Prospects for International Cooperation of EAEU Countries on Export Development

K V Trubitsyn¹, A A Mitioglo¹

¹Samara State Technical University, Molodogvardeiskaya str., 244, Samara, 443100, Russia

E-mail: trubitsyn.kv@samgtu.ru

Abstract. The article discusses the issues of export development in the context of Eurasian economic integration. Achieving the goal of creating an effective system of division of labor and production cooperation within the EAEU is planned through the growth in the volume of trade turnover between Russia and the EAEU member states by 2024 by 1.5 times. Successful implementation of challenges of integration within the framework of the EAEU may provide a total supplementary GDP growth of the EAEU by 2030 by $210 billion on current basis. In order to achieve the predicted effects, the article includes an estimation of the trade turnover between the EAEU member states using the Tinbergen gravity model. An analysis of the results obtained makes it possible to conclude that the GDP growth of the EAEU member states will lead to an increase in exports of goods from Russia. The paper also presents the impact of gross domestic products of Russia and the EAEU Member States on the total value of the relevant exports.

1. Introduction

The regionalization process of the world economics is becoming increasingly important and is an effective response to new economical realities concerning problems of trade and sanctions.

Eurasian economic union as an international organization of regional economical integration (EAEU) was established in Astana (the capital of Kazakhstan) in May 2014 to achieve free movements of goods, services, capital and labour and to develop coherent and coordinated policy in the branches of economics defined by the agreement about EAEU and international agreements within the framework of the Union [1].

In addition, one of the key principles of UAEU operation is to provide mutually beneficial partnership, equal rights and consideration for national interests of Member States [1].

According to the Decree "On National Purposes and Strategic Development Challenges of the Russian Federation until 2024" issued On May 7, 2018, the Russian government was instructed to achieve certain objectives by 2024. The key issues are as follows:

- to develop the global competitive non-raw-material sectors in manufacturing, agriculture and services sector, where the overall share of goods export (work, services) will be at least 20% of GDP of the county;
- to achieve the export volume of non-resource-based and non-energy goods (in value terms) up to 250 billion $ per year including machinebuilding production (50 billion $ per year), agricultural products (45 billion $ per year) and services (100 billion $ per year);
- to develop the effective system of division of labor and production-sharing within the Eurasian Economic Community to increase trade volumes between the Member States by at least one and a half times and to provide the volume growth of accumulated mutual investments by one and a half times.

To achieve these goals, the Russian President has proposed to focus on the following:

- orientation of industrial, agricultural and trade policies including the applied mechanisms of state support to achieve international competitiveness of Russian goods (works, services) in order to ensure their presence in foreign markets;
- reduction of administrative procedures and barriers in the field of international trade including the abolition of excess requirements in export licensing and currency control; organization of interaction between the international trade entities and supervisory authorities using a “single-window” approach by 2021;
- completion of the flexible strategy for financial export support tools including expanded pre-export, export and equity financing, leasing and long-term support measures by 2021;
- removal of logistical restrictions on the export of goods using rail, road and sea transport, as well as the construction (modernization) of checkpoints on the state border of the Russian Federation;
- development of a unified system of institutions for export promotion aimed at the modernization of Russian trade missions abroad;
- completion of the establishment of common market for goods, services, capital and labor within the framework of the Eurasian Economic Union including the final removal of barriers, restrictions and the eliminating exemptions in economic cooperation with active using of the mechanisms of joint project activities.

The practical tool for the implementation of the "may" Presidential Decree was the establishment of the Presidential Council for Strategic Development and Priority National Projects. On September 24, 2018 the presidium approved the Passport of the national project (program) "International Cooperation and Export".

According to this Passport, export of non-primary non-energy goods is expected to increase by 85% and reach USD 250 billion, and export of services - by 73% and reach USD 100 billion by 2024 (figure 1).

![Figure 1](image_url)

**Figure 1.** Planned export values for non-primary non-energy goods and services by 2024 (compiled by the author on the basis of [2]).

The roadmap of solving the task for completion of common markets for goods, services, capital and labor in the framework of the EAEU provides:
- identification of the priority sensitive obstacles in the internal market of the Union and their consideration in the EEC by 01.06.2019;
- preparation of a consolidated position of the Russian Federation on the completion of the plan of measures (the “road map”) to eliminate exemptions and restrictions in the EAEU internal market by June 30, 2019;
- adoption of documents on the expansion of the number of service sectors in which the single market operates and the definition of the content equivalence of the service sectors by June 30, 2020 [2].

As mentioned earlier, the goal of an effective system development of division of labor and production cooperation within the EAEU is planned due to the growth in trade turnover between Russia and the Member States of the Union by 1.5 times by 2024 (figure 2).

Figure 2. Planned values of trade goods turnover between Russia and the EAEU Member States (compiled by the author on the basis of [2]).

2. Statistical analysis of the trade
The authors conducted a statistical analysis of the trade turnover between the Russian Federation and the EAEU member states in 2008-2017 (figure 3).
The next «minimum» of the turnover (2014-2015) was due to the third wave of the economic crisis in Russia's recent history. And if after the global economic crisis (2008–2009) the national economy recovered for a little more than two years, the consequences of the events of five years ago still affect the Russian economy (figure 4).

Eurasian Economic Commission estimates that the successful implementation of integration tasks within the EAEU can provide cumulative additional GDP growth of the EAEU by $ 210 billion in current prices by 2030. For a number of Member States the effect of participation in the EAEU is estimated by ECE experts up to 13% of additional GDP growth by 2030. The achievement of the predicted effects will be accompanied by an increase in labor productivity and in the fiscal capacity of the population [4]. In this regard, the question to determine the effectiveness of integration processes does not lose its relevance from a scientific and practical point of view.

3. Export Modeling Using Gravity Model of Trade

The most important methodological task to achieve the predicted effects is the assessment and forecast of trade turnover between the EAEU Member States using mathematical models.
Any model describing international trade flows can be formulated in varying degrees of detail. The authors use the fundamental law of physics — Newton’s law of gravitation — as applied to the description of the flow of goods and services between the EAEU and Member States.

According to this law, the gravitational force \( F \) between two physical bodies is directly proportional to masses of these bodies \( m_1 \) and \( m_2 \) and inversely proportional to the square of the distance \( d \) between them:

\[
F = G \frac{m_1 m_2}{d^2},
\]

where \( G \) — gravity constant.

Taking the equation (1) as a basis, the Dutch economist Jan Tinbergen, the first Nobel laureate in economics (1969), together with R Frisch created and applied dynamic models to analyze economic processes.

This model is called Gravity Model of Trade, and the main idea here is that the foreign trade turnover is directly proportional to the economic potential of countries and inversely proportional to the distance between them [5].

The form of Tinbergen gravity model is as follows:

\[
y_{ij} = \frac{k x_i^\alpha x_j^\beta}{d_{ij}^\gamma},
\]

where \( k \) — absolute term of an equation (scale factor);

\( y_{ij} \) — exports from country \( i \) to country \( j \);

\( x_i, x_j \) — economical sizes of exporter and importer;

\( d_{ij} \) — costs of trade between countries;

\( \alpha, \beta \) and \( \gamma > 0 \).

J Tinbergen considered the gross domestic product (GDP) of a country as a measure of economic size, the distance between countries, fictitious variables of common borders and membership in trade unions as measures of trade costs. According to Anderson and van Wincoop (2004) the determinants of trade costs also include customs tariffs, transportation costs, geographic variables (island state, no access to the sea), etc. [6].

Table 1 shows the distances between Moscow (capital of the Russian Federation) and the capitals of EAEU Member States. Assume that there are no customs borders, import customs duties and no trade preferences between the Member States of the Union (\( d_{ij} \) — distance between the capitals).

| №  | Name of parameter                                      | Distance, \( km \) |
|----|--------------------------------------------------------|------------------|
| 1  | Moscow – Yerevan (Armenia), \( d_{12} \)              | 1804.74          |
| 2  | Moscow – Minsk (Belarus), \( d_{13} \)                | 675.33           |
| 3  | Moscow – Nur-Sultan (Kazakhstan), \( d_{14} \)        | 2272.65          |
| 4  | Moscow – Bishkek (Kyrgyzstan), \( d_{15} \)           | 2990.82          |

The initial data for building gravity models are presented in table 2. After taking the logarithm, a degree function (2) is reduced to the linear one and is as follows:

\[
\ln y_{ij} = \ln \left( \frac{k x_i^\alpha x_j^\beta}{d_{ij}^\gamma} \right);
\]

\[
\ln y_{ij} = \ln k + \alpha \cdot \ln x_i + \beta \cdot \ln x_j - \gamma \cdot \ln d_{ij}.
\]
Table 2. Initial data for gravity models building.

| Year | Armenia \(y_{1t}\) | Belarus \(y_{14}\) | Kazakhstan \(y_{13}\) | Kyrgyzstan \(y_{15}\) | GDP of a EAEU Member State (in billions, US $) |
|------|-------------------|-----------------|------------------|-------------------|----------------------------------|
| 2008 | 692354            | 23603840        | 13300911         | 1310957           | Armenia \(x_{1t}\) 11.66 60.76 133.4 5.14 |
| 2009 | 611923            | 16717150        | 9147033          | 915531            | Belarus \(x_{14}\) 8.65 49.21 115.3 4.69 |
| 2010 | 700553            | 18058191        | 15795755         | 992049            | Kazakhstan \(x_{13}\) 9.26 57.22 148.0 4.79 |
| 2011 | 785090            | 24922590        | 13347807         | 1159268           | Kyrgyzstan \(x_{15}\) 10.14 61.76 192.6 6.2 |
| 2013 | 915469            | 24565946        | 15080353         | 1634066           | GDP RF (billion $ USA) 2210.3 65.69 208.0 6.61 |
| 2014 | 997965            | 20228286        | 17632241         | 2029443           | 2016 962526 14216273 9560398 1032619 1284.7 50.72 137.3 6.81 |
| 2017 | 1244988           | 18594953        | 12439612         | 1396262           | 2017 1244988 18594953 12439612 1396262 1577.52 54.44 159.41 7.56 |

Assume that \(Y_{ij} = \ln y_{ij}, X_i = \ln x_i, X_j = \ln x_j, D_{ij} = \ln d_{ij}\) and \(K = \ln k\), then the linearized equation (2) is as follows:

\[
y_{ij} = K + \alpha \cdot X_i + \beta \cdot X_j - \gamma \cdot D_{ij}.
\]  

Let's make the supporting table 3 with initial data after taking the logarithm.

Table 3. Supporting table for gravity models building.

| Year | Armenia \(X_1\) | Belarus \(X_2\) | Kazakhstan \(X_3\) | Kyrgyzstan \(X_4\) |
|------|-----------------|-----------------|------------------|-------------------|
| 2008 | 13.448          | 16.977          | 16.403           | 14.086            |
| 2009 | 13.324          | 16.632          | 16.029           | 13.727            |
| 2010 | 13.46           | 16.709          | 16.195           | 13.808            |
| 2011 | 13.574          | 17.031          | 16.407           | 13.963            |
| 2012 | 13.727          | 17.017          | 16.529           | 14.307            |
| 2013 | 13.813          | 16.823          | 16.685           | 14.523            |
| 2014 | 13.905          | 16.809          | 16.463           | 14.371            |
| 2015 | 13.865          | 16.547          | 16.194           | 14.08             |
| 2016 | 13.777          | 16.47           | 16.073           | 13.848            |
| 2017 | 14.035          | 16.738          | 16.336           | 14.149            |
On the basis of the data presented in table 3, we derive multiple regression equation for export from the Russian Federation to each EAEU Member State. The number of measurements is 10 (by the number of analyzed periods). To estimate the parameters of the equations obtained, we apply the least squares method.

The multiple linear regression equations obtained are presented in table 4.

### Table 4. The obtained multiple linear regression equation.

| №  | Russia’s export to Member States | Equations obtained                                                                 |
|----|---------------------------------|------------------------------------------------------------------------------------|
| 1  | Armenia                         | \( Y_{12} = 10.28 - 0.08 \cdot X_1 + 1.7 \cdot X_2 \) (4)                        |
| 2  | Belarus                          | \( Y_{13} = 11.47 + 1.06 \cdot X_1 - 0.63 \cdot X_3 \) (5)                        |
| 3  | Kazakhstan                       | \( Y_{14} = 10.02 + 0.83 \cdot X_1 + 0.02 \cdot X_4 \) (6)                        |
| 4  | Kyrgyzstan                       | \( Y_{15} = 7.93 + 0.68 \cdot X_1 + 0.62 \cdot X_5 \) (7)                        |

Results of statistical analysis of equations obtained (4) – (7) are shown in table 5.

### Table 5. Results of statistical analysis of multiple regression equations.

| №  | Russia’s export to Member States | Average approximation error of, % | Determination coefficient, \( R^2 \) | \( F \)-criteria | \( DW \) |
|----|---------------------------------|-----------------------------------|----------------------------------------|-----------------|--------|
| 1  | Armenia                         | 0.8                               | 0.48                                   | 3.23            | 0.67   |
| 2  | Belarus                          | 0.45                              | 0.68                                   | 7.53            | 0.96   |
| 3  | Kazakhstan                       | 0.33                              | 0.91                                   | 34.4            | 1.91   |
| 4  | Kyrgyzstan                       | 0.6                               | 0.8                                    | 13.8            | 1.63   |

Statistical analysis of equations (4) – (7) shows satisfactory results of multiple regression.

So, the determination coefficient \( R^2 \) shows the quality of equations obtained. The closer this coefficient is to one, the better the regression equation explains the behavior of \( Y_{ij} \).

Thus, on the basis of the equations obtained, Russia’s export of goods to EAEU Member States by 48% (Armenia), 68% (Belarus), 91% (Kazakhstan) and 80% (Kyrgyzstan) is explained by changes of factors \( X_i \) and \( X_j \) (GDP of concerned countries).

Checking the overall quality of multiple regression equations was carried out on the basis of \( F \)-statistics of Fisher distribution. The tabular value of the \( F \)-criterion with degrees of freedom \( k_1 = 2 \) and \( k_2 = n - m - 1 = 10 - 2 - 1 = 7 \) is equal \( F_{tabl} = 4.74 \). It follows that the regression equations obtained for Russia’s exports to Belarus, Kazakhstan and Kyrgyzstan are statistically reliable (the determination coefficients of these equations are statistically significant).

The Durbin Watson (DW) statistics is used to analyze the correlation of deviations. It is considered that the autocorrelation of residues is absent if \( 1.5 < DW < 2.5 \). In our case, the autocorrelation of residuals is absent in equations (6) and (7).

In order to find the true elasticity coefficients \( \alpha \) and \( \beta \) which have a specific economic interpretation, we exponentiated equations (4) – (7) and obtained the concluding expressions for gravity models (table 6).
Table 6. Sought-for export gravity models.

| №  | Russia’s export to Member States | Model obtained |
|----|----------------------------------|----------------|
| 1  | Armenia                          | $y_{12} = 2.91 \cdot 10^4 \cdot x_1^{0.92} \cdot x_2^{5.47}$ (8) |
| 2  | Belarus                          | $y_{13} = 9.58 \cdot 10^4 \cdot x_1^{2.89} \cdot x_3^{0.53}$ (9) |
| 3  | Kazakhstan                       | $y_{14} = 2.25 \cdot 10^4 \cdot x_1^{2.29} \cdot x_4^{1.02}$ (10) |
| 4  | Kyrgyzstan                       | $y_{15} = 2.78 \cdot 10^3 \cdot x_1^{1.97} \cdot x_5^{1.86}$ (11) |

The economic interpretation of the model parameters makes it possible to conclude that Russia’s increase in GDP by 1% will lead to an increase in Russia’s exports of goods to Armenia by 0.92%, to Belarus – by 2.89%, to Kazakhstan – by 2.29% and to Kyrgyzstan – by 1.97%. GDP growth in the corresponding EAEU Member States by 1% will lead to an export increase from Russia: for Armenia – by 5.47%, for Belarus – by 0.53%, for Kazakhstan – by 1.02% and for Kyrgyzstan – by 1.86%.

Figures 5 – 8 graphically compare model calculations and real data for the export of goods from the Russian Federation to the EAEU Member States (in thousands of US dollars).

Figure 5. Russia – Armenia export.

Figure 6. Russia – Belarus export.
4. Conclusions
Figure 9 shows in a three-dimensional way the impact of GDP of Russia and Armenia on the value of corresponding exports. According to the graph, it is possible to determine at what values of GDP the maximum export value is obtained.

Figure 9. The GDP impact on the value volume of Russia’s export to Armenia.
After \( Y_m(\text{max}) \) was graphically determined, the appropriate values of \( x_1 = 1700 \) and \( x_2 = 12 \) were found. Consequently, with a GDP ratio of Russia and Armenia \((x_1/x_2)\) which is equal to approximately 141.67, the maximum model value of Armenia’s export will be reached.

Similar relations were found for Russia and Belarus (22.37), Kazakhstan (7.08) and Kyrgyzstan (224.87).

5. References

[1] Treaty on the Eurasian Economic Union (ed. from 11.04.2017)
http://www.consultant.ru/document/cons_doc_LAW_163855/

[2] Passport of the national project (program) "International cooperation and export
http://static.government.ru/media/files/FL01MAEp8YVuAkvbZotaYtVKNEKuALYA.pdf.

[3] Customs statistics of foreign trade http://www.customs.ru/

[4] Shukhno S S 2017 Two years to the Eurasian Economic Union: major achievements and
development prospects Russian foreign economic bulletin 6 3-14

[5] Troekurova I S, Pelevina K A 2014 Gravity models of foreign trade of the BRICS countries
News of Saratov University New Ser. Ser. Economy. Control. Law 14 1 part 2 133-142

[6] Anderson J E, E van Wincoop 2004 Trade Costs Journal of Economic Literature 42 691-751