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Econometric Analysis for Russia-Iran Foreign Trade Relations

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ABSTRACT

The aim of the study is to examine the prospects for economic relations between Russia and Iran in the context of the latter's transition to free trade within the EAEU. **The relevance** of the article stems from the growing importance of international trade in the context of globalisation and the need to develop effective strategies for trade. According to the author, due to geopolitical instability and economic sanctions, the study of factors affecting foreign trade is particularly important for sustainable economic growth and diversification of export markets. **Methods.** The research uses descriptive statistics and econometric analysis including the gravity approach. **Results.** The econometric models in the article allow to confirm a strong potential for rapidly growing trade between Russia and Iran as a result of such an agreement sealed. The author also draws conclusions on the importance of efforts to promote economic integration and shows the need for further measures to develop the system of bilateral free trade agreements.

Keywords: foreign trade; Russia; Iran; globalisation; economic integration; bilateral agreements; free trade; gravity model; regression analysis

INTRODUCTION

In the current geopolitical context, the integration of the economies of various countries has gained particular importance, especially in the Eurasian space, where new regional unions are being formed. For example, the EAEU and Iran are striving to create a free trade area (FTA). Russia, as the leader of the integration process within the Eurasian Economic Union, actively collaborates with Iran. In recent years, both countries have strengthened bilateral relations, driven by mutual economic interests and the necessity to adapt to new challenges in the international arena.

The EAEU and Iran, possessing a rich resource base, strategic geographic position, and significant economic potential, demonstrate mutual interest in developing cooperation.

The prospects of Iran's integration into the EAEU are the subject of numerous studies, as such cooperation could significantly alter the ecomic landscape of the region. However, these studies are mainly qualitative in nature and do not provide quantitative assessments of the potential impact of integration on the economic indicators of the parties involved.

In this regard, there is a need to apply econometric methods for modeling and forecasting the consequences of Iran's potential accession to the EAEU. The results obtained are expected to be useful for government bodies, the business community, and academic circles. The econometric model developed within this work can serve as a tool for making strategic decisions and planning further cooperation, contributing to the enhancement of the region's economic stability and competitiveness.

METHODOLOGY

Gravitational models, widely used in econometrics for analyzing international trade, allow for the examination of the statistical relationship between various factors. The history of these models traces back to the work of economist Jan Tinbergen, who proposed a concept similar to the one presented in the 1960s. He noted that the volume of trade between two countries is usually proportional to their economic size and inversely proportional to trade costs [1].

The gravitational approach to modeling international trade has evolved over time. The modern formulation of the gravitational model was developed in the 1970s through the work of economists such as Jan Tinbergen, James Anderson, and Eric Van Wincoop [2, 3]. They applied mathematical tools, similar to the laws of gravity, to analyze trade between countries [4], based on the following assumptions:

• Trade is proportional to the economic size of the country: Larger economies produce more goods and services for export, and they have higher levels of domestic consumption.

• Trade is proportional to the distance between the economic centers of the trading countries: The farther apart two countries are, the less likely they are to trade with each other due to high transport and other trade costs.

• Economic integration stimulates trade growth. The model can account for different forms of economic integration (such as customs unions or free trade areas), which help reduce trade costs between countries.

• The model can be supplemented with various coefficients to account for other factors affecting trade, such as linguistic, cultural, and historical ties between countries. Modern gravitational models often include additional dummy variables reflecting institutional characteristics, trade barriers, production structure, infrastructure, etc.

Gravitational models are widely used to analyze trade flows, assess and predict the consequences of changes in trade policy, and evaluate the impact of economic events on the global economy. This approach has gained significant popularity due to the high predictive power of the models and the availability of data and methods for estimating coefficients.

Models of this type also allow for the assessment of trade potential between countries — the maximum possible trade volume under ideal con-

ditions (without any barriers or restrictions) — based on their economic, geographic, institutional, and cultural characteristics. Even if it is not possible to establish precise numerical values, it is possible to roughly estimate how much of the potential is realized and identify growth areas that are most effective for strengthening trade relations.

RESULTS AND DISCUSSIONS

The Eurasian Economic Union was established in 2015. It consists of five countries: Russia, Belarus, Kazakhstan, Armenia, and Kyrgyzstan. The goal of the organization is to ensure the free movement of goods, services, capital, and labor between the member states. A single customs space ensures the absence of customs duties on the internal border and a unified customs tariff on the external border. Within the framework of the EEU, coordination of economic policy, harmonization of technical regulation requirements, sanitary, veterinary, and phytosanitary measures is carried out; integration institutions and supranational governing bodies, such as the Eurasian Economic Commission (EEC), have been created. Russia, as the largest economy of the EEU, plays a key role in shaping the Union's policy and promoting integration processes [5].

Trade relations between the Eurasian Economic Union and the Islamic Republic of Iran are of strategic importance to both. Geographical proximity, the need to diversify markets and sources of supply, as well as the desire to minimize the impact of international sanctions, are driving both parties to deepen cooperation.

According to the EEC, in 2022, the total trade turnover between the EEU and Iran amounted to 5.6 billion US dollars, demonstrating a positive growth trend.[1] Exports from the EEU to Iran mainly consist of food products and agricultural goods (grain, oil, meat), as well as products from the chemical industry, metals and metal products, machinery, equipment, and vehicles. Imports from Iran to the EEU are mostly represented by agricultural products (fruits, dried fruits, and vegetables) and petrochemical industry products.[2]

Russia is the main trading partner of Iran among the countries of the Union, accounting for more than 70% of the total trade turnover. Mutual interest is reflected in the expansion of the range of goods and an increase in trade volumes.

In May 2018, a Temporary Agreement leading to the creation of a Free Trade Area (FTA) between the EEU and Iran was signed in Astana. It came into effect in October 2019 and became the first step toward creating a full-fledged free trade area.[3] Its main provisions include reducing or eliminating import duties on a specific list of goods (primarily agricultural products), harmonizing rules of origin, and creating a joint committee to monitor the implementation of the agreement.

The implementation of this document led to a growth in trade turnover of more than 30% [6]. The Temporary Agreement demonstrated the mutual interest of the parties in strengthening economic ties and laid the foundation for further cooperation.

Thus, negotiations began for the conclusion of a full Free Trade Agreement. It envisages extending the free trade regime to a larger portion of the product range, as well as specifying a dispute resolution mechanism and the procedure for adopting protective measures. The document is expected to be an important step in the development of trade and economic relations between the participating countries. At the same time, Russia plays a key role in promoting Iran's integration into the EEU, acting as the main initiator and moderator of negotiations, as well as the primary beneficiary of this process.

The Temporary Agreement has already proven its effectiveness by establishing the foundations for sustainable cooperation. The conclusion of a

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[1] URL: https://eec.eaeunion.org/news/speech/zal-vyzhidaniya-v-evraziyskoy-komissii-privetstvuyut-namerenie-irana-stat-nablyudatelem-pri-eaes/

[2] URL: https://eec.eaeunion.org/upload/medialibrary/57a/EAES_Iran.pdf

[3] URL: https://eec.eaeunion.org/upload/medialibrary/77b/FTA-EAEU_Iran.pdf

full Free Trade Agreement will strengthen the positions of the EEU and Iran on the international stage, contributing to the increased competitiveness of the economies and the well-being of their populations. However, to understand the further prospects, it is necessary to conduct economic research using quantitative methods.

One of the methods for assessing and forecasting the potential of foreign trade between Russia and Iran, as well as other countries, is a multifactor econometric model. Its advantage is that it allows identifying factors specific to Russia that influence foreign trade, while its drawback is that the number of observations is limited by the number of countries trading with Iran for which relevant statistical data is available.

The model is presented in a logarithmic form and has the following structure:

$$\left(\ln Y = \beta_0 + X_1 \ln \beta_1 + X_2 \ln \beta_2 + \ldots + X_n \ln \beta_n + \varepsilon \right), (1)$$

where ε is the random error; $X_1 - X_n$ are the values of the independent variables considered; $\beta_1 - \beta_n$ are the regression coefficients.

The independent (forecasted) variable in this model is the trade turnover of Iran (Y) with

Table 1

Coefficients of econometric model and regression statistics

Parameter	Coefficient	Standard errow	*t*-statistics	*p*-value
Y-intersection	14.26161	2.663713	5.354035	3.74E-07
$\ln(GDP_j)$	1.121109	0.104479	10.73047	1.15E-19
COM.B	2.605968	0.80102	3.253311	0.001451
$\ln(POP_j)$	−1.13516	0.316894	−3.58214	0.000479
$\ln(DIST_{ij})$	2.193679	0.720813	3.043338	0.002828
FTA.PTA	1.066041	0.468479	2.275538	0.024497
Regression statistics				
Multiple *R*	0.759321313			
R-squared	0.576568856			
Normalized *R*-squared	0.560407362			
Standard errow	2.266625953			
Observations	137			
Variance analyses				
	F		Significance F	
Regression	35.67546751		6.5427E-23	

Source: compiled by the author.

a partner country in millions of US dollars at nominal values in 2022 prices.

The model considers the impact of the following factors:

- GDP$_j$ — GDP of the partner country in foreign trade in 2022 at fixed prices of 2015, in trillion dollars;
- COM.B — sharing common borders;
- POP$_j$ — population of the partner country in foreign trade;
- DIST$_{ij}$ — distance between the economic centers of the two countries;

FTA.PTA — participation of the two countries in a Free Trade Agreement (FTA) or Preferential Trade Agreement (PTA), a binary qualitative variable that takes the value of "1" for a pair of countries that are members of a trade union and "0" for countries not part of the trade agreement.

The model was estimated based on 160 observations in logarithmic form; the coefficients and regression statistics are presented in *Table 1*.

Thus, the equation of the model is as follows:

$$\ln VOL = 14,262 + 1,121 \ln GDP_j - 1,135 \ln POP_j +$$
$$+ 2,194 \ln DIST_{ij} + 1,066 FTA.PTA + 2,606 COMB. \quad (2)$$

The conclusions from the regression statistics indicate that the model is overall significant. The multiple correlation coefficient (R) is 0.759, which suggests that about 76% of the variation in the dependent variable is explained by the regressors considered.

The coefficient of determination R squared = = 0.5766, meaning that approximately 58% of the variance of the dependent variable is explained by the model. The F-statistics for the regression is 35.68, which indicates statistical significance for the model as a whole.

The p-values and t-statistics indicate the statistical significance of all the regression coefficients.

Therefore, we can conclude that there is a strong positive relationship between the volume of trade and the following factors:

- sharing a common border, which helps reduce transport and logistics costs and simplifies business contacts;
- distance between economic centers, which is proportional to the logistics costs imposed on participants in international trade, directly affecting the competitiveness of most export goods;
- membership in a bilateral or multilateral free trade agreement, emphasizing the importance of removing tariff and non-tariff barriers and other costs to develop international trade and economic cooperation.

The regression coefficients allow not only qualitative conclusions but also provide a quantitative assessment of the impact of the studied factors on trade. The most significant interest lies in the coefficient of the variable participation in trade agreements and free trade zones (FTA.PTA). Given that the model is log-linear and the FTA.PTA variable is binary, the interpretation of this coefficient requires the following formula:

$$R = (e^{\beta_n} - 1) * 100\%, \quad (3)$$

where R represents the percentage change in Y when the value of the dummy variable changes from "0" to "1"; β_n is the coefficient of variable n.

Calculations based on this formula allow us to conclude that, in the case of Iran, participation in a trade agreement or a free trade zone (FTA) could lead to nearly a two-fold increase in trade volumes (190%).

Based on the results obtained, several key conclusions can be made, and corresponding solutions proposed.

Firstly, to further increase trade volumes between Iran and Russia, attention should be focused on improving transport and logistics infrastructure. Investments in the development of transport corridors, modernization of ports, and the creation of new logistics centers will contribute to significant reductions in costs and improve the competitiveness of exported goods.

Secondly, to remove trade barriers and create favorable conditions for business, a crucial step

is to intensify efforts to conclude a Free Trade Agreement (FTA) between the EAEU and Iran. This will help reduce tariff and non-tariff barriers, simplify administrative procedures, and enhance the transparency of trade operations. The currently active Temporary Agreement has proven to be an effective measure for the development of bilateral trade in agricultural products. The Permanent Agreement is awaiting ratification. Its conclusion could lead to a substantial strengthening of economic ties between the countries and provide them with additional opportunities to expand markets and attract investment.

The second type of model is characterized by the fact that the dependent variable is the export of each country in the sample. However, since the export of one country is the import for another, the model also accounts for trade turnover. The data set includes exports of countries to their trading partners for which statistical data is available, and whose trade turnover is not zero. The advantage of this model is the significantly larger number of observations, allowing for the evaluation of a broader set of factors. At the same time, it is less effective than the previously described model in identifying the statistical significance of specific factors for any single country, and only allows for generalized conclusions — i.e., its findings are not universally applicable.

The model is as follows:

$$\ln Y = \beta_0 + \ln \beta_1 + \ln \beta_2 + \ldots + \ln \beta_n + \varepsilon, \quad (4)$$

where ε is the random error; $\beta_1 - \beta_n$ are the regression coefficients.

It is calculated using panel data on exports, GDP, population, and other parameters from

Table 2

Variable models

Y	ln_EXPORT	Dependent variable, volume of exports from country i to country j, in thousand USD.
β_1	ln_GDP_X	GDP of exporting country in USD at 2015 prices, trillion USD
β_2	ln_GDP_I	GDP of importing country in USD at 2015 prices, trillion USD
β_3	ln_POP_X	Population of exporting country, in millions people
β_4	ln_POP_I	Population of importing country, in millions people
β_5	ln_DIST	Distance between economic centers of exporting and importing countries (km)
Dummy variables		
β_6	EU	Dummy variable, equals "1" if both countries are EU members
β_7	EAEU	Dummy variable, equals "1" if both countries are EAEU members
β_8	ASEAN	Dummy variable, equals "1" if both countries are ASEAN members
β_9	OPEC	Dummy variable, equals "1" if both countries are OPEC or OPEC+ members
β_{10}	APEC	Dummy variable, equals "1" if both countries are APEC members
β_{11}	FORM.USSR	Dummy variable, equals "1" if both countries are former USSR members
β_{12}	SAME.REL	Dummy variable, equals "1" if both countries share the same religion
β_{13}	COMM.LANG	Dummy variable, equals "1" if both countries speak the same language

Source: compiled by the author.

more than 50 countries. The independent variables for its construction are listed in *Table 2*. The sample size amounted to 3,150 observations.

The model equation is as follows:

$$\ln_{EXPORT} = 2,6207 + 1,4792\ln_{GDP_X} + 1,0185\ln_{GDP_i} +$$
$$+ -0,3670\ln_{POP_x} - -0,1724\ln_{POP_i} + -0,0048\ln_{DIST} +$$
$$+ 1,9370EU + 1,7355EAEU + 0,7929ASEAN -$$
$$- -0,5482OPEC + 0,7147APEC + 0,4499SAME.REL +$$
$$+ 2,4406COMM.LANG. \qquad (5)$$

The model coefficients and regression statistics are presented in *Table 3*.

Regression statistics and analysis of variance indicate the statistical significance of the model. The multiple *R* value is 0.788, which suggests a strong relationship between the dependent variable (export volume, ln_GDP_X) and the independent variables (GDP, population, etc.). The *R*-squared value is 0.6210, meaning that 62% of the variation in export volume is explained by the independent variables in the model. The *F*-

Table 3

Model coefficients and regression statistics

Variable	Coefficient	Standard errow	t-statistics	P-value
Y-intersection	2.6207	0.2995	8.7498	< 0.0001
ln_GDP_X	1.4792	0.0344	42.9468	< 0.0001
ln_GDP_I	1.0185	0.0351	28.9874	< 0.0001
ln_POP_X	−0.3670	0.0382	−9.5972	< 0.0001
ln_POP_I	−0.1724	0.0390	−4.4166	< 0.0001
ln_DIST	−0.0048	0.1162	−0.0413	0.9670
EU	1.9370	0.1691	11.4517	< 0.0001
EAEU	1.7355	0.5388	3.2212	0.0013
ASEAN	0.7929	0.4555	1.7408	0.0818
OPEC, OPEC+	−0.5482	0.1044	−5.2522	< 0.0001
APEC	0.7147	0.2613	2.7353	0.0063
SAME.REL	0.4499	0.0888	5.0680	< 0.0001
COMM.LANG	2.4406	0.1658	14.7201	< 0.0001
Regression statistics				
F-test			428.325	
Pr > F			<0.0001	
R²			0.6210	
Normalized R-squared			0.6195	
Multiple R			0.7880	

Source: compiled by the author.

statistics is 428.325, and the *p*-value tends to approach "0," indicating that the model is overall statistically significant.

Since the *t*-statistic values are high, and the *p*-values are low, the coefficient for the variable ln_DIST is not statistically significant. Therefore, the interpretation of the model coefficients does not suggest a statistical relationship between the forecasted variable ln_EXPORT and the distance between the economic centers of the countries. The most significant factors are as follows:

• the prevalence of a common language of communication, which is essential for international trade and economic relations;

• the membership of both countries in the EU and ASEAN, which indicates the effectiveness of these blocs in promoting international trade and highlights the importance of studying and considering the possibility of adapting their experiences;

• the inclusion of both countries in the EAEU with the opportunity for free trade, which points to the successes of the union in the area of economic integration.

Quantitative interpretation of the coefficients for the dummy variables in this model can also be carried out using the formula described earlier:

$$R = (e^{\beta_n} - 1) * 100\%. \qquad (6)$$

This allows us to conclude that the greatest effect on bilateral trade comes from joining the EU and the EAEU. According to the results, membership in the EU allows for an almost sixfold (594%) increase in mutual trade growth, while membership in the EAEU results in nearly a fivefold (467%) increase.

Thus, the results of both models highlight the importance of economic integration and confirm the effectiveness of the EAEU for trade and economic cooperation. Continuing and intensifying efforts to conclude and implement a Free Trade Agreement between the EAEU and Iran will not only contribute to increasing trade volume but also to diversifying the commodity structure, which, in turn, will ensure economic stability for both parties.

CONCLUSION

The sanctions imposed on Russia and Iran dictate the need to find new partners and markets, making bilateral trade relations strategically important.

Both sides are interested in developing trade, as the diversification of suppliers and markets is a key element in ensuring economic security. In the context of global instability and sanctions pressure, diversification helps mitigate risks associated with dependence on a limited number of trading partners.

The econometric models discussed in the article, based on the gravity model approach, demonstrate a strong statistical relationship between joining effective trade alliances and the growth of bilateral trade, which positively affects economic development. The conducted econometric analysis suggests that there is potential for a multiple increase in trade turnover between Iran and the members of the EAEU, including Russia. Strengthening trade relations between Russia and Iran could become an important factor in stimulating economic growth in both countries.

The results highlight the importance of deepening cooperation with Iran within the framework of the Eurasian Economic Union, as it is beneficial for all its members.

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