ABSTRACT

OTGUN, HANIFI. The Impact of a Customs Union with the EU on Turkey's Trade Flows. A Gravity Model Approach. (Under the direction of Dr. Ivan Kandilov).

Although it has been many years since the customs union agreement was signed between the European Union and Turkey, discussions are still up to date about its positive and negative effects. Unfortunately, most of the empirical studies in the literature are insufficient since they include either a small group of countries or a limited time interval in their datasets. In this study, considering this issue, 46 countries accounting for 80% of Turkey's total trade flows are analyzed for the 1989-2018 time period. Moreover, the gravity model, one of the most robust empirical tools in international trade theory, is utilized to evaluate Turkey's trade flows. The study results reveal that the gravity model provides a good fit of Turkey's trade patterns. Specifically, Turkey's exports and imports are triggered by the increase in its and trading partners' GDP, while transportation costs decrease the volume of Turkey's bilateral trade flows. In addition, according to the results, the customs union agreement seems to have a significantly positive effect on Turkey's exports and imports. Precisely, it is found that the agreement has increased Turkey's exports by 36% and its imports by 29%. In this context, Turkey's balance of trade arising from its trade with the EU has significantly improved over the years.

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The Impact of a Customs Union with the EU on Turkey's Trade Flows
A Gravity Model Approach

by
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DEDICATION

To my family for their endless support

BIOGRAPHY

Hanifi Otgun was born in 1988 in Igdir, Turkey. He earned a Bachelor of Science Degree in Agricultural Economics from Akdeniz University. In 2016, after passing a highly competitive selection process, he qualified for a governmental scholarship that the Turkish Ministry of Education grants for graduate education abroad. Afterward, he began his graduate studies at North Carolina State University in fall 2019. In spring 2021, he completed all of the course works successfully and earned a Master of Science degree in economics. His research interests include international trade, applied econometrics, and agricultural policy.

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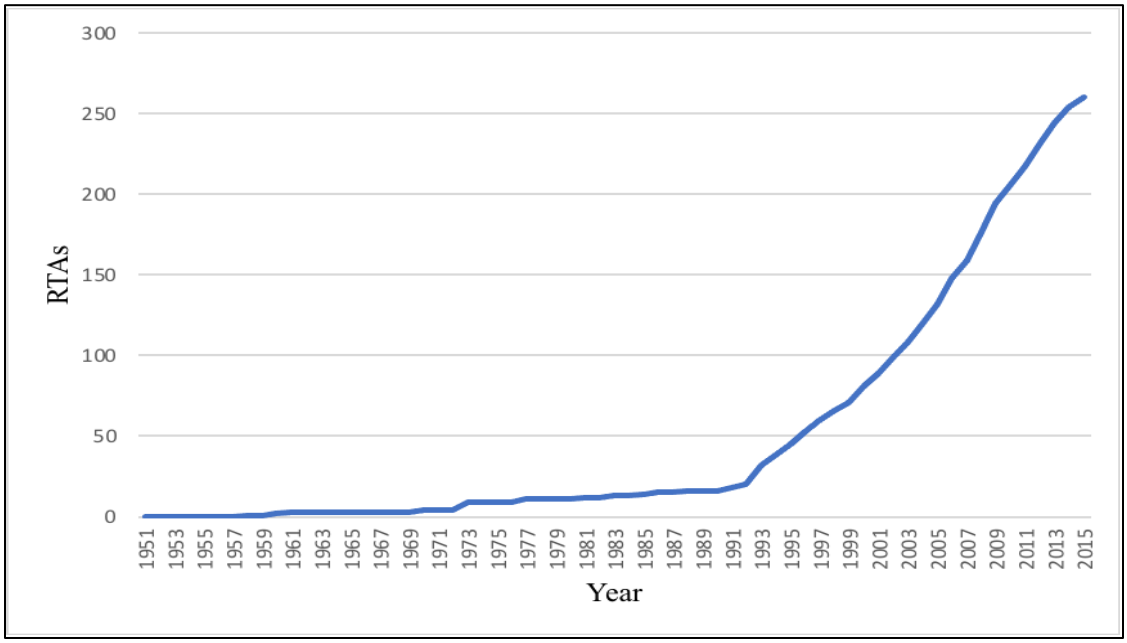
1. Introduction

In the early 1980s, developed countries started pursuing outward-oriented policies to recover their economies after the oil crisis occurred in the 1970s. On the other hand, with the influence of neoliberalism prevailing in those times, regional policies became more popular among these countries. Afterward, with the developing countries' involvement in this trend, regionalism has become a new global policy pattern. Baldwin (1997) states that the expansion of regionalism is a crucial step for the global trade system in the recent past, claiming that regionalism significantly contributes to trade liberalization that leads to free trade worldwide. In the Dictionary of Trade Policy Terms, Regionalism is defined as "Actions by governments to liberalize or facilitate trade on a regional basis, sometimes through free trade areas (FTAs) or customs union (CU)." Having said that, in terms of the World Trade Organization (WTO), it might be more specific as the WTO can regulate conditions of the agreements to give equal treatment to the members.

In recent years, regional trade agreements (RTAs) have become more desirable across many countries. These countries have established RTAs to increase their welfare by accessing foreign markets and promoting investments among one another. In contrast, just a small number of countries have persistently stuck with protectionist policies. World Bank's (2018) report conspicuously shows this trend by mentioning the increasing number of RTAs worldwide (Figure 1). According to this report, there were 16 RTAs in force in 1990, and surprisingly 260 in 2015. The report also claims that deep trade agreements covering various policies are likely to promote trade and investments across many countries. The European Union (EU), the North American Free Trade Agreement (NAFTA), Southern Common Market (MESCOUR), and Association of

Southeast Asian Nations (ASEAN) are some of the well-known examples of RTAs around the world.



Source: World Bank (2018)

Figure 1. The Number of RTAs in the World Over Time

Smith (1776), in "The Wealth of Nations," states that the wealth of nations depends on their development. In addition, he suggests that development is driven by international trade rather than autarky. This idea has become a phenomenon once again due to liberalization winds in the 1980s. As a result, most of the countries have begun removing trade barriers to gain more from trade. To do that, governments mostly have preferred the tool of RTA in different forms. Since then, it is an ongoing argument in the literature that establishing different forms of RTAs can be either beneficial or detrimental. (see, Carrere 2006, and De Sousa 2012).

The term "Regional Trade Agreements" is the general name of the bilateral or plurilateral agreements such as FTA and CU. The CUs are generally assumed as an enhanced form of the FTAs. Table 1 below highlights how CUs differ from FTAs. It is seen that CUs are more extended

versions of FTAs as besides FTA content, they also include some other features such as external tariffs on imports from and export to the third countries.

Table 1. Differences between FTA and CU

<table>
<tr><th>Free Trade Agreement (FTA)</th><th>Customs Union (CU)</th></tr>
<tr><td>earlier FTAs:
- Trade in goods (both industrial and agricultural goods): market access, trade liberalization, removal of most tariffs; prohibition of quantitative restrictions; customs cooperation</td><td rowspan="2">In addition to the content of FTAs, CUs also contain:
- Common external tariffs (for both imports and exports)
- Common customs code
- Common customs rules and legislation
- Common commercial policy / or at least a high level of alignment
- Technical regulations for goods under free circulation a high level of alignment
- Rules on competition and state aid, and on intellectual property rights
Based on all the above:
- Free movement of goods (no rules of origin)</td></tr>
<tr><td>recent FTAs also contain:
- Trade in services: market access, national treatment, mutual recognition provisions, schedules of specific commitments in sectors
- Establishment: provisions on national treatment
- Access to public procurement markets
- Rules in intellectual property rights, competition
- Dispute settlement
- Regulatory issues: technical barriers to trade, sanitary and phytosanitary measures etc.
- Rules in several trade policy areas: trade and sustainable development, trade in energy and raw materials, SMEs, transparency, etc.</td></tr>
</table>

Source: European Commission (2016)

Shiells (1995) claims that countries join the RTAs for various reasons. For example, some countries aim for economic benefits, while some might seek political gains. Nevertheless, small countries may aim to secure market access, while some might seek to become more potent for negotiations, as seen in the Uruguay Round.

For the reasons discussed above, like many other countries, Turkey also shifted its economic policies to orient itself outwards at the beginning of the 1980s. As stated by Neyapti et al. (2007), after a long-term inward-oriented growth plan, Turkey established new policies based on trade liberalization in the early 1980s.

According to WTO Regional Trade Agreements Database (2021a, 2021b), Turkey has 23 RTAs in force. Some examples of Turkey's RTAs include EU-Turkey CU, European Free Trade Association (EFTA)-Turkey, Turkey-Israel, and Egypt-Turkey FTAs. Turkey lastly established an FTA with the United Kingdom (UK) right after Brexit. Turkey was one of the first countries that signed an FTA with the UK post-Brexit.

WTO Regional Trade Agreements Database (2021b) also shows that Turkey is one of the top 5 countries that use RTAs the most. Without a doubt, one of Turkey's most critical RTAs is the CU agreement signed with the EU in 1995 and put into effect the following year. It was considered that the CU would make significant contributions to Turkish foreign trade as the EU includes some of the largest trading partners for Turkey. In other words, the EU is the largest trading region of Turkey, accounting for 41.3% of its total exports and 33.4% of its total imports (Republic of Turkey Ministry of Trade, 2021a). As stated by the CU agreement, customs duties and restrictions between Turkey and the EU were eliminated for industrial goods and processed agricultural products. Besides, Turkey imposed a standard external tariff for the third countries. (Republic of Turkey Ministry of Foreign Affairs (MFA Turkey), 2019)

Although it has been many years since the CU agreement between the EU and Turkey, discussions are still up to date about its positive and negative impacts on the Turkish economy. The CU theory suggests that the agreement would positively impact participating countries' economies if the pattern of trade shifts from a high-cost producer to a low-cost producer. On the

contrary, if the trade shifts from a low-cost producer outside the union to a higher-cost producer inside the union, economies would be negatively affected (Viner 1950). In this study, the impact of the EU-Turkey CU on Turkey's trade flows will be investigated, considering Turkey's exports and imports with 46 countries for the 1989-2018 time period. The gravity model of trade will be used for the evaluation since it is a very common and robust method for testing the impact of the CUs (see, Frankel and Rose 2000).

The thesis structure will be as follows; Chapter 2 gives brief information about the CU theory and discusses its expected effects. Chapter 3 consists of information about the historical relations between the EU and Turkey and the background of the EU-Turkey CU. Chapter 4 reviews the literature relevant to the impact of the EU-Turkey CU on the Turkish economy. Chapter 5 introduces methodology and data. Chapter 6 goes over the results and discusses them. Chapter 7 concludes the thesis.

2. The Theory of the Customs Union

2.1. Definition

According to the CU theory, member countries remove the factors that hinder trade between them and apply a common customs tariff against countries outside the union. Thus, free trade is ensured within the union, and protectionist policies are maintained against trading countries outside the union.

In the General Agreement on Tariffs and Trade (1947) Article XXIV section eight, it is defined that the substitution of a single customs territory is met by understanding a customs union for two or more customs territories in order to:

i. Eliminate some duties and other restrictive regulations of commerce in the matter of all the trade between the constituent territories of the union or all the trade in products coming from such territories.

ii. Apply the same duties and other regulations of commerce on the trade of territories not included in the union by the union members.

Most of the time, one of the main purposes of CUs is to provide political unification between countries besides economic benefits. Nevertheless, from an economic perspective, it is expected from CU to bring some structural amendments to the member countries' economies within the union in consequence of the shifting relative prices of trading goods. The economic effects of the CU are generally observed in the production, consumption, and export-import flows of the member countries.

2.2. Economic Effects of the Customs Union

There are two major effects of the CU, which are static and dynamic. Static effects refer to the reallocation of production resources within the union (Viner, 1950). Static effects are seen in the short-term period assuming that there are no structural or technological changes in the economy. On the other hand, dynamic effects are the long-term effects of the market structure and productivity changes (Balassa, 1961).

2.2.1. Static Effects

Viner (1950), in "The Customs Union Issue," first time states that there are two static effects: trade creation and trade diversion. The trade creation effect theoretically substitutes expensive domestic production with cheaper imports from the other union members. Oppositely, the trade diversion effect is based on replacing the cheap imports from outside of the CU by more expensive imports within the CU. While the trade creation effect increases welfare transferring resources to more productive sectors, the trade diversion effect adversely decreases it moving resources to less productive areas.

Viner's statement is based on the production effect, and he does not consider the consumption effect. This gap was revealed by Meade (1955), and he developed Viner's analysis by incorporating the missing consumption effect into the CU theory. The consumption effect stands for the shifting in consumption preferences arising from decreased relative prices of goods due to the abolition of customs. If the elasticity of demand for the consumption goods is greater than zero, the increase in the demand for the cheaper goods shows the positive consumption effect. On the other hand, if relative prices increase due to CU, the decrease in the demand for expensive goods shows the negative consumption effect.

Lipsey and Lancaster (1956), adapting the general theory of the second-best to the CU issue, state that the maximum gain is only possible under pure free trade, and CU conditions are far away from this approach because while tariffs are abolished, and trade is liberalized within the union, the common tariff is still maintained against third countries. Thus, they conclude that CU's welfare effect would not be as high as Viner has stated.

2.2.2. Dynamic Effects

Customs unions also lead to some changes in the countries' economic structure, productivity, and technology, and these changes have a significant impact on the GDP and welfare of the member countries over time. Many economists argue that the dynamic effects of the CU are more important than its static effects (see, Josic and Josic, 2013 and Missalla, 2019) because; the fact that dynamic effects are ongoing effects over time makes these effects superior to the static effects.

Balassa (1961) introduces the dynamics effects of integration on "economies of scale, external economies, market structures (competition), technological change, risk and uncertainty, and investment." To briefly explain each of them:

i. **Economies of Scale:** It refers to the efficient production of the firms as a result of diminishing marginal cost. Due to economic integration, firms find themselves in a larger market and expand themselves to get more share from the market benefits. This means that they reduce their costs and increase their productivity in the market.

ii. **External Economies:** External economies can be defined as unrequited benefits made by one firm to another within the industry or intersectoral benefits that reduce

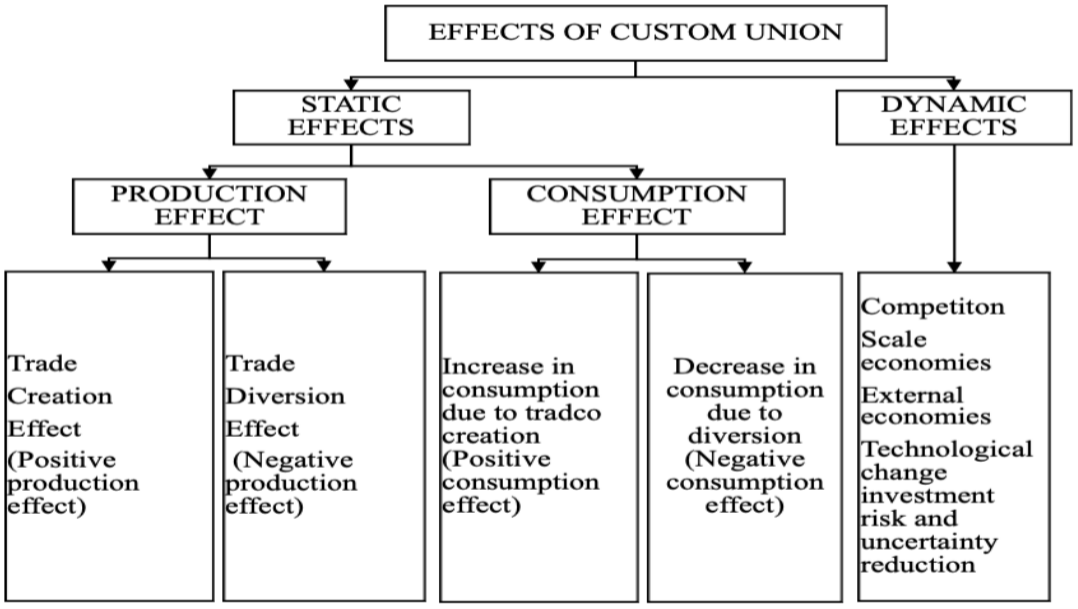
production costs. The benefits of external economies increase as a result of expanding market due to integration.

iii. **Market Structures:** Market structures change due to the competition from the increasing number of foreign direct investments. As the number of firms increases, they become more productive as a result of competition.

iv. **Technological Change:** The competition that arises with the expansion of the market causes an increase in research expenditures, and as a result, technological progress is made.

v. **Risk and Uncertainty**: Integration is likely to reduce the risks associated with tariffs and trade restrictions as it abolishes tariffs and other trade related restrictions.

vi. **Investment**: Reduced risks and expanding market due to integration is likely to stimulate foreign direct investment.



Source: Cherunilam (2008)

Figure 2. Effects of Custom Union

2.2.3. Factors Affecting the Success of the CUs

The success of the CUs relies on some characteristics of the member countries and their features. According to Cherunilam (2008), the success of regional integration agreements (RIAs) like CUs depends on the following factors:

i. **Similarity in Economies:** If the members' economic structures are similar, the agreement is more likely to succeed. Because, in this case, the resulting competition will increase the productivity of the companies within the member countries.

ii. **Distance Between Member Countries:** If the distances between the members are long, the integration will be negatively affected by the transportation costs. On the other hand, the closer the countries are to each other, the integration will have a greater chance of success.

iii. **Size of the Union:** The magnitude of the integration will help companies benefit from economies of scale. EU and NAFTA can be shown as examples of having such benefits of a large size union.

iv. **Size of the Member Countries:** The smaller the member countries, the more they benefit from expanding market.

v. **Scope of Trade Barriers:** If the trade between countries is limited due to high taxes or other barriers before the integration, the integration is more likely to be efficient for those countries as these barriers will be removed due to integration.

If these factors are to be evaluated in terms of the EU-Turkey CU, the Turkish economy differs structurally and technologically from most European countries. Thus, the first factor can be considered a factor that negatively affects the success of the EU-Turkey CU. On the other hand, the distance factor can be considered as enhancing the positive effect of the EU-Turkey CU as Turkey is relatively close to the EU countries, and the parties get benefit from the low-cost transportation facilities. Moreover, the size of the union and the member countries are other positive factors that increase the efficiency of the EU-Turkey CU as the EU CU is one of the biggest RTAs in the world, including big countries like Germany, Italy, France, Spain. Therefore, Turkey enjoys having the benefits of such a large union, and trading with its powerful countries.

Last but not least, trade barriers before the CU agreement were extremely high between the EU and Turkey. Now Turkey is experiencing tariff-free trade of non-agricultural goods with the EU. To sum up, other than the factor of the economic similarity, all the factors that Cherunilam (2008) has mentioned are likely to positively affect the EU- Turkey CU.

3. Historical Process of the European Union-Turkey Customs Union

3.1. Turkey on Moving into the European Union

After the Second World War, Turkey has taken an active role as a member in many international organizations such as the United Nations (UN), Organization for Economic Co-Operation and Development (OECD), Group of Twenty (G-20), International Monetary Fund (IMF) and North Atlantic Treaty Organization (NATO). Nearly one and half years after the establishment of the European Economic Community (EEC), Turkey applied for its membership on July 31, 1959 (MFA Turkey, 2020). Despite its challenges, like its suspension of relations in 1980 due to the military coup, Turkey has never given up its decisive stance for membership. According to the reports of MFA Turkey (2019) and (2020), the chronological process of the EU-Turkey relations is as follows:

Turkey's application for membership to the EEC was carefully evaluated and conditionally accepted by the Ministerial Council of the EEC. Afterward, the Ankara agreement was signed on September 12, 1963, and it became effective on December 1, 1964. The main purpose of the Ankara agreement was to ensure three stages were met before the full membership to the EU. These stages are "preparation, transition, and establishment of the CU."

The second article of the Ankara agreement declares that:

''The aim of this Agreement is to promote the continuous and balanced strengthening of trade and economic relations between the Parties, while taking full account of the need to ensure an accelerated development of the Turkish economy and to improve the level of employment and living conditions of the Turkish people."

Another important aspect of the Ankara Agreement is article 28, in which it states:

‘‘As soon as the operation of this Agreement has advanced far enough to justify envisaging full acceptance by Turkey of the obligations arising out of the Treaty establishing the Community, the Contracting Parties shall examine the possibility of the accession of Turkey to the Community.”

The preparation period, which was expected to last five years, ended in 1973, for a total of nine years. After that, the Additional Protocol was signed in 1973, beginning the transitional period into its full membership with the EU. In this period, it was envisaged to ensure the free movement of trading goods and labor between the EU and Turkey. Afterward, because of political conflicts, relations between the EU and Turkey have been destabilized since the 1970s, and negotiations were officially suspended following the September 12, 1980, military coup.

After handling the military coup and solving its internal issues, Turkey reapplied to the EU for its ultimate membership in 1987 without waiting for the first two periods to finalize as stated in the Ankara Agreement. In 1989, the EU Commission rejected this application due to Turkey’s insufficient social, political, and economic conditions. This is why Turkey had to wait until 1995 to meet these conditions in order to establish CU with the EU. In 1995, the agreement between EU-Turkey CU was signed and went into force the following year in 1996.

The Helsinki Summit, held in 1999, is considered a cornerstone in the relations between the EU and Turkey. Turkey has been recognized as an unconditional candidate state by the Helsinki Summit. It decided to evaluate Turkey in equal conditions with the other candidates.

Turkey made some progress in the Brussels Summit, which was held in 2004. The council stated that Turkey had fulfilled all the political criteria, and negotiations for the membership would begin on October 3, 2005.

Up to the present moment, 16 out of the 35 chapters have been opened for consideration of membership to the EU. Because of the Cyprus issue and ongoing interruptions from other member countries, the negotiation process was hampered. Especially after 2010, some countries objected Turkey's advancement into the EU. Therefore, only a few chapters were able to open in the last decade, while 13 chapters opened between 2006 and 2013.

Table 2. EU-Turkey Bilateral Relations

Association	1963 Association Agreement (Ankara Agreement)	Establishes association between the European Economic Community (EEC) and Turkey, with the aim to continuously strengthen trade and economic relations, in particular through the progressive establishment of a customs union in three stages: preparatory, transitional and final, with protocols laying down the rules of the preparatory stage.
	1970 Additional Protocol	Lays down the rules for implementing the transitional stage of creating the customs union, including the progressive abolition of customs duties between the EEC and Turkey over twenty-two years.
Current bilateral preferential trade framework (BPTF) including CU for industrial goods	1995 Customs Union Decision	Establishes the customs union for industrial goods by the final stage which ensures that Turkey aligns its external tariffs to those of the EU. Also requires that Turkey aligns its customs and technical legislation to the EU as well as its commercial policy vis-à-vis third countries in the CU context.
	1996 Coal and Steel FTA	FTA on coal and steel products (including rules on competition).
	1998 Agriculture and Fisheries 'FTA'	Bilateral preferential concessions in agricultural and fisheries products.
Accession process	1999 Turkey candidate for EU accession	Turkey takes political commitment to progressively harmonize its national legislation with the EU acquis.
	2005 start of accession negotiations	Up to now, 16 out of the total 35 chapters have been opened.

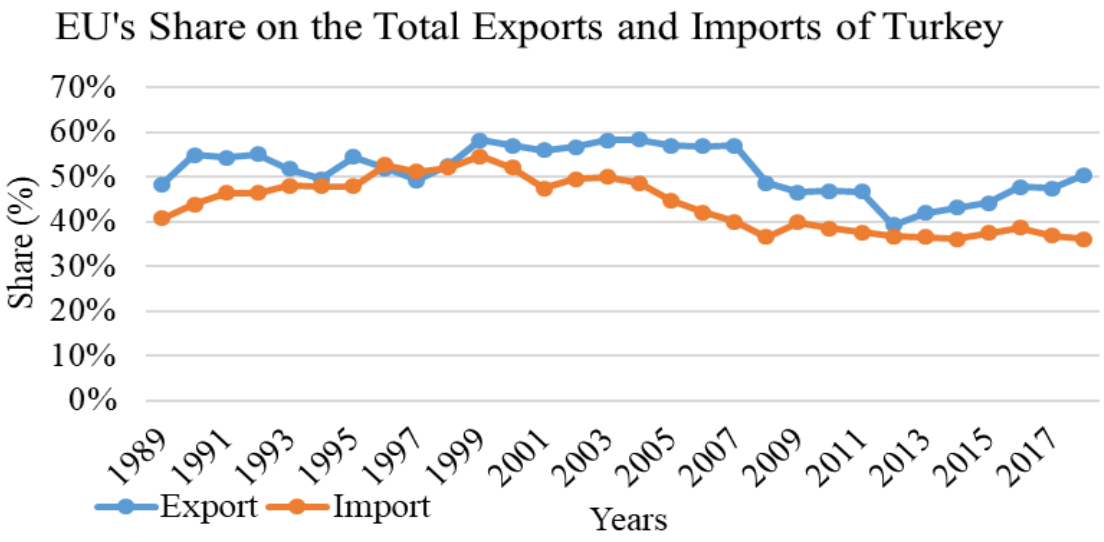
Source: European Commission (2016)

3.2. The European Union-Turkey Economic Relations

Turkish economy is among the top 20 economies globally and is the sixth-largest economy in Europe in terms of Gross Domestic Product (GDP). Turkey is a member of the G-20 representing one of the world's most powerful economies. It is also known as one of the major suppliers of agricultural products and textiles in the world.

On the other hand, the EU is one of the largest economies in the world, with approximately 453 million consumers and a per capita income of $ 44,436. The EU is the second-largest economy globally after the USA in terms of GDP of 17.1 trillion dollars. The exports and imports of the EU account for 15.2% and 14.7% of the total exports and imports of the world, respectively (Republic of Turkey Ministry of Trade, 2021b).

In Figure 3 it is seen that European countries have a significant share in Turkey's total exports and imports. According to the calculation made by the WITS (2019) data, the share of the EU-28 countries in Turkey's total exports was 48.30% in 1989 and 50.46% in 2018. On the other hand, for the imports, the share of the EU-28 was 40.75% in 1989 and 36.08% in 2018.



Source: Authors Creation Based on the Data from WITS

Figure 3. EU's Share on the Total Exports and Imports of Turkey

Table 3 indicates that the trade volume between Turkey and the EU increased significantly between 1996 and 2018, revealing the trade creation effect resulting from the CU. Although there were some decreases for some specific years during this period, it is observed that both imports and exports of Turkey with the EU have had an increasing trend since the beginning of the CU agreement. Considering the years when the decreases were observed, it is seen that the main reason for these decreases is due to economic contractions in Turkey as a result of the economic crisis. Some of these crises are the 1998 Russian financial crisis, the 2001 Turkish economic crisis, and the 2008 housing crisis.

Table 3. The EU's Share in Turkey's Total Exports and Imports

Year	World				European Union			
	Export ($)	Change (%)	Import ($)	Change (%)	Export ($)	Change (%)	Import ($)	Change (%)
1989	11.627.286	-	15.759.744	-	5.616.381	-	6.422.251	-
1990	12.959.382	11,46%	22.300.672	41,50%	7.108.534	26,57%	9.793.587	52,49%
1991	13.593.446	4,89%	21.046.997	-5,62%	7.374.979	3,75%	9.748.958	-0,46%
1992	14.714.608	8,25%	22.871.026	8,67%	8.087.858	9,67%	10.624.333	8,98%
1993	15.348.913	4,31%	29.429.301	28,68%	7.946.686	-1,75%	14.146.989	33,16%
1994	18.106.030	17,96%	23.267.977	20,94%	8.953.683	12,67%	11.147.057	-21,21%
1995	21.598.626	19,29%	35.707.437	53,46%	11.744.063	31,16%	17.077.754	53,20%
1996	23.047.717	6,71%	42.930.274	20,23%	11.979.135	2,00%	22.573.733	32,18%
1997	26.244.684	13,87%	48.585.060	13,17%	12.899.291	7,68%	24.860.357	10,13%
1998	26.881.362	2,43%	45.908.185	-5,51%	14.116.808	9,44%	23.896.506	-3,88%
1999	26.587.173	-1,09%	40.686.711	11,37%	15.463.629	9,54%	22.193.385	-7,13%
2000	27.485.359	3,38%	54.149.795	33,09%	15.671.478	1,34%	28.159.490	26,88%
2001	31.333.944	14,00%	41.399.079	23,55%	17.519.346	11,79%	19.641.145	-30,25%
2002	35.761.981	14,13%	51.270.196	23,84%	20.259.454	15,64%	25.373.654	29,19%
2003	47.252.836	32,13%	69.339.692	35,24%	27.466.501	35,57%	34.595.751	36,35%

Table 3 (continued).

2004	63.120.949	33,58%	97.539.766	40,67%	36.821.163	34,06%	47.380.829	36,96%
2005	73.476.408	16,41%	116.774.151	19,72%	41.857.301	13,68%	52.180.871	10,13%
2006	85.534.676	16,41%	139.576.174	19,53%	48.614.146	16,14%	58.789.987	12,67%
2007	107.271.750	25,41%	170.062.715	21,84%	61.134.118	25,75%	68.033.060	15,72%
2008	132.027.196	23,08%	201.963.574	18,76%	64.167.486	4,96%	73.867.505	8,58%
2009	102.142.613	22,64%	140.928.421	30,22%	47.496.964	25,98%	56.075.024	-24,09%
2010	113.883.219	11,49%	185.544.332	31,66%	53.410.937	12,45%	71.454.733	27,43%
2011	134.906.869	18,46%	240.841.676	29,80%	62.969.576	17,90%	90.531.110	26,70%
2012	152.461.737	13,01%	236.545.141	-1,78%	59.828.951	-4,99%	86.903.238	-4,01%
2013	151.802.637	-0,43%	251.661.250	6,39%	63.562.752	6,24%	92.007.904	5,87%
2014	157.610.158	3,83%	242.177.117	-3,77%	67.888.450	6,81%	87.513.649	-4,88%
2015	143.850.376	-8,73%	207.206.509	14,44%	63.505.263	-6,46%	77.645.666	-11,28%
2016	142.529.584	-0,92%	198.618.235	-4,14%	67.935.548	6,98%	76.587.410	-1,36%
2017	156.992.940	10,15%	233.799.651	17,71%	74.433.593	9,57%	85.999.907	12,29%
2018	168.023.391	7,03%	223.039.038	-4,60%	84.781.623	13,90%	80.465.618	-6,44%

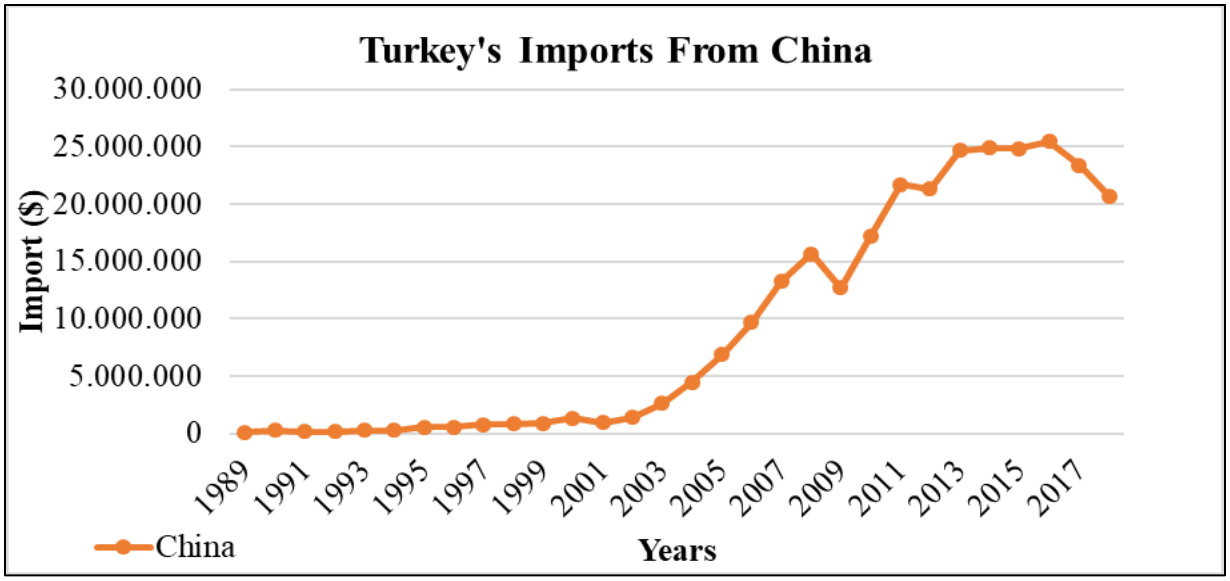
Source: Autor's Calculation Based on the Data from WITS

As shown in Table 4, the share of Turkey's foreign trade deficit originating from the EU in the total foreign trade deficit has been gradually decreasing over the years. This ratio was 53% in 1996, and it was -8% in 2018. For the first time in history, Turkey had a foreign trade surplus arising from its trade with the EU. This decrease in imports from the EU countries is potentially due to the good economic relations and increasing import volume with China in the last two decades. (see, Figure 4)

Table 4. The EU's Share in Turkey's Foreign Trade Deficit

Year	Foreign Trade Deficit			
	EU ($)	EU %	Non-EU Countries ($)	Non-EU Countries %
1996	-10.594.598	53%	-9.287.960	47%
1997	-11.961.066	54%	10.379.311	46%
1998	-9.779.698	51%	-9.247.125	49%
1999	-6.729.756	48%	-7.369.782	52%
2000	-12.488.013	47%	14.176.424	53%
2001	-2.121.799	21%	-7.943.336	79%
2002	-5.114.200	33%	10.394.015	67%
2003	-7.129.249	32%	14.957.606	68%
2004	-10.559.666	31%	23.859.151	69%
2005	-10.323.570	24%	32.974.173	76%
2006	-10.175.840	19%	43.865.659	81%
2007	-6.898.942	11%	55.892.023	89%
2008	-9.700.020	14%	60.236.359	86%
2009	-8.578.060	22%	30.207.748	78%
2010	-18.043.796	25%	53.617.317	75%
2011	-27.561.534	26%	78.373.273	74%
2012	-27.074.287	32%	57.009.118	68%
2013	-28.445.152	28%	71.413.461	72%
2014	-19.625.199	23%	64.941.760	77%
2015	-14.140.403	22%	49.215.730	78%
2016	-8.651.862	15%	47.436.789	85%
2017	-11.566.314	15%	65.240.397	85%
2018	4.316.005	-8%	59.331.652	108%

Source: Author's Calculation Based on the Data from WITS



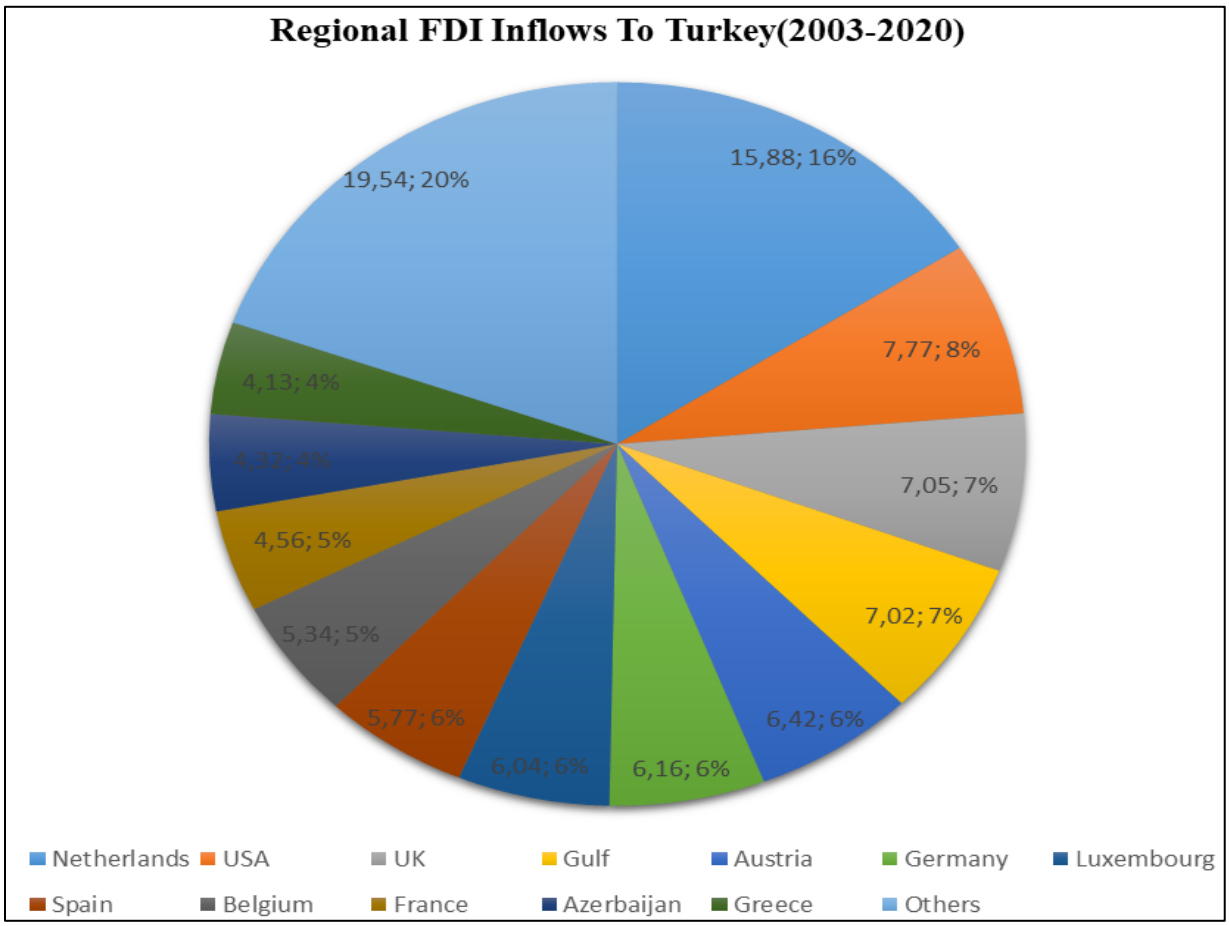
Source: Author's creation Based on the Data from WITS

Figure 4. Turkey's Imports from China

Because of its increasing economic performance in recent years and the structural economic innovations implemented in the last decade, Turkey has been the focus of many international investors. Turkey was ranked the 9th most popular foreign direct investment (FDI) destination in Europe in 2020. Moreover, Turkey became the second most popular FDI destination among developing European countries, after Poland, with a 16% share in 2020. (Investment office of Turkish Presidency 2020)

While the total FDI to Turkey between 1980 and 2002 amounted to 15 billion USD, it reached approximately 225 billion USD from 2003 to 2020. Over the past two decades, the greater part of the total FDI inflows originated from EU countries. (Investment office of Turkish Presidency 2020). According to this data, there was no improvement for the first five years in the amount of FDI after the CU agreement, as the amount of FDI was slightly less than one billion annually. However, the increases in FDI began in the early 2000s. This seems to be a consequence of the EU's decision of starting membership negotiations with Turkey in 2004. Netherlands,

United Kingdom, Austria, Germany, Luxembourg, Spain, Belgium, France, and Greece were the major EU countries accounting for approximately 60% of the total FDI inflows to Turkey. (see, Figure 5)



Source: Investment office of Turkish Presidency (2020)

Figure 5. Regional FDI Inflows to Turkey (2003-2020)

3.3. Contents of the EU-Turkey Customs Union Agreement

As of January 1, 1996, the customs duties applied to industrial goods and processed agricultural products between the EU and Turkey were abolished. Furthermore, Turkey started to apply the EU's common customs tariff to third countries (Republic of Turkey Ministry of Trade, 2020).

According to Association Council Decision No. 1/95, the main points of the EU-Turkey CU are as follows (Republic of Turkey Ministry of Trade Turkey, 2020).

- The agreement will only cover industrial goods. Tariffs and quotas applied by Turkey on all goods for which tariffs have not been reset during the transition period will be removed, and agricultural products will be excluded.
- For the processed agricultural products containing flour, oil, and sugar, industrial shares will be determined, and no tax will be charged on them.
- Turkey will make the necessary arrangements to harmonize with the EU on intellectual, industrial, and commercial property rights.
- Turkey will take the necessary measures for harmonization with the EU's common agricultural policy.

In accordance with the decision of the Association Council No. 1/95, in order to fulfill the obligations of the CU and to implement the EU common commercial policy, common rules on foreign trade, management of quotas, and protection against dumped and subsidized imports have been harmonized with the EU. In this context, the import regime of Turkey has been prepared, taking into account Turkey’s obligations under the CU agreement, as well as WTO commitments and the provisions of FTAs signed with the third countries. In addition, in order to ensure the free movement of goods, regulations on subsidies, taxation, and intellectual and industrial property rights have been made, taking into account international standards (Republic of Turkey Ministry of Trade, 2020).

4. Literature Review Regarding the Impact of the EU-Turkey Customs Union

The literature shows us that the impact of the EU-Turkey CU on Turkey's economy is analyzed utilizing different methodologies such as computable general equilibrium models, synthetic control methods, and gravity models.

Harrison et al. (1997) applied the computable general equilibrium model to analyze the impact of the EU-Turkey CU. They found that the CU generated a welfare gain between 1 and 1.5 percent of Turkey's GDP.

On the contrary, using the same model, Mercenier and Yeldan (1997) claim that the CU agreement does not meet the expectations of increasing welfare for Turkey. They further argue that the expected welfare cannot be achieved unless the non-tariff trade barriers are eliminated. Therefore, they concluded that only full membership to the EU, which removes non-tariff trade barriers, will increase welfare.

Togan (1997) investigated the possible effects of the CU on resource allocation by using nominal and effective protection rates. He claimed that the reduction of the nominal protection rates applied by the CU will lead to losses in tax revenues. Further, he argues that the new reforms implemented due to the CU will change the functioning of the markets.

In his other study, Togan (2000) re-evaluates the effect of the CU on Turkey taking into account export and import flows for Turkey. According to this study, CU has been deemed insignificant on Turkey's export to the EU. However, he states that there has been an increase in import activities from the EU and non-EU countries. In this context, he concludes that the increasing rate of Turkey's imports from the EU is higher than that of non-EU countries.

Neyapti et al. (2003) empirically analyzed the international trade of Turkey by observing changes after the CU. They observed data for more than 150 countries over the years 1980-2001,

and they claimed that the CU agreement has positively affected both the foreign trade of Turkey and the behavior of import-export. Moreover, in this study, they also observed that exports became more sensitive to real exchange rate changes. According to the study results obtained empirically, it was stated that the overvalued Turkish Lira in the post-CU period might have had a negative effect on exports.

Antonucci and Manzocchi (2006) utilize the gravity model with panel data consisting of Turkey's trade flows with 45 countries between 1967-2001. First, they check whether the model is good enough to explain Turkey's trade patterns. Then, they test whether there is already a "special" trade relationship between Turkey and the EU. They find that the gravity model is well aligned with Turkey's trade patterns, and there is no evidence of additional trade between the EU and Turkey.

Adam and Moutos (2008) investigate the impact of the EU-Turkey CU on the trade flows between Turkey and the EU 15 countries. They utilize a gravity model based on the data from 24 countries between 1988-2004. The study results show that CU has positively affected both exports and imports of Turkey to the EU-15 countries. Specifically, according to their estimation, Turkey's exports to the EU-15 countries increased by 31%, while imports increased by 65%.

Lehmann et al. (2007) Examine the sectoral trade flow between Turkey and the EU using data from 1988 to 2002. In this study, some of Turkey's most important export sectors have been considered, and it is claimed that the improvement in price competitiveness in Turkey led to an increase in exports for all sectors. They also practice a simulation that includes agricultural goods in the scope of the EU-Turkey CU, and the simulation results suggest that agricultural goods included, exports of those goods would significantly increase. It is seen that the effect of the CU

is relatively small on the non-agricultural goods compared to the simulated results of agricultural goods.

Kalayci and Artan (2009) empirically analyze how the customs union affected Turkey's exports to EU-15 countries. In the study, 16 countries are examined, including Turkey, for 2000-2007. The findings of the study indicate that the customs union significantly increased Turkey's exports to EU-15 countries.

Nart (2010) used panel data from 1990 through 2007 with a fixed effect to analyze the impact of the customs union on Turkey's trade flows. According to her empirical study, due to the customs union, trade volume has increased while the net export has decreased.

Ketenci (2014) investigates the impact of the EU-Turkey CU on Turkey's balance of trade. She employs a generalized method of moments using data from OECD countries between 1980 and 2012. The study's main findings show that Turkey's trade balance has improved due to the EU-Turkey CU.

Aytug et al. (2015) used the synthetic control method to estimate export and GDP level per capita, and they concluded that Turkey would have less of an export and GDP per capita in the absence of CU. Specifically, the export and GDP level of Turkey could be 38 and 13 percent less, respectively.

Magee, C. S. (2016) investigates the effects of the EU-Turkey CU by analyzing industrial level trade flows. This paper determines the difference between trade-creation and trade-diversion effects with the general equilibrium model by employing data from 1993 to 2010. It concludes that the trade creation effect of the Customs Union is twice as much as the trade diversion effect.

One of the most recent empirical studies concerning the impact of the EU-Turkey CU is conducted by Mertzanis, C. (2017). In this study, the determinants of the trade between Turkey

and the EU are analyzed using the gravity model. The trade with the EU-15 countries and five other countries between 1990 and 2016 are examined, and it is concluded that CU has a positive effect on trade. In addition, according to the study results, the increase in Turkey's trade volume is mostly triggered by the increase in Turkey's GDP and trading partners' GDP and is slightly affected by transportation costs.

Although this subject is still newsworthy in real life, the number of empirical studies on it has been gradually decreasing in the literature in recent years. In addition, most of the foregoing empirical studies are insufficient since they include a small group of countries or a limited time period in their datasets. In this study, considering this issue, 46 countries accounting for 80% of Turkey’s total trade flows are analyzed for the 1989-2018 time period.

5. Data and Methodology

In this study gravity model will be used to analyze the impact of the EU-Turkey CU on Turkey's trade flows. The model proposes that the economic size of countries magnetize them to trade with one another, while the greater distance between them lowers the magnetic effect.

The panel data used in this study is unbalanced because of a few missing countries for some years and comprises 46 countries, including EU-27, and Turkey's largest trading partners (Algeria, Brazil, China, Egypt, India, Iran, Iraq, Israel, Japan, Libya, Morocco, Russia, Saudi Arabia, South Korea, Switzerland, Ukraine, United Arab Emirates, United Kingdom, and the United States) for the period of 1989-2018. These countries accounted for 80% of Turkey's total trade flows in 2019. (Source: Global Edge) The advantage of using panel data is to examine the changes observed both in units and over time.

The data set includes Turkey's export and import flows, GDPs in US dollars and the distances between countries in kilometers. All data used in this study are obtained from the database of CEPII and most trading partners are chosen based on the data from Global Edge. Some of the greatest trading partners are listed in Table 7. Additionally, a dummy variable is formed for the EU-Turkey CU that takes the value of one for the EU-27 after 1996, and zero otherwise.

In most of the studies in the literature, the distance factor in the gravity models is measured as the crow flies between countries' capitals. Instead of this approach, the weighted distances between Turkey and trading countries are added into the model. The main idea behind this approach is to take into account the population-weighted distance between the most crowded cities (Mayer and Zignago, 2006).

A summary of the statistics of all dependent and independent variables used in the export and import models are presented in Table 5 and Table 6.

Table 5. Summary Statistics of Export Model Variables

Variable	Mean	Std. Dev.	Min	Max	Observations
lnX_{ij} overall	12.958	1.717	5.511	16.593	N = 1333
between		1.263	10.168	15.822	n = 46
within		1.205	6.314	15.248	T-bar= 28.978
$lnGDP_i$ overall	19.727	.700	18.488	20.655	N = 1358
between		.0387	19.710	19.857	n = 46
within		.699	18.504	20.671	T-bar = 29.521
$lnGDP_j$ overall	19.096	1.778	14.566	23.745	N = 1328
between		1.695	15.518	23.152	n = 46
within		.572	16.942	20.967	T-bar = 28.869
$lnDist_{ij}$ overall	7.699	.644	6.442	9.232	N = 1358
between		.647	6.442	9.232	n = 46
within		0	7.699	7.699	T-bar = 29.521
CU_{ij} overall	.474	.499	0	1	N = 1358
between		.388	0	1	n = 46
within		.319	-.410	.707	T-bar = 29.521

Source: Author's calculation on Stata

Table 6. Summary Statistics of Import Model Variables

Variable	Mean	Std. Dev.	Min	Max	Observations
lnM_{ij} overall	13.176	2.037	-.030	17.261	N = 1332
between		1.645	9.082	16.097	n = 46
within		1.246	2.234	16.581	T-bar= 28.956
$lnGDP_i$ overall	19.727	.700	18.489	20.655	N = 1358
between		.0387	19.710	19.857	n = 46
within		.699	18.506	20.671	T-bar = 29.521
$lnGDP_j$ overall	19.115	1.787	14.566	23.745	N = 1328
between		1.704	15.518	23.152	n = 46
within		.576	16.960	20.985	T-bar = 28.869
$lnDist_{ij}$ overall	7.746	.698	6.442	9.559	N = 1358
between		.701	6.442	9.559	n = 46
within		0	7.746	7.746	T-bar = 29.521
CU_{ij} overall	.474	.499	0	1	N = 1358
between		.388	0	.884	n = 46
within		.319	-.410	.707	T-bar = 29.521

Source: Author's calculation on Stata

Table 7. Most Trading Partners of Turkey and Their Shares

Partner	Export ($)	Export (%)	Import ($)	Import (%)	Balance
Germany	$16,617,492,227	9.19%	$19,278,825,939	9.17%	($2,661,333,712)
United Kingdom	$11,278,995,688	6.24%	$5,638,296,330	2.68%	$5,640,699,358
Iraq	$10,223,404,727	5.65%	$2,678,192,909	1.27%	$7,545,211,818
Italy	$9,753,403,290	5.39%	$9,349,566,650	4.44%	$403,836,640
United States	$8,978,403,489	4.96%	$11,847,544,776	5.63%	($2,869,141,287)
Spain	$8,139,094,146	4.50%	$4,446,112,450	2.11%	$3,692,981,696
France	$7,952,061,097	4.40%	$6,760,062,936	3.21%	$1,191,998,161
Netherlands	$5,761,792,372	3.19%	$3,202,985,033	1.52%	$2,558,807,339
Israel	$4,463,830,959	2.47%	$1,600,818,044	0.76%	$2,863,012,915
Russia	$4,152,137,036	2.30%	$23,115,236,226	11%	($18,963,099,190)
Romania	$4,073,195,350	2.25%	$2,770,907,789	1.32%	$1,302,287,561
UAE	$3,627,237,215	2.01%	$4,388,996,383	2.09%	($761,759,168)
Egypt	$3,508,812,771	1.94%	$1,903,804,826	0.91%	$1,605,007,945
Poland	$3,448,859,425	1.91%	$2,603,243,204	1.24%	$845,616,221
Belgium	$3,396,324,080	1.88%	$3,229,279,703	1.54%	$167,044,377
Saudi Arabia	$3,292,797,077	1.82%	$2,005,216,796	0.95%	$1,287,580,281
Iran	$2,737,252,376	1.51%	$3,608,218,512	1.72%	($870,966,136)
China	$2,726,407,095	1.51%	$19,127,997,104	9.09%	($16,401,590,009)
Bulgaria	$2,668,332,231	1.48%	$2,384,901,108	1.13%	$283,431,123

Source: Global Edge (2019)

The gravity model of trade, in its simplest terms, is based on “Newton's law of universal gravitation.” It was first presented by Jan Tinbergen in 1962 suggesting that bilateral trade flows can be estimated by the gravity equation obtained from Newton’s law of gravity (Chaney, 2013).

Tinbergen (1962) suggested that countries can be perceived as physical entities, and their masses can be expressed in terms of GDP. In addition, the distance between them can be considered as distance between their capitals or the largest cities. Afterward, he conducted an empirical study showing that international trade flows are positively related to the economic size of the countries while inversely proportional to the distance between them.

Linnemann (1966) investigated the factors that might have impact on trade between countries. He expanded the gravity model by integrating the population factor into it and suggested that, because of their increasing populations, countries will push themselves toward policies that tend to be self-sufficient, which will reduce trade between them.

The first contribution to the theoretical foundations of the empirical model was made by Anderson (1979). He derived the gravity equation from characteristics of expenditure systems and stated that the most common usage of the equation is restricted to countries with similar structure of traded-goods preference and similar transport cost and trade tax structures.

Bergstrand (1985) contributed to the microeconomic foundations of the gravity model by deriving it from a general equilibrium model. He also mentioned that other than standard variables of the gravity model, exchange rates also have a potentially significant effect on trade flows. In another study, Bergstrand (1989) considered per capita incomes as well as exporter and importer incomes.

As briefly mentioned above, the gravity model has been used in many different studies and provided robust results. It is also a favorable model when it comes to evaluating economic

integrations. In particular, there are many studies that utilize the gravity model in order to evaluate FTAs and CUs such as EU, MESCOUR, and NAFTA.

Likewise, this study investigates the impact of the EU-Turkey CU on Turkish foreign trade with the gravity model approach.

The basic gravity equation of trade is as follows:

$$T_{ij} = \frac{GDP_i^{\beta^1} x\, GDP_j^{\beta^2}}{D_{ij}^{\beta^3}}$$

Where: T_{ij} denotes a trade flow such as export, import or total trade from country i (origin) to country j (destination), GDP_i and GDP_j denotes economic size of two countries and D_{ij} denotes the distance between two countries.

Equation 1 can be obtained by taking log of both sides in the basic gravity equation, then it becomes as follows.

$$lnT_{ij} = ln\beta^1 GDP_i + ln\beta^2 GDP_j - ln\beta^3 D_{ij} \quad (1)$$

In addition to that, in order to consider the effect of the EU-Turkey CU, a dummy variable can be integrated to the model. And finally, the following equations can be used to estimate Turkey's import and export flows.

$$ln\, X_{ijt} = \beta_0 + ln\beta^1 GDP_{it} + ln\beta^2 GDP_{jt} - ln\beta^3 D_{ij} + \beta^4 CU_{ijt} + U_{ijt} \quad (2)$$

$$ln\, M_{ijt} = \beta_0 + ln\beta^1 GDP_{it} + ln\beta^2 GDP_{jt} - ln\beta^3 D_{ij} + \beta^4 CU_{ijt} + U_{ijt} \quad (3)$$

All variables that are used in model 2 and model 3 are explained below.

X_{ijt}: Export from Turkey to country j in time t

M_{ijt}: Import from Turkey to country j in time t

GDP_{it}: Turkey's GDP in time t

GDP_{jt}: GDP of country j in time t

D_{ij}: Distance between Turkey and country j

CU_{ijt}: The Customs Union Dummy that takes the value of one for the EU-27 after 1996, and zero otherwise.

U_{ijt}: Error term

6. Results

The regression results regarding the gravity model of the aggregate bilateral trade between Turkey and EU-27 and 19 other non-EU countries are presented in table 8 and table 9.

In order to decide between fixed effect (FE) and random effect (RE) in the models, the Hausman test is performed for both export and import models. The following hypothesis is established for testing.

H_0: RE model is appropriate

H_A: FE model is appropriate

The result of Hausman test for the export model is Prob > chi2 = 0.0007 and for the import model is Prob>chi2 = 0.1275

The results indicate that we have to reject H_0 in favor of H_A for the export model, which means that the RE model is not an appropriate model. On the other hand, we cannot reject H_0 for the import model, implying that the RE model is an appropriate model. Thus, the FE model is employed to estimate the export model, while the RE is used to estimate the import model.

The decision between country FE and year FE is generally made based on the previous relevant literature for the FE models. However, it is also important to have some reason for justification on this decision. In this study, country FE is employed to control country-specific characteristics that remain constant over time, such as culture, geography, climate, and borders.

Further, Breusch-Pagan and White tests are performed in order to test for heteroskedasticity. (see, Wooldridge, 2015) The result of Breusch-Pagan test is Prob>F = 0.0000 and the White test is Prob>F = 0.0000. According to the results, there is heteroskedasticity in both models. This is a frequently encountered result in panel data models. In the presence of heteroscedasticity, it is highly recommended to use robust regression to deal with it. (see,

Wooldridge, 2015) Therefore, all of the regression estimates in this study were made in robust regression format.

According to table 8 and table 9, coefficients of all explanatory variables in the models, including Turkey's GDP, GDP of the trading country, weighted distance, and the CU dummy, seem statistically significant. In addition, export and import models are entirely statistically significant, and they explain approximately 77% and 66% of Turkey's export and import flows, respectively.

Table 8. Regression Results of the Export Model

Variables	Model 1 (FE)	Model 1 (RE)	Model 2 (FE)	Model 2 (RE)
$lnGDP_{it}$	.740*** (.123)	.770*** (.103)	.630*** (.119)	.679*** (.104)
$lnGDP_{jt}$	.940*** (.121)	.899*** (.084)	.977*** (.113)	.922*** (.080)
$lnDist_{ij}$	0 (omitted)	-1.557*** (.198)	0 (omitted)	-1.523*** (.191)
CU_{ijt}	-	-	.368*** (0.099)	.323*** (.099)
Constant	-19.638 (1.205)	-7.425 (2.006)	-18.344 (1.259)	-6.507 (1.996)
R^2	0.766	0.766	0.773	0.772
Number of Observation	1309	1309	1309	1309
Number of groups	46	46	46	46
Hausman Test				0.0007
Breusch Pagan Test				0.0000
White Test				0.0000

*** significant at the 0.001 level, **significant at the 0.05 level, *significant at the 0.1 level

Table 9. Regression Results of the Import Model

Variables	Model 1 (FE)	Model 1 (RE)	Model 3 (FE)	Model 3 (RE)
$lnGDP_{it}$	.653*** (.129)	.624*** (.096)	.554*** (.147)	.542*** (.097)
$lnGDP_{jt}$	.946*** (.152)	.982*** (.097)	.976*** (.147)	1.00*** (.095)
$lnDist_{ij}$	0 (omitted)	-.776*** (.172)	0 (omitted)	-.759*** (.175)
CU_{ijt}	-	-	.336*** (0.111)	.295*** (.109)
Constant	-17.795 (1.754)	-11.919 (1.728)	-16.589 (1.927)	-10.961 (1.900)
R^2	0.656	0.656	0.661	0.661
Number of Observation	1310	1310	1310	1310
Number of groups	46	46	46	46
Hausman Test			0.1275	
Breusch Pagan Test			0.0000	
White Test			0.0000	

*** significant at the 0.001 level, **significant at the 0.05 level, *significant at the 0.1 level

Regression results reported in table 8 and table 9 show that the basic gravity model of trade fits Turkey's trade flows remarkably well. Specifically, a 1% increase in Turkey's GDP increases its exports and imports by 0.77% and 0.62%, respectively. On the other hand, a 1% increase in its trading partners' GDP increases Turkey's exports and imports by 0.89% and 0.98 %. Moreover, the distance between Turkey and its trading partner has a negative effect on both Turkey's export and imports. It is seen that a 1% increase in the distance between Turkey and its trading partner decreases Turkey's exports by -1.5% and its imports by -0.77%.

The results make sense based on the foundations of the gravity model, as Tinbergen (1962) stated that trade flows are positively related to the economic size of the countries and inversely proportional to the distance between them.

The study results also indicate that the CU dummy that stands for the EU-Turkey CU has a significantly positive effect on Turkey's trade flows as expected. It is seen that the customs union agreement has increased Turkey's exports and imports by 36% and 29%, respectively. The models used in this study give approximately the same results as some of the important empirical studies in the literature with extended panel data.

Adam and Moutos (2008), utilizing the gravity model, concluded that the CU increased both exports and imports of Turkey to the EU-15 countries. Similarly, using the gravity model, Mertzanis (2017) found that the impact of the CU on trade was positive but not extreme.

Strikingly, Aytug et al. (2015) found approximately the same result for Turkey's exports using the synthetic control method. According to this study results, the CU increased Turkey's exports by 38%. Obtaining the same results with different approaches shows the robustness of these results.

7. Conclusion

RTAs have grown in popularity across many countries over the past three decades. These countries have made many agreements to improve their well-being by gaining access to international markets and encouraging investment. Turkey, like many other countries, shifted its economic policies to orient itself outwards at the beginning of the 1980s. In this context, Turkey was involved in many RTAs, including the European CU. The EU-Turkey CU is one of Turkey's most important trade agreements as the EU is the largest trading region for Turkey.

The purpose of the CUs is to provide political integration as well as economic contributions to the member countries. Economically, it is expected that CUs will cause structural changes in the member economies because of changes in the relative prices of the trading goods. These changes are observed in production, consumption, and trade flows.

The aim of this study is to investigate the impact of the EU-Turkey CU on the trade flows between Turkey and its EU-27 and other main trading partners. The data used in this study is panel data and is drawn from the CEPII database. The advantage of using panel data is to examine the changes observed both in countries and over time.

For the analysis, the gravity model is used, seen as a workhorse of international trade theory founded by Tinbergen (1962). The gravity model is preferred over the other models because it has an acceptable structure for analyzing determinants of countries' bilateral trade flows. Moreover, due to its structure, the model is very convenient to include both economic and non-economic variables that explain the impact of the RTAs.

The study results show that the gravity model provides a good fit of Turkey's trade patterns. Specifically, Turkey's exports and imports are triggered by the increase in its and trading partners' GDP, while transportation costs decrease the volume of Turkey's bilateral trade flows.

In addition, the EU-Turkey CU has a significantly positive effect on Turkey's trade flows. The agreement has increased Turkey's exports by 36% and imports by 29%, respectively. It has a more positive effect on Turkey's exports than its imports, and it is potentially due to the increasing volume of Turkey's imports from China since the early 2000s shown in Figure 4. This study also reveals that Turkey's balance of trade arising from its trade with the EU has significantly improved over the years due to the increase in Turkey's exports more than its imports. The share of the European countries on Turkey's total foreign trade deficit was 53% in 1996, at the beginning of the CU agreement, and it was -8% in 2018 (see, Table 4).

Although there are some studies in the literature claiming that the EU-Turkey CU is detrimental to the Turkish economy, this study finds its effect to be positive as most of the foregoing studies by using quite extended data. (see, Adam and Moutos 2008, Mertzanis 2017, Aytug et al. 2015). Last but not least, the effects of the EU-Turkey CU on Turkey not only have economic impacts but also have political impacts as well. After completing the customs union process, Turkey will likely have a full membership to the EU, which means it will increase the scope of the customs union, including free movement of labor, liberalization in services, and further liberalization in agricultural trade.

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APPENDICES

Appendix A. STATA Outputs of the Export Model

```
                                                              ___  ____  ____  ____  ____(R)
                                                             /__    /   ____/   /   ____/
                                                            ___/   /   /___/   /   /___/
                                                              Statistics/Data analysis

      ___  ____  ____  ____  ____ ©
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  Notes:
        1. Unicode is supported; see help unicode_advice.
        2. Maximum number of variables is set to 5,000; see help set_maxvar.
        3. New update available; type -update all-

1 . use "C:\Users\hotgun\Desktop\TEZ\TEZ2\TurkeyOrigin.dta"

2 . xtset id year

  Panel variable: id (unbalanced)
   Time variable: year, 1989 to 2018
           Delta: 1 unit

3 . xtsum logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU

  Variable           |      Mean   Std. dev.       Min        Max |    Observations
  -------------------+--------------------------------------------+----------------
  logtra~o overall   |   12.9588   1.717098   5.511612   16.59359 |        N =    1333
           between   |             1.263885   10.16836   15.82204 |        n =      46
           within    |             1.205518   6.314674   15.24819 |   T-bar = 28.9783
                     |                                            |
  lngdp_o  overall   |  19.72717   .7007687   18.48834   20.65517 |        N =    1358
           between   |             .0387874   19.71069   19.85707 |        n =      46
           within    |             .6997951   18.50483    20.6716 |   T-bar = 29.5217
                     |                                            |
  lngdp_d  overall   |  19.09661   1.778362   14.56629   23.74511 |        N =    1328
           between   |             1.695666     15.518   23.15247 |        n =      46
           within    |             .5724704    16.9421   20.96705 |   T-bar = 28.8696
                     |                                            |
  lndist~e overall   |  7.699026   .6442091   6.442714   9.232575 |        N =    1358
           between   |             .6473004   6.442714   9.232575 |        n =      46
           within    |                    0   7.699026   7.699026 |   T-bar = 29.5217
                     |                                            |
  CU       overall   |  .4742268   .4995193          0          1 |        N =    1358
           between   |             .3882438          0   .8846154 |        n =      46
           within    |             .3195236  -.4103886   .7075601 |   T-bar = 29.5217

4 . xtreg logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU, fe
  note: lndistance omitted because of collinearity.

  Fixed-effects (within) regression               Number of obs     =      1,309
  Group variable: id                              Number of groups  =         46

  R-squared:                                      Obs per group:
       Within  = 0.7730                                         min =         17
       Between = 0.3479                                         avg =       28.5
       Overall = 0.4757                                         max =         30
```

```
                                                F(3,1260)         =    1430.55
corr(u_i, Xb) = -0.5572                         Prob > F          =     0.0000

------------------------------------------------------------------------------
logtradefl~o | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lngdp_o |   .6307944   .0518625    12.16   0.000     .5290479    .7325408
     lngdp_d |   .9773764   .0593115    16.48   0.000     .8610163    1.093737
  lndistance |          0  (omitted)
          CU |   .3688707   .0598288     6.17   0.000     .2514957    .4862458
       _cons |  -18.34424   .5657729   -32.42   0.000     -19.4542   -17.23428
-------------+----------------------------------------------------------------
     sigma_u |  1.3159394
     sigma_e |   .5636239
         rho |   .84499033   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(45, 1260) = 91.37                     Prob > F = 0.0000

5 . estimate store fe

6 . xtreg logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU, re

Random-effects GLS regression                   Number of obs     =      1,309
Group variable: id                              Number of groups  =         46

R-squared:                                      Obs per group:
     Within  = 0.7728                                         min =         17
     Between = 0.6257                                         avg =       28.5
     Overall = 0.6937                                         max =         30

                                                Wald chi2(4)      =    4331.37
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =     0.0000

------------------------------------------------------------------------------
logtradefl~o | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lngdp_o |   .6798437   .0445274    15.27   0.000     .5925717    .7671157
     lngdp_d |   .9229174   .0476492    19.37   0.000     .8295267    1.016308
  lndistance |  -1.523903   .1807701    -8.43   0.000    -1.878206     -1.1696
          CU |   .3239181   .0588174     5.51   0.000     .2086382     .439198
       _cons |  -6.507554   1.398741    -4.65   0.000    -9.249037   -3.766072
-------------+----------------------------------------------------------------
     sigma_u |   .6947456
     sigma_e |   .5636239
         rho |   .60308047   (fraction of variance due to u_i)
------------------------------------------------------------------------------

7 . estimate store re

8 . hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference       Std. err.
-------------+----------------------------------------------------------------
     lngdp_o |   .6307944     .6798437       -.0490493        .0265902
     lngdp_d |   .9773764     .9229174         .054459        .0353186
          CU |   .3688707     .3239181        .0449526        .0109546
------------------------------------------------------------------------------
                           b = Consistent under H0 and Ha; obtained from xtreg.
            B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

  Test of H0: Difference in coefficients not systematic
```

```
    chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =  17.05
Prob > chi2 = 0.0007
(V_b-V_B is not positive definite)

 9 . xtreg logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU, fe
note: lndistance omitted because of collinearity.

Fixed-effects (within) regression               Number of obs      =      1,309
Group variable: id                              Number of groups   =         46

R-squared:                                      Obs per group:
     Within  = 0.7730                                         min =         17
     Between = 0.3479                                         avg =       28.5
     Overall = 0.4757                                         max =         30

                                                F(3,1260)          =    1430.55
corr(u_i, Xb) = -0.5572                         Prob > F           =     0.0000

------------------------------------------------------------------------------
logtradefl~o | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lngdp_o |   .6307944   .0518625    12.16   0.000     .5290479    .7325408
     lngdp_d |   .9773764   .0593115    16.48   0.000     .8610163    1.093737
  lndistance |           0  (omitted)
          CU |   .3688707   .0598288     6.17   0.000     .2514957    .4862458
       _cons |  -18.34424   .5657729   -32.42   0.000     -19.4542   -17.23428
-------------+----------------------------------------------------------------
     sigma_u |  1.3159394
     sigma_e |   .5636239
         rho |   .84499033   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(45, 1260) = 91.37                     Prob > F = 0.0000

10 . predict e, residuals
(49 missing values generated)

11 . gen e2 = e^2
(49 missing values generated)

12 . reg e2 lngdp_o lngdp_d lndistance CU

      Source |       SS           df       MS      Number of obs   =     1,309
-------------+----------------------------------   F(4, 1304)      =     51.50
       Model |  1819.86273         4  454.965683   Prob > F        =     0.0000
    Residual |  11518.9074     1,304  8.83351797   R-squared       =     0.1364
-------------+----------------------------------   Adj R-squared   =     0.1338
       Total |  13338.7702     1,308  10.1978365   Root MSE        =     2.9721

------------------------------------------------------------------------------
          e2 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lngdp_o |   .8181675   .1330511     6.15   0.000     .5571499    1.079185
     lngdp_d |  -.3791171   .0618075    -6.13   0.000    -.5003702    -.257864
  lndistance |   1.412652   .1654438     8.54   0.000     1.088086    1.737217
          CU |  -1.723593   .1849302    -9.32   0.000    -2.086386     -1.3608
       _cons |  -16.96605   2.611861    -6.50   0.000    -22.08996   -11.84214
------------------------------------------------------------------------------
```

```
13 . xtreg logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU, fe
   note: lndistance omitted because of collinearity.

   Fixed-effects (within) regression               Number of obs      =      1,309
   Group variable: id                              Number of groups   =         46

   R-squared:                                      Obs per group:
        Within  = 0.7730                                         min =         17
        Between = 0.3479                                         avg =       28.5
        Overall = 0.4757                                         max =         30

                                                   F(3,1260)          =    1430.55
   corr(u_i, Xb) = -0.5572                         Prob > F           =     0.0000

------------------------------------------------------------------------------
logtradefl~o | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      lngdp_o |   .6307944   .0518625    12.16   0.000     .5290479    .7325408
      lngdp_d |   .9773764   .0593115    16.48   0.000     .8610163    1.093737
    lndistance |          0  (omitted)
            CU |   .3688707   .0598288     6.17   0.000     .2514957    .4862458
         _cons |  -18.34424   .5657729   -32.42   0.000     -19.4542   -17.23428
-------------+----------------------------------------------------------------
       sigma_u |  1.3159394
       sigma_e |   .5636239
           rho |   .84499033   (fraction of variance due to u_i)
------------------------------------------------------------------------------
   F test that all u_i=0: F(45, 1260) = 91.37                     Prob > F = 0.0000

14 . predict yhat, xb
   (30 missing values generated)

15 . gen yhat2 = yhat^2
   (30 missing values generated)

16 . reg e2 yhat yhat2

      Source |       SS           df       MS      Number of obs   =     1,309
-------------+----------------------------------   F(2, 1306)      =     37.98
       Model |  733.233355         2  366.616678   Prob > F        =    0.0000
    Residual |  12605.5368     1,306  9.65201899   R-squared       =    0.0550
-------------+----------------------------------   Adj R-squared   =    0.0535
       Total |  13338.7702     1,308  10.1978365   Root MSE        =    3.1068

------------------------------------------------------------------------------
          e2 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        yhat |  -4.196629   .4922652    -8.53   0.000    -5.162346   -3.230912
       yhat2 |   .1630655   .0188367     8.66   0.000      .126112    .200019
       _cons |   28.41386   3.179204     8.94   0.000     22.17695    34.65076
------------------------------------------------------------------------------

17 . xtreg logtradeflow_comtrade_o lngdp_o lngdp_d lndistance CU i.id , fe robust cluste
   > r(id)
   note: lndistance omitted because of collinearity.
   note: 2.id omitted because of collinearity.
   note: 3.id omitted because of collinearity.
   note: 4.id omitted because of collinearity.
   note: 5.id omitted because of collinearity.
   note: 6.id omitted because of collinearity.
   note: 7.id omitted because of collinearity.
   note: 8.id omitted because of collinearity.
   note: 9.id omitted because of collinearity.
   note: 10.id omitted because of collinearity.
   note: 11.id omitted because of collinearity.
   note: 12.id omitted because of collinearity.
   note: 13.id omitted because of collinearity.
```

```
note: 14.id omitted because of collinearity.
note: 15.id omitted because of collinearity.
note: 16.id omitted because of collinearity.
note: 17.id omitted because of collinearity.
note: 18.id omitted because of collinearity.
note: 19.id omitted because of collinearity.
note: 20.id omitted because of collinearity.
note: 21.id omitted because of collinearity.
note: 22.id omitted because of collinearity.
note: 23.id omitted because of collinearity.
note: 24.id omitted because of collinearity.
note: 25.id omitted because of collinearity.
note: 26.id omitted because of collinearity.
note: 27.id omitted because of collinearity.
note: 28.id omitted because of collinearity.
note: 29.id omitted because of collinearity.
note: 30.id omitted because of collinearity.
note: 31.id omitted because of collinearity.
note: 32.id omitted because of collinearity.
note: 33.id omitted because of collinearity.
note: 34.id omitted because of collinearity.
note: 35.id omitted because of collinearity.
note: 36.id omitted because of collinearity.
note: 37.id omitted because of collinearity.
note: 38.id omitted because of collinearity.
note: 39.id omitted because of collinearity.
note: 40.id omitted because of collinearity.
note: 41.id omitted because of collinearity.
note: 42.id omitted because of collinearity.
note: 43.id omitted because of collinearity.
note: 44.id omitted because of collinearity.
note: 45.id omitted because of collinearity.
note: 46.id omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      1,309
Group variable: id                              Number of groups  =         46

R-squared:                                      Obs per group:
     Within  = 0.7730                                         min =         17
     Between = 0.3479                                         avg =       28.5
     Overall = 0.4757                                         max =         30

                                                F(3,45)           =     274.38
corr(u_i, Xb) = -0.5572                         Prob > F          =     0.0000

                                  (Std. err. adjusted for 46 clusters in id)
------------------------------------------------------------------------------
             |               Robust
logtradefl~o |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lngdp_o |   .6307944   .1196577     5.27   0.000     .3897913    .8717974
     lngdp_d |   .9773764   .1135059     8.61   0.000     .7487638    1.205989
  lndistance |           0  (omitted)
          CU |   .3688707   .0992928     3.71   0.001     .1688847    .5688567
             |
          id |
           2 |           0  (omitted)
           3 |           0  (omitted)
           4 |           0  (omitted)
           5 |           0  (omitted)
           6 |           0  (omitted)
           7 |           0  (omitted)
           8 |           0  (omitted)
           9 |           0  (omitted)
          10 |           0  (omitted)
          11 |           0  (omitted)
          12 |           0  (omitted)
```

13	0	(omitted)				
14	0	(omitted)				
15	0	(omitted)				
16	0	(omitted)				
17	0	(omitted)				
18	0	(omitted)				
19	0	(omitted)				
20	0	(omitted)				
21	0	(omitted)				
22	0	(omitted)				
23	0	(omitted)				
24	0	(omitted)				
25	0	(omitted)				
26	0	(omitted)				
27	0	(omitted)				
28	0	(omitted)				
29	0	(omitted)				
30	0	(omitted)				
31	0	(omitted)				
32	0	(omitted)				
33	0	(omitted)				
34	0	(omitted)				
35	0	(omitted)				
36	0	(omitted)				
37	0	(omitted)				
38	0	(omitted)				
39	0	(omitted)				
40	0	(omitted)				
41	0	(omitted)				
42	0	(omitted)				
43	0	(omitted)				
44	0	(omitted)				
45	0	(omitted)				
46	0	(omitted)				
_cons	-18.34424	1.259117	-14.57	0.000	-20.88023	-15.80825
sigma_u	1.3159394					
sigma_e	.5636239					
rho	.84499033	(fraction of variance due to u_i)				

Appendix B. STATA Outputs of the Import Model

```
  ___  ____  ____  ____  ____(R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/
  Statistics/Data analysis

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Notes:
      1. Unicode is supported; see help unicode_advice.
      2. Maximum number of variables is set to 5,000; see help set_maxvar.
      3. New update available; type -update all-

1 . use "C:\Users\hotgun\Desktop\TEZ\TEZ2\Turkey_Destination.dta"

2 . xtset id year

Panel variable: id (unbalanced)
 Time variable: year, 1989 to 2018
         Delta: 1 unit

3 . xtsum log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu

Variable          |      Mean   Std. dev.       Min        Max    |    Observations
------------------+-----------------------------------------------+----------------
log_tr~d overall  |   13.17677   2.037903  -.0304592    17.2611    |     N =    1332
         between  |              1.645127   9.082828   16.09735    |     n =      46
         within   |              1.246337   2.234549   16.58111    |  T-bar = 28.9565
                  |                                               |
log_gd~o overall  |   19.11517   1.787673   14.56629   23.74511    |     N =    1328
         between  |               1.70428     15.518   23.15247    |     n =      46
         within   |               .576967   16.96066    20.9856    |  T-bar = 28.8696
                  |                                               |
log_gd~d overall  |   19.72718   .7007671   18.48968   20.65517    |     N =    1358
         between  |              .0387869   19.71074   19.85707    |     n =      46
         within   |              .6997935   18.50611    20.6716    |  T-bar = 29.5217
                  |                                               |
log_di~w overall  |   7.746675   .6980883   6.442714   9.559649    |     N =    1358
         between  |              .7015215   6.442714   9.559649    |     n =      46
         within   |                     0   7.746675   7.746675    |  T-bar = 29.5217
                  |                                               |
cu        overall |   .4742268   .4995193          0          1    |     N =    1358
         between  |              .3882438          0   .8846154    |     n =      46
         within   |              .3195236  -.4103886   .7075601    |  T-bar = 29.5217

4 . xtreg log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu, fe
note: log_distw omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      1,310
Group variable: id                              Number of groups  =         46

R-squared:                                      Obs per group:
     Within  = 0.6614                                         min =         17
     Between = 0.6796                                         avg =       28.5
     Overall = 0.6685                                         max =         30
```

```
                                                F(3,1261)         =     821.19
corr(u_i, Xb) = -0.2679                         Prob > F          =     0.0000

------------------------------------------------------------------------------
log_tradef~d | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
   log_gdp_o |   .9765326   .0745096    13.11   0.000     .8303563    1.122709
   log_gdp_d |   .5546124   .0655437     8.46   0.000     .4260258    .6831991
   log_distw |           0  (omitted)
          cu |   .3361803   .0748474     4.49   0.000     .1893411    .4830194
       _cons |  -16.58955   .7065076   -23.48   0.000    -17.97561   -15.20349
-------------+----------------------------------------------------------------
     sigma_u |  .94771148
     sigma_e |  .70746359
         rho |  .64215457   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(45, 1261) = 45.16                     Prob > F = 0.0000

5 . estimate store fe

6 . xtreg log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu, re

Random-effects GLS regression                   Number of obs     =     1,310
Group variable: id                              Number of groups  =        46

R-squared:                                      Obs per group:
     Within  = 0.6613                                         min =        17
     Between = 0.7522                                         avg =      28.5
     Overall = 0.7218                                         max =        30

                                                Wald chi2(4)      =   2601.07
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =    0.0000

------------------------------------------------------------------------------
log_tradef~d | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
   log_gdp_o |   1.003513   .0560445    17.91   0.000      .893668    1.113358
   log_gdp_d |   .5422319   .0539276    10.05   0.000     .4365357    .6479281
   log_distw |  -.7594119   .1833167    -4.14   0.000    -1.118706   -.4001177
          cu |   .2958428   .0728026     4.06   0.000     .1531523    .4385333
       _cons |  -10.96182   1.460283    -7.51   0.000    -13.82392   -8.099719
-------------+----------------------------------------------------------------
     sigma_u |  .75152228
     sigma_e |  .70746359
         rho |  .53017065   (fraction of variance due to u_i)
------------------------------------------------------------------------------

7 . estimate store re

8 . hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference       Std. err.
-------------+----------------------------------------------------------------
   log_gdp_o |    .9765326     1.003513      -.0269805        .0490988
   log_gdp_d |    .5546124     .5422319       .0123805         .037253
          cu |    .3361803     .2958428       .0403375        .0173756
------------------------------------------------------------------------------
                           b = Consistent under H0 and Ha; obtained from xtreg.
            B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

  Test of H0: Difference in coefficients not systematic
```

```
    chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =   5.69
Prob > chi2 = 0.1275
(V_b-V_B is not positive definite)

 9 . xtreg log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu, fe
note: log_distw omitted because of collinearity.

Fixed-effects (within) regression               Number of obs      =      1,310
Group variable: id                              Number of groups   =         46

R-squared:                                      Obs per group:
     Within  = 0.6614                                         min =         17
     Between = 0.6796                                         avg =       28.5
     Overall = 0.6685                                         max =         30

                                                F(3,1261)          =     821.19
corr(u_i, Xb) = -0.2679                         Prob > F           =     0.0000

------------------------------------------------------------------------------
log_tradef~d | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
   log_gdp_o |   .9765326   .0745096    13.11   0.000     .8303563    1.122709
   log_gdp_d |   .5546124   .0655437     8.46   0.000     .4260258    .6831991
   log_distw |           0  (omitted)
          cu |   .3361803   .0748474     4.49   0.000     .1893411    .4830194
       _cons |  -16.58955   .7065076   -23.48   0.000    -17.97561   -15.20349
-------------+----------------------------------------------------------------
     sigma_u |  .94771148
     sigma_e |  .70746359
         rho |  .64215457   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(45, 1261) = 45.16                     Prob > F = 0.0000

10 . predict e, residuals
(48 missing values generated)

11 . gen e2 = e^2
(48 missing values generated)

12 . reg e2 log_gdp_o log_gdp_d log_distw cu

      Source |       SS           df       MS      Number of obs   =     1,310
-------------+----------------------------------   F(4, 1305)      =     13.83
       Model |  597.650301         4  149.412575   Prob > F        =     0.0000
    Residual |   14100.39     1,305  10.8048965   R-squared       =     0.0407
-------------+----------------------------------   Adj R-squared   =     0.0377
       Total |  14698.0403     1,309  11.2284494   Root MSE        =     3.2871

------------------------------------------------------------------------------
          e2 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
   log_gdp_o |  -.4200518   .0675697    -6.22   0.000    -.5526089   -.2874947
   log_gdp_d |   .2704034   .1476214     1.83   0.067    -.0191978    .5600047
   log_distw |   .1466825   .1648859     0.89   0.374    -.1767879     .470153
          cu |   -.675538   .2011388    -3.36   0.001    -1.070129   -.2809472
       _cons |   3.245562   2.873838     1.13   0.259    -2.392287    8.88341
------------------------------------------------------------------------------
```

```
13 . xtreg log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu, fe
   note: log_distw omitted because of collinearity.

   Fixed-effects (within) regression               Number of obs      =       1,310
   Group variable: id                              Number of groups   =          46

   R-squared:                                      Obs per group:
        Within  = 0.6614                                         min =          17
        Between = 0.6796                                         avg =        28.5
        Overall = 0.6685                                         max =          30

                                                   F(3,1261)          =      821.19
   corr(u_i, Xb) = -0.2679                         Prob > F           =      0.0000

   ------------------------------------------------------------------------------
   log_tradef~d | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
   -------------+----------------------------------------------------------------
      log_gdp_o |   .9765326   .0745096    13.11   0.000     .8303563    1.122709
      log_gdp_d |   .5546124   .0655437     8.46   0.000     .4260258    .6831991
      log_distw |           0  (omitted)
             cu |   .3361803   .0748474     4.49   0.000     .1893411    .4830194
          _cons |  -16.58955   .7065076   -23.48   0.000    -17.97561   -15.20349
   -------------+----------------------------------------------------------------
        sigma_u |  .94771148
        sigma_e |  .70746359
            rho |  .64215457   (fraction of variance due to u_i)
   ------------------------------------------------------------------------------
   F test that all u_i=0: F(45, 1261) = 45.16                     Prob > F = 0.0000

14 . predict yhat, xb
   (30 missing values generated)

15 . gen yhat2 = yhat^2
   (30 missing values generated)

16 . reg e2 yhat yhat2

          Source |       SS           df       MS      Number of obs   =     1,310
   -------------+----------------------------------   F(2, 1307)      =     32.69
           Model |  700.237229         2  350.118615   Prob > F        =     0.0000
        Residual |  13997.803      1,307  10.7098722   R-squared       =     0.0476
   -------------+----------------------------------   Adj R-squared   =     0.0462
           Total |  14698.0403     1,309  11.2284494   Root MSE        =     3.2726

   ------------------------------------------------------------------------------
              e2 | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
   -------------+----------------------------------------------------------------
            yhat |  -2.893895   .5396793    -5.36   0.000    -3.952627   -1.835162
           yhat2 |   .0973763   .0203026     4.80   0.000     .0575471    .1372055
           _cons |   22.25394    3.54664     6.27   0.000     15.29621    29.21167
   ------------------------------------------------------------------------------

17 . xtreg log_tradeflow_comtrade_d log_gdp_o log_gdp_d log_distw cu, re robust cluster(
   > id)

   Random-effects GLS regression                   Number of obs      =       1,310
   Group variable: id                              Number of groups   =          46

   R-squared:                                      Obs per group:
        Within  = 0.6613                                         min =          17
        Between = 0.7522                                         avg =        28.5
        Overall = 0.7218                                         max =          30

                                                   Wald chi2(4)       =      490.06
   corr(u_i, X) = 0 (assumed)                      Prob > chi2        =      0.0000
```

(Std. err. adjusted for **46** clusters in id)

log_tradef~d	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
log_gdp_o	**1.003513**	**.0950472**	**10.56**	**0.000**	**.8172241**	**1.189802**
log_gdp_d	**.5422319**	**.0978512**	**5.54**	**0.000**	**.3504471**	**.7340167**
log_distw	**-.7594119**	**.1755692**	**-4.33**	**0.000**	**-1.103521**	**-.4153027**
cu	**.2958428**	**.1092164**	**2.71**	**0.007**	**.0817826**	**.509903**
_cons	**-10.96182**	**1.900295**	**-5.77**	**0.000**	**-14.68633**	**-7.237311**
sigma_u	**.75152228**					
sigma_e	**.70746359**					
rho	**.53017065**	(fraction of variance due to u_i)				

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