



## TRADE FLOWS BETWEEN RUSSIA AND OTHER BLACK SEA ECONOMIC COOPERATION COUNTRIES: A GRAVITY MODEL ANALYSIS

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### ABSTRACT

This paper applies the Gravity Model of international trade to the import and export flows between Russia and Black Sea Economic Cooperation (BSEC) countries. Since trade flows are not only related with the macro-economic variables, the basic Gravity Model is augmented using colonial link and population variables. The period analyzed in this paper is 1997-2015. Several model selection tests are used then it is concluded that the Feasible Generalized Least Squares (FGLS) and Panel-Corrected Standard Errors (PCSE) models are suitable. The results of the analyses show that GDP of trading partners, GDP of Russia, colonial link, population of the trading partner countries and geographical distance have a statistically significant impact on Russia's both imports and exports.

**Keywords:** Gravity Model, BSEC, Panel Data Analysis

**JEL Codes:** F1, F15, C33

## RUSYA İLE DİĞER KARADENİZ EKONOMİK İŞBİRLİĞİ ÜLKELERİ ARASINDAKİ TİCARET AKIMLARININ ÇEKİM MODELİ İLE ANALİZİ

### ÖZ

Bu çalışma Çekim Modelini Rusya ile Karadeniz İşbirliği Örgütü (KEİ) ülkeleri arasındaki ihracat ve ithalat akımlarına uygulamaktadır. Ticaret akımları yalnızca makroekonomik değişkenlerden etkilenmediğinden, temel Çekim Modeli kolonyal geçmiş ve nüfus değişkenleri kullanılarak genişletilmiştir. Bu çalışmada analiz edilen dönem 1997-2015 dönemidir. Birçok model seçim ölçütü kullanılmış ve Uygulanabilir Genelleştirilmiş En Küçük Kareler (UGEK) ve Panel-Düzeltilmiş Standart Hata (PDSH) modellerinin uygun modeller olduğu görülmüştür. Bulgular ticaret ortağı ülkelerin GSYH'si, Rusya'nın GSYH'si, kolonyal geçmiş, ticaret ortağı ülkelerin nüfusu ve coğrafi uzaklık değişkenlerinin Rusya'nın hem ihracatında, hem de ithalatında istatistiksel olarak anlamlı etkilerinin olduğunu göstermektedir.

**Anahtar Kelimeler:** Çekim Modeli, KEİ, Panel Veri Analizi

**JEL Kodu:** F1, F15, C33

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## **INTRODUCTION**

Regional integration agreements are the main sources of foreign trade and economic cooperation among countries for decades. On one hand, international institutions have been expanding the foundation of the global free trade via international agreements. On the other hand, countries seek further economic, social and political cooperation via regional agreements. The most common type of regional cooperation is regional trade agreement. According to The World Trade Organization (WTO) Regional Trade Agreement Database (2017); in the period 1948-1994, the General Agreement on Tariffs and Trade (GATT) received 124 notifications of regional trade agreements, and since the creation of the WTO in 1995, over 400 additional arrangements covering trade in goods or services have been notified. Many countries are members of more than one regional trade agreements. Customs union and common market are the other types of regional integration agreements which lead to more profound economic integration of participating countries.

After the disintegration of the Soviet Bloc, Turkey aimed to create a strong relationship and regional economic cooperation with post-Soviet countries. Turkey began building up relations with the former members of post-Soviet countries on the basis of bilateral agreements. For this reason, Turkey started the meetings between Armenia, Azerbaijan, Bulgaria, Georgia, Moldova, Romania and Russia in Ankara in 1990. With the later applications, Black Sea Economic Cooperation (BSEC) was initiated in 1992 with participation of eleven countries. Since 2004, with the participation of Serbia, BSEC has 12 members. The BSEC participating states have agreed to promote economic cooperation by contributing to the expansion of the mutual trade both in goods and services in a way that is not contravening their obligations with third parties. Therefore, the BSEC is not a free trade agreement but it pursues to establish an open trade regime in the Black Sea region. One of the official goals of the cooperation is to achieve larger volumes of trade between members. Because it is the biggest economy in the region, Russian international trade flows are investigated in this paper. The objective of the study is to estimate the import/export flows between Russia and the other BSEC countries. Contribution to the literature of this paper is twofold. First, the paper discusses import and export flows among Russia and BSEC countries. Second, it develops an augmented Gravity model to Russian international trade among BSEC countries.

To sum up, the trade flows between BSEC members and Russia have been analyzed using Gravity Model of international trade in this study. Within this framework, the rest of the paper is organized as follows: In Section 2 the BSEC is introduced, foreign economic view of the member countries and a review of the related literature are presented. In the third section exports of Russia to the other BSEC member countries and imports of Russia from BCES countries are separately analyzed over the period 1997-2015 using Gravity equations and panel data techniques. In the last section the results of these analyses and concluding remarks are presented.

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## **1. AN OVERVIEW OF THE BSEC AND LITERATURE REVIEW**

Geographically, Black Sea region is surrounded by Europe, Asia and Caucasus region. Because of its geopolitical position, the region has struggles among not only regional powers but also global powers. Black Sea region has been a cradle of various civilizations: Roman, Persian and Ottoman empires. The Black Sea is an inland sea and important cities along the coast include Constanta, Yalta, Odessa, Sevastopol, Kerch, Novorossiysk, Sochi, Sukhumi, Batumi, Trabzon, Samsun, Istanbul, Burgas, and Varna. Moreover, the Black Sea region is the land route through Central Asia, along with the “Maritime Silk Road”.

Nowadays The Black Sea region has gained much more importance because of becoming host to alternative routes for the transportation of Caspian, Central Asian and even Middle Eastern hydrocarbon resources to European Union (EU) countries (Çelikpala, 2013). Baku-Tbilisi-Ceyhan (BTC) pipeline aims to the transportation of crude oil produced in the Caspian Basin. The others are Baku-Supsa oil pipeline and the South Caucasus gas pipeline (SCP), Trans Anadolu Pipeline (TANAP), and Nabucco. Black Sea region becomes the area of increasing priority and it is sensitive to bilateral relations habitat for the Russian-Turkish cooperation and depends on mostly the Russian-Turkish dialogue (Druzhinin et al., 2013; Druzhinin, 2015). In the 1999-2010 period, the average annual GDP growth rate of Russia was 5.4 percent, 1999-2010 amounted to 2.4 percent per year (Kiselev and Romashkin, 2012). Astrov and Havlik (2008) state that; all Black Sea countries are poorer than the Central European member states. 2016 data shows the same results of this fact. The authors indicate that countries in the region experienced an economic decline during the late 1980s to early 1990s except Turkey. During the crisis term GDP had declined by almost a half in Armenia, nearly two-thirds in Georgia, 42 percent in Azerbaijan, 82 percent in Bulgaria, 40 percent in Russia. Since 1999, Russia has experienced a rapid growth. Despite of the 1991, 1994 and 2001 crises, Turkey experienced economic growth as well.

The countries are sorted by their gross domestic product for 2016 at current prices in Table 1. First ranked country is Russia, second is Turkey and third is Greece. Romania is the fourth country in 2016. Albania, Armenia and Moldova are three countries with the lowest GDP respectively in BSEC in 2016. The table shows that the BSEC countries are not homogenous in terms of GDP, there are substantial differences among countries. Some of the countries in the cooperation were part of Soviet Block and some of them have been part of Western economy also have been member of European Union or have been in the member process of European Union. Dikkaya and Orhan (2004) criticize this diversified economic construction of the member countries. The authors think that it expresses a new concept of multilateralism in the Black Sea region. The new concept leads to common economic

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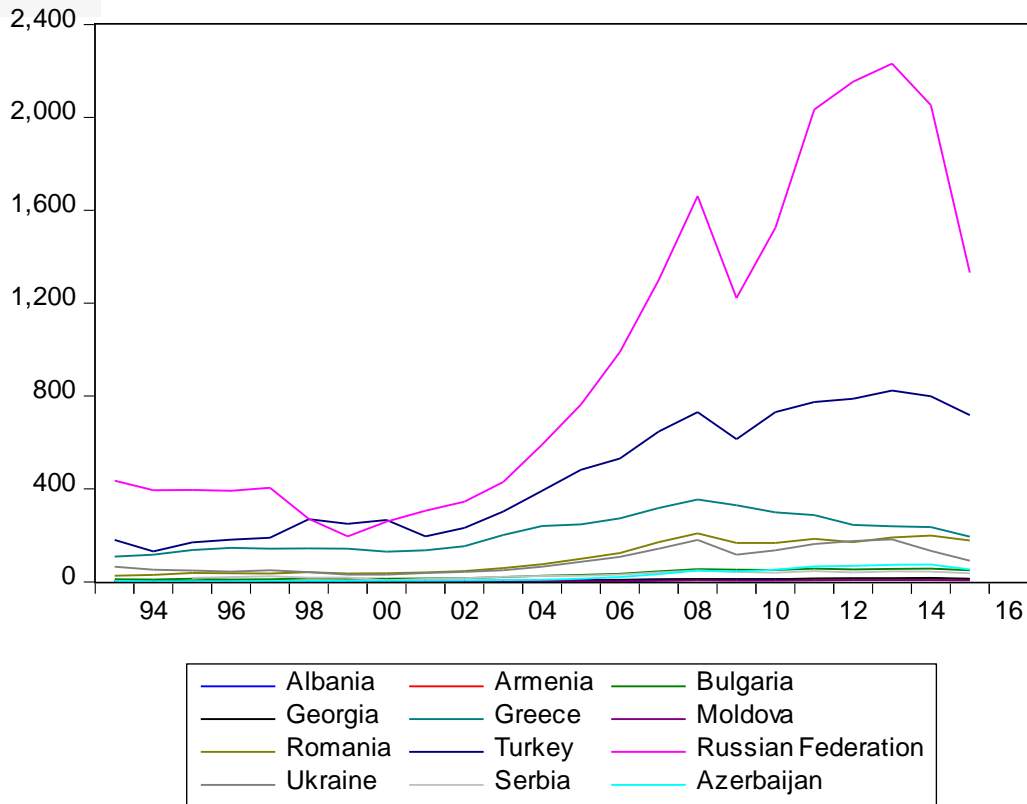
language and multiple, diverse economic relations between these countries because some of the countries were closed economy and some of them are market economy.

Russia is the best performing country due to its high-energy exports especially after 2000's. Both Russia and Azerbaijan have significant trade surpluses as a result of their energy exports (Astrov and Havlik, 2008).

**Table 1: Gross domestic product, current prices-2016 (Billion USD)**

<b>Country</b>	<b>GDP</b>	<b>Rank</b>
<b>Albania</b>	12.269	10
<b>Armenia</b>	10.774	11
<b>Azerbaijan</b>	35.141	8
<b>Bulgaria</b>	49.364	6
<b>Georgia</b>	13.942	9
<b>Greece</b>	194.594	3
<b>Moldova</b>	6.084	12
<b>Romania</b>	181.944	4
<b>Russia</b>	1132.739	1
<b>Serbia</b>	37.381	7
<b>Turkey</b>	751.186	2
<b>Ukraine</b>	83.55	5

Source: IMF, World Economic Outlook Database, April 2016



**Graph 1: GDP of the BSEC countries (Billion USD)**

Graph 1 presents GDP (current billion US\$) of the 12 BSEC countries between 1993-2015. Russia has the highest GDP except the year of 1999, Turkey is the second and the Greece is the third big country by means of GDP. Moldova has the lowest GDP among these countries.

Table 2 presents the mean of GDP sequentially for 1993-2000, 2001-2005, 2006-2010 and 2011-2015 periods. Table 2 shows that for the each of the periods Russia, Turkey and Greece are the biggest economies among the BSEC countries, last two countries are Armenia and Moldova. Ranking of the GDP of the countries are same for first three and for the last two countries but it is changing for the rest of the BSEC countries.

**Table 2: Descriptive Statistics of GDP of the Countries (Billion USD)**

1993-2000			2001-2005		
Country	Mean	Obs.	Country	Mean	Obs.
Russia	343.6132	8	Russia	487.4189	5
Turkey	204.6578	8	Turkey	321.3383	5
Greece	133.5514	8	Greece	196.0502	5
Ukraine	45.72501	8	Romania	64.53464	5
Romania	35.33981	8	Ukraine	56.31205	5
Serbia	17.51341	6	Bulgaria	21.49736	5
Bulgaria	12.02122	8	Serbia	20.13724	5
Azerbaijan	3.972366	8	Azerbaijan	8.229069	5
Georgia	2.998152	8	Albania	5.943239	5
Albania	2.633372	8	Georgia	4.428571	5
Armenia	1.609003	8	Armenia	3.15579	5
Moldova	1.579482	6	Moldova	2.141989	5
2006-2010			2011-2015		
Country	Mean	Obs.	Country	Mean	Obs.
Russia	1339.608	5	Russia	1960.783	5
Turkey	650.8159	5	Turkey	780.7113	5
Greece	315.1312	5	Greece	240.8487	5
Romania	167.7345	5	Romania	185.2049	5
Ukraine	136.7411	5	Ukraine	149.2739	5
Bulgaria	47.22606	5	Azerbaijan	67.29763	5
Serbia	40.44682	5	Bulgaria	54.80226	5
Azerbaijan	40.01601	5	Serbia	42.81997	5
Albania	11.30923	5	Georgia	15.37917	5
Georgia	10.62373	5	Albania	12.52199	5
Armenia	9.032203	5	Armenia	10.80432	5
Moldova	5.023052	5	Moldova	7.367361	5

Following the end of the Cold War, as a result of Turkey's initiative, Black Sea Economic Cooperation (BSEC) was launched on 25 June 1992 in Istanbul among the Black Sea countries by signing "Summit Declaration on Black Sea Economic Cooperation". The summit defined the scope of the BSEC and the countries are Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey and Ukraine. The BSEC acquired the status of a regional economic organization by signing The BSEC's Charter on 5 June 1998 during the Yalta summit of the Heads of State and Government. However, Yalta summit entered into force on 1 May 1999 and the BSEC acquired the status of a regional economic organization; the Organization of BSEC. In 2004 Serbia and

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Montenegro entered to organization (BSEC, 1995; OSCE, 2014). Sayan (2005) stated that five channels constitute the organization. The channels stated in Sayan (2005) are governmental channel, parliamentary channel, business channel, finance channel and academic channel. The Council of Foreign Ministers is leaded governmental channel, The Parliamentary Assembly (PABSEC) is leaded parliamentary channel, The BSEC Business Council (BSEC BC) is leaded business channel, BSEC Trade and Development Bank (BSTDB) is leaded finance channel and The International Centre for Black Sea Studies (ICBSS) is leaded academic channel.

Diana (2011) summarizes common features of the BSEC based on its emergence, pre-conditions and functionality. The author asserts that BSEC emergence is weak states' strategy. If the preconditions are discussed; Turkey, Russia and Ukraine are the local core states, intense socio-economic interregional relations are intergovernmental, bilateral and multilateral. About the functionality features, cooperation areas are maritime security, environment, borders security, transport and migration. Dikkaya and Orhan (2004) state that although in the start of the initiation the founder countries aimed to gradually obtain a "free trade zone", BSEC is an "economic cooperation".

Sayan (1998) and Sayan (2005) emphasize on some the Articles of the declaration (declaration of 1992). By the Article 10 the countries' concerns are problems emerged in the period of transition to market economy. By the Article 5 the member countries aim to have higher degree of integration into the world economy and to do this BSEC is used as a channel for this integration into the global economy. The author also stated that "fundamental motivation behind any form of regional economic integration is to improve welfare of the members through a reduction or elimination of barriers to trade in the region." By the Article 14 of whole BSEC countries aim to cooperate to have larger volumes of trade between members. To achieve this fundamental motivation imports and exports within these countries must increase.

Foreign trade has an important role in the Black Sea countries. The foreign trade does not only flow from energy reach countries to others but is mutual among all countries. Except for Armenia and Turkey, the Black Sea countries have strong economic performance by imports. As a result, they have trade deficits (Astrov and Havlik, 2008).

Sayan (1998) investigates if BSEC cause any trade creation or trade diversion (TD) effects. Trade creation (TC) effects are the effects which tend to improve welfare, and trade diversion (TD) effects are the ones which tend to decrease welfare. To investigate these effects simple Gravity Model is used for three BSEC member countries and their partner non-BSEC countries over 1992-1994 period. The countries used for the BSEC members are Greece, Romania and Turkey and non-BSEC countries are ex-socialist members of BSEC within COMECON<sup>4</sup> and Egypt, Iran, Israel, Jordan and

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<sup>4</sup> COMECON was a Communist association for international exchange started in 1949 and disbanded in 1991. The headquarters of the organisation was in Moscow and it consisted principally of Eastern European Communist states and the

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Syria. The Council for Mutual Economic Assistance (COMECON) countries which contains Albania, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russian Federation, Turkey, Ukraine, Hungary, Poland, Egypt, Iran, Israel, Jordan and Syria. The results show that total value of actual exports by BSEC members to non-members in the sample exceeded the total projected values and Turkey managed to increase its exports in this period. Sayan (2005) then extended his early work (1998) and found similar results. Genç et al. (2011) investigates determiners of the trade in BSEC region using gravity model. The results show that GDP and population of the countries have positive distance has negative effect on trade in BSEC countries. Sorhun (2013) applies the gravity model to investigate Turkish foreign trade using EU member countries, Mediterranean Countries, Middle-East Countries, African Countries, BSEC member countries and Central Asian Countries for 1995-2012 annual data. The results show that income of the both Turkey and partner country increase both import and export of Turkey also the BSEC countries are the second fast increasing by means of trade after Mediterranean countries. The author states that the reason of this fast convergence thanks to shipping in trade with two groups of countries. Uğurlu and Bayar (2014) uses gravity model for Turkish export and import data for 2001-2011 period for 44 leading trade partnership of Turkey. Most of the BSEC countries in these 44 countries and the results show that GDP increases both import and export and distance has negative effect.

Anastasios and Ioannis (2013) investigate the characteristics of international trade of the Black Sea Region countries for 2001-2008 period and the results show that export products of the countries are mainly low technology and medium-low technology products.

Lissovlik and Lissovlik (2004) focus on Russian exports to WTO countries and use several estimations of Gravity Models. It is found that distance and output coefficients are all significant and the sign is what is expected from the theory. The authors used dummy variables to show if the countries are former Soviet Union and COMECON and the coefficient of the dummies are positive in the models. However, the dummy variable of WTO countries is generally insignificant or negative which means that Russia systematically tended to export more to non-WTO countries than to WTO countries. Konno (2016) analyses Russia's trade pattern with eight major trading partners<sup>5</sup> for the period 2000–2013 and finds that GDP of Russia and the trading partners have a positive effect, while the distance between the two countries has a negative on trade.

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Soviet Union. Full members at the end of the 1980s were the Soviet Union, Bulgaria, Czechoslovakia, the German Democratic Republic (East Germany), Hungary, Romania, Poland, Cuba, the Mongolian People's Republic and Vietnam (Tisdell,2006)

<sup>5</sup> Germany, Italy, USA, China, Japan, Ukraine, Belarus and Kazakhstan



## 2. THE MODEL AND EMPIRICAL APPLICATION

The Gravity Model originates from the “Law of Universal Gravitation” by Isaac Newton in 1687. The law states that every two particles in the universe attract each other. Formulation of the law is as follows for two objects  $i$  and  $j$ :

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2} \quad (1)$$

where;  $F_{ij}$  is the attractive force,  $M_i$  and  $M_j$  are the masses and  $D_{ij}$  is the distance between the two objects,  $G$  is a gravitational constant depending on the unit of measurement for mass and force.

The Gravity equation to model the size of bilateral trade flows between any two countries was firstly presented in 1962 by Jan Tinbergen (Muratoğlu and Muratoğlu, 2016). The simple Gravity Model of international trade by Tinbergen (1962) is as follows:

$$E_{ij} = \alpha_0 \frac{Y_i^{\alpha_1} Y_j^{\alpha_2}}{D_{ij}^{\alpha_3}} \quad (2)$$

where;

$E_{ij}$  : Trade flows  $i$  country to  $j$  country

$Y_i^{\alpha_1}$  : GDP of country  $i$

$Y_j^{\alpha_2}$  : GDP of country  $j$

$D_{ij}^{\alpha_3}$  : Geographic distance between countries,

$\alpha_0, \alpha_1, \alpha_2$  and  $\alpha_3$  are free parameters of the model.

After Tinbergen’s research the model has been widely used. The early papers investigated the theory of the model indicated in Dinçer (2014) are: Linnemann (1966), Anderson (1979, 2003, 2010), Bergstrand (1985, 1989), Helpman (1987), Deardorff (1995), Smarzynska (2001), Evenett and Keller (2002).

The general form of the model used in Gravity Model studies is as follows:

$$Trade_{ij} = \alpha_0 \frac{GDP_i^{\alpha_1} GDP_j^{\alpha_2}}{Distance_{ij}^{\alpha_3}} \quad (3)$$

where  $Trade_{ij}$  is the value of the bilateral trade between country  $i$  and  $j$ ,  $GDP_i$  and  $GDP_j$  are country  $i$  and  $j$ ’s respective national incomes.  $Distance_{ij}$  is a measure of the bilateral distance between the two countries and is a constant of proportionality. To have linear model, logarithms of the equation should be taken and we have as follows:

$$\log(\text{Trade}_{ij}) = \alpha + \beta_1 \log(\text{GDP}_i \text{GDP}_j) + \beta_2 \log(\text{Distance}_{ij}) + u_{ij} \quad (4)$$

In this study, we analyze both export flows and import flows between Russia and ten BSEC countries over the period 1997-2015. We analyze exports and imports separately using Gravity equations. These equations of our two models are as follows:

$$\ln \text{exports}_{ijt} = \alpha_i + \beta_1 \ln(\text{GDP}_i) + \beta_2 \ln(\text{GDP}_j) + \beta_3 \ln(\text{Dist}_{ij}) + \beta_4 \ln(\text{Pop}_i) + \beta_5 \ln(\text{Pop}_j) + \beta_6 (\text{Colony}_{ij}) + u_{it} \quad (5)$$

$$\ln \text{imports}_{ijt} = \alpha_i + \delta_1 \ln(\text{GDP}_i) + \delta_2 \ln(\text{GDP}_j) + \delta_3 \ln(\text{Dist}_{ij}) + \delta_4 \ln(\text{Pop}_i) + \delta_5 \ln(\text{Pop}_j) + \delta_6 (\text{Colony}_{ij}) + u_{it} \quad (6)$$

Where;

- $\text{Exports}_{ijt}$  is the exports flow of Russia to each BSEC country.
- $\text{Imports}_{ijt}$  is the imports flow of Russia from each BSEC country.
- $\text{GDP}_i$  is the GDP of Russia.
- $\text{GDP}_j$  is the GDP of BSEC countries.
- $\text{Dist}_{ij}$  is the geographical distance between Russia and each BSEC country.
- $\text{Pop}_i$  is the population of Russia.
- $\text{Pop}_j$  is the population of other BSEC countries.
- $\text{Colony}_{ij}$  is the dummy variable indicating whether Russia and the other BSEC countries ever had a colonial link (takes value 1 if they had, takes value 0 if there is no colonial link). Colonization is a general term that is used to describe a relationship between two countries, independently of their level of development, in which one has governed the other over a long period of time and contributed to the current state of its institutions (Mayer and Zignago, 2006). Thus, former colonial ties between two countries are assumed to have a positive impact on the volume of trade among them.
- $u_{it}$  is the error term,  $\alpha_i$  is the constant which denotes unobservable individual effects.

**Table 3: Data Sources**

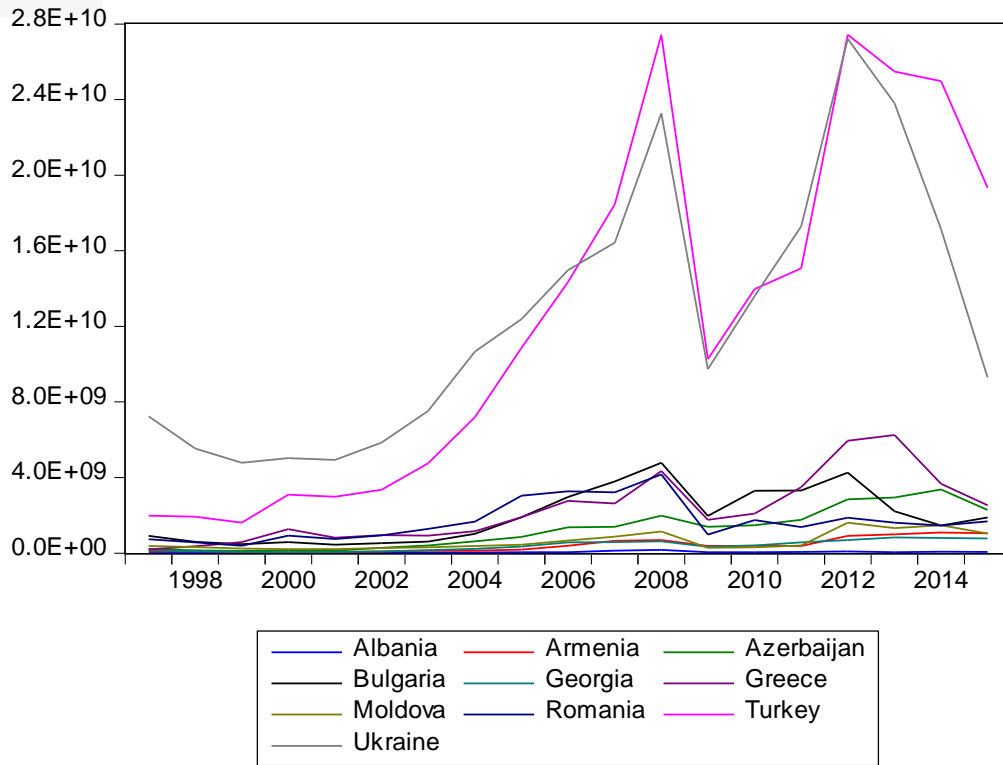
Variable	Source
<b>GDP</b>	IMF, World Economic Outlook Database
<b>Distance</b>	CEPII Geo-Dist Dataset
<b>Exports</b>	IMF, Direction of Trade Database
<b>Imports</b>	IMF, Direction of Trade Database
<b>Population</b>	IMF, World Economic Outlook Database
<b>Colony</b>	CEPII Geo-Dist Dataset

Table 4 shows the descriptive statistics of exports of Russia to other BSEC countries. The mean values of the country's exports show that Turkey and Ukraine are the first two trade partners of Russia by trade volume. Graph 2 shows the increases and decreases of the export flows of Russia.

**Table 4: Descriptive Statistics of Exports of Russia (1993-2015) USD**

Country	Mean	Max	Min.	Std. Dev.	Obs.
<b>Albania</b>	51455830	1.77E+08	588000	45907296	19
<b>Armenia</b>	4.14 x10 <sup>8</sup>	1.09 x10 <sup>9</sup>	27523610	3.72 x10 <sup>8</sup>	19
<b>Azerbaijan</b>	1.25 x10 <sup>9</sup>	3.37 x10 <sup>9</sup>	1.15 x10 <sup>8</sup>	1.06 x10 <sup>8</sup>	19
<b>Bulgaria</b>	1.95 x10 <sup>9</sup>	4.78 x10 <sup>9</sup>	4.45 x10 <sup>8</sup>	1.41 x10 <sup>9</sup>	19
<b>Georgia</b>	3.91 x10 <sup>8</sup>	8.36 x10 <sup>8</sup>	42280016	2.81E+08	19
<b>Greece</b>	2.30 x10 <sup>9</sup>	6.24 x10 <sup>9</sup>	2.02 x10 <sup>8</sup>	1.77 x10 <sup>9</sup>	19
<b>Moldova</b>	6.25 x10 <sup>8</sup>	1.61 x10 <sup>9</sup>	2.10 x10 <sup>8</sup>	4.67 x10 <sup>8</sup>	19
<b>Romania</b>	1.67 x10 <sup>9</sup>	4.17 x10 <sup>9</sup>	3.95 x10 <sup>8</sup>	1.04 x10 <sup>9</sup>	19
<b>Turkey</b>	1.23E+10	2.74 x10 <sup>10</sup>	1.62 x10 <sup>9</sup>	9.32 x10 <sup>9</sup>	19
<b>Ukraine</b>	1.25E+10	2.72 x10 <sup>10</sup>	4.79 x10 <sup>9</sup>	6.94 x10 <sup>9</sup>	19

It can be understood from the Graph 2 that between the years 2008 and 2010 and after the year 2012, the level of exports decreased. Except these two years, exports have generally increased. It has also more than doubled in 2008 what it was in 2000 then also doubled in 2012 compared to 2010.

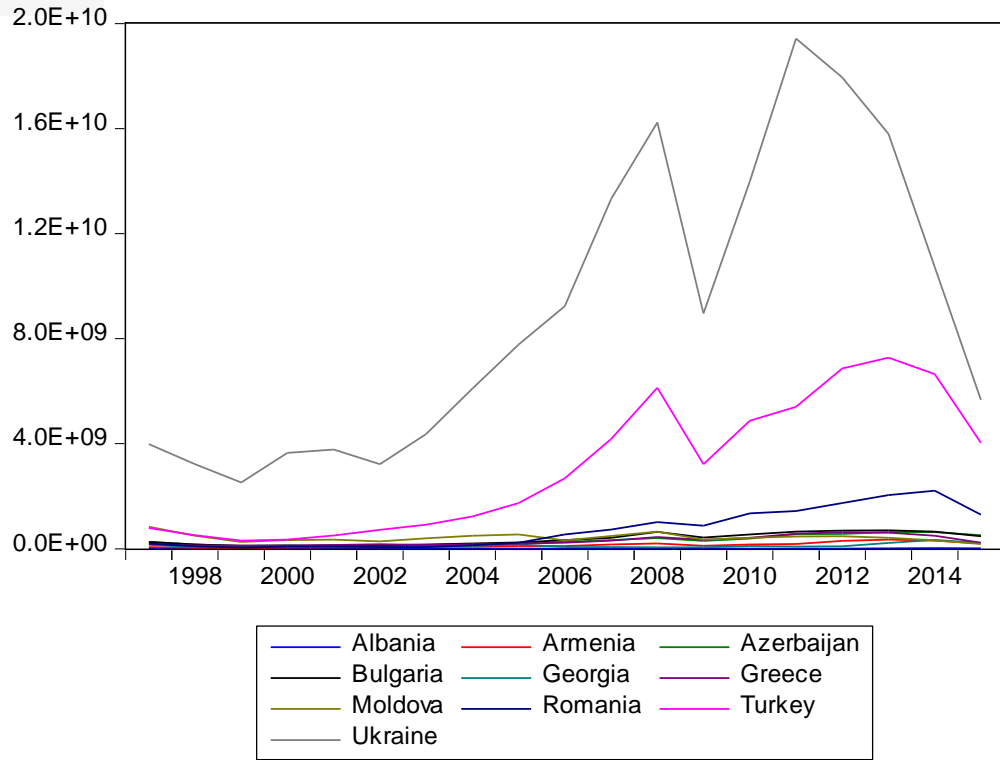


**Graph 2: Exports of Russia to BSEC countries**

If the imports variable is considered, Table 5 presents the descriptive statistics of imports of Russia from BSEC countries. Ukraine is the first and Turkey is the second import partner by volume. The trend of the imports is similar with exports variable.

**Table 5: Descriptive Statistics of Imports of Russia (1993-2015) USD**

Country	Mean	Max	Min.	Std. Dev.	Obs.
<b>Albania</b>	6557468	28236864	333756	7721083	19
<b>Armenia</b>	1.38x10 <sup>8</sup>	3.52 x10 <sup>8</sup>	27522768	99070399	19
<b>Azerbaijan</b>	3.07 x10 <sup>8</sup>	6.36 x10 <sup>8</sup>	72608850	1.96 x10 <sup>8</sup>	19
<b>Bulgaria</b>	3.71 x10 <sup>8</sup>	7.02 x10 <sup>8</sup>	1.08 x10 <sup>8</sup>	2.21 x10 <sup>8</sup>	19
<b>Georgia</b>	1.12 x10 <sup>8</sup>	3.36 x10 <sup>8</sup>	49821684	74650643	19
<b>Greece</b>	2.98 x10 <sup>8</sup>	6.33 x10 <sup>8</sup>	1.22 x10 <sup>8</sup>	1.78 x10 <sup>8</sup>	19
<b>Moldova</b>	4.26 x10 <sup>8</sup>	8.41 x10 <sup>8</sup>	1.86 x10 <sup>8</sup>	1.50 x10 <sup>8</sup>	19
<b>Romania</b>	7.49 x10 <sup>8</sup>	2.21 x10 <sup>9</sup>	47767370	7.36 x10 <sup>8</sup>	19
<b>Turkey</b>	3.07 x10 <sup>9</sup>	7.27 x10 <sup>9</sup>	3.12 x10 <sup>8</sup>	2.52 x10 <sup>9</sup>	19
<b>Ukraine</b>	8.94 x10 <sup>9</sup>	1.94 x10 <sup>10</sup>	2.52 x10 <sup>9</sup>	5.61 x10 <sup>9</sup>	19



**Graph 3: Imports of Russia from BSEC countries**

Russia applied for membership in the General Agreement on Tariffs and Trade (GATT) in June 1993 (Jensen et al., 2007). In 2000, Russia's one of top priorities is to be a member of the WTO because of the structural changes in the Russian economy. It was the main energy importer of the West. (Åslund, 2010). Consequently, Russia aims to increase its foreign trade. In the light of this information, the import flows and export flows between Russia and BSEC countries were estimated in this study.

In the estimation process, first of all, the models were tested for heteroscedasticity, serial correlation and cross sectional dependence. Table 6 presents the results of Modified Wald test for groupwise heteroscedasticity, Wooldridge test for autocorrelation in panel data and Pesaran's test of cross sectional independence.

**Table 6: Test Results for Heteroscedasticity, Serial Correlation and Cross Sectional Dependence**

Model 1 (Dep Var: Exports)	Statistics
Modified Wald test for groupwise heteroscedasticity	0.0000
Wooldridge test for autocorrelation in panel data	0.0000
Pesaran's test of cross sectional independence	1.9766

**Model 2 (Dep Var: Imports)**

Modified Wald test for groupwise heteroscedasticity	0.0000
Wooldridge test for autocorrelation in panel data	0.1673
Pesaran's test of cross sectional independence	1.9833

According to these results, cross sectional dependence is not present in the first model but it suffers from both heteroscedasticity and serial correlation. The second model suffers from heteroscedasticity but there is no cross sectional dependence or serial correlation in the second model. Therefore, we ran Feasible Generalized Least Squares (FGLS) and Panel-Corrected Standard Errors (PCSE) regressions which can be employed when standard error estimates are robust to disturbances being heteroscedastic and/ or autocorrelated. Thus these types of regressions are convenient for our analyses.

In the first model, Russia's exports to the other 10 BSEC countries (Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Turkey and Ukraine) in 1997-2015 period was analyzed using Gravity equation 5.

All of the BSEC countries are analyzed in the model except for Serbia, which entered BSEC in 2004, could not be included in the analysis due to lack of Serbia's multilateral data for this time period. The results are presented in Table 7.

**Table 7: Model Results (Dependent Variable: Exports)**

Variable	Coefficient	
	FGLS	PCSE
<b>GDP<sub>i</sub></b>	0.473** (2.34)	0.135 (1.01)
<b>GDP<sub>j</sub></b>	0.324** (2.53)	0.629*** (3.95)
<b>Distance<sub>ij</sub></b>	-0.754** (-2.41)	-1.048*** (-3.07)
<b>Pop<sub>i</sub></b>	-0.445 (-1.27)	Omitted
<b>Pop<sub>j</sub></b>	0.853*** (4.85)	0.586*** (2.84)
<b>Colony<sub>ij</sub></b>	0.630** (2.51)	1.146*** (3.63)
<b>Cons</b>	Omitted	Omitted
<b>R<sup>2</sup></b>		0.9640
<b>Hausman</b>		0.3547

Note: t statistics in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

The results indicate that there is a positive relationship between GDPs of the importer countries and Russia's exports. Russia's GDP also has a positive sign and is statistically significant. These are the main variables of the Gravity Model of international trade. GDP of the importer country represents the size of the potential market and GDP of the exporter country represents the supply capacity of the exports. According to the Gravity Model, larger economic magnitude of countries

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attract larger trade flows. In our analysis, both Russia's GDP and GDPs of the partner countries positively affect the exports of Russia which means an increase in the economic size of Russia leads to enhanced export flows and increases in the economic size of partner countries also lead to increased export flows from Russia.

Population of Russia and populations of the other BSEC countries which are trading partners are the variables of the analysis. According to the findings of the exports model, population of partner countries is statistically significant and has a positive sign while Russia's population was found statistically insignificant. These findings imply that the increases in populations of the trading partner countries positively affect Russia's exports to these countries but Russia's own population does not have a significant effect on exports.

Gravity Model also highlights the negative relationship between the volume of trade and transportation costs. Transportation costs are higher when the distance between countries are further. Therefore, in theory, geographical distance between the exporter and the importer country has a negative relationship with the trade flows between them. Results of the exports model indicate that the distance variable is statistically significant in both of the regressions and it has a negative sign which confirms the negative relationship between Russia's exports and geographical distance between the trading partners.

Another variable is the colonial link between Russia and BSEC countries. Armenia, Azerbaijan, Georgia, Moldova and Ukraine has a colonial history with Russia. This link is included to the models via a dummy variable which takes the value 1 if there is a colonial link and takes value 0 if there is not any colonial history between countries. Theoretically it is generally assumed that the colonial link increases trade between countries in the Gravity Model. Our exports model results also indicate that the colonial link variable positively affects the exports of Russia to the countries with colonial link among them.

The coefficients of the variables also provide valuable findings. In the exports model, distance and colonial link variables have the highest magnitude of coefficients which mean that these variables have more substantial effects on the exports of Russia. 1% increase in distance causes more than 1% decrease in exports which highlights the importance of transportation costs in international trade. Also, colonial ties between countries generate more increment in exports than other variables. Population of the trading partners of Russia also have a significant impact on the exports of Russia (the magnitude of the coefficients are higher than 0.5%) which represent the high demand side for Russian exports. GDP of Russia determines the supply capacity of Russia therefore it affects exports more than GDPs of other BSEC countries and this fact is being reflected in the coefficients of GDP variables.

In Table 8, results of the second model are presented. In the second model, Russia's imports from the other 10 BSEC countries in 1997-2015 period was analyzed using a Gravity equation.

**Table 8: Model Results (Dependent Variable: Imports)**

Variable	Coefficient	
	FGLS	PCSE
GDP <sub>i</sub>	1.151** (2.21)	0.461** (2.56)
GDP <sub>j</sub>	0.414*** (5.94)	0.684*** (7.10)
Distance <sub>ij</sub>	-1.678*** (-7.03)	-2.180*** (-8.21)
Pop <sub>i</sub>	-1.127 (-1.42)	Omitted
Pop <sub>j</sub>	0.657*** (6.73)	0.479*** (4.14)
Colony <sub>ij</sub>	1.091*** (6.16)	1.666*** (7.02)
Cons	Omitted	-2.163 (-0.39)
<b>R<sup>2</sup></b>		0.8198
<b>Hausman</b>		0.9740

Note: t statistics in parentheses. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

The findings of the second model also reveal a positive relationship between GDPs of BSEC countries and Russia's imports from them. Russia's GDP also has a positive sign and is statistically significant. Distance variable and colonial link variable gave similar results to the first model. Colonial link variable has a positive sign and is statistically significant. Distance variable has the expected negative sign and is statistically significant. Population of Russia is statistically insignificant however population of trading partner countries has a positive sign and is statistically significant.

In the imports model, similar to the previous analysis, distance and colony variables have the highest coefficients as well. 1% increase in distance causes more than 1.5% decrease in imports. This finding shows the importance of transportation costs for the importing countries once again. Also, colonial ties between countries generate more increment in imports than other variables (more than 1%) which means having colonial ties to Russia greatly affects the trade flows between these countries and Russia. GDP variables are statistically significant in both models however the magnitude of the coefficient of GDP of Russia is higher than the coefficient of GDPs of the other BSEC countries in one model and smaller in the other model. Therefore, the comparison of the magnitudes of the coefficients for these variables is inconclusive.

Most of these results are the expected results of the Gravity Model and they are consistent with the related literature. The increases in GDPs of trading partner countries create larger trade flows between them. This is because larger economic size of the importer country means a larger potential market and higher demand for exporter countries. Larger economic size of the exporter country means higher production (supply) capacity for exports. Having a colonial history also positively contributes to the volume of trade flows between these countries. Geographical distance is a proxy for



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transportation costs. Thus the further the trading countries are, the less the trade flows between them. Population can also effect the volume of trade among countries. Higher population of the importer countries contribute to higher exports from partner countries. We reached similar results to these assumptions of the Gravity Model of international trade in our exports and imports models for the trade between Russia and ten BSEC countries.

### CONCLUSION

This paper aims to estimate the determinants of trade flows between Russia and the other BSEC countries. For this purpose, augmented Gravity equations were estimated for imports and exports variables of Russia. In these models Russia is the host country of the trade and the trade flows of Russia by means of imports and exports separately are the dependent variables while GDP of Russia and GDP of the other countries, distance, population of Russia, population of BSEC countries and colonial link dummy are the independent variables.

The results show that GDPs of the partner countries and GDP of Russia has a positive effect on Russia's both exports and imports. Another result about the exports indicate that exports are not affected by Russian population but it is related with partner countries' populations. Geographical distance has a negative and significant relationship with both imports and exports models as expected. Also colonial link has a positive effect on the trade flows of Russia. These finding shows that not only economic sizes of the trading countries and the geographical distance between them are the most important factors determining the imports and exports of Russia but also the historical relationship of these countries and population are important explanatory variables. These results altogether are consistent with the main assumptions of the Gravity Model of international trade and the findings in the vast related literature.

### REFERENCES

- Aktürk, Şener (2006), "Turkish-Russian Relations after the Cold War (1992-2002)", *Turkish Studies*, 7:3, pp.337 - 364 To link to this article: DOI: 10.1080/14683840600891034
- Anastasios, Alexadridis – Antoniadis Ioannis (2013), "Export Performance and Intra-Industry Trade of the Economies of the Black Sea Region", *Journal of European and Economy*, 12 (3), pp. 296-308 September
- Anders Åslund (2010), "Why Doesn't Russia Join the WTO?", *The Washington Quarterly*, 33:2, pp.49-63, DOI: 10.1080/01636601003661670
- Anderson, James – Eric Van Wincoop (2003), "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, American Economic Association, Vol. 93(1), pp.170-192.

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Anderson, James (1979), “A Theoretical Foundation for the Gravity Equation”, *American Economic Review*, No: 69, pp.106-116.

Anderson, James (2010), “The Gravity Model”, *Annual Review of Economics*, Annual Reviews, Vol: 3, No: 1, pp.133-160.

Astrov, Vasily - Peter Havlik (2008), “Economic Developments in the Wider Black Sea Region”, in *The Wider Black Sea Region in the 21st Century: Strategic, Economic, and Energy Perspectives*, ed. Daniel Hamilton and Gerhard Mangott, Center for Transatlantic Relations, The Johns Hopkins University and the Austrian Institute for International Affairs, 2008, pp. 137–9.

Bergstrand, Jeffrey (1985), “The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence”, *Review of Economics and Statistics*, No: 67(3), pp.474-481.

Bergstrand, Jeffrey (1989), “The Generalized Gravity Equation Monopolistic Competition, and the Factor-Proportions Theory in International Trade”, *Review of Economics and Statistics*, No: 71, pp.143-153.

CEPII (2017), Geo-Dist Dataset. [http://www.cepii.fr/CEPII/en/bdd\\_modele/bdd\\_modele.asp](http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp)

Çelikpala, Mitat (2013), “Turkey and the New Energy Politics of the Black Sea Region”, *Neighbourhood Policy Paper*, Kadir Has University Center for International and European Studies, pp.1-12.

Deardorff, Alan (1995), “Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?”, *NBER Working Papers*, No: 5377, National Bureau of Economic Research, Inc. <http://www.nber.org/papers/w5377.pdf>.

Dinçer, Gönül (2014), “Turkey's Rising Imports from BRICS: A Gravity Model Approach”, *Proceedings of the New York State Economics Association*, Vol. 7, October, New York, pp.50-61.

Dikkaya Mehmet- Mehmet Orhan (2004), “Economies of the Black Sea Economic Cooperation (BSEC) Countries and their Bilateral Trade”, *Journal of Economic and Social Research*, 6 (2), pp.63-86

Druzhinin, Alexandr G. (2015), “The Black Sea Region in Modern Russian-Turkish Cooperation: Geo-Strategic Aspect”, *International Journal of Economics and Financial Issues*, 5(Special Issue) pp.81-84.

Druzhinin, Alexandr- G., Ibragimov- A., Bashekan, A. (2013), “Cooperation between Russia and Turkey in the post-Soviet era: The factors, trends, problems and prospects”. *Izvestiia Russkogo Geograficheskogo Obshchestva*, 145(5), pp.78-87.

Evenett, Simon – Wolfgang Keller (2002), “On Theories Explaining the Success of the Gravity Equation”, *Journal of Political Economy*, No: 110, pp.281-316.

---

Genç, M. Can- Seyfettin Artan- Metin Berber (2011), “Karadeniz Ekonomik İşbirliği Bölgesinde Ticaret Akımlarının Belirleyicileri: Çekim Modeli Yaklaşımı”, **Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi**, 25 (2), pp.207-224

Helpman, Elhanan (1987), “Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries”, *Journal of the Japanese and International Economies*, No: 1(1), pp.62-81.

IMF (2017), Direction of Trade Statistics Database. <http://data.imf.org/dot>

Jensen, Jesper - Thomas Rutherford - David Tarr (2007), “The Impact of Liberalizing Barriers to Foreign Direct Investment in Services: The Case of Russian Accession to the World Trade Organization”, *Review of Development Economics*, 11(3), pp.482–506.

Kiselev, Sergey- Roman Romashkin (2012), *Possible Effects of Russia's WTO Accession on Agricultural Trade and Production*, ICTSD Programme on Agricultural Trade and Sustainable Development.

Konno, Yugo (2016), “Evaluating Russia’s trade patterns”, *Post-Communist Economies*, 28:3, pp.300-313, DOI: 10.1080/14631377.2016.1184427

Linneman, Hans (1966), *An Econometric Study of International Trade Flows*, North Holland Publishing Company: Amsterdam.

Lissovolik, Bogdan –Lissovolik, Yaroslav (2004), “Russia and the WTO: The Gravity of Outsider Status”, *IMF Staff Papers*, 53, pp.1–27.

Mayer, Thierry – Soledad Zignago (2006), *GeoDist: the CEPII’s Distances and Geographical Database*. [http://www.cepii.fr/CEPII/en/bdd\\_modele/presentation.asp?id=6](http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6)

Muratoğlu, Gönül - Yusuf Muratoğlu (2016), “1960-2010 Döneminde Türkiye’den OECD Ülkelerine Gerçekleşen Göçün Çekim Modeli ile Analizi”, *Bulletin of Economic Theory and Analysis*, 1(1), pp.51-69.

OSCE, Statement By H.E. Ambassador Ahmet Kamil Erozan First Deputy Secretary General of the Organization Of The Black Sea Economic Cooperation Permanent International Secretariat on the Occasion of the 21st OSCE Ministerial Council (Basel, 4-5 December 2014), <https://www.osce.org/cio/128791?download=true>, Access: 03.03.2017

Rusu, Diana (2011), “Regionalization in the Black Sea Area: A Comparative Study”, *Romanian Journal of European Affairs*, Vol. 11, No. 2, pp. 47-65, June

Sayan, Serdar (1998), “The Black Sea Economic Cooperation Project: A Substitute for or A Complement to Globalization Efforts in the Middle East and the Balkans?”, *Cairo, Egypt: Economic Research Forum*, 1998, Working Paper No: 980

Sayan, Serdar (2005), “The Effects of the BSEC on Regional Trade Flows”, *Agora without Frontiers*, 10 (4), pp.334-347

Smarzynska, Beata (2001), “Does Relative Location Matter for Bilateral Trade Flows? An Extension of the Gravity Model”, *Journal of Economic Integration*, Center for Economic Integration, Sejong University, 16, pp.379-398.

Sorhun, Engin (2013), “Türkiye’nin Eksik Dış Ticareti, Ticari Potansiyeli ve Yeni Fırsatlar” , *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*,28 (1), pp.25-47

Tinbergen, J., (1962) “Shaping the World Economy: Suggestions for an. International Economic Policy”, New York, Twentieth Century Fund.

Tisdell, Clem (2006), “China’s Economic Performance and Transition in Relation to Globalisation: From Isolation to Centre-Stage?”, *The University of Queensland, Economic Theory, Applications and Issues*, Working Paper No. 40.

Uğurlu, Erginbay, - Bayar, Yılmaz (2014), “Foreign direct investment and international trade in Turkey: Time-series-cross-section methods”, *Ekonomik Yaklaşım*, 25(91), 69-84.