Research Article

BMIJ

ISSN: 2148-2586

BUSINESS & MANAGEMENT STUDIES:
AN INTERNATIONAL JOURNAL
Vol.:7 Issue:5 Year:2019, pp. 2964-2979

Citation: Uzel, G. & Gürlük, S. (2019), Turkey's Agricultural Export: An Application Of The Gravity Model, BMIJ, (2019), 7(5): 2964-2979 doi: http://dx.doi.org/10.15295/bmij.v7i5.1222

TURKEY'S AGRICULTURAL EXPORT: AN APPLICATION OF THE GRAVITY MODEL

Gökhan UZEL [1]

Serkan GÜRLÜK [2]

Received Date (Başvuru Tarihi): 24/08/2019

Accepted Date (Kabul Tarihi): 19/10/2019

Published Date (Yayın Tarihi): 25/12/2019

ABSTRACT

The aim of this study is to determine the agricultural export structure of Turkey with the gravity model method and discuss possible policy proposals. In line with this aim an annual panel data of 16 selected countries Turkey export to for the period 2001-2030 has been used in the gravity model. According to the estimation results, GDP and population of the countries that Turkey export to are related to the agricultural exports positively while the distance variable is negatively. As the per capita animal protein consumption ratio increase, it can be said that new agricultural export areas can be opened for Turkey. At this point, it has been determined that Turkey needs to follow increasing domestic consumption trends and emerging markets. As a result, it is important for policy makers to take into account the relevant determinations of the export strategy of agricultural products.

Keywords: *International Trade, Gravity Model, Agricultural Product Export, Agricultural Production Value, Per Capita Animal Protein Consumption*

JEL Codes: *F10, F14, F17*

TÜRKİYE'NİN TARIMSAL İHRACATI: BİR ÇEKİM MODELİ UYGULAMASI

ÖZ

Bu çalışmanın amacı, Türkiye'nin tarımsal ihracat yapısını çekim modeli yöntemi ile belirlemek, olası politika önerilerini tartışmaktır. Bu amaç doğrultusunda 2001-2030 yıllarını dönemini kapsayan ve Türkiye'nin ihracat yaptığı seçilmiş 16 temsilci ülkeye ait yıllık panel veriler çekim modelinde kullanılmıştır. Yapılan tahmin sonuçlarına göre, Türkiye'nin tarımsal ürün ihraç ettiği ülkelerin GSMH ve nüfusları tarımsal ihracatı ile pozitif yönde ilişkiliyken, mesafe değişkeni ise tarım ürünleri ihracatı ile negatif yönde ilişkilidir. Yine son yıllarda dünyadaki kişi başı hayvansal protein tüketim oranlarının arttığı bilinmektedir. Bu artışlar analiz sonuçları ile paralellik göstermektedir. Kişi başı hayvansal protein tüketim oranları arttıkça Türkiye için yeni tarımsal ihracat alanları açılabileceği söylenebilir. Bu noktada Türkiye'nin artan iç tüketim trendlerini ve yükselen pazarları takip etmesinin gerekli olacağı tespit edilmiştir. Sonuç olarak, politika yapıcıların tarım ürünleri ihracatı stratejisine yönelik söz konusu tespitleri dikkate almaları önem arz etmektedir.

Anahtar Kelimeler: *Uluslararası Ticaret, Çekim Modeli, Tarım Ürünleri İhracatı, Tarımsal Üretim Değeri, Kişi Başı Hayvansal Protein Tüketimi*

JEL Kodları: *F10, F14, F17*

[1] Res. Asisst., Uludag University, uzelgokhan@uludag.edu.tr http://orcid.org/0000-0001-9939-2523

[2] Prof. Dr, Uludag University, serkan@uludag.edu.tr http://orcid.org/0000-0002-3159-1769

1. INTRODUCTION

Due to the scarce resource on earth, countries have to meet the need for production factor which is necessary for the production but cannot meet within their borders. Meeting these factor needs, which can be categorized as (raw materials, capital, labour, and technology) is crucial for countries to achieve economic growth and development. Therefore, countries need to understand the importance of foreign trade, which plays an important role in national growth in the growth and development processes. It is important to determine the right trade policies in this regard.

Especially in the 1990s, the economic difficulties experienced by emerging economies were noteworthy. Examples include rapid population growth, income distribution inequalities, the formation of poor segments, inadequate industrialization, technology imports and low per capita income. Due to all these factors, these countries need to act in a planned manner to be minimally affected by the negativity that may arise during the economic growth process. For, these difficulties or adversities may leave the countries in an internationally difficult situation. For this reason, countries need to be successful in every sector, especially in international trade, to reach the ultimate goal of the level of developed countries. The key to success in international trade is highly competitive power. At this point, the share of exports from the realized production is an important indicator in terms of competitiveness. The export rate of Turkey's Gross Domestic product (GDP) is around 25% and is lower than some developed countries. This ratio is 49% in Germany, 30% in Italy and 27% in China (Schwab, 2013). In this regard, the right foreign trade policies are needed.

Along with the increasing world population, international competition has become of great importance for the agricultural sector as well. The agriculture sector meets the food needs that people need to survive and is of great importance due to its contribution to employment and national income (Sandalcilar, 2012). Despite Turkey has significant importance in many agricultural products like nuts, raisins, apricots, figs, tomato, its share of global trade is under his potential. In this context, the policies and strategies that countries will implement in order to stand out in international trade are very important. Certain methods are used to determine the strategies and policy options to be implemented. One of these is the gravity model. The gravity model is preferred both because of the structure of the model and some of the advantages it provides in its analysis of trade flows. The first one of these advantages is that the data required fort he model is easily accessible and reliable. The second is that the model for international trade is very debated on the theory and the model has been developed to get better results from

the model. In defining international trade strategies, it helps us to understand matters such as distance between countries, language, religion, neighbourhood relations and other cultural similarities. In this context, it is important to investigate the export performance of agricultural sector, which has the potential to generate a significant income item in Turkey's exports. Therefore, factors affecting Turkey's agricultural exports were estimated by the gravity model in the study. The results of the research may contribute to policymakers' agricultural export strategies.

2. MATERIAL AND METHODS

The literature on the gravity model was started around 1960s. Many researchers have contributed to the development of the gravity model literature by working on in various ways from that day on. For the first time, Tinbergen and Poyhonen empirically developed the model and showed how Newton's drafting model could be used in trade among countries(Tinbergen, 1962; Poyhonen, 1963).

Linneman (1966), by adding many variables to the analysis of international trade flows, developed the Walras General Equilibrium model and showed how the theoretical model of foreign trade would be applied theoretically (Linneman, 1966).

Aitken (1973), aimed to determine the main forces shaping Europe's trade relations by using gravity model and found that GNP had a positive effect on trade flows and distance and population had a negative effect (Aitken, 1973).

Thursby and Thursby (1987), reached the conclusion that the Linder hypothesis and exchange rate elasticity strongly influence bilateral trade in the analysis of 17 countries using the gravity model (Thursby & Thursby, 1987).

Nitsch (2000), used the gravity model to investigate the impact of national boundaries on international trade within the EU. The author has used the panel data set covering the period 1979-2000 for the 12 EU countries and has reached the conclusion that national boundaries in unity in international trade are still important (Nitsch, 2000).

Atıcı and Güloglu (2006), used the gravity model in their study and found that Turkey’s fruit and vegetable export has been influenced from the variables of revenue of the EU countries, Turkish population density and Mediterranean countries positively. On the other hand, the distance to exporting countries has a negative effect on the export rates (Atıcı & Güloglu, 2006).

Sevela (2002), analyzed the agricultural exports of the Czech Republic and found a positive relationship between agricultural exports and food and animal products. It was also found that there is a negative relationship between agricultural exports and per capita income and geographical distance (Sevela, 2002).

In Turkey, the number of studies investigating agricultural exports are quite limited in the literature.

Demirel and Erdem (2004), has investigated that effects of real exchange rate uncertainty of Turkey on the US, Germany, Britain, France and Italy's sectoral export. For the agricultural sector, it has been found that the real exchange rate uncertainty has a negative effect on exports (Demirel &Erdem, 2004).

Erdem and Nazlıoğlu (2008), have investigated the factors affecting the export of agricultural products of Turkey to the EU countries. In addition to the variables of the previous studies, the field variable covered by the agricultural land included in the study and re-estimated the gravity model (Erdem & Nazlıoglu, 2008).

It was found that while the EU countries population influenced exports of agricultural products positively, EU countries had a negative impact on agricultural products exports covered by agricultural land.

In the study carried out, variables of the values of agricultural production and per capita animal protein consumption was added to the study, differently from the variables added and estimated in previous studies. Panel data for the variables between the years 2001-2017 was used. Moreover, the same data was used to estimate the 2030 export data with the projected annual rate of increase. Turkey's agricultural export potential in a decade.

In line with all this information, the aim of this study is to determine the agricultural exports structure of Turkey with the gravity model method and to discuss possible policy proposals. To this end, annual panel data for the selected 16 representative countries that Turkey export for the period of 2001-2030 have been used in the gravity model. In the following sections of the study, the structure of the foreign trade of the agricultural products of Turkey will be examined and the gravity model created will be explained. The results of the model will be discussed in the fourth section and the conclusions and recommendations will be given in the fifth section.

The gravity model plays an important role in studying the commercial relations of the countries with each other. Production-oriented models such as Ricardo's theory of comparative

advantages, the Heckscher-Ohlin theorem, and the commercial neoclassical model have been substituted with demand-oriented models that demonstrate the advantages of international trade (Kulkarni et al., 2015). In this direction, the gravity model was first used by Jan Tinbergen in 1962 and by P. Pöyhönen in 1963 in the analysis of foreign trade flows. The gravity model is based on the attraction relations between objects in physics. In the models for the analysis of foreign trade flows, with reference to some theories in physics, instead of masses of objects, gross domestic product, population of countries, surface area of countries which can represent the economic magnitudes of countries and geographical distances between countries are used instead of the distance between objects. In this case, the total foreign trade volume between the two countries is directly proportional to the economic magnitudes of the countries and inversely proportional to the geographical distance between them. This case, called the standard gravity model, can be formulated as follows:

$$T_{iJ} = c\frac{M_i M_J}{D_{iJ}}$$

In this formula, T_{iJ} i and j express the trade volume between countries. M_i shows the Gross National Product (GNP) of the exporter country while M_j shows the GNP of the importer country and it is expected to have a negative impact on the foreign trade. According to the theory, there is a positive proportion between the foreign trade volume of countries and GNP. As GNP grows, foreign trade volume also grows, or foreign trade volume decreases as GNP decreases. In D_{ij}; i and j represent the geographical distance between countries. As distance increases and complicates transportation and communication costs, it has a negative effect on foreign trade volume (Ata, 2013). Thus the equation becomes

When the logarithms of both sides are taken into the equation, we get the following equation.

$$\text{Log}(T_{iJ})=\text{Log}(c)+\text{Log}(GSMH_i)+\text{Log}(GSMH_J)-\text{Log}(D_{iJ}) \quad (1)$$

Equation (1) represents the gravity model in its simplest form. In a gravity model, the trade between countries i and j is most commonly expressed by the following equation:

$$Log(X_{iJT}) = \alpha_0 + \alpha_t + \alpha_{ij} + \beta_{ijt}Z_{ijt} + \varepsilon_{ijt}, t = 1,....,T \quad (2)$$

In this equation, X_{ijt}, i and j represent the trade in t years between countries. The constant coefficient consists of three parts. The first is the common part α_0 for all years and country pairs, the second is the common α_t to all the country pairs specific to the year t, the third is

common α_{ij} for all years and for each country pair. All other variables are represented by Z_{ijt}vector and their coefficients are represented by β_{ijt}.

In order to estimate the standard gravity model equation given in Eq. (2), it is necessary to apply some restrictions on the coefficients. The restrictions applied in collective horizontal section models, which are frequently seen in the literature, are $\alpha_i j=0$, $\beta_{ijt}=\beta_t$ and $\beta_1=\beta_2=\ldots=\beta_t=\beta$ restrictions. When these restrictions are applied to equation (2), we get

$$Log(X_{IJT}) = \alpha_0 + \alpha_t + \beta\, Z_{ijt} + \varepsilon_{ijt}, t = 1,....,T \quad (3)$$

equation and this equation is estimated by least squares method (LSM).

An important point here is to choose between fixed effects or random effects estimation. The fixed effect model assumes that some non-time dependent properties of the panel groups affect the explanatory variables and are correlated; and the removal of these non-time dependent variables ensures that only the true effects of the explanatory variables are visible. The random effects model, on the other hand, assumes that the variation between panel groups is random and that there is no correlation between the explanatory variables. In this point, since the fixed effects estimation method excludes the variables (distance, common language, etc.) which do not change by years, random effects prediction method was used in this study.

Moving from this point, in studies conducted in different countries or groups of countries in the literature, analysis were made using variables that affect or are probable to affect trade flows. The common feature of analysis is that they investigate the suitability of the existing hypothesis by testing the variables that are effective or expected to be effective on the trade flows of the countries or groups of countries.

The validity of the gravity model is tested for the selected 16 economies in this study. Exports of agricultural products made by Turkey to selected countries for the period of 2001-2030 were tried to be explained by the variables of countries' gross national product, population, distance, the value of agricultural production and the amount of animal protein consumed per capita. To this end, GNP data was taken from the official website of the International Money Fund (IMF, 2018), population data from United Nations Conference on Trade and Development (UNCTAD, 2018), data of air distances between the capitals of the countries from Distance Calculator Home Page (www.distancefromto.net, 2018), and the value of Turkey's agricultural exports to these countries, total agricultural production and per capita animal protein values from FAOSTAT's official website (FAO, 2018a,b), and the gravity model was created with the agricultural export as dependent variable and other parameters as independent variables.

$$\log(\dot{I}HR_{ij})=\beta_0+\beta_1\log(GNP_I)+\beta_2\log(population)+\beta_3\log(distance)+u \quad (4)$$

$$\log(\dot{I}HR_{ij}) = \beta_0+ \beta_1\log (GNP_I) + \beta_2\log (population) + \beta_3\log (distance) + \beta_4\log (productionvalue)+\beta_5\log(animalproteinconsumptionpercapita)+u \quad (5)$$

Model (4) and Model (5) represent the models to be empirically analyzed. Logarithmic transformation was applied to the series added to the models. 16 countries were selected in this study where the panel data method was applied. These countries are Iraq, India, Republic of South Africa, Indonesia, Bangladesh, Iran, Poland, Canada, Russia, Thailand, China, Germany, Pakistan, Colombia, and UK. Sixteen different gravity models were estimated and it was tried to be determined at what level the model was valid for the countries selected with the variables used.

Panel data analysis was performed in order to estimate the model for the variables used in the research. Panel data analysis includes horizontal section and time series information. In other words, it has two dimensions, horizontal section, and time series. Panel data models include N units and T corresponding observations per each. The results obtained by using the random effective gravity model with the help of the panel data have been given below.

3. FOREIGN TRADE STRUCTURE OF TURKEY'S AGRICULTURAL PRODUCTS

When we look at Turkey's main agricultural export data in this direction by 2013, Turkey's agricultural exports have reached 15 billion 964 million USD (FAO, 2018a). The share of agricultural exports in general exports is 11.2% (Erol, 2015).

When we look at the leading countries in the agricultural exports of Turkey shown in Figure 1, as of 2013, Iraq (20,15%), Germany (7,85%), Russia (7,19%), Italy (3,93%), USA (3,89%), Syria (3,01%), France (2,82%), England (2,50%), Netherlands (2,34%) and Saudi Arabia (2,26%).

Turkey exports agricultural products to 186 countries. While 10 countries represented in Figure 1 constitute 56% of Turkey's agricultural exports, the other 176 trade partners have a share of 44%.

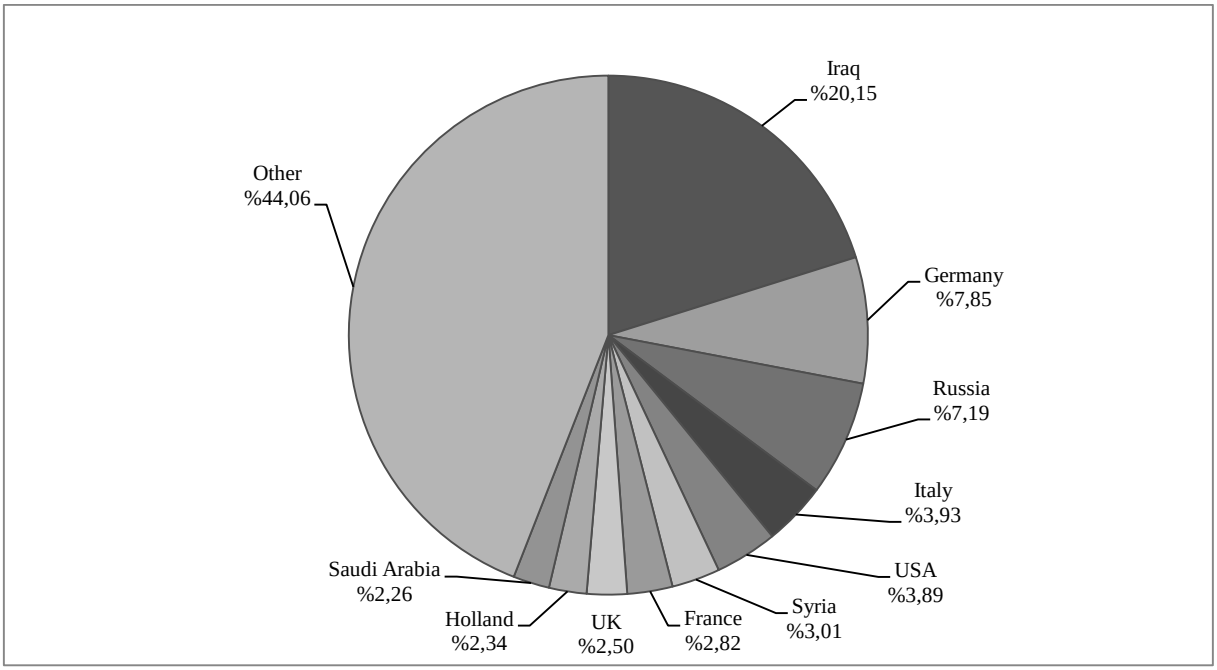

Figure 1. Leading Countries in the Agricultural Exports of Turkey

Source: FAO, 2018a.

Agricultural imports of Turkey was 12 billion 969 million dollars as of 2013. The share of agricultural imports in general imports is 5.5% (Erol, 2015). Figure 2 shows the world's leading countries in Turkey's agricultural imports.

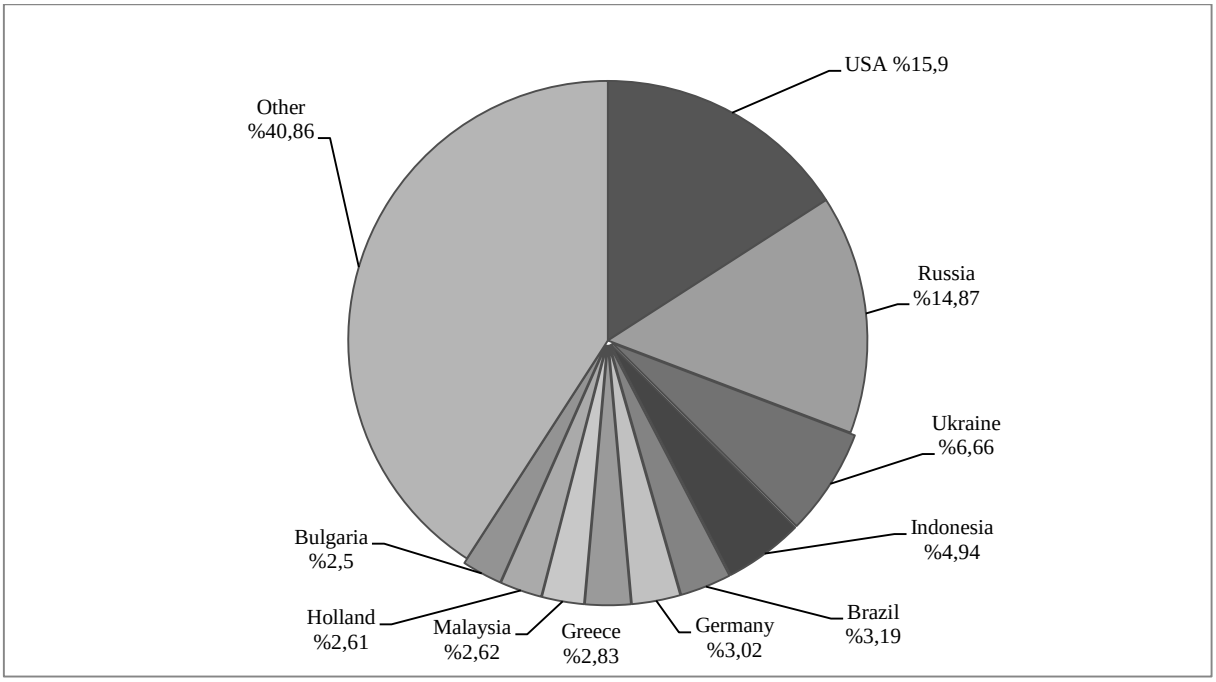

Figure 2. Leading Countries in the Agricultural Imports of Turkey

Source: FAO, 2018a.

When we look at these countries, the US (15.9%) takes the first place in agricultural imports of Turkey. Russia also has a significant share with a rate of 14.87%. The share of other countries are as follows: Ukraine (6,66%), Indonesia (4.94%), Brazil (3.19%),Germany (3.02%), Greece (2.83%), Malaysia (2.62%), The Netherlands (2,61%) and Bulgaria (2.5%) Turkey imports agricultural products from 145 countries. These 10 countries account for 59% of agricultural imports of Turkey. The remaining 135 countries account for 41%.

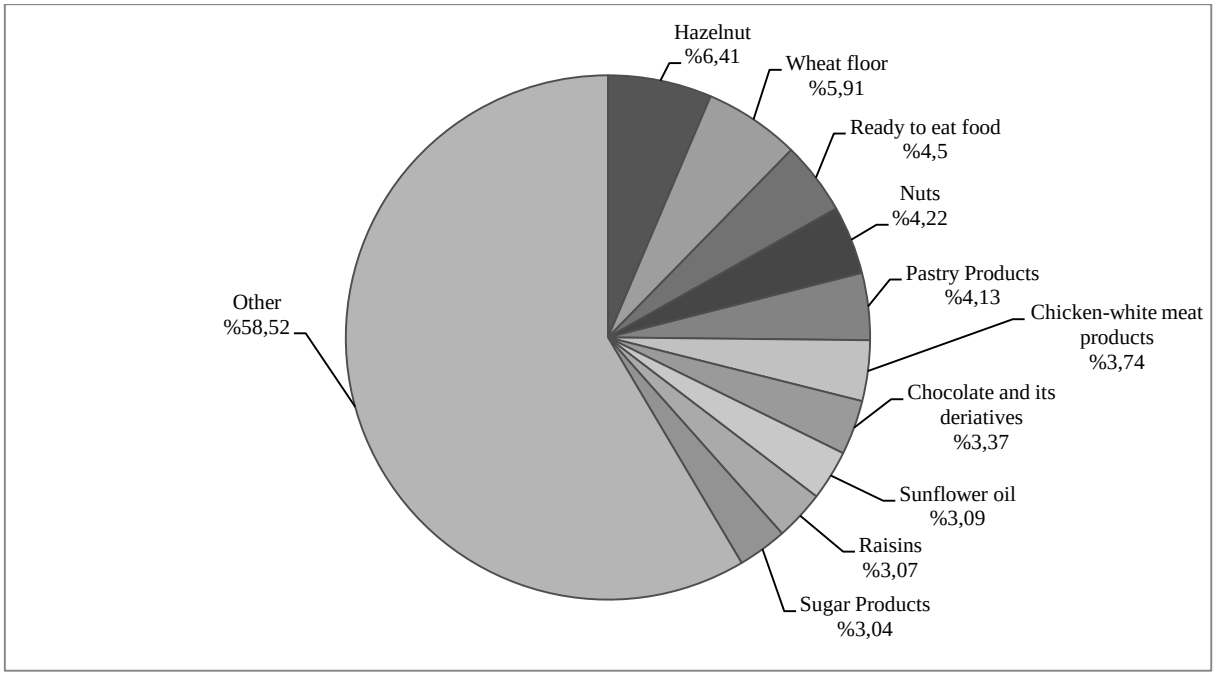

Figure 3. Leading Agricultural Export Products of Turkey on Product Basis

Source: FAO, 2018b.

When agricultural exports are evaluated on a product basis, hazelnuts (6.41%), wheat flour (5.91%), ready-to-eat foods (4.5%), nuts (4.22%),pastry products (4,13%), chicken-white meat products (3.74%), chocolate and its derivatives (3,37%),sunflower oil (3.09%), raisins (3.07%) and sugar products (3.04%) come to the forefront in Turkey's exports of agricultural products

Turkey has 272 agricultural export products. The first ten items that are shown in Figure 3 account for 41.5% of Turkey's agricultural exports. The other 262 export products constitute the remaining 58.5%.

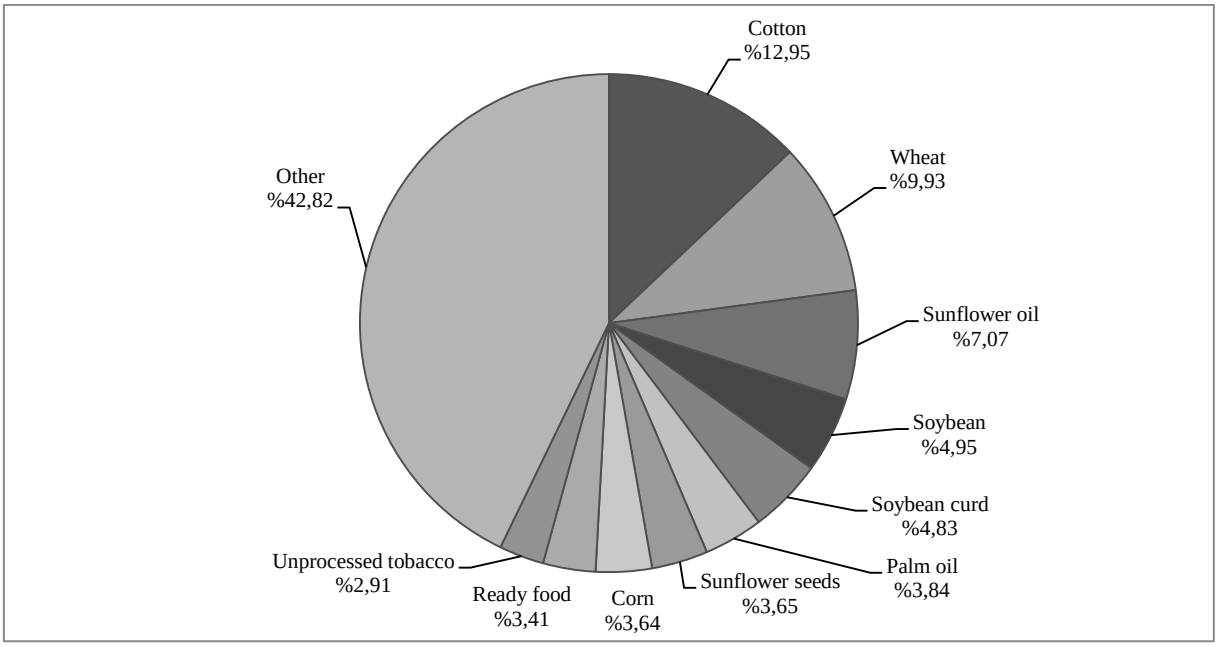

Figure 4. Leading Agricultural Import Products of Turkey on Product Basis

Source: FAO, 2018b.

When agricultural imports are evaluated on a product basis, cotton (12.95%),wheat (9.93%),sunflower oil (7.07%), soybean (4.95%),soybean curd (4.83%),palm oil (3.84%), sunflower seeds (3.65%),corn (3.64%),ready food (3.41%), unprocessed tobacco (2.91%) stand out among Turkey's imports of agricultural products.

Turkey imports 282 products. The top 10 products shown in Figure 4 constitute 57% of Turkey's total agricultural imports. The remaining 272 items constitute 43%.

In this respect, with its climate and soil characteristics, Turkey is very suitable for agricultural production. Despite this advantageous position and being one of the world's leading agricultural producer countries, a large majority of production cannot be directed to foreign trade due to different reasons. The main reasons why Turkey's export volume is very low compared to the amount of agricultural production are that the products subject to export are not in line with international market standards; -quantity and quality losses are quite high in the process starting from production until consumption and producers are not usually leaning to export the products.

4. EMPIRICAL FINDINGS

Tables 1, 2, 3 and 4 demonstrate the results of the gravity model analysis for the selected economies. The reliability tests necessary for the model are the consistent normality assumption and autocorrelation tests. In cases where the assumption of normality is not consistent or when

autocorrelation is encountered, the problems were removed by taking the primary differences of the logarithm-derived data. In addition, no problems with multiple linear connections were found. The Randomized Models Corrected Forecast results are shown and interpreted in this section, assuming that the variation between the panel groups is not correlated with the random and explanatory variables.

Table 1. Random Effects Model Forecast Results with 3 Parameter

Countries		S. Africa Rep.	Indonesia	Iran	Poland	Germany
Coefficient	**GNP**	1.967003	0.750250	0.706966	1.020793	5.915533
Std. error		0.562799	0.216294	0.706966	0.209147	0.169373
P-value		0.0005	0.0005	0.0001	0.0000	0.0005
Coefficient	**Population**	1.408265	1.572211	0.805631	0.763863	1.502185
Std. error		0.119858	0.100505	0.040305	0.036095	0.016930
P-value		0.0000	0.0000	0.0000	0.0000	0.0000
Coefficient	**Distance**	-6.627799	-307.5790	-46.35320	-18.76243	-22.86752
Std. error		1.744735	534.5938	80.18809	84.53631	45.98649
P-value		0.0001	0.5651	0.5632	0.1982	0.6190
-	**R^2**	0.586577	0.620007	0.722284	0.642262	0.622889

Table 2. Random Effects Model Forecast Results with 5 Parameter

Countries		Russia	Thailand	China	Bangladesh
Coefficient	**GNP**	2.814513	4.167948	-1.900217	0.810832
Std. error		1.190085	4.419849	0.928076	2.769972
P-value		0.0265	0.3457	0.0406	0.7723
Coefficient	**Population**	0.488196	1.446935	59.16912	2.186965
Std. error		0.063989	0.088895	1.531631	0.229530
P-value		0.0000	0.0000	0.0000	0.0000
Coefficient	**Distance**	10.08608	-227.9559	-130.9933	-277.6621
Std. error		66.11101	5.540704	219.7090	568.5265
P-value		0.8800	0.6808	0.9952	0.6297
Coefficient	**Agricultural**	3.099479	-1.959399	3.344176	-1.729629
Std. error	**Production**	1.412825	3.703461	0.383361	3.007162
P.value	**Value**	0.0382	0.5968	0.0000	0.5705
Coefficient	**Per Capita**	16.52344	12.79426	11.37901	17.96866
Std. error	**Animal**	7.597676	12.89746	11.27369	21.38928
P-value	**Protein**	0.0397	0.0322	0.0427	0.0492
	Consumption				
-	**R^2**	0.744792	0.696633	0.735344	0.794283

If some of the results obtained are to be interpreted, for example, for Russia, the variables of GNP, population, agricultural production value and per capita animal protein consumption were found significant. In this direction, a 10% change in Russia's GNP will have the potential to increase Turkey's agricultural exports to this country by 28%. A 10% change in the population of Russia will increase Turkey's agricultural exports to Russia by 4%. The 10% change in Russia's agricultural production value could increase Turkey's agricultural exports to Russia by 30%. A 10% change in Russia's per capita animal protein consumption could also increase Turkey's agricultural exports to that country by 165%.

The findings of the analysis for China revealed that GNP, population, the value of agricultural production and consumption of animal protein per capita are significant. In this direction, a 10% change in China's GNP will have the potential to reduce Turkey's agricultural exports to this country by 19%. In this context, it can be stated that a possible economic growth in China will lead to a change in the socio-economic structure of China, which may lead to the import of agricultural products with high added value. In this context, it must be aimed to export high value-added and processed products in the far east markets. A 10% change in the Chinese population may increase Turkey's agricultural exports to China by 591%. A 10% change in China's agricultural production value could increase Turkey's agricultural exports to China by 334%. A 10% change in China's per capita animal protein consumption could also increase Turkey's agricultural exports to this country by 113%.

The analysis of data obtained for Thailand revealed that the variables of the population and per capita animal protein consumption is significant. A 10% change in the Thai population will have the potential to increase Turkey's agricultural exports to this country by 14.4%. Again, a 10% change in per capita animal protein consumption could increase Turkey's agricultural exports to that country by 127%.

Similar findings were obtained for Bangladesh, another far east country.

Colombia as a Latin American country is among the recently rising countries with it’s increasing population. The results of the analysis obtained are consistent with macroeconomic benefits. According to the analysis results, variables of population and agricultural production value are meaningful. A 10% change in Colombia's population has the potential to increase Turkey's agricultural exports to this country by 16.8%. A 10% change in the value of Colombian agricultural production could increase Turkey's agricultural exports to Colombia by 2.9%.

Table 3. Random Effects Model Forecast Results with 5 Parameter

Countries		Canada	Pakistan	Colombia	UK
Coefficient	**GNP**	0.250111	-2.006622	0.062931	0.333099
Std. error		1.073255	1.585483	0.185880	0.629916
P-value		0.8157	0.2056	0.7349	0.5969
Coefficient	**Population**	0.809207	2.411728	1.687595	0.630042
Std. error		0.037068	0.098080	0.040409	0.013724
P-value		0.0000	0.0000	0.0000	0.0000
Coefficient	**Distance**	-89.73651	-72.47844	-188.53404	-16.82275
Std. error		278.5223	221.1457	2.262004	30.97431
P-value		0.7473	0.7431	0.4126	0.5870
Coefficient	**Agricultural**	0.544925	3.419632	0.290757	0.580100
Std. error	**Production**	0.743927	1.574617	0.116810	0.414204
P-value	**Value**	0.4639	0.0299	0.0128	0.1614
Coefficient	**Per Capita**	5.180252	6.170375	-1.516587	-3.888415
Std. error	**Animal**	12.86823	10.69633	5.129307	6.433795
P-value	**Protein**	0.6873	0.5640	0.7675	0.5456
	Consumption				
-	**R^2**	0.754885	0.671672	0.708551	0.584719

Table 4. Random Effects Model Forecast Results with 5 Parameter

Countries		Brazil	Iraq	Nigeria
Coefficient	**GNP**	0.284196	0.843499	0.129207
Std. error		3.040954	0.024732	0.159816
P-value		0.9255	0.0006	0.4188
Coefficient	**Population**	1.800282	3.16026	2.135496
Std. error		0.181926	0.050802	0.042620
P-value		0.0000	0.0000	0.0000
Coefficient	**Distance**	-133.834	54.28257	-27.00709
Std. error		981.9795	61.43170	69.57981
P-value		0.1753	0.3769	0.6979
Coefficient	**Agricultural**	0.303708	3.356358	0.087206
Std. error	**Production**	4.014641	0.249278	0.202098
P-value	**Value**	0.9397	0.0178	0.6661
Coefficient	**Per Capita**	-8.676862	7.986085	0.328153
Std. error	**Animal**	18.19691	3.430909	3.104649
P-value	**Protein**	0.6335	0.0199	0.9158
	Consumption			
-	**R^2**	0.657778	0.686303	0.721215

For Pakistan, the variables of population and agricultural production value were found to be significant, and the potential of these variables to increase Turkey's agricultural exports to this country was determined as 24,1% and 34,1%, respectively. For Nigeria, an African country, population change was found significant. A 10% change in the Nigerian population could increase Turkey's agricultural exports to this country by 21.3%.

The analysis results for Iraq, Turkey's largest agricultural export partner, are also striking. The variables of GNP, population, agricultural production value and per capita animal protein consumption were found significant. In this direction, a change of 10% in the GDP of Iraq has the potential to increase Turkey's agricultural exports to this country by 8,43%. A 10% change in the Iraqi population may increase Turkey's agricultural exports to Iraq by 31.6%. A 10% change in the value of Iraq's agricultural production could increase Turkey's agricultural exports to Iraq by 33.5%. Similarly, a 10% change in Iraq's per capita animal protein consumption could also increase Turkey's agricultural exports to this country by 79.8%.

Significant results were also achieved for Germany, another important agricultural export partner of Turkey. For Germany, the results of the analysis show that GNP and population are significant. A 10% change in the GNP of Germany could increase Turkey's agricultural exports to this country by 59.1%. Similarly, a 10% change in the population of Germany will also increase Turkey's agricultural exports to this country by 15%.

For South Africa, a South African country, the distance variable was found to be significant in addition to other variables. While it can be seen that the GNP and population variables can cause positive changes, this is negative in the distance variable. A 10% change in the distance between Turkey and the South African Republic can reduce Turkey's exports of agriculture products to this country by 66.2%. It is also important to solve logistical problems at this point. To solve these problems, food items must be packaged appropriately in such a way that they do not deteriorate in physical, chemical or microbiological terms before the expiry date and it is important to provide requirements such as time, temperature, humidity and light. There should be a continuous flow of information between the companies that provide and receive logistics services. The culture of co-operation can be generalized among producers, logistics service providers, and customers and it is necessary to increase the efficiency of the entire process through information sharing and joint planning.

5. CONCLUSION

International trade is crucial for economic growth and the development of the countries. If the trading countries are aware of the factors that are believed to have a positive effect on trade with other countries, they will increase their income from foreign trade. At this point, it is of great importance for economic profitability to be able to identify and correctly interpret the fundamental factors that affect foreign trade which has a serious role in the economic growth and development of a country. In recent years, the gravity model has been frequently used to measure these factors in international trade. The studies revealed that the model gave successful results in explaining the bilateral trade of the countries. Therefore, the gravity model was used to identify the determinants of agricultural exports among selected countries.

In this respect, the factors affecting agricultural exports of Turkey were investigated with the gravity model. For this purpose, annual panel data covering the period 2001-2030 belonging to 16 countries were used in the gravity model. According to the result of the analysis, it is important for Turkey to make use of the analysis parameters regarding the countries that have a trading relationship with Turkey. When the change trends are examined in general, it is seen that the population and GNP ratios are increasing. At this point, while the current markets are protected in terms of these variables, it is important to move to new markets for emerging economies. Additionally, there is a similar situation in terms of population variable. An increase in agricultural production has been determined to carry a large potential for agricultural exports. Looking at the analysis findings from the point of view of the distance variable, it can be said that Turkish exporters have solved this problem to a great extent. -It is known that in recent years, the per capita animal protein consumption rates have increased throughout the world. These increases are in line with the results of the analysis. As the per capita animal protein consumption increases, new agricultural export destinations would be possible for Turkey. At this point, it would be rational for Turkey to follow the rising consumption trends and emerging markets. Especially in far east regions, low per capita animal protein ratios are seen. Therefore, in parallel with the increasing animal protein consumption rates of the far eastern countries, it may be beneficial to move towards these markets. When the analysis results are evaluated within this scope, it will be beneficial if policymakers take into account the factors identified when shaping Turkey's agricultural product export policy.

REFERENCES

Aitken, N. (1973). The Effects of the EEC and EFTA on European Trade: A temporal Cross-Section Analysis. *The American Economic Review*, 63(5)- 881-892.

Ata, S. (2013). Turkey's Trade with Neighbour Countries: A Gravity Model Analysis. International Conference on Eurasian Economies, St. Petersburg, Russia, 17-18 September 2013, p:500-509.

Atıcı, C., & Güloğlu, B. (2006). Gravity Model of Turkey's Fresh and Processed Fruit and Vegatable Export to the EU. *Journal of International Food& Agribusiness Marketing*, 18:(3-4)- 7-21.

Demirel B., & Erdem, C. (2004). The impact of exchange rate variability on export: The case of Turkey. *The Journal of Economy, Business and Finance*, 19(223): 116-127.

Distance Calculator Home Page. http://www.distancefromto.net/ (accessed on 04.08.2019)

Erdem, E., & Nazlıoğlu S. (2008). Gravity Model of Turkish Agricultural Exports to the European Union. International Trade and Finance Association Working Papers, pp:21.

Erol, E. (2015). Structural Analysis of Turkish Agricultural Foreign Trade and Effects of EU Process Türkiye. *EU Expertise Thesis.* Ministry of Food, Agriculture and Livestock Directore General of EU and Foreign Affairs, Ankara, Turkey,

FAO (2018a). Food and Agriculture Organization of the United Nations Home Page. Available Online: http://www.fao.org/faostat/en/#data/QV (accessed on: 04.08.2019)

FAO (2018b). Food and Agriculture Organization of the United Nations Home Page. Available Online: http://www.fao.org/faostat/en/#data/TM(accessed: 04.08.2019)

IMF (2018). International Monetary Fund Home Page https://www.imf.org/external/pubs/ft/weo/2014/02/weodata/index.aspx (accessed on 04.08.2019)

Kulkarni, G.K., Gupte, R., Sethi, S. 2015. Gravity Model: India's Exports. *SCMS Journal of Indian Management*, 38-50.

Linnemann H. (1966). An Econometric Study of International Trade Flows, *Humanities Press*, Newyork.

Nitsch V. (2000). National borders and international trade: Evidence from the European Union. *The Canadian Journal of Economics*, 33(4): 1091-1105.

Poyhonen, P. A. (1963). Tentative Model for Volume in Trade Between Countries. *Weltwirtschaftliches Archiv*, 90:91-113.

Sandalcılar, A.R. (2012). Determinants of Agricultural Product Trade in the Black Sea Basin: Gravity Model Approach. *Turkish international Cooperation and Coordination Agency*. Eurasian Etudes, 41(1): 71-94.

Schwab, K. (2013). The Global Competitiveness Report 2013-2014. *World Economic Forum*, Geneva.

Sevela M. (2002). Gravity-type Model of Czech Agricultural Export. *AgriculturalEconomics*, 48:463-466.

Tinbergen, J. (1962). Shaping the World Economy: Suggestions For an International Economy Policy, *The Twentieth Century Fund.* New York.

Thursby J.G., & Thursby M.C. (1987). Bilateral Trade Flows, Linder Hypothesis and Exchange Risk. *Rewiew of Economics and Statistics*, 69(3): 488-495.

UNCTAD (2018). United Nations Conference on Trade and Development Home Page http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx (accessed on 04.08.2019)