of weak domestic demand, the import of goods, according to the Ministry of Economic Development of Russia (2019), decreased by 0.4% after an increase of 1.7% in 2018.

In the context of the components of use in the first half of 2019, there was a slowdown in both investment and consumer activity. The growth of investments in fixed assets in January-June 2019 amounted to 0.6% (4.3% in 2018). Along with the deterioration of business climate, a significant factor in the slowdown in the dynamics of capital investments in the first half of 2019 was a decrease in budget investment costs (by 11.4% in January – June 2019), which in the first half of 2019, according to the Russian Ministry of Economic Development, made a negative contribution to the growth rate of investments in fixed assets (0.9 percentage points). At the same time, in July and August 2019 there was a catch-up growth in the federal budget investment expenditures - by 23.8% in annual terms for two months (as a result, the lag from the previous year was reduced to almost zero). In general, according to the results of 2019, the growth rate of investments in fixed assets is estimated by the Ministry of Economic Development of Russia (2019) at 2.0% compared to 4.3% in 2018.

The Ministry of Economic Development of Russia has developed a forecast for socio-economic development of Russian economy in three scenarios - basic, target and conservative for the period until 2024 and 2036.

The forecast is based on current internal and external trends, the forecast for the development of the world economy and external economic conditions, as well as the results of the socio-economic development of the Russian Federation for January-August 2019. For our analysis we will consider the conservative scenario, because that covers the scenario with low oil prices. The key difference between the conservative scenario and the basic one is the prerequisite for a more negative development of the external economic situation (a further slowdown in world economic growth is expected to reach a level slightly above 2% by 2021, which corresponds to the concept of “global recession”, the scenario also contains a premise on the unfavorable situation in the world product markets). Now, due to the COVID 19 the situation is even more conservative than the government expected.

The conservative scenario is based on the assumptions of higher risk than what expected in the baseline case (table 1). In particular, the global economy is assumed to slow down in the context of further escalation of trade conflicts between the largest economies to about 2.5% in 2020 and to a little above 2% in 2021(Ministry of Economic Development, 2019).

The slowdown in global economic growth in the conservative scenario will lead to a decrease in demand for energy and other commodities. In this regard, under the conservative scenario, a more significant deterioration in the situation of world commodity markets is expected compared to the baseline: for example, oil prices will drop to $ 42.5 per barrel in 2020 and will continue to grow at a rate close to the dollar inflation (up to $ 45.9 per barrel by 2024).

The current design of macroeconomic policy will limit the response of internal parameters to fluctuations in oil prices. At the same time, a weak external demand for Russian export goods will have a negative effect on economic growth in a conservative scenario. The influence of external factors will affect the slowdown in GDP growth to 1.1% in 2020. In the future, as structural measures are implemented, growth is expected to accelerate, but it will be more moderate than in the baseline scenario - up to 2.5% by 2024. Given the more significant slowdown in the global economy, the dynamics of Russian GDP projected under a conservative scenario will make it possible to reach a growth rate above the world average by 2024.

Table-1. The conservative forecast of the Ministry of Economic Development. (in % to the corresponding period of the previous year)

Growth	2019	2020	2021	2022	2023	2024	2025-2030
GDP %	1,3	1,1	1,9	2,3	2,5	2,5	3,2
Consumption %	1	0,9	2,2	2,4	2,7	2,8	3,46
Household %	1	0,6	2,2	2,5	2,7	2,9	3,59
Government Expenditure %	1	1,5	2,2	2,2	2,5	2,6	3,1
Investment %	2	3,6	3,4	3,1	3,4	3,8	4,1
Export %	0,7	3,6	4,1	4,1	5,4	6	7,17
Import %	1,4	3,6	4,1	4,6	4,5	4,6	5,72
Oil Price “Urals” ($/barrel)	62,2	42,5	43,3	44,2	45	45,9	52,2

Source: Ministry of Economic Development of Russian Federation (2019)

Specific measures of socio-economic policy for the period 2018–2024 were set up taking into account the need to achieve national development goals and fulfill other priority tasks set by Decree of the President of the Russian Federation of May 7, 2018 No. 204 “On National Goals and Strategic Development Tasks of the Russian Federation” for the period until 2024.

Priorities for socio-economic development for the period up to 2024 are focused on the development of human capital and improving the quality of life. Achievement of tasks is impossible without reaching high and stable rates of economic growth, which requires expanding the potential of the economy. The set goals are achievable solely on the basis of an investment-oriented model of economic growth, accompanied by an increase in consumer spending based on revenue growth.

Since 2018, the Government of the Russian Federation has introduced a new element of the management system in the implementation of state policy - national projects. National projects have been developed and are being implemented in those areas of socio-economic development that have been identified as priority for the period up to 2024. The new tool is aimed at achieving understandable and measurable results, the deadlines and those responsible for their implementation are fixed. In addition, the mechanism for working with national projects has become a complete tool for making managerial decisions. According to the official data from the government (2019) the total budget for the national projects is 25,7 billion rubles. It has three major components, which are human capital (5,7 bln), comfortable living environment (9,9 bln) and economic growth (10,1 bln). Around 18 billion rubles come from the budget as a public investment, the rest are from non-budget sources.

Thus, the implementation of national projects and a number of other measures launched so far are designed to tackle the problem of ensuring balanced, sustainable and inclusive economic growth. Additional factors to accelerate investment activity and, accordingly, economic growth should be the measures included in the plan of additional measures to accelerate economic growth, which the Ministry of Economic Development of Russia prepared on behalf of the President of the Russian Federation.

4. METHODOLOGY

The model used in this paper is a modified version of the model developed by Paltsev (1999), which is rooted in the Shoven-Whalley (1992) applied general equilibrium framework. Our model is a recursive dynamic computable general equilibrium model (CGE), which was initially constructed as a static model and illustrated the flow of goods and services across sectors in a certain time period. Paltsev's (1999) CGE model is based on the Arrow-Debreu (1954) model, which proposes that aggregate demand and aggregate supply for each good is equal under certain prices and economic assumptions. The economy has consumers with endowments of goods and set of preferences. Demand for the goods is in line with the Walras's law and implies that consumer consumptions are equal to their incomes at any given prices. CES production functions characterize the technology in the model. Producers are profit-maximizers and prices matter only in relative terms. The equilibrium in the model is described by market clearance, income balance and zero-profit equations implying that market demand and market supply for goods are equal in each sector.

It is required to make an assumption for functional forms describing technology and preferences in the model. The model rests on the mathematical programming system for general equilibrium analysis (MPSGE) that constructs essential production and utility functions considering the relevant information on the amount, prices and elasticities.

In our model using capital, labor and intermediate inputs each sector produces domestically consumed commodities and commodities for the export. The assumptions suggest that they are imperfect substitutes with constant elasticity of transformation. The production function for a sector i is represented in the following form:

$$Y_i = g(D_i,E_i) = f(K_i, L_i, A_{ji}) \quad (1)$$

Where D_i is domestically produced good in sector i, and E_i is the export of sector i. K_i and L_i are capital and labor in sector i, A_{ij} stands for the quantity of the production in sector i utilized in the sector j’s production.

We have two transformation functions for input and output, which are represented as g and f respectively. For output combination we assume it to be the constant elasticity of transformation (CET) function

$$G(D_i,E_i) = CET(D_i, E_i) \quad (2)$$

As an input formation, a Leontief aggregation of factors of production is being used. For each sector, we have Cobb-Douglas function of capital and labor and intermediate goods as a Leontief aggregate:

$$f(K_i, L_i, A_{ji}) = LF[CD(K_i, L_i), LF(A_{1i}, A_{2i}, \dots , A_{ji})] \quad (3)$$

Equation (4) shows that inputs from a sector j to a sector i are functions of an Armington aggregate of domestic product and import with a constant elasticity of substitution (CES).

$$A_{ji} = CES(D_j, M_j) \qquad (4)$$

Armington aggregate in the model is exploited for household consumption, government expenditures, investment, and as an intermediate input for production. Investment and government expenditures are both Leontief aggregates (Rutherford,1999).

$$I = LF(A_i); \quad G = LF(A_i) \qquad (5)$$

The economy has a representative agent, who owns primary factors (capital and labor) of production. The representative agent is the one who collects taxes and has a demand for investment, public and private commodities. The demand for goods by the agent is set by his utility maximization, while the public goods and investment are defined exogenously. The utility function of the consumer is represented as a Cobb-Douglas function over Armington collection of domestic output and imports.

$$C = CD(A_i) \quad (6)$$

After formulating the functional forms, we return to our equilibrium conditions, which we have three. In our model zero-profit conditions imply that the cost of production without taxes equals to the total output for all sectors. In the market-clearance conditions, we have to have equality between sum of output and initial endowment and total demand of intermediate and final goods or of factors of production. And the last condition, which is income balance, claims that the amount of consumption should be equal to the level of income of economic agents, which are households and government in our case. The equations for the given conditions are created by MPSGE.

At this stage we described the construction of the static model, which we will convert to dynamic one. A representative agent maximizes his utility function subject to the following constraints for capital and consumption.

$$C_t = F(K_t, L_t) - I_t \quad (7)$$

$$K_{t+1} = K_t(1-\delta) + I_t \quad (8)$$

Where δ is the depreciation rate of capital and t is the time period. Solving maximization problem by Lagrangian gives us Lagrange multipliers, which we interpret as the output price, today's price of capital and tomorrow's P_t, PK_t and PK_{t+1} respectively. MPSGE solves all the equations itself and constructs necessary equilibrium conditions (market-clearance, zero-profit and income balance). In order to transform our static model into dynamic we add time periods, declare our parameters and factors, like depreciation and growth rates. Then we introduce new scalars for rental rate of capital in the first period, base capital stock and base capital earnings.

In our study the public investment is exogenously modeled. The reason for that is that the funds for public investment are taken from the Russian Direct Investment Fund (RDIF) rather than from the regular government taxes. The RDIF was established in 2011 to serve as accelerator of economic development through direct investments in the country. Part of the funds is coming from the units of investment funds of National Wealth Fund (NWF) of Russia, which is under the management of Russian Ministry of Finance. It is the Russian state reserve fund with a total fund of 7,84 trillion rubles as of February, 2020 and formed mainly at the expense of additional federal budget revenues from the oil and gas sector and revenues from own funds management (Ministry of Finance,2020). Its main function is to support the pension system of Russia. However, the money from the NWF are also used as a part of the RDIF to invest in national projects. Therefore, increase in public investment in our model does not imply increase in future taxes. As a result, we may have a significant impact on economic growth.

Different from the Paltsev's dynamic model, we apply the Tobin's q investment function to have a more dynamic capital stock accumulation rather than the linear investment function. It is widely used in the recursive dynamic CGE models (Lemelin, 2007; Annabi, Bazlul et al. 2005; Annabi, Cissé et al. 2005). The theory suggests that the ratio of return to capital to its user costs describes the allocation of investment. The study by Kristkova (2014) shows that applying Tobin's q approach results in more consistent projections of investment growth with the real data. To increase public investment, firstly, we calculate the share of capital stock in each sector, and allocate investment for each sector. Then, using Tobin's q investment function equation we calculate it and add our additional investment, which then appears in capital accumulation equation (8). As a result, the capital stock for the next period increases. Higher capital stock implies fall in the price of capital considering constant demand for capital. This leads to lower production costs in the domestic market, which result in increase of production and hence exports. On the other hand, more production means more taxes to the government. So, the impact on economic growth depends on the allocation of investment for each sector and its growth. Therefore we apply Tobin's q investment function, which allows each sector to attract investment depending on its ratio to capital to user cost, and to grow accordingly.

Another difference is that the dynamics of the model is defined by the following factors:(i) growth of the population (ii) total factor productivity, (iii) depreciation rate of capital and (iv) change in oil prices (table B1). All these factors are exogenously determined. Growth of the population was retrieved from the World Bank dataset (2019) and projected up to 2030 using Excel forecast function. It affects the labor supply and government expenditure. Total Factor Productivity (TFP) at constant national prices for Russia acquired from FRED, Federal Reserve Bank of St. Louis (2020), is modeled as exogenous. It serves as a multiplier of the capital and labor supply and adjusted to 2011 as the base year. Oil price data was taken as an average price of Dubai, Brent and West Texas Intermediate from the World Bank (2019) dataset on crude oil. The time period is 20 years in total, from 2011 until 2030. After accurate calibration, we get the final form of the model and can use it to simulate different scenarios.

5. DATA

In order to estimate the impacts of changes in investment or commodity prices on intermediate and final demand and labor price across different sectors of the economy we start with an input-output (IO) table. We used the most recent IO table for Russia for 2011 and aggregated small sectors into large sectors, calculating the investment, government and household expenditures for each of the sectors.

The information on taxes and amounts of exports and imports in each of the sector is given. IO table has several blocks. First matrix represents the intermediate demand across sectors. The rows give the values of produced goods in each sector, while columns stand for the use of intermediate inputs by each sector. The top right matrix represents the allocation of the produced goods as household consumption, government expenditures, exports and investment. The last column shows the total amount of domestically produced good by each sector. The bottom side of the table provides the corresponding information on the amount of costs for production factors, which are labor and capital, the value of imports and taxes for both consumption and production. The last row is the same as the last column, because inputs and outputs in each sector should be equal, except for the last four cells, which shows the total amount of household consumption, government expenditure, export and investment.

Adjusting the IO table into the standards may create different problems. The important thing is to check the table for the balance. If it is not balanced, it requires some adjustments from the modeler. In our case, we check firstly by calculating gross value added and the total use, where we sum up final, intermediate goods and exports, and then we subtract consumption taxes and imports. Lastly, we take the difference between the total output produced in a given sector plus gross value added and the total use at basic prices that we calculated previously. As a result, we have small differences, which can be attributed to statistical errors evolved when the data was gathered.

The initial IO table contains 126 sectors, which we aggregated to 15 according to the Russian Industry Classification System (OKVED) (see appendix A). This was done to make it easier for analysis and in accordance with the official classification system. The value of economic transactions is given in million rubles. The table includes flow of intermediate goods between sectors, factors of production, which are capital and labor, agents such as government, households and the rest of the world, and taxes on production and labor. It also provides accounts for the total investment for each sector.

According to the table, the largest sector of the economy is the manufacturing sector, which consists of 45 industries including such big ones like iron and steel, petrochemicals, meat and animal products and many other small subsectors. The country has a positive balance of trade, while the most exported sectors are manufacturing and mining sectors, in total comprising more than 60% of exports, the most importing sector is also manufacturing, standing for 85% of total imports. Among subsectors, oil and oil products and wholesale trade services have the highest value of exports, 1 838 610 and 1 816 310 million rubles respectively. Motor vehicles are the most imported goods (1 293 753 mln); other highly imported industries include ships, aircraft and spacecraft, other vehicles and equipment subsector and pharmaceutical preparations, medical chemical products and herbal medicines subsector. Real estate operations, rental and provision of services sector is the most capital-intensive one (7,6 bln), the second most capital-intensive sector is wholesale and retail trade sector (5,9 bln), which is also among the most labor-intensive industries together with manufacturing and public administration, military and social security sector. The real estate services together with trade sector make up roughly 45% of total capital in the economy. Manufacturing as the largest sector in the economy also has high consumption and production taxes, but the highest consumption tax is observed in public administration, whereas the highest production tax is in financial activity sector. Agriculture is subsidized by the government.

Investment accounts give us the value of total investment in each sector for the given year. Not surprisingly, the most invested sector is the construction sector. The second sector, which attracted the most investment is manufacturing. The total amount of investment in both sectors is 76% of total investment in the economy.

Our model requires extraneous parameters, such as Armington elasticities of substitution, elasticities of substitution between capital and labor, elasticities of transformation, etc. Considering that we have explained in details our production and utility functions in methodology parts, here we need to stand on elasticity parameters. The production function has three levels, which are characterized by elasticity of substitution between inputs, elasticity of transformation between outputs in production and elasticity of substitution in individual input nests. The elasticity of substitution between inputs, which are capital and labor in our model, characterizes the ability of the economy to change its production structure as a result of variation in relative prices or supply of the factors. The value "s=0" in the production function implies that the elasticity of substitution between inputs within each sector is zero (Leontief), meaning that the ratio of intermediate goods is fixed. If the elasticity of substitution between intermediate and value added goods at the sectoral level is one "va=1", then we have Cobb-Douglas production function. Each sector has its own elasticity of substitution between composite intermediates and composite value-added and provided by the Global Trade Analysis Project (Hertel et al. 2019). The numbers range between 0.20 for oil, gas, fishing and forestry sectors to 1.68 for more elastic sectors such as construction, trade and transportation. At the top level we have the elasticity of transformation between outputs of production characterizing the level of mobility of produced goods between domestic and foreign market. In our model it is defined as "t:", and the closer the value of t to zero the less elastic outputs we have, which implies that the production supply does not respond to changes in relative prices of output in the domestic and export markets and remains fixed. We have calibrated parameter to t:1, constant elasticity of transformation, meaning that outputs are sensitive to relative prices changes.

6. SIMULATIONS AND PRELIMINARY RESULTS

In this Section, we present the results from our simulations. We examine the implications on the economy of the following scenarios. *Scenario 1* is going to be our baseline scenario. First of all, we calibrate our model to replicate the real data on economic growth of Russia until 2020. For the next 10 years our baseline scenario is in line with conservative forecast developed by the Russian Ministry of the Economic Development (2019). *Scenario 2* examines the effects of increase in public investment by 1 billion rubles each year for the next 5 years starting from 2020 on the economic growth, sectoral production, exports and imports, price of labor and capital in the economy. *Scenario 3* presents the results of prolongation of the import ban imposed by Russian government in August 2014 on agricultural products until 2025. We do not simulate other sanctions because there is a lack of data and most economic sanctions were tailored against specific people, so in other words the sanctions were relatively mild. The imposition of import ban was a retaliatory policy against the sanctions imposed by Western countries. The list of products, which is subject to the ban, includes milk, fruit and vegetables, all meet products and dairy (Boulanger, 2015). Since we do not have sectors by products, we cut the import of agricultural sector by 50% to evaluate the impact on the Russian economy. The import ban was extended by the Decree No.305 of President of Russia in 2016.

From the figure 3 we can observe how increase in public investment and imposition of the import ban affect the GDP growth rate each year relative to the baseline scenario. The impact of public investment seems to be very significant. In the first two years the relative growth is lower, but then it increases slightly. In 2023 GDP grows by 3,01%, while in the baseline it grows only by 2,53%. The highest growth rate is achieved in 2026 (4,02%), which is more than the baseline growth by more than one percentage point (3,00%). In the consecutive years the economic growth slows down and by 2030 it falls almost to the baseline level. The increase in public investment could be a good economic policy in order to boost the economy. The effect of the import ban on the economic growth is less observable, but in total it is negative for the Russian economy. In the first two years the GDP growth slows down with 1,61% and 2,25% compared to the 1,92% and 2,3% in the baseline scenario. In the next years the growth rate differs only by 0,01 percentage points.

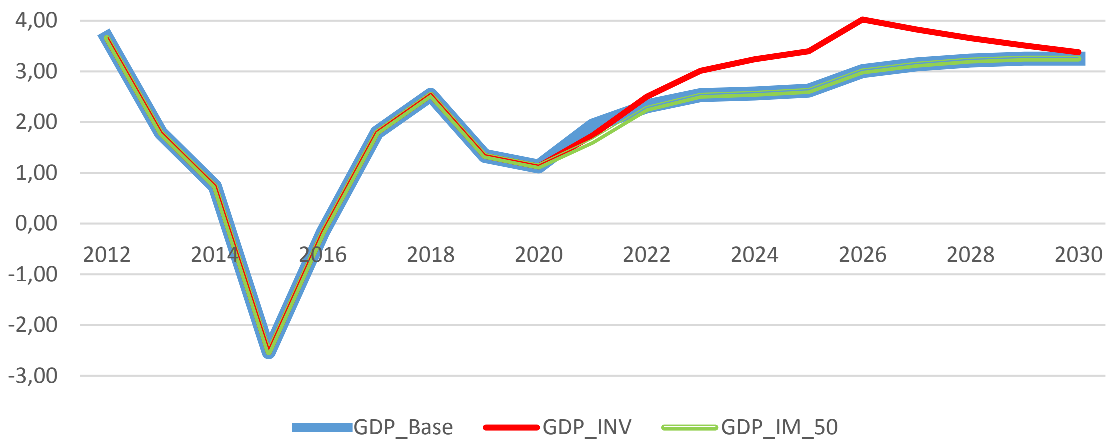


Fig-3. Real GDP Growth %

Table 2 presents the results of the simulations on sectoral effects for the mentioned three cases. In the baseline scenario, which can be observed from the table -2A, we have overall growth in all sectors except mining and construction. This could be explained due to the fall in oil prices. Different from the mining sector, which includes oil and gas production, the construction sector starts to increase after 2024. Sectors with high level of capital endowments, such as agriculture, trade, hotel and restaurants and real estate sectors increased the most, i.e. by more than 20%. The least affected sector is the public services sector, the growth is only 1% in the beginning and 4% in the 2030, given that this sector is highly labor intensive. Sectoral exports and imports also grow, except for education and healthcare sectors, which exhibit negative growth in exports, while mining sector experiences negative growth in imports (see the table-B2 in the appendix B). That could be due to the fact that education and healthcare have the highest ratio of labor to capital among all sectors. As we can observe from the table-B3 in the appendix B, expansion of the capital stock leads to decrease in its price and increase in the marginal product of labor. Rise in the wage rate negatively affects exports in industries with high labor-to-capital ratio. The opposite effect we observe in the mining sector, which has the highest capital-to-labor ratio. Similarly, the domestic price falls in this sector as well as in sectors with high ratio of capital-to-labor, such as agriculture and real estate sectors.

Scenario 1 Baseline

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,25	1,30	1,33	1,36	1,40	1,45	1,49	1,55	1,61	1,67	1,74
FIS	1,14	1,19	1,20	1,22	1,24	1,26	1,28	1,30	1,32	1,34	1,36
MNG	0,79	0,75	0,77	0,79	0,82	0,84	0,87	0,90	0,93	0,96	1,00
MNF	1,04	1,04	1,07	1,10	1,13	1,15	1,18	1,22	1,25	1,29	1,32
EGW	1,13	1,14	1,16	1,18	1,21	1,24	1,27	1,31	1,35	1,39	1,43
CON	0,82	0,86	0,91	0,95	0,99	1,01	1,06	1,09	1,12	1,14	1,15
TRD	1,31	1,38	1,41	1,44	1,48	1,52	1,57	1,62	1,67	1,73	1,79
HRS	1,30	1,34	1,36	1,39	1,41	1,45	1,49	1,54	1,59	1,65	1,71
TRC	1,20	1,24	1,27	1,29	1,32	1,35	1,38	1,42	1,46	1,50	1,54
FIN	1,19	1,23	1,26	1,28	1,31	1,34	1,38	1,41	1,46	1,50	1,54
RST	1,32	1,40	1,44	1,49	1,55	1,61	1,68	1,75	1,84	1,93	2,02
PUB	1,01	1,01	1,02	1,02	1,02	1,02	1,03	1,03	1,03	1,03	1,04
MSP	1,12	1,15	1,16	1,17	1,19	1,20	1,22	1,23	1,25	1,27	1,29
EDU	1,02	1,03	1,03	1,03	1,03	1,03	1,03	1,03	1,04	1,04	1,04
HLT	1,03	1,04	1,04	1,04	1,04	1,04	1,05	1,05	1,05	1,05	1,06

Table-2A. Results of simulation (baseline scenario). Impact on Sectoral production.

Scenario 2

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,25	1,29	1,32	1,36	1,41	1,46	1,54	1,61	1,69	1,76	1,84
FIS	1,14	1,18	1,19	1,21	1,22	1,24	1,26	1,29	1,31	1,33	1,36
MNG	0,79	0,75	0,78	0,81	0,84	0,87	0,90	0,94	0,97	1,01	1,04
MNF	1,04	1,05	1,08	1,11	1,15	1,18	1,22	1,25	1,29	1,32	1,35
EGW	1,13	1,13	1,15	1,17	1,20	1,23	1,28	1,33	1,38	1,43	1,48
CON	0,82	0,92	1,02	1,09	1,16	1,20	1,19	1,18	1,17	1,17	1,17
TRD	1,31	1,36	1,39	1,42	1,46	1,51	1,59	1,66	1,73	1,80	1,87
HRS	1,30	1,30	1,30	1,32	1,35	1,39	1,47	1,55	1,62	1,70	1,77
TRC	1,20	1,23	1,25	1,27	1,30	1,34	1,39	1,44	1,49	1,54	1,58
FIN	1,19	1,22	1,24	1,26	1,29	1,33	1,38	1,43	1,48	1,53	1,58
RST	1,32	1,40	1,45	1,52	1,60	1,70	1,80	1,91	2,02	2,12	2,23
PUB	1,01	1,01	1,02	1,02	1,02	1,02	1,03	1,03	1,03	1,04	1,04
MSP	1,12	1,14	1,13	1,14	1,14	1,15	1,18	1,21	1,23	1,26	1,28
EDU	1,02	1,02	1,02	1,02	1,02	1,01	1,02	1,02	1,02	1,03	1,03
HLT	1,03	1,03	1,03	1,02	1,02	1,02	1,03	1,03	1,04	1,04	1,05

Table-2B. Results of simulation (increase in public investment). Impact on Sectoral production.

Scenario 3

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,25	1,40	1,45	1,49	1,53	1,58	1,63	1,69	1,75	1,82	1,89
FIS	1,14	1,17	1,18	1,20	1,22	1,23	1,26	1,28	1,30	1,32	1,34
MNG	0,79	0,74	0,76	0,78	0,80	0,83	0,85	0,88	0,91	0,95	0,98
MNF	1,04	1,03	1,05	1,08	1,10	1,13	1,16	1,19	1,23	1,26	1,30
EGW	1,13	1,13	1,16	1,18	1,21	1,24	1,27	1,30	1,34	1,38	1,43
CON	0,82	0,86	0,91	0,96	1,00	1,02	1,06	1,10	1,13	1,15	1,16
TRD	1,31	1,38	1,40	1,44	1,48	1,52	1,56	1,61	1,67	1,73	1,79
HRS	1,30	1,33	1,35	1,38	1,41	1,45	1,49	1,54	1,59	1,65	1,71
TRC	1,20	1,24	1,26	1,29	1,31	1,34	1,38	1,41	1,45	1,49	1,54
FIN	1,19	1,23	1,25	1,28	1,31	1,34	1,38	1,41	1,45	1,50	1,54
RST	1,32	1,40	1,44	1,49	1,55	1,61	1,68	1,75	1,84	1,93	2,02
PUB	1,01	1,01	1,02	1,02	1,02	1,02	1,02	1,03	1,03	1,03	1,04
MSP	1,12	1,15	1,16	1,18	1,19	1,20	1,22	1,24	1,25	1,27	1,29
EDU	1,02	1,03	1,03	1,03	1,03	1,03	1,03	1,03	1,04	1,04	1,04
HLT	1,03	1,04	1,04	1,04	1,04	1,04	1,05	1,05	1,05	1,06	1,06

Table-2C. Results of simulation (import ban). Impact on Sectoral production.

Note: The benchmark year is 2011. The number 1.25 for AGR in 2020 implies an increase of production in agricultural sector by 25% in 2020 relative to the production in 2011.

As we can see from the table-2B scenario 2 shows that as a result of increase in public investment yearly by 1 billion rubles, the real GDP growth rate increases by nearly 1 percentage point compared to the baseline growth. Sectors react differently for the investment increase, production in most of the sectors falls by a little or remains the same in the first 5 years and later grows, except for the mining, manufacturing and construction sectors, which benefit immediately from additional investment. Their production expands by 1 or 2 percentage points more than it was in the baseline scenario. This has a negative effect on other sectors, especially on agricultural, which declines by 10% as of 2030. If we look to the terms of trade we observe from the figure 4 that total exports start to increase after rise in the public investment. The same is true for total imports, which seem to be affected even more. The gap between baseline import and new imports is getting larger every year, reaching the difference of 700 million rubles by 2030 (see figure 5).

Scenario 3 in our model is the imposition of import ban on agricultural sector by 50% starting from 2020 until 2030. The ban on the import of agricultural products obviously leads to the fall in the total amount of import. As we can observe from the figure 5 the difference in imports increases each year reaching the gap of 300 million rubles. Interestingly, we observe the same amount of difference in the gap for exports by 2030 (see figure 4). The import ban has similar impact on both export and import of the country. Table-B4 in the appendix B shows that sectors with the highest increase in the export are agriculture, wholesale and retail trade, and real estate sectors. In terms of sectoral production the agriculture sector is expectedly influenced the most (see table-2C). Its production increases by more than 10 percentage points each year. Production in other sectors does not change significantly, most of them remain the same as in the baseline scenario.

7. CONCLUSION

In this paper, we developed a recursive dynamic CGE model calibrated to data from IO table for 2011 and apply it to estimate the sectoral impact of Russian import ban and an increase in public investment on the production and economic performance of Russia for the period until 2030. The model differs from the Paltsev's model, which is taken as the base model, in the use of Tobin q investment function rather than linear. In addition, the dynamics of our model is determined by population growth, total factor productivity, depreciation rate of capital and change in oil prices. We aggregated the economy into 15 sectors according to official industry classification system.

The paper simulates three different scenarios. In the first scenario, we calibrate the model to replicate the conservative forecast of the Ministry of Economic Development of Russia. In the second scenario, we increase yearly from 2020 the public investment by 1 billion rubles and find out a positive effect on economic growth and production for all sectors. In the third scenario, we simulate import ban on agricultural sector. The results show that it does not affect much the GDP growth rate, but it has a negative impact on exports and imports not only in agricultural sector. In terms of production the only significantly affected sector is agriculture, showing an increase by more than 10 percentage points relative to the baseline scenario.

The results of scenario 2 on increasing public investment is in line with the findings of Lall (2006), Neumann (2001) and Mbanda et al. (2018). They also found a positive impact of public investment on economic growth. In the studies of Kutlina-Dimitrova (2017) and Boulanger (2015) the effect of import ban on Russian consumer's welfare is substantial, but in our case in terms of GDP growth the impact found out to be not significant. However, our simulation resulted in the increase of production in agricultural sector, but decline in the rest, which is similar to the previous findings, where total production in Russia declines by 0.03%, while agricultural sector shows an increase in domestic production.

As in many other studies this paper also has limitations and caveats regarding assumptions, calibration parameters of the model, such as factor productivity and depreciation rate of capital, and also time constraints. The model does not take into account some critical trade issues. For instance, the products banned by Russia could enter the market from the neighboring countries, which are not subject to the import ban through the re-exporting of imports. Whereas in our model we estimate the impact of ban on total import of products of agricultural sector from all countries by 50%. The model also does not cover the financial situation, the impact of depreciation of Russian ruble and other external shocks.

Further research may include sensitivity analysis for the extraneous parameters, to see how each parameter affects our variable of interest and provide further insight for the estimated results. Data on public investment for each sector, which was not available, could be collected in the future and used for simulating more realistic cases.

Appendix A

IO Mapping. Sectoral abbreviations according to Russian Industry Classification System (OKVED).

AGR: agriculture, hunting and forestry

FIS: fishing

MNG: mining

MNF: manufacturing

EGW: electricity, gas and water production and distribution

CON: construction

TRD: wholesale and retail trade; repair of motor vehicles, motorcycles, household products and personal use

HRS: hotel and restaurants

TRC: transportation and communication

FIN: financial activity

RST: real estate operations, rental and provision of services

PUB: public administration and ensuring military security; social insurance

MSP: provision of other municipal, social and personal services

EDU: education

HLT: healthcare and provision of social services

Appendix B

Table-B1. Parameters for the baseline scenario

Year	Pop_growth_RATE	TFP	Oil price	Ch_price	DEP_RATE
2011	0,0000	1,00	99,91	0,00	0,036
2012	0,0017	0,99	104,96	0,05	0,041
2013	0,0021	0,99	108,95	0,04	0,048
2014	0,0022	1,00	58,54	-0,46	0,049
2015	0,0019	1,01	40,41	-0,31	0,042
2016	0,0017	1,01	57,43	0,42	0,043
2017	0,0011	1,02	63,20	0,10	0,041
2018	-0,0001	1,00	68,30	0,08	0,045
2019	0,0008	1,01	60,00	-0,12	0,047
2020	0,0007	1,02	42,50	-0,29	0,041
2021	0,0006	1,02	43,30	0,02	0,044
2022	0,0004	1,02	44,20	0,02	0,045
2023	0,0003	1,02	45,00	0,02	0,047
2024	0,0002	1,01	45,90	0,02	0,046
2025	0,0000	1,02	46,73	0,02	0,047
2026	-0,0001	1,02	47,58	0,02	0,047
2027	-0,0002	1,02	48,43	0,02	0,047
2028	-0,0003	1,02	49,28	0,02	0,048
2029	-0,0005	1,02	50,13	0,02	0,048
2030	-0,0006	1,02	50,98	0,02	0,048

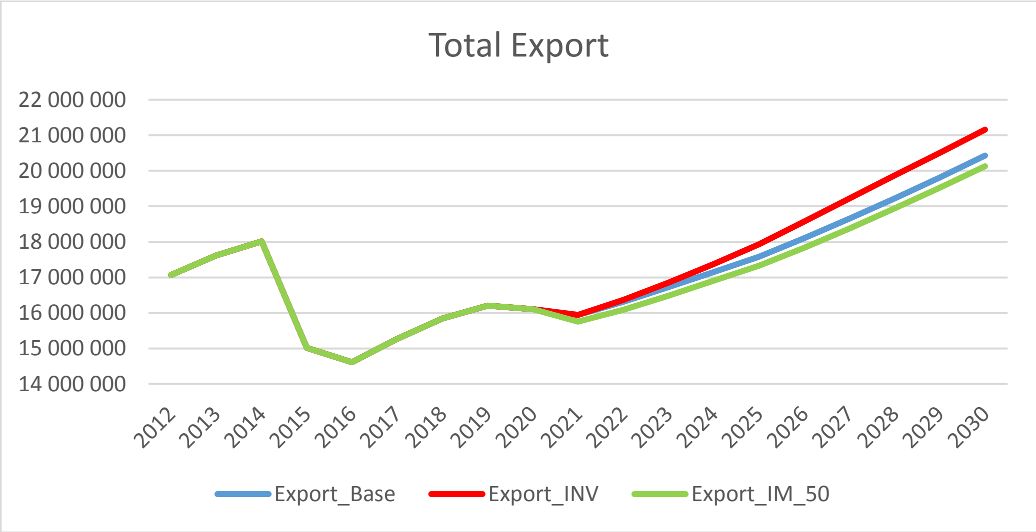


Fig-4. Total Export in million rubles

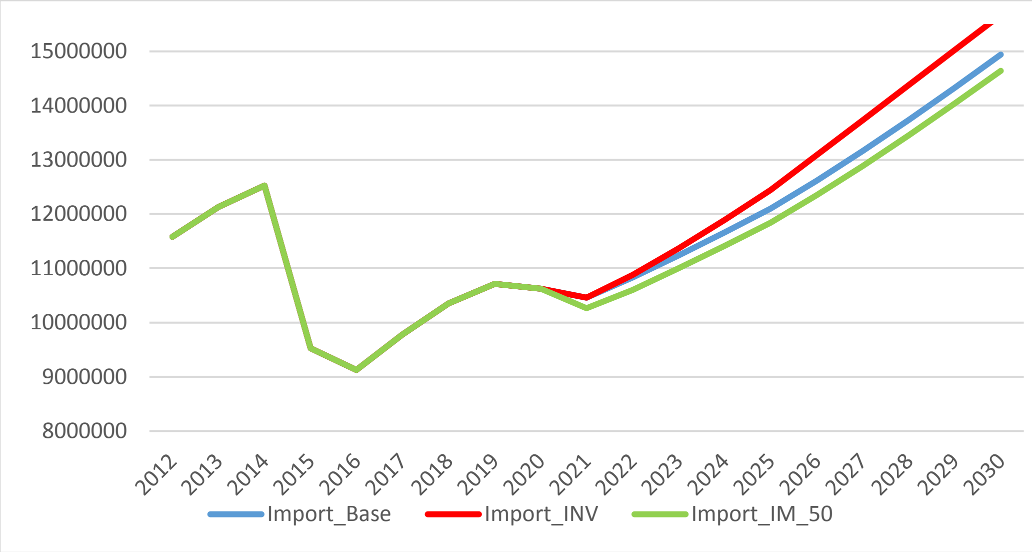


Fig-5. Total Import in million rubles

Table-B2. Sectoral Exports. Baseline scenario.

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,36	1,44	1,47	1,51	1,55	1,60	1,65	1,71	1,77	1,84	1,91
FIS	1,17	1,24	1,25	1,26	1,28	1,29	1,30	1,31	1,33	1,34	1,35
MNG	0,42	0,26	0,27	0,29	0,30	0,32	0,34	0,36	0,38	0,41	0,43
MNF	1,06	1,07	1,09	1,12	1,14	1,17	1,20	1,23	1,26	1,29	1,32
EGW	1,15	1,18	1,20	1,22	1,24	1,27	1,30	1,33	1,36	1,39	1,43
CON	0,86	0,92	0,97	1,01	1,05	1,07	1,11	1,14	1,17	1,18	1,19
TRD	1,41	1,53	1,55	1,59	1,62	1,66	1,71	1,76	1,81	1,87	1,93
HRS	1,38	1,44	1,46	1,49	1,51	1,55	1,58	1,63	1,67	1,73	1,78
TRC	1,25	1,33	1,35	1,37	1,39	1,42	1,45	1,48	1,51	1,54	1,57
FIN	1,25	1,33	1,35	1,37	1,39	1,41	1,44	1,47	1,50	1,53	1,56
RST	1,45	1,59	1,64	1,69	1,75	1,82	1,89	1,98	2,08	2,18	2,29
PUB	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
MSP	1,13	1,18	1,18	1,19	1,19	1,19	1,19	1,19	1,19	1,19	1,19
EDU	0,99	1,01	1,00	0,99	0,98	0,97	0,95	0,94	0,92	0,90	0,88
HLT	1,01	1,03	1,03	1,02	1,01	0,99	0,98	0,97	0,95	0,94	0,93

Table-B3. Sectoral Exports. Scenario 2 (increase in public investment).

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,36	1,43	1,46	1,50	1,56	1,62	1,71	1,79	1,87	1,96	2,04
FIS	1,17	1,23	1,24	1,25	1,26	1,26	1,27	1,29	1,30	1,31	1,32
MNG	0,42	0,26	0,28	0,29	0,31	0,33	0,36	0,38	0,41	0,43	0,46
MNF	1,06	1,08	1,11	1,14	1,17	1,20	1,23	1,26	1,29	1,32	1,35
EGW	1,15	1,17	1,18	1,20	1,23	1,26	1,30	1,34	1,38	1,42	1,46
CON	0,86	0,99	1,09	1,16	1,23	1,26	1,24	1,23	1,22	1,21	1,20
TRD	1,41	1,51	1,53	1,57	1,61	1,66	1,73	1,80	1,87	1,94	2,01
HRS	1,38	1,41	1,40	1,42	1,44	1,47	1,55	1,62	1,69	1,76	1,82
TRC	1,25	1,32	1,33	1,35	1,37	1,40	1,44	1,48	1,52	1,55	1,59
FIN	1,25	1,31	1,33	1,34	1,36	1,39	1,43	1,46	1,50	1,54	1,57
RST	1,45	1,59	1,65	1,73	1,82	1,93	2,05	2,18	2,30	2,43	2,56
PUB	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
MSP	1,13	1,17	1,16	1,14	1,13	1,12	1,12	1,13	1,13	1,13	1,13
EDU	0,99	1,01	0,99	0,97	0,95	0,93	0,90	0,88	0,86	0,84	0,82
HLT	1,01	1,03	1,01	1,00	0,98	0,95	0,93	0,92	0,90	0,88	0,87

Table-B4. Sectoral Exports. Scenario 3 (import ban).

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AGR	1,36	1,43	1,46	1,50	1,56	1,62	1,71	1,79	1,87	1,96	2,04
FIS	1,17	1,23	1,24	1,25	1,26	1,26	1,27	1,29	1,30	1,31	1,32
MNG	0,42	0,26	0,28	0,29	0,31	0,33	0,36	0,38	0,41	0,43	0,46
MNF	1,06	1,08	1,11	1,14	1,17	1,20	1,23	1,26	1,29	1,32	1,35
EGW	1,15	1,17	1,18	1,20	1,23	1,26	1,30	1,34	1,38	1,42	1,46
CON	0,86	0,99	1,09	1,16	1,23	1,26	1,24	1,23	1,22	1,21	1,20
TRD	1,41	1,51	1,53	1,57	1,61	1,66	1,73	1,80	1,87	1,94	2,01
HRS	1,38	1,41	1,40	1,42	1,44	1,47	1,55	1,62	1,69	1,76	1,82
TRC	1,25	1,32	1,33	1,35	1,37	1,40	1,44	1,48	1,52	1,55	1,59
FIN	1,25	1,31	1,33	1,34	1,36	1,39	1,43	1,46	1,50	1,54	1,57
RST	1,45	1,59	1,65	1,73	1,82	1,93	2,05	2,18	2,30	2,43	2,56
PUB	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
MSP	1,13	1,17	1,16	1,14	1,13	1,12	1,12	1,13	1,13	1,13	1,13
EDU	0,99	1,01	0,99	0,97	0,95	0,93	0,90	0,88	0,86	0,84	0,82
HLT	1,01	1,03	1,01	1,00	0,98	0,95	0,93	0,92	0,90	0,88	0,87

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