# MODEL OF ECONOMIC GROWTH IN RUSSIA UNDER CONDITIONS OF INTEGRATION INTO THE WORLD ECONOMY

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**Abstract**

The article is devoted to the development of a model of economic growth in Russia under conditions of integration into the world economy. Modeling and forecasting are based on the macroeconomic analysis of the effectiveness of integration processes in the business environment of the Russian economy on the basis of game theory, which is made on the basis of the analysis of alternative scenarios of economic growth in Russia under conditions of integration into the world economy. The authors simulate the optimal parameters of macroeconomic indicators for economic growth in Russia under conditions of integration into the world economy.

**Keywords:** economic growth, integration into the world economy, game theory, macro-economic analysis of the effectiveness of modern Russia.

## 1. Introduction

Under conditions of Russia's integration into the world economy, there arises a situation of uncertainty, related to complexity of modeling of consequences of integrating processes for the Russian economy. On the one hand, this can push forward the development of entrepreneurship and increase of business activity and ensure high rate of economic growth [7, 8, 9]. On the other hand, this can undermine the domestic entrepreneurship and start a systemic crisis of Russian economy [1, 2, 3].

Therefore, there is a serious scientific problem of forecasting possible negative aspects of Russia's integration into the world economy and their minimization, as well as of revealing positive aspects and perspectives of integrating processes and search for ways to maximize possible advantages for Russia's economy [4, 5, 6]. To solve this problem, it is advisable to go back from parametric ("soft") models of growth [10] and concentrate attention on possible causative conditions of integration.

This article offers the hypothesis that it is possible to reach high rate of economic growth of Russia's economy under conditions of integration into the global economy. In order to test this hypothesis, it is necessary to conduct the modeling and

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forecasting of possible results of integrating processes and their influence on the economic growth of modern Russia's economy.

## 2. Analysis of the factors of modern Russia's economic growth

Let us consider the main macro-economic indicators of Russia for the last five years (Table 1).

Table 1. The main macro-economic indicators of Russia for 2010-2014.

| Year | Annual average population, million | Employed population, million | Gross domestic product 2000=100 | Index of expenses for the private consumption of households 2000=100 | Index of industrial production 2000=100 | Index of manufacture of agricultural production 2000=100 | Index of consumer prices 2000=100 |
|------|------|------|------|------|------|------|------|
| 2010 | 142.9 | 70.7 | 166.8 | 224.3 | 153.9 | 145.3 | 352.5 |
| 2011 | 150.0 | 74.2 | 175.1 | 235.5 | 161.6 | 152.6 | 370.1 |
| 2012 | 157.5 | 77.9 | 183.9 | 247.3 | 169.7 | 160.2 | 388.6 |
| 2013 | 165.4 | 81.8 | 193.1 | 259.7 | 178.2 | 168.2 | 408.1 |
| 2014 | 173.7 | 85.9 | 202.7 | 272.6 | 187.1 | 176.6 | 428.5 |

Source: Russia in numbers, 2015.

As is seen from Table 1, in 2010-2014 there was positive dynamics of Russia's population and employed population growth, GDP growth, increase of population expenses, index of industrial production, index of manufacture of agricultural production, and index of consumer prices, which in a whole shows the development of economics. In order to determine the factors of modern Russia's economy growth, we shall conduct the analysis of Russia's human capital quality. For that, we shall use Table 2.

Table 2. Indicators of Russia's human capital quality in 2006-2014.

| Indicators of human capital | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|------|------|------|------|------|------|------|------|------|------|
| Economically active population | 75060 | 70740 | 72770 | 73432 | 75159 | 75757 | 75658 | 75440 | 75752 |
| Quantity of students | 2613 | 2791 | 4741 | 7064 | 7461 | 7513 | 7419 | 7050 | 6490 |

Source: Russia in numbers, 2015.

As is seen from Table 2, in 2006-2014 there was positive dynamics of economically active population and quantity of students, which shows the increase of human capital quality. Correlation analysis of increase of Russia's human capital and GDP allowed revealing a positive interconnection, which shows that human capital is a factor of growth of Russia's economy. Let us analyze the structure of Russia's GDP (Table 3).

As is seen from Table 3, the following spheres prevail in the structure of Russia's economy: manufacturing (27%), wholesale and retail trade (15%), and the third place is occupied by transport and connection (9%). Thus, it is possible to state that Russia's economy has an industrial nature, but there are conditions for formation

of post-industrial economy. Let us consider the commodity composition of export and import in Russia in 2014. (Figures 1, 2).

Table 3. Structure of Russia's economy in 2010-2014, thousands of rubles

| Sectors of economy | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Agriculture, hunting, and forestry | 2,892,506 | 3,031,754 | 3,928,530 | 4,517,810 | 5,195,481 |
| Fishery and fish breeding | 179,549 | 169,344 | 202,281 | 232,623.2 | 267,516.6 |
| Mineral production | 4,748,097 | 5,950,895 | 7,613,648 | 8,755,695 | 10,069,049 |
| Manufacturing | 16,869,217 | 20,461,516 | 25,737,786 | 29,598,454 | 34,038,222 |
| Production and distribution of energy, gas, and water | 3,727,421 | 4,506,096 | 5,217,857 | 6,000,536 | 6,900,616 |
| Building | 4,906,339 | 5,588,103 | 6,440,913 | 7,407,050 | 8,518,107 |
| Wholesale and retail trade, repair of transport, motorcycles, utility products, and personal appliances | 9,822,720 | 11,743,638 | 14,029,058 | 16,133,417 | 18,553,429 |
| Hotels and restaurants | 697,028 | 771,628 | 876,867 | 1,008,397 | 1,159,657 |
| Transport and connection | 6,410,432 | 7,309,538 | 8,066,906 | 9,276,942 | 10,668,483 |
| Financial activity | 2,373,143 | 2,465,091 | 2,773,750 | 3,189,813 | 3,668,284 |
| Operations with real estate, rent, and services | 6,511,146 | 7,276,241 | 8,191,097 | 9,419,762 | 10,832,726 |
| State administration and defense; social security | 4,242,799 | 4,551,116 | 5,273,618 | 6,064,661 | 6,974,360 |
| Education | 1,534,347 | 1,575,656 | 1,802,659 | 2,073,058 | 2,384,017 |
| Healthcare and social services | 2,157,583 | 2,284,478 | 2,708,279 | 3,114,521 | 3,581,699 |
| Other utility, social, and personal services | 1,044,122 | 1,074,986 | 1,218,168 | 1,400,893 | 1,611,027 |

Source: Russia in numbers, 2015.

As is seen from Figure 1, in the Annex, a larger part of Russia's import in 2014 belongs to machines, equipment, and transport (48%), as well as to food and agricultural products (14%). Analysis of external trade activities of Russia in 2014 showed that Russia actually exports resources and import the final products, which determines its high dependence on import and impedes the economic development. Therefore, the key factors of economic growth of modern Russia are human capital, mineral resources, and manufacturing enterprises.

### 3. Modeling of effectiveness of integrating processes in the business environment on the basis of the Game Theory

This research offers the following economico-mathematical and micro-economic model for analysis of competitiveness of domestic enterprises under conditions of integration of the country into the world economy:

$$C=LC*[(I+HC+M)/CR] \qquad (1)$$

where C – competitiveness of enterprise;

LC – level of competitiveness in the market;

I – amount of available investments for enterprises;

HC – availability and effectiveness of use of human capital, determining the quality of management at the enterprise;

M – quality of enterprise's marketing, i.e. it's reputation and image;

CR – cost of resources, required for conducting the business activity.

As a result of integrating processes of the Russian economy, there will be a significant improvement of competition and, probably, increase of investments into the economy due to the improvement of its openness and adjustment to world trends and standards; other parameters will, most likely, stay at previous levels. Under the conditions of integrating processes, the model of competitiveness of Russian enterprises has the following form: $C=2LC*[(1,5I+HC+M)/CR]$. The formula shows that competitiveness and effectiveness of entrepreneurship in Russia is going to increase as a result of its integration into the world economy.

The following variants of behavior of Russian enterprises under conditions of integrating processes of the Russia's economy are possible:

– continuation of independent existence, which will lead to weakening of their position in the market and decrease of competitiveness and profit;
– integration with Russian enterprises, which supposes the formation of vertically and/or horizontally integrated domestic clusters that ensure the increase of competitiveness and rentability of enterprises that they consist of, with preservation of high level if independence of cluster members;
– integration with foreign enterprises, which supposes realization of mergers and acquisitions with foreign rivals that entered the Russian market as a result of lowering the barriers and cancelling the system of protective measures, which leads to decrease or even loss of independence of Russian enterprises within the framework of these unions.

Using the tools of the Game Theory, let us build a model of behavior of Russian enterprises under conditions of integrating processes of Russian economy. Assuming that the profitability of enterprises before Russia's integration into the world economy is 1 c.u. (conditional unit). Thus, under the conditions of instability and uncertainty, the expected profitability at the independent existence of the enterprise will probably reduce 2 times with the probability of 50%.The expected return at the integration with Russian enterprises will probably increase 2 times with the high probability for unstable situation of 80%. The expected return at integration with foreign enterprises will increase less – 1.5 times with the probability of 60%, as the actions of foreign partners are not easy to forecast (Table 1).

Table 1. Model of behavior of Russian enterprises under conditions of integrating processes of the Russian economy

| Variants of behavior | Expected returns, c.u. | Probability | Probable result, c.u. |
| --- | --- | --- | --- |

| Continuation of independent existence | 0.5 | 0,5 | 0.5*0.5=0.25 |
|---|---|---|---|
| Integration with Russian enterprises | 2 | 0,8 | 2*0.8=1.6 |
| Integration with foreign enterprises | 1.5 | 0,6 | 1.5*0.6=0.9 |

Based on the calculations in Table 1, it is possible to conclude that the most optimal is integration with Russian enterprises, as it ensures the largest profit with the highest probability compared to other variants, which form the largest probable result.

## 3. Modeling of optimal parameters of macro-economic indicators for provision of Russia's economic growth under conditions of integration into the world economy

Let us consider the existing models of economic growth. According to the model R. Solow, economic growth is calculated by the following formula [13]:

$$EG=sf(k)-(n+g+b)k \qquad (2)$$

where EG – economic growth;

sf(k) – investments in economy;

n – rate of growth of employees (labor);

g – capital attrition;

b – technological progress;

k – capital endowment of enterprises.

Despite the fact that this model considers a lot of factors, it is exogenous and oriented at closed economy which develops in stable, unchanging conditions. According to the model of Ramsey-Cass-Koopmans, the economic growth is calculated by the following formula [12]:

$$EG=q+n+p+Qg \qquad (3)$$

where EG – economic growth;

q – rate of capital attrition;

n– rate of growth of employees (population);

p– positive coefficient of discounting, reflecting intertemporal preferences of individual;

Qg – flexibility of marginal utility as to consumption.

This model is also oriented at closed economy which is in a dynamically changing environment. According to the model of J. Grossman and E. Helpman, economic growth is calculated by the following formula [11]:

$$EG=\lambda n ln\gamma \qquad (4)$$

where EG – economic growth;

$\lambda$ – technological progress;

n – rate of growth of employees (population);

$ln\gamma$ – involvement of the country in the world trade.

This model is oriented at open economy which develops in stable environment. The comparative analysis of the existing models of economic growth is shown in Table 1.

As a result of comparative analysis of existing models of economic growth in Table 1, it is possible to conclude that existing models do now allow forecasting the character and rate of economic growth of open dynamic economy and, consequently,

they are not suitable for modeling economic growth of Russia's economy under conditions of integration into the world economy.

Table 1. Comparative analysis of existing models of economic growth

| Criteria of comparison | Model of R. Solow | Model of Ramsey-Cass-Koopmans | Model of J. Grossman and E. Helpman |
|---|---|---|---|
| Orientation of model | exogenous (internal orientation) | exogenous (internal orientation) | endogenous (external orientation) |
| Key factor of economic growth | technological progress, capital | human capital, consumption | activity of international trade |
| Advantages | accounting of many factors | accounting of market's dynamics and character of demand and consumption | accounting of external factors, orientation at open economy |
| Disadvantages | orientation at stable closed economy | orientation at closed economy | orientation at stable economy |

Therefore, this research offers to use the specifically developed authors' model of economic growth of Russia's economy under conditions of integration into the world economy:

$$EG(ПА)=LC*(I+Inf+R+T+L)*VSM \qquad (5)$$

where EG – economic growth;
LC – level of competition in economy;
I – availability and amount of investments;
Inf – quality and availability of infrastructure;
R – availability of resources at enterprises;
T – level of technologies development;
L – quality of human resources;
VSM – volume of sales market.

In this model, the key factor of economic growth is business activity which depends on a variety of factors. The key factors are the level of competitiveness and amount of investments into economy. Russia's integration into the world economy will lead to the increase of competitiveness and of investments in the national economy, which is a basis for economic growth within the frame of the developed model.

Russia's infrastructure quality is medium one – same as the level of technologies development; these factors will remain unchanged under the conditions of integrating processes. However, these drawbacks may be compensated by high quality of human resources and large volume of resources of Russian enterprises. That will lead to the increase of sales market due to the possibility of Russian enterprises' entry to the global markets, which is an additional motivation for the development of business in Russia. The model of economic growth of Russia under conditions of integration into the world economy is presented in the Figure 1 in the Annex. Function of business activity in the economy is presented in Figure 2 in the Annex.

As is seen from Figure 2, the function of activity of business in economy depends on two key factors: level of competitiveness and volume of investments. Let

us conduct the analysis of alternative scenarios of economic growth of Russia under conditions of integration into the world economy (Table 2).

Table 2. Analysis of alternative scenarios of economic growth of Russia under conditions of integration into the world economy

| Macro-economic indicators | Scenarios | | |
|---|---|---|---|
| | Pessimistic scenario (stagnation of economy) | Normal scenario (low rates of economic growth) | Optimistic scenario (high rates of economic growth) |
| Level of competition in economy | x-1.5x | 1.6x-2x | 2x |
| Availability and volume of investments | x-1.3x | 1.4x-1.6x | 1.7x-2x |
| Quality and availability of infrastructure | x | x-1.1x | 1.1x-1.2x |
| Resources of enterprises | x | x | x |
| Level of technologies development | x | x-1.2x | 1.3x-1.5x |
| Quality of human resources | x | x | x |
| Volume of sales market | nx | nx | nx |
| Inflation rate | >10% | 8-10% | <8% |
| Interest rate on credit | >20% | 18-20% | <20% |
| Economic growth | 0.5-1% | 1-4% | 5-8% |
| Probability of scenario's realization | 0.3 | 0.4 | 0.3 |

As is seen from Table 2, for the provision of economic growth of Russia under conditions of integration into the global economy, the most optimal are the parameters of macroeconomic indicators of optimistic or normal scenario. These scenarios suppose reduction of inflation rate and rate of interest on credits, as well as increase of investments as least 1.5 times and improvement of Russian economy's competition 2 times.

Also, a slight development of technologies and infrastructure is expected. These scenarios are quite realistic and do not require huge changes and radical actions from the government, as they can be realized by market method and by means of integrating process.

## Conclusion

Thus, as a result of the research, the offered hypothesis is proved; the result of modeling and forecasting showed that it is possible to reach high rates of economic growth of Russia's economy under conditions of integration into the world economy. This requires the stabilization of macro-economic situation, at a least a slight reduction of inflation rate and rate of interest on credits, and attraction of investments.

The key vector of economic growth of Russian economy within the developed model is the improvement of competitiveness and expansion of sales markets due to the integration into the world economy. The position of the authors of this research as to the optimal scenario of economic growth comes down to the

necessity of reduction of the role of government in the provision of economic growth of Russian economy and orientation at the market self-regulation.

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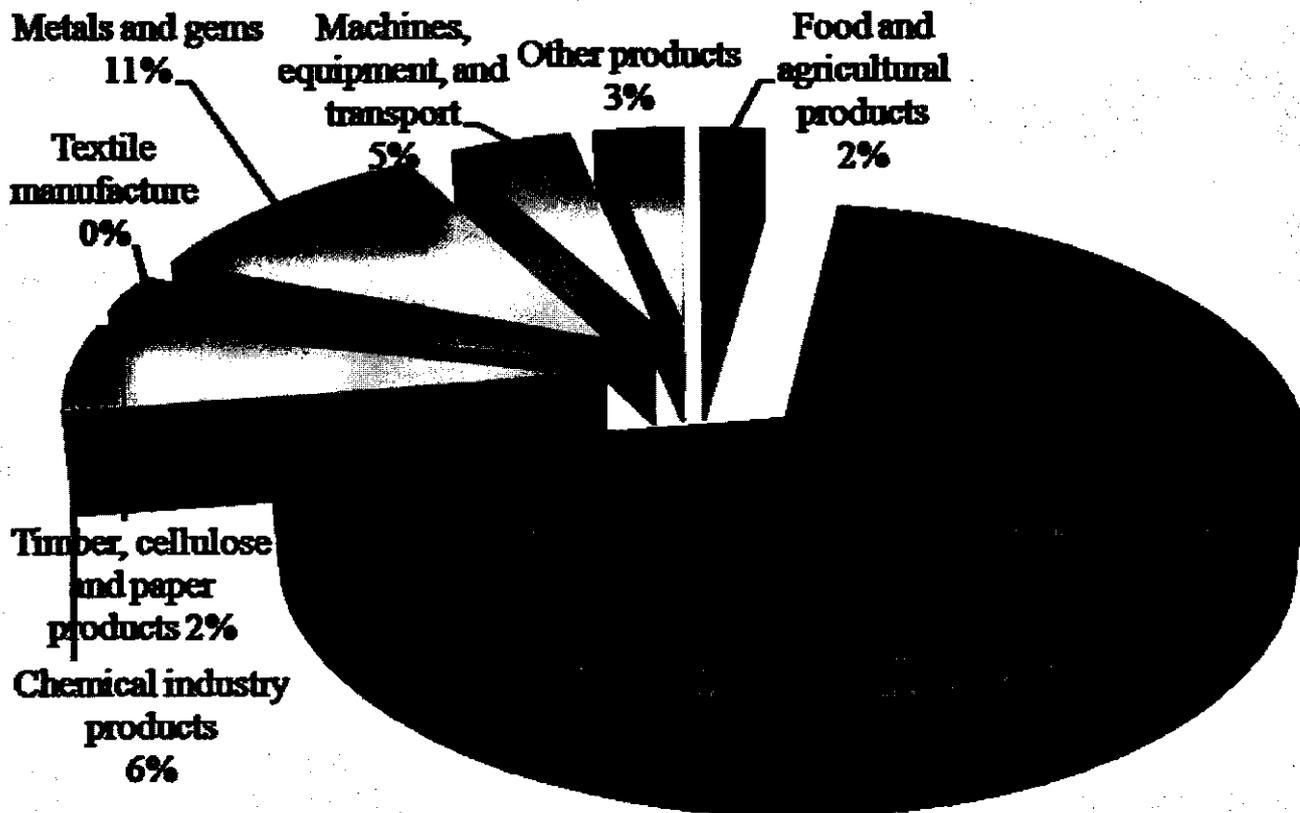
Annex



Figure 1. Commodity composition of Russia's export in 2014 at current prices

Source: Russia in numbers, 2015.

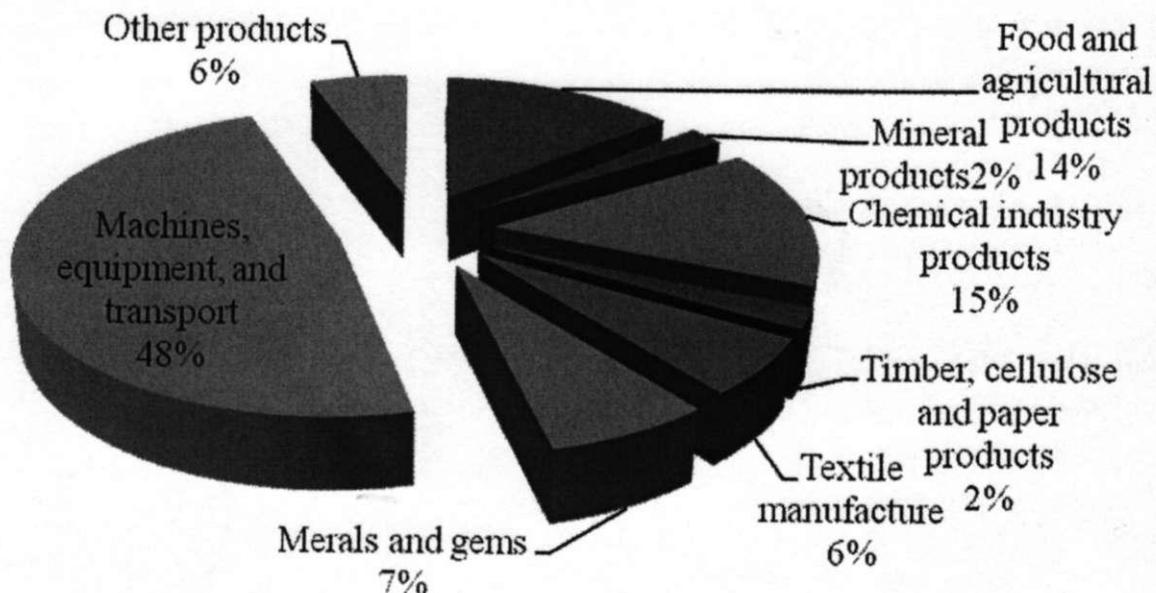As is seen from Figure 1, a larger part of the structure of Russia's export in 2014 belongs to minerals (71%).



Figure 1. Commodity composition of Russia's import in 2014 at current prices
Source: Russia in numbers, 2015.