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School of Slavonic and East European Studies

IMESS: Economics & Business

Master thesis

2021 **XIANGYI KONG**

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The Trade Effects of the EU-Turkey Customs Union: Based on the Gravity Model

Master thesis

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Abstract

In view of the postponement of negotiations for the modernization of the EU-Turkey customs union, this paper is aimed to look back and examine the ex-post impacts of the CU by examining its trade creation and diversion effects. The study tests effects of 44 countries (including Turkey, 28 EU and 15 non-EU countries) with aggregated data for time period from 1989 to 2019 and disaggregated sectoral trade data from 1995 to 2019. For estimation, the gravity model with strong theoretical and empirical foundation is used by combining various fixed effects with PPML method. The results from the aggregated analysis confirm the trade-promoting effects of the EU-Turkey customs union with mixed effects on both trade within the members (intra-trade creation effects) and trade with non-members (extra-trade creation effects). But the trade diversion is not significantly proved in the model. Besides, a substantial heterogeneity in the CU effect is found across different industries, suggesting the CU has significantly improved the trade on textiles, transportation, machinery, metals and plastics/rubbers, but negligibly influence agriculture, mineral and chemicals. Furthermore, the study also evidences that the impact of the CU is stronger in EU's export to Turkey than Turkey's export to the EU. Finally, CU's different impacts for each EU members are also demonstrated.

Abstrakt

S ohledem na odložené jednání o modernizaci celní unie mezi EU a Tureckem je cílem této práce ohlédnout se zpět a posoudit ex post dopady celní unie zkoumáním jejích vlivů na vytváření a odklon obchodu. Studie zkoumá vliv ve 44 zemí (včetně Turecka, 28 zemí EU a 15 zemí mimo EU) s agregovanými údaji za období od roku 1989 do roku 2019 a disagregovanými údaji o odvětvovém obchodu od roku 1995 do roku 2019. Pro odhad byl použit gravitační model se silným teoretickým a empirickým základem

spolu s různými fixními efekty metody PPML. Výsledky agregované analýzy potvrzují smíšené účinky celní unii v podpoře obchodu mezi EU a Tureckem jak na obchod mezi vlastní členy (účinky vytváření vnitřního obchodu), tak na obchod s nečleny (účinky vytváření vnějšího obchodu). V modelu však není významně prokázán odklon obchodu. Kromě toho, že byla zjištěna značná heterogenita účinku celní unie v různých průmyslových odvětvích, nasvědčuje tomu, že celní unie významně zlepšila obchod s textilem, dopravou, stroji, kovy a plasty/kaučuku, ale zanedbatelně ovlivňuje zemědělství, obchod s minerály a chemikáliemi. Studie dále dokazuje, že celní unie má silnější dopad při vývozu z EU do Turecka než při vývozu z Turecka do EU. Nakonec jsou také demonstrovány různé dopady celní unie na jednotlivé členy EU.

Keywords

The EU-Turkey Customs Union, Gravity Model, PPML estimation, Trade Creation, Trade diversion, Turkey, EU

Klíčová slova

Celní unie mezi EU a Tureckem, gravitační model, odhad PPML, tvorba obchodu, odklon obchodu, Turecko, EU

Range of thesis: 22,284 (Word Accounts), 103(Pages)

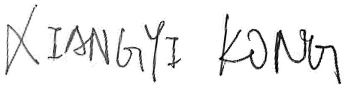
Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague 27 July, 2021 XIANGYI KONG



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Name: XIANGYI KONG

Program: IMESS: Economics & Business

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Dissertation title: The Trade Effects of the EU-Turkey Customs Union: Based on Gravity Model

Head of Seminar: Jiri Vykoukal

Supervisor: Petr Jeřábek

Research Questions: Due to current political problems between Turkey and the EU, it is hard for Turkey to join the EU. Therefore, these structural problems and conjunctural challenges may put pressure to both parties to revise the existing CU. In order to modify the original CU policies, the EU needs to understand the influences of current CU policies, and in which part it benefits countries most. Therefore, it is important to evaluate the trade effects of the EU-Tukey Customs Union: whether it plays an important role in stimulating the trade activities and bringing more revenues between EU member states and Turkey? What other factors motivate the trade? Is there any industry specific effects? Are the effects consistent for different countries? etc. The paper will discuss the issue based on these questions, investigating the effects of the CU, providing some policy implications.

Sources: Data can be obtained from UN Comtrade database, World Bank database, CEPII Database. The past literature can be obtained from UCL online library, EU commission work paper, etc.

Methodology: In the research, the gravity model will be applied to evaluate the trade effects of the CU. This method has been widely applied in social science evaluation and become a common instrument in international trade analysis after Carey (1858) firstly applied the gravity model (from physics) in studying human behavior. In analogy to Newton's law of gravitation, the traditional gravity model (Tinbergen 1962; Poyhonen 1963) indicates that the trade between two countries is determined by national income of the two countries and the distance between them. Later, Anderson and van Wincoop (2003) further extends the model by involving multilateral resistance terms, which will be the basic model for the dissertation. In addition to Pooled OLS and fixed effect model, the PPML estimator will also be applied (Santos Silva and Tenreyro 2006; Yotov et.al., 2016).

Proposed Structure:

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2.2 Gravity Model
2.3 Theoretic Analysis of CU
3. Current Situation of EU-Turkey Trade
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3.2 The Trade Indexes
4. The Trade Effects of EU-Turkey CU: Based on Theoretic Analysis
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5.1 Data
5.2 Methodology and Formula
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   5.2.1 Model 1 (OLS, FE, RE, PPML)
   5.2.2 Model 2 (Based on Different Industry)
   5.2.3 Model 3 (Different Effects on different EU members)
   5.2.4 Forecasting the Trade (Or Test the Trade Potential)
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Contents

1. Introduction

The EU-Turkey customs union (CU) implementation in December 1995 opens a new chapter in the relations between these two regions, which significantly improved their trade liberalization and economic integration. According to DOTS statistics (2020), Turkey's exports to the EU jumped by 400.7% from 1996 to 2015, reaching $56.48 billion, and imports from the EU increased from $21.1 billion to $76.8 billion, a growth rate of 264.5%.

However, some design flaws in original agreements such as constraint scopes, asymmetry structure, the existence of non-tariff barriers (NTB) have hindered both parties from gaining higher benefits from the customs union. Together with the promotion of the macroeconomics situation, the Turkish Ministry of Economy and the European Commission (EC) agreed to modernize the 20-year-old Customs Union Agreement and applied for a mandate to state negotiations in 2016. But in 2017, the preparations for the reform of the customs union were publicly opposed by the German government due to the concerns about issues such as human rights, democracy, and political freedoms in Turkey (Höhler, 2017; Tastan, 2017). Later in 2018, Ankara's naval operations near the Greek islands and Cyprus further deteriorate their relationship. Turkey's involvement in the Libyan and Syrian conflicts has led many Europeans to see its policies in the Middle East as destabilizing. It is only recently that tensions have begun to be defused due to the positive signals from Turkey for the EU-Turkey relations, including pausing its naval activities, resuming diplomacy with Greece, and signaling that it wanted better relations with Europe (Scazzieri, 2021). Therefore, the European Council can offer Turkey a forward-looking agenda that explores win-win options to develop new trade and economic relations with Turkey, including through the modernization of the customs union.

Given this complex political situation and expectations for future modernization of the customs union, it is essential to look back and assess the effects of the current CU

between the EU and Turkey. Therefore, the paper's main research objective is to investigate whether the EU-Turkey customs union has significantly improved the trade of these two regions?

In fact, this paper is not the only one to discuss the problem. Two large-scale studies (World Bank, 2014; BKP, Panteia and AESA, 2016), which are used to prepare negotiation talks between the EU and Tukey, reached clear conclusions about the effects of the EU-Tukey customs union on bilateral trade flows based on the gravity model. In contrast to the World Bank (2014) results indicating no statistically significant effects, BKP, Panteia, and AESA (2016) found that the EU-TUR CU negatively influences the bilateral goods trade. In addition, many other studies based on gravity modeling also examined the trade effects of this customs union (Antonucci and Manzocchi, 2006; Neyapti, Taskin, and Üngör, 2007); Akan and Balin, 2016; Frede and Yetkiner, 2017). However, the conclusions are vary depending on the focus and methodology of studies. In this way, the paper tries to provide a more comprehensive understanding of the EU-Turkey customs union effect, which is proposed in the main research question by filling the gaps in past literature with some innovative ways.

According to the customs union theory (Viner, 1950), the effects of the CU can be divided into trade creation (with members or non-members) and trade diversion (mainly with non-member countries). Unlike trade creation which always benefits the social welfare, trade diversion leads to inefficiency in global production and also be harmful to member countries when the cost of production inefficiency exceeds the consumer surplus. Therefore, in addition to the focus on how the customs union impact the intra-bloc trade flows between the EU and Turkey, the trade diversion effects with third countries are also examined to find whether the net trade effect of the CU is positive. These combined effects are seldom investigated in the current academic study since most researchers concentrate more on the trade creation between the members or changes in one country's trade flows. Only World Bank (2014) and Magee (2016) tried

to figure out the different effects of trade creation and diversion, but the results are inconclusive. In this way, our model will give more information about how the customs union influences trade between the EU and Turkey and non-member countries of the world. Also, this research question can help to investigate how the asymmetric structure of CU potentially affects members' trade with third countries.

Besides, the paper also uses trade flows data at the industry level in addition to most aggregated trade data analysis to measure the customs union's impact on different sectors. By analyzing the RCA index and IIT index, we will initially obtain the comparative advantages of each trade industry for both regions and their changes with the implementation of the customs union. The primary model of gravity equation will further examine the trade effects of the EU-TUR CU on top-8 trading sectors (Textiles, Transport Equipment, Machinery, Metals, Chemicals, Minerals, Agriculture and Plastics/Rubbers). Since the original customs union between the EU and Tukey does not include all trading items, some industries may gain limited benefits from the agreements. Therefore, this sub-question results will help us provide some suggestions for future modernization in trading sectors included.

In addition, the effects of the customs union may vary on trade direction, so possible asymmetry of trade effects of the EU-TUR CU in the direction of trade, that is, for EU versus Turkish exports to another, is examined.

Finally, different effects of the EU-Turkey CU for individual countries are conducted. Although all the nations can benefit from trade liberalizations according to general economic theories (Jackson, 2006), recently, many researches on regional trade agreements have implied that the RTAs may only bring economic growth to some specific countries. Therefore, the following sub-question is raised: are there any heterogeneous directional impacts of the EU-Turkey customs union observed for each EU member country?

As for the datasets and methodology applied in the paper, some innovations are also proposed. First, the data size covered is more extensive than most of past literature, containing 44 countries (including Turkey, 28 EU counties, and 15 non-EU countries), which are all important trading partners with Turkey with time period from 1989 to 2019. This long time examined will give us more complete and reliable results of the study. Second, the primary model applied in the study is the gravity model, which would be estimated by OLS, fixed effects, and PPML. In the past, most experts applied pooled OLS model or fixed-effects model, which controlling for country pair dummies or time dummies (Antonucci and Manzocchi, 2006; Akan and Balin, 2016). However, recent gravity estimation developments suggest that considering exporter-time, importer-time, and country-pair fixed effects will give more precise and valuable results. Therefore, the fixed effects with different settings will be taken into account when regressing. In addition, the PPML estimator is used to solve the zero trade problem, which had been ignored in most EU-Turkey customs union impact assessments.

The rest of this article is structured as follows. Chapter 2 discusses the history and recent challenges of the EU-Turkey Customs Union. Chapter 3 provides a literature review on 1) the theory of Customs Union, 2) theoretical foundations and empirical studies about the gravity model, 3) existing literature in studying trade effects of the CU between the EU and Turkey. Chapter 4 presents the current trade analysis between the EU and Turkey, including the overall situation and sectoral structure research. Chapter 5 introduces the model and data applied in the further quantitative evaluation. Chapter 6 gives the empirical results, and Chapter 7 concludes the study.

2. The EU-Turkey Customs Union

In this section, the history and development of the customs union between the EU and Turkey will be presented, allowing us to understand better the importance of this agreement and the need for future reform of the customs union.

2.1 The Establishment of the EU-Turkey CU

The origins of the customs union between the European Union and Turkey can be traced back to the last century. In order to end frequent conflicts between neighbors and economically and politically secure lasting peace after World War II, the union of European states gradually formed. In 1950, the European Coal and Steel Community was first established. And in 1957, the Treaty of Rome created the European Economic Community (EEC), which built a common market for the movement of goods, services, people, and capital among its members by eliminating most trade barriers (Carbaugh and Robert J., 1992). Later, the EEC began its enlargement process in the European Area, trying to grow into a strong community against the two major powers (the United States and the Soviet Union). And spontaneously, the union attracted many new members.

In 1959, Turkey first asked for an association with the EEC to further extend its cooperation with the West. In fact, Turkey has been closely watching economic and political developments in Western Europe for years. Since many years ago, Turkey has played an important role in European politics (Y. Elveren and Kar, 2005). It has been a reliable friend of the West since the Second World War. Besides, it has become a founding member of all essential other European organizations, a member of the OECD in 1948, the Council of Europe in 1949, the NATO in 1952 (Pala, 2011).

However, this application was not admitted by the EEC in 1959. But it led Turkey to sign the Ankara Agreement in 1963. The agreement envisaged creating a ‘Customs Union’ in three successive stages so that Turkey could trade goods with the European

Economic Community without restrictions. Besides, the agreement also contemplated integration in many areas such as free movement of workers, liberalization of capital flows, services, and the right of establishment. Annexed by the Additional Protocol in 1970, the detailed rules to progressively remove tariffs and quotas on industrial goods were signed, with a transition phase for 12 and 22 years. This protocol entered into force in 1973, followed by Turkey's application for full EU membership in 1987. On 31 December 1995, the Customs Union agreement entered into force and started a new association phase between Turkey and the European Community. And therefore, Turkey became the first non-EU country that entered a substantial customs union with the European Union (European Commission, 2020).

2.2 The framework of the CU

2.2.1 Scope

The customs union between the EU and Turkey covers all industrial products and processed agricultural products. A preferential agreement was applied to coal and steel products (1996), agricultural products (1998). In other words, the deal does not cover trade in services, harmonized public procurement, and business in raw agricultural and fishery goods. Its primary function has been to remove tariffs on most of the manufacturing goods. Still, it does not focus on abrogating non-tariff barriers (NTBs), which also impede trade in goods but particularly in services.

2.2.2 Structure

Following the CU decision of the Association Council, Turkey has undertaken various alignments and regulation changes to adapt to the EU framework.

Firstly, Turkey and the EU build a single customs space. Turkey needs to abolish all duties and quotas on imports of industrial goods from the EU. Besides, the country needs to harmonize its tariffs with the EU's Common External Tariff (CET) and equivalent charges on goods imported from outside these countries. As a result, this

action eliminates the need for 'rules of origin' (RoO) verification of trading products. The rules of origin (RoO) is a criterion needed to identify the national origin of a product to ensure that only the outcomes of the contracting parties (usually in FTA) receive preferential access or special tariff rates under the agreement. The application of the RoO usually tends to prevent exports from third countries via further FTA members with the lowest tariff (Yalcin and Felbermaryr, 2019). In reality, proving the proper origin of a product to customs authorities when entering a country is time-consuming and costly. Therefore, the customs union ensures the free movement of industrial goods between the EU and Turkey. Since then, Turkey's weighted average rates of protection through customs duties on industrial imports from countries in the European Union and the European Free Trade Association reduced from approximately 10% to 0% as of 1 January 1996. And for products imported from third countries, the rate was 16% before implementing the customs union, declined to 5.4% in 2019 (Turkish Ministry of Trade, 2020).

In addition, the adaptation of relevant Turkish legislation to the EU's laws and competition policies to function are required according to the customs union. Accordingly, Turkey had to adjust its national regulations with the related European Union laws like competition policies, the Common Commercial Policy (CCP), technical legislation, and the approximation of laws on protecting intellectual property. Besides, a State Aid Monitoring and Supervision Board are also obliged for Turkey to create to align state aid control with the EU framework (though the law is only partially enforced now). The Treaty is generally created to prohibit State aid that helps companies gain advantages over competitors by government support (Hakura, 2018). To fulfill these terms from the CU, Turkey first introduced a Competition Law in 1994 and then established the organization of the Competition Authority in 1997 (Yilmaz, 2010).

Although Turkey has still not fully complied with its legislation with the EU *acquis*

until now, the establishment of the institutions mentioned above and regulatory harmonization with the EU improve the formation of a more rule-oriented and transparent commercial environment in international trade. Consequently, the trade flows have increased more than sixfold after the establishment of the EU-Turkey customs union. Besides, the liberalization of tariffs and alignments with the EU *acquis* has significantly advanced Turkey's global competitiveness and promoted its integration into the global value chain and European production networks (Olpak, 2018).

2.3 Modernization in 2016

In December 2016, the EU Trade Commissioner and Turkey's Minister of Economy agreed to negotiate about the modernization of the Customs Union with the extension of bilateral trade relations to areas such as services, public procurement, and sustainable development. The pressing necessity for the reform can be summarized for several reasons as below.

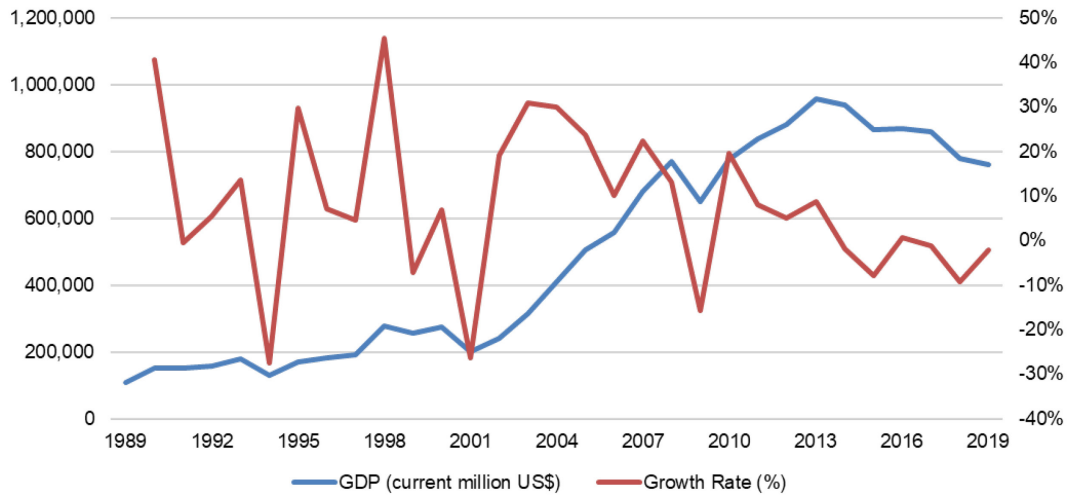
2.3.1 The Economic and Political Motives for the Modernization

The economies and trade performance of Turkey and the EU have developed dramatically by the current Customs Union, promoting further cooperation between them. According to Eurostat (2016), advances in both export and import numbers push Turkey-EU bilateral trade volume to $151.3 billion in 2015, making Turkey the EU's fifth-largest trade partner, surpassing Norway. At the same time, the EU is the most critical trading countries for Turkey, producing 41% of Turkey's total trade. Besides, the EU remains Turkey's most important economic partner in trade, foreign investment, and tourism. In this sense, the original Customs Union contributed significantly to the economic development of the early 2000s in both the EU and Turkey.

However, the Turkish economy is siding backward recently. From Figure 1, it can be proved that the GDP of Turkey enjoyed significant improvement in the economy after

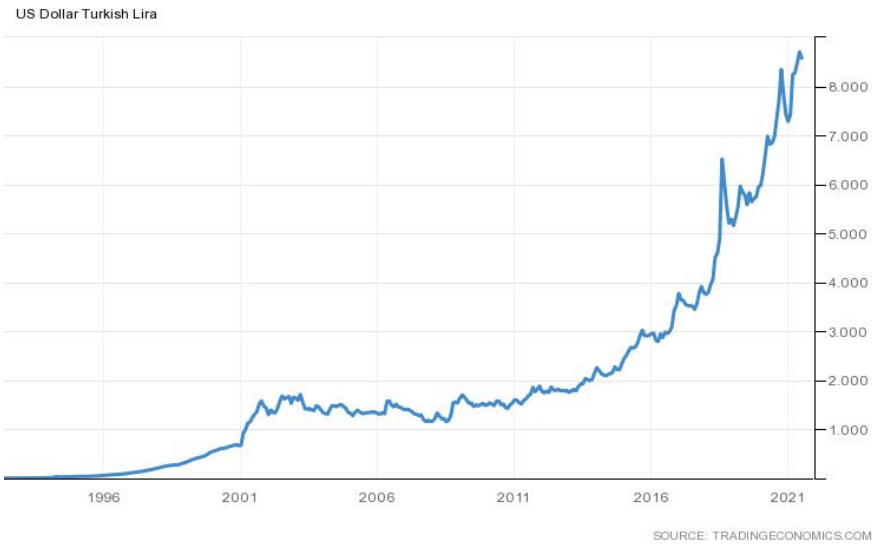
its stability of the political environment in 2002. In the following years until 2008, Turkey has experienced an annual GDP growth rate of over 10% (even achieved 30% in 2004). After recovery from the financial crisis, Turkey's growth in GDP remains a relatively stable size, but the growth rate decreases. However, from 2013, Turkey's GDP started to drop, and the trend continues until recently. Besides, a dramatic increasing devaluation of the Turkish Lira can be found in Figure 2, together with double-digit inflation and high political uncertainty. All of these fragilities of the economic situation make the EU indispensable for Turkey. Besides, considering the country's loss of faith in the EU accession process due to political reasons, modernizing the CU might be an effective way for Turkey to promote its further integration with Europe and gain more benefits for itself (Berger, 2021).

Figure 1. GDP and GDP growth rate of Turkey, 1989-2019 ($ Million)



Source: World Bank Database

Figure 2. Exchange Rate of US Dollar(USD)/Turkish lira (TRY)



Source: TradingEconomicsCom

As for the EU, the economic potential of Turkey is an essential part of supporting the cooperation. A survey by The European Council on Foreign Relations (2018) suggests that most of the member states assert that their governments believe Turkey to be "a strategically important partner and would make the EU stronger."

According to Impact Assessment studies (European Commission, 2016) prepared by the EU and Turkey, the modernization of the Customs Union will bring many profits to both parties. According to the impact assessment of the European Union project (2-16), the expected gains would reach $6.4 billion (approximately 0.01% of GDP) for the EU and $14.8 billion (1.44% of GDP) for Turkey. Therefore, it is not surprising that both the EU and Turkey expressed their supports for the modernization of the Customs Union.

2.3.2 Existing Shortcomings of the original CU structure

As mentioned above, the CU was mainly created to improve the frictionless trade of goods between Turkey and the EU. And a six-fold growth of the bilateral trade flows has been witnessed during the last two decades, supporting the strong trade enhancing

the power of the customs union. However, some shortcomings have become increasingly apparent over time which should be solved in the reformed customs union.

One of the most obvious flaws of the original CU is its constraint scope. The EU-Turkey customs union excludes services, rights of establishment, public procurement, and raw agriculture. While the preferential concessions which proposed in 2016 have provides opportunities for the majority of Turkish agricultural and fishery goods to have duty-free access to the EU market, tariff quotas and non-tariff barriers (NTB) are still put on certain Turkish agricultural products because these two regions have different agricultural policies and regulations (Binder, 2017). As for effects on the non-manufacturing trading activities, the development of the employment labor market may stay untapped since the CU excludes service sectors. Therefore, it is essential to widen the scope of the customs union to discover and utilize the enormous potential of the human resources on both markets, thus yielding more economic gains from higher employment across the EU and Turkey.

Besides, the asymmetry regarding the customs union can be found in the fact that Turkey is not involved in the decision-making of most CU trading policies. And it has no voting rights even though Turkey is a member of many EU committees. Even during the consultation procedure provided by the customs union decision as an indirect way of Turkish involvement in the EU's policymaking, the institutional cooperation mechanism function is not effective with an improper system (Gstöhl, 2015). As a result, the interests of Turkey are rarely considered.

The asymmetry structure also leads to Turkey's trouble in undertaking EU's FTAs and thus generating problems in market access. Since the early 2000s, due to a slowdown in the liberalization of the multilateral trading rules within WTO, the EU turned to sign FTAs with third parties, following a global policy trend. Turkey, however, is not included in these FTAs. According to World Bank report (2014), the EU has entered

FTAs with 48 countries while Turkey has concluded FTAs with only 17 of them. Many countries which already had trade agreements with the EU, usually have little incentive to negotiate a separate FTA with Turkey since the CU already affords them automatic access to the Turkish market via the EU. As a result, Turkey, which can neither negotiate with third countries nor conduct parallel negotiations due to its limited rights, might lose its competitive advantage in the international market. Therefore, Turkey has to implement origin controls on imports from the EU, particularly in sensitive sectors, to determine whether they originate from countries with an FTA with the EU (Çigdem and Ozer, 2017). Only by using this protectionism measure can Turkey keep its profits. However, Turkey had inevitably lost some market access opportunities vis-à-vis European firms, Mexico and also South Africa (Daily Hürriyet, 2013). Therefore, this result is far from the original objective of the EU-Turkey customs union, which aims to motivate higher production efficiency and cooperation.

Furthermore, some commercial policies and technical regulations in many industries are often implemented by Turkey and the EU without coordination (YALCIN and FELBERMAYR, 2021). In fact, Turkey has built a variety of non-tariff barriers for exports from the EU, such as specific licenses, certification, quotas, or minimum local content requirements resulting in higher trade costs for EU exporters (Global Trade Alert, 2020).

In addition, road transport quotas which also acted as non-tariff barriers, impede the free trade of goods and increasing the cost and delivery times when trading. For example, Turkish transporters that enter the EU annually at the Bulgarian, Hungarian, or Austrian borders always face administrative burden. A variety of compulsory documents are required to submit to relevant authorities before crossing the border, from commercial invoice, certificate of Insurance to bills of lading, rail/road manifests, transport permits, thus costing a lot of time for transportation (Srivastava and Barker, 2017). Since 75% of goods in Turkey's foreign trade with the EU foreign trade with the

EU transported via roads (DAILY SABAH, 2020), the removal of the transit pass problem is expected to contribute significantly to the exports not only to Turkey but to the EU as well.

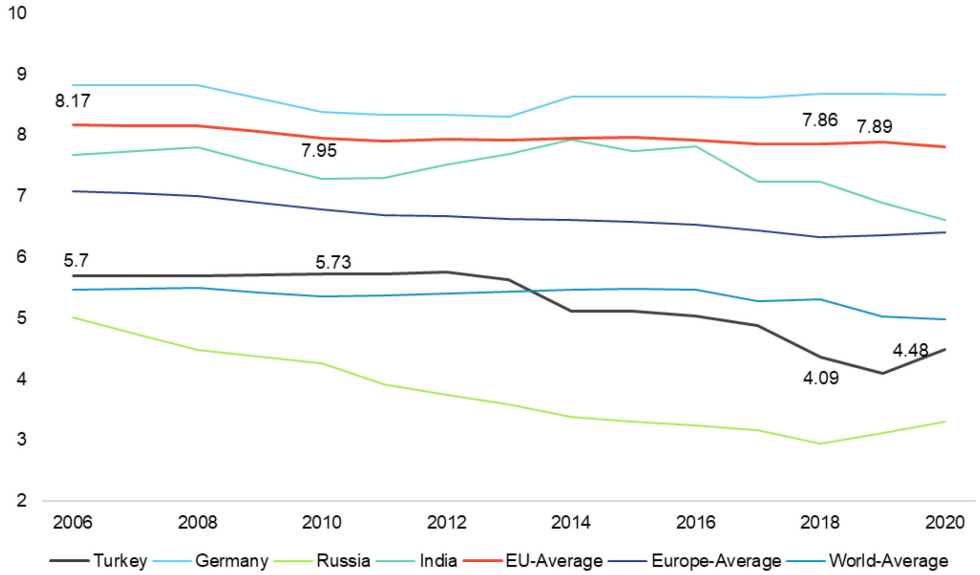
Except for the above weakness of the EU-Turkey customs union, difficulties encountered in practical implementation of regulation harmonization between the two countries, lack of dispute settlement mechanism (DSM) are also some shortcomings which mentioned by many experts, suggesting there is still a lot of room for improvement.

Therefore, given the underlying problems behind the design of the customs union itself, and the intention of both parties to seek economic development and cooperation together, it is urgent to make some difference.

2.4 Recent Challenges and Opportunities for the CU

Although both Turkey and the EU have shown their initial intention to update the customs union during 2015 to 2016, various problems emerged in the successive year, thus hindering the concrete implementation of the modernization. In 2017, for instance, the preparations for the reform of the customs union were publicly opposed by the German government due to concerns about issues such as human rights, democracy, and political freedoms in Turkey (Höhler, 2017; Tastan, 2017). In order to verify this idea, the democracy index of the Economist Intelligence Unit is demonstrated in Figure 3. We can indeed find that Turkey is increasingly moving away from EU member states. The democracy index for Turkey is around 5 from 2006 and dropped to 4.48 in 2019. While for the EU, its average value stabilized at 7 to 8. This difference can partly be one of the evidence of fundamental gaps between the EU and Turkey.

Figure 3. Democracy Index (EIU) of Turkey, compared to other countries



Source: EIU Data, the detailed data is listed in Appendix 10.

Later, relations of EU countries with Turkey further deteriorated. In addition to Germany, some member states and, to a lesser degree Italy and Poland increasingly treat Turkey as a challenge to their vital interests. Besides, Turkey has even turned into an adversary threatening their security, as is the case with Cyprus and Greece (Adar, 2020). As we all know that, Turkey has serious refugee problem with Greece, and it is also involved in the conflict with Cyprus over the oil exploitation in the Eastern Mediterranean. From Brussels's view, they condemned Turkey's actions towards Greece and Cyprus as violations of sovereignty and imposed some symbolic sanctions. Therefore, the EU refused to consider the further renegotiation of the Customs Union.

The December 2020 European Council (European Commission, 2020) reaffirmed that Turkey has engaged in unilateral actions and provocations and escalated its rhetoric against the European Union. But the EC also affirmed that the European Union has a strategic interest in developing a cooperative and mutually beneficial relationship with Turkey. Unfortunately, this opening negotiation is still hard to come into enforcing. It

is until now that Ankara started to show some positive signs seeking cooperation between the EU and Turkey. In 2021, Turkey paused its naval activities, resumed diplomacy with Greece, and signaled better relations with Europe (Scazzieri, 2021). Along with the stabilization of the situation in the Eastern Mediterranean, relations between the EU and Turkey are gradually improving. It made it possible for the European Union to offer Turkey a forward-looking agenda that protected the core interests of all sides (Berger, 2021).

Given the current complex political environment between the EU and Turkey, an effort to look back and examine the effects that the current customs union generated seems to be meaningful and reasonable. It will help us understand the CU's actual trade effects and investigate how to improve it, precisely the motivation for this article and the focus of further analysis.

3. Literature Review

3.1 The Theory of Customs Union

The ‘Customs Union’ is first defined by J. Viner (1950), which indicates eliminating all tariffs and other types of restrictions on trade between member countries and implementing common customs tariffs on trade with non-member countries. Unlike other standard trade theories (e.g., the general equilibrium analysis), which concerns more about the effects of non-discriminatory tariff changes, the CU combines free trade with protectionism (Södersten and Reed, 1994). Therefore, it is hard to decide whether the effects and welfare for the participants are positive or negative. For example, a country has a tariff on imports of the same good from two other countries. But if a customs union is built later with one of the other countries, it will eliminate the tariff on imports from its new partner while retaining a tariff on imports from the third country. This is to say, only one side of the ‘distortions’ has been removed, and ordinary tariff theory is quite complicated when considering this characteristic. On that account, the theory of the customs union and its impact on member countries or non-member countries will be studied before the further quantitative research of this paper.

3.1.1 Static Effects

According to David Ricardo's theory, reducing tariffs and leading to more liberal trade in the world has been considered to increase the world’s welfare. However, Jacob Viner (1950) argues that while forming a customs union could have welfare-increasing effects in some circumstances, it could have welfare-decreasing effects in others. And he introduced the fundamental concepts of static effects of the customs union, which arose from redistribution of resources, containing trade creation and trade diversion.

The trade creation effect is based on more specialization of production by exploiting comparative advantages and the resulting productivity gains. With the establishment of a customs union, inefficient production is displaced by more efficient output from other member countries, referring to the replacement of relatively high-cost domestic

production with lower-cost imports from the partner country. Namely, trade goods prices between the customs union members will be lowered due to the removal of tariffs and quotas. Thus, more consumption from cheaper sources will be generated in member states, as well as increasing intra-bloc trade volume since new trade is created within the union. Clearly, this trade creation effect promotes bilateral trade among the member countries and thus leading to greater efficiency and grown social welfare (Viner, 1950).

Trade diversion occurs when the most efficient producer remains outside the CU and when the member states' imports from internal countries in the union. Due to the decrease in tariff rates and transportation fees among customs union members, exporting products becomes cheaper in other member countries' markets. Therefore, it stimulates consumer purchases, increases imports from members, and finally leads to the substitution of intra-bloc trade for extra-bloc trade. Trade diversion thus causes a welfare loss in the outsider and hence in the world as the outsider cannot export the same goods to that country as it did before (Pala, 2011). However, whether diverting effects benefit or decrease the welfare of the member states has been discussed. Viner (1950) first suggests that trade diversion is a 'bad thing.' In contrast with trade creation which reflects production activities moving from inefficient places to efficient places, trade diversion reflects the trade transfers simply arising from differences between intra-bloc and extra-bloc trade policies and tariff levels. Although the trade flows within the intra-bloc will be increased in the short term, with the production activities shifting from more efficient extra-regional countries to intra-regional member countries, the welfares of the customs union member states will also be reduced. While Meade (1955) and Lipsey (1957) argue that customs unions lessen the price of imported commodities thanks to the elimination of tariffs, thus leading to a decrease in the selling prices of similar products in the domestic market. Hence, consumer demand will be driven, subsequently promoting the need for importing more of the products. As long as the social welfare from this consumption effect brought about by customs unions is greater than the trade diversion effect, the establishment of customs unions will still positively

impact the improvement of member countries' welfare levels and the world.

To conclude, both trade creation and trade diversion can increase trade flows among the CU members. Trade creation is expected chiefly due to its healthy market competition and production efficiency promoting influences. On the other hand, the trade diversion effect is mixed. It may (or may not) be harmful to the intra-CU country, but it usually harms the country outside the CU. Therefore, the impact of a customs union should be examined by combining the trade creation effect and the trade diversion effect.

3.1.2 Dynamic Effects

Bela Balassa (1961) systemically introduces the dynamic effect of the customs union, which is led by structural changes caused by the market unification in the medium and long term, including increased competition between member countries, external economies of scale, improvement of technology, terms of trade, etc.

The most significant dynamic benefit from establishing a customs union is considered to be the increased competition (Pala, 2011). Before the CU, the markets of the member states are possibly not dynamic with exclusive occupation power of the monopolists. After reducing tariff rates and trading obstacles, the transaction and communication of companies are increased, resulting in improvements in technology, production efficiency, and labor allocations. Therefore, more growing companies will appear in the market, increasing the competition between each other and bringing more benefits to the customers. Another benefit that is likely to result from the enlarged market is the economies of scale (Corden, 1972). Before the agreements, the developments of some members are limited to their agricultural land resources, population, and economic hierarchy. The domestic market can easily reach saturation point, but it is far from achieving economies of scale. Therefore, entering the CU helps them to expand the market size, highly integrate individual industrial advantages, fully utilize production

equipment and labor resources with partners. As a result, the manufacturing costs are dropped, thus increasing production efficiency and bringing economies of scale, and then promoting the overall economic development of the whole region in the union. Besides, the stimulus to investment, improvement of technology, improvement of structural policies (Plummer, 2019) are also possible dynamic benefits of the customs union.

Since the 1970s, many scholars have studied the dynamic effects of free trade arrangements (Scitovsky, T. 1970; Corden 1972; Rivera-Batiz 1991; Baldwin 1992; Grossman and Helpman 1995). However, since there are so many variables to consider and the models are difficult to quantify, most of these studies have focused on the theoretical level without systematic empirical analysis.

3.1.3 Empirical Research on the Customs Union Theory

Based on the theoretical trade effects discussed in the 1990s, many researchers discuss the effect of FTA (includes RTA and CU) by analyzing the trade creation, diversion, and dynamic impacts. Tochitskaya and Aksen (2001) apply the revealed comparative advantage (RCA) index for medium- and high-tech industries, suggesting that the CIS countries' Customs Union effects on Belarus include trade diversion, as well as production efficiency (results from dynamic effects). Karaman and Lerzan Ozkale (2005) analyze Turkey’s import demand function using an econometric panel data application. The result shows that the Customs Union Agreement has trade creation effects in the machinery and automotive sectors and generated trade diversion effects in the iron and steel industries.

In addition, many other early papers focus on the trade effects of the North American Free Trade Agreement (NAFTA). For example, Fukao, Okubo, and Stern (2003) use the gravity model to analyze the trade diversion effect of NAFTA. The fixed-effect panel estimations by trade flows in different product sectors from 1992 to 1998 are

tested. They suggest that the most significant diversion in trade can be found in industries of textile industry in the US's imports from other partners of the NAFTA. On the other hand, Chan (2018) used the Balassa model and contends that NAFTA creates more trade creation effect than trade diversion, significantly increases Mexico's welfare level, and has great potential for trade between Mexico and member countries.

However, sometimes the results from these traditional trade analysis methods are hard to determine whether trade creation exceeds trade diversion effects (Clausing, 2001). Magee (2004, 2016) additionally proposes a new approach to measuring trade creation and trade diversion. The industry-specific trade effect of the FTA can be measured by comparing the relationship between the imports in the current year with imports in the previous year, with added dummies like pre-existing preferential trade arrangements and common language distance.

3.2 Methodology Revisited: Gravity Model

3.2.1 Theoretical Foundation

Following the suggestions from much of the existing literature in international trade analysis, the gravity model is used in our empirical research. In fact, the gravity model has been widely applied to analyze economic variables and has become a common instrument in international trade studies due to its simplicity of the principle, the applicability of the data, and the ease with which the model can be used in econometric studies (Walsh, 2006). The basic idea behind it comes from the physical gravity theory, from which it also takes its name. In analogy with Newton's 'force of gravity' function, the basic gravity model, which was firstly developed by Tinbergen (1962), Poyhonen (1963), and Pulliainen (1963), show that the trade flows (F_{ij}) between two countries is determined by the gross national income of these two countries (F_i, F_j) and the geographical distance between them (d_{ij}).

$$F_{ij} = G \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{d_{ij}^{\beta_3}} \quad (1)$$

Based on this structure, Linnemann (1966) extends the gravity model by introducing the endogenous variable 'country population' and the dummy variable 'trade agreement,' in which the result has shown a negative relationship between population and bilateral trade flow. Later, the gravity equation has become evidently one of the most widely used empirical approaches in international trade study. However, the improvement of this model is limited in focus on adding explanatory variables. There is still have a lot of uncertainty about the theoretical foundations behind the gravity model, which is a major weakness.

Since the 1980s, a relatively complete gravitational theory has been gradually formed, classified into four broad themes (Paas, 2002; Kabir, Salim, and Al-Mawali, 2017).

(1) Based on Computable General Equilibrium Models (CGE), represented by the study of Anderson (1979), Bergstrand (1985), Anderson and Van Wincoop (2003).
(2) Based on international trade theory models, among which there are Factor Endowments Models (FEMs), including Heckscher-Ohlin and their extension models, represented by Bergstrand (1989, 1990), Deardorff (1998); Ricardian Trade Model, represented by Eaton and Kortum (2002); and Increasing Returns to Scale (IRS) model, represented by Helpman and Krugman (1985).
(3) Homogeneous and heterogeneous based products and preferences, represented by (Melitz, 2003; Chaney, 2008; Melitz and Ottaviano, 2008).
(4) The structural gravity model focuses on the elasticity of substitution in consumption and the comparative statics of general equilibrium. (Bergstrand et al., 2013).

Therefore, in the following part, the theoretical development of the gravity model with all these four kinds of basis will be discussed.

(1) Computable general equilibrium based models

A theoretical foundation of the gravity model is firstly presented by Anderson (1979) based on Cobb–Douglas and constant elasticity of substitution (CES) production

functions. The study constructs a model with Armington's assumption: products are differentiated according to the origin, and consumers have preferences for all differentiated products. This structure suggests that a country would consume at least some of each country's goods, regardless of price. All goods are tradable, all countries are tradable, and in equilibrium, national income is the sum of domestic and foreign demand for the unique goods produced in each country. As a result, more imports and exports are generated for the larger countries. Despite this fruitful theoretical foundation, the model was not applied extensively among trade studies because it is too complex to use (Leamer and Levinsohn, 1995).

The subsequent extension (Bergstrand, 1985) follows the CET production function by Anderson and builds a systematic general gravity model that includes price index. However, Bergstrand (1985) does not analyze trade costs in detail. Later Anderson and Van Wincoop (2003) develop a multi-country general equilibrium model of international trade in which each country is endowed with a single commodity that distinguishes it from other countries analyzes the main components of trade cost factors. The model derivation still adopts the Armington assumption and CES utility function. But the difference is that they introduce exogenous bilateral trade costs as the key element of their model, which focuses on the demand side of the economy and assumes that production is exogenous. The paper also proposes an important non-theoretical term "Remoteness" and Multilateral Resistance Terms (MRTs) to innovate the traditional gravity model, that is, when the two-country trade, the comparative trade barriers between them and the relative size of these barriers should be considered, and the two countries should be compared with other countries in the world.

(2) International trade theory-based models

The theoretical development of the model further expanded by adding new trade theory into the gravity model framework, giving more reasons for the division of trade and the demand for differentiated products.

Bergstrand (1989) successfully introduced the international trade theory of trade factor endowment theory to elaborate the rationality of general equilibrium analysis. In the study, he shows that a gravity model is a direct implication of a trade model based on monopolistic competition instead of Armington models whereby goods are different depending on the location of production by assumption. In his model, the same countries trade differentiated goods because consumers have preferences for variety. In 1990, Bergstrand additionally explained the intra-industry trade in gravity model based on the Heckscher-Ohlin-Chamberlin-Linder model with two factors: two industries and N countries.

Later, Deardorff (1998) argues that the gravity model can be derived directly from the H-O model of international trade and shows a gravity model rose from traditional factor-proportions explanation of trade. And Eaton and Kortum (2002) suggest a gravity model from a Ricardian type of model with different technologies in countries. Besides, some studies focus on the theory of increasing returns to scale (IRS) (Helpman and Krugman, 1985; Evenett and Keller, 2002).

(3) Heterogeneous products and preference-based models

Complete and incomplete specialization and firm heterogeneity are also incorporated with the explanation in gravity model theory. In 1980, Paul Krugman suggested that based on the model of homogeneous firms, the higher the elasticity of substitution of products, the more significant the impact of trade flows on trade resistance. However, Chaney (2008) proposed the opposite view according to the heterogeneous firm model. His model is built on Melitz's (2003) specification in which each firm produces a unique product subject to bilateral fixed costs of exporting, suggesting that the elasticity of substitution can reduce the impact of trade flows on trade resistance, not increase it.

Melitz and Ottaviano (2008) also use a heterogeneous firm model theory to explain the

theory. But unlike what is argued by Chaney (2008), they claim that a nascent firm will face sunk entry costs when entering a market but only have variable trade costs during export (without no fixed export costs).

(4) The Structural Gravity Model

A structural gravity model is developed by Bergrstrand et al. (2013), which is based on Krugman's (1980) monopolistic competition and increasing returns to scale model. The model extends the framework from Ann and van Wincoop (2003) and EK (2002), demonstrating that the elasticity of substitution can be identified precisely with unobservable ad valorem trade-cost measures. Besides, unlike Ann and van Wincoop's framework with the assumption that one country only produces one good, the model considers a world that consists of many countries, where each economy produces a variety of goods to trade with the rest of the world. Therefore, this approach is gradually preferred by more and more scholars due to the reduced assumption restrictions.

In summary, the theoretical framework of the gravity model shows the gradual expansion and broader application. From the beginning of the Armington assumption, utility and production functions, homogeneous firms, perfect substitutability of domestic and foreign products, to perfect competition as well as non-perfect competitive markets, non-similar preferences, heterogeneous firms, differentiated products, differentiated endowments, and technology, providing a more solid theoretical basis for gravity model as well as the analysis of the factors influencing international trade flows.

3.2.2 Empirical Progress in international trade analysis

In accordance with theoretical developments, many empirical studies are published using the gravity model in various scope of trade analysis, including potential trade between countries, determinants of FDI and trade flows, ex-post effects of regional trade agreements, etc. Head and Ries (2008), for example, apply the AvW (2003)

gravity model and find that the development in the exporting country is a highly significant factor in explaining outflows of FDIs. Shanping Yang (2014) combines Viner's theory (1950) and applies the gravity model to measure the trade creation and trade diversion effects of the China-ASEAN FTA by panel data for 31 countries between 1995 and 2010. The results show that the establishment of CAFTA had a significant net trade creation effect, especially in the machinery sector. Some other papers focus on the specific industry by using disaggregated data. Grant and Lambert (2008) conducted a gravity model study about the effects of RTA on agriculture. It is found that RTAs bring more benefits to the agriculture sector compared to non-agriculture. Therefore, it can be easily proved that the gravity model plays a vital role in the study of international trade.

From the perspective of the variable choices, essential analysis elements for the gravity model include an economic scale for a given country (usually measured by GDP/GNP), population, and distance. In addition, more profound research into economic geography also turns to focus on some dummy variables like linguistic proximity (Chiswick and Miller, 1992; Fasih, 2018), colonial status (Campbell, 2010), cultural similarity, political stability (Srivastava and Green, 1986) and also the interest of this paper, the entry of the FTA (including RTA and CU). Besides, some studies have also used time-varying variables such as exchange rates and tariffs in the gravity equation (Thursby, 1987; Theie, 2020).

Furthermore, more and more estimation methods have been proposed to improve the empirical study of the gravity model. For example, standard gravity models often use cross-section data to estimate trade patterns in a given year or on averaged data. However, using panel data can lead to higher estimation efficiency by capturing relevant relationships over time and avoiding the risk of choosing an unrepresentative year. Moreover, panels allow the controlling of unobservable individual effects between trading partners. Since heterogeneous trading relationships should be taken into account

when running a proper econometric estimation of the gravity model, this feature is very important. Therefore, panels are more frequently used in recent studies (Christie, 2002; Ravishankar and Stack, 2014). Besides, the methods applied for the gravity model have been improved from pooled OLS to fixed effects model, which considers some unobserved heterogeneous component that affects each individual (pair of countries) of the panel (Gomez-Herrera, 2013). Recently, nonlinear regression like Tobit (Martin and Pham 2008), GPML (Dadakas, 2020), PPML (Zylkin, 2020) methods are widely tested in the model.

In summary, the gravity model has been continuously validated and improved in the analysis of international trade with the expansion of studying scope, developments of explanatory variables, and improvements of complicated econometric methods. Therefore, applying the gravity model in this study, which concentrates on the trade effects of the EU-Turkey customs union, will provide us with more reliable, valid, and effective results and recommendations.

3.3 Literature on Trade Effects of EU-Turkey CU

The effect of the customs union between the EU and Turkey on their trade flows has been studied for years. The literature features an extensive range of estimates on whether or not the CU significantly impacted trade between members and non-members, with some studies finding customs union's influences on social welfare.

The effect of the EU-Turkey customs agreement is analyzed based on many different methodologies. For example, a computable general equilibrium model (CGE) is used by Harrison et al. (1997) to quantify the impact of the CU between Turkey and the EU. They find low trade diversion costs due to the low average tariff rate on nonagricultural imports. Similarly, Lejour and de Mooij (2005) investigate the effects of the customs union between the EU and Turkey for both the EU-15 countries and Turkey. The conclusion from the CGE model for the world economy implies that the effect of

Turkey's accession to the single market is favorable for Turkey but negligible for the EU-15.

Furthermore, many other researchers use the gravity model of trade to analyze this issue. The results imply that most of the studies conclude that the CU has no significant impact on trade flows between the EU and Turkey. For example, the model from Antonucci and Manzocchi (2006) proves that there is no evidence for strong influence of the customs union or the 1963 Association agreement between Turkey and the EU on Turkish trade flow. Bilici et al. (2008) also show that the CU did not strongly increase the EU's position in Turkey's trade flows and is not significantly long-lasting. In addition, one large study on the Turkey-CU trade effects is provided by the World Bank (2014). The study similarly identifies a positive but not significant impact of the CU, and even in many of the reported equations, the effect is negative. Besides, a panel data covering the period 1980-2013 which used by Akan and Balin (2016) to estimate the impact of the CU on EU 15-Turkey trade. They also find that there is no significant impact on EU 15-Turkey trade. However, Larch, Schmeißer, and Wanner (2020), in contrast to previous studies that support the Turkey-EU CU's marginal effects, indicate that the customs union made a significantly positive and robust impact by 55 to 65% on trade between the EU and Turkey.

And as we mentioned before, few studies test the effects of the trade creation and trade diversion. To be more specific, the World Bank (2014) first want to investigate these combined effects of the CU, but insignificant effects of the trade creation prevent them from further testing the trade diversion effects. While Magee (2016) employs data from 1993 and 1996-2010 (when the tariff data is available) and applied the Poisson pseudo maximum likelihood estimator to conduct a study that concentrated on the trade creation and diversion effects of the CU. The paper finds that the Turkey-EU customs union has generated more than twice as much trade creation as trade diversion but that the overall impact of the customs union is relatively tiny. Besides, Ketenci (2017) finds

that the CU improved Turkey's trade balance with EU countries but decreased its trade balance with non-EU countries (ROW), which may imply the existence of trade diversion.

If we looking more deeply into the disaggregated sectoral investigation, Nowak-Lehmann et al. (2017) estimate the effect of the customs union on Turkey's exports to the European Union with a gravity model for each of Turkey's top sixteen export sectors. In line with most previous literature, a negligible effect can be found in Turkey's exports of industrial products like plastics and rubbers, machinery, and the largest exporting sector textiles. Besides, after assuming an expansion of the customs union to allow frictionless trade movement in agricultural goods, Turkey will experience significant growth in Turkey's exports of vegetables, fruit, and processed fruits and vegetables.

From the perspective of directional effects of the agreement, the CU impacts differently on the EU-Turkey total trade volume, EU's export, or Turkey's exports. This can be attributed to the asymmetric design of the customs union between the EU and Turkey regarding to Turkeys' limited access to decision making on the common commercial policy, regulatory harmonization and other important conversations. The heterogeneous directional effects of the agreement can be proved by many experts, though the results are different. For example, the impact assessment report by BKP, Panteia, and AESA (2016) claims that the customs union between the EU and Turkey can significantly improve the Turkish exports to the EU but surprisingly decrease the EU exports to Turkey. Besides, they also find an extremely negative effect on bilateral trade when considering the whole period data. Only when limiting the analysis to the early phase of the CU with data from 1990 to 2000, a positive effect can be found.

In contrast, some experts found that the customs union between the EU and Turkey had brought more positive effects for EU exports to Turkey than for Turkish exports to the

EU, which can be attributed to the fact that the EU had already opened its markets for Turkish exports long before the EU-Turkey Customs Union came into effect (World Bank, 2014; Frede and Yetkiner, 2017). Neyapti et al. (2007) find that Turkey's bilateral trade with the EU can be significantly increased due to the CU. To be more specific, the customs union promoting rate for Turkey's exports to the EU is 30% lower than what it brought to Turkish imports from the EU. In addition, Adam and Moutos (2008) support that the CU has a positive impact on both Turkey's and the EU's manufacturing export to each other, but the effects on EU's export is stronger. Similarly, Frede and Yetkiner (2017) analyze the Turkish export and import flows concerning regional clusters and bilateral trade costs using a panel data gravity model. According to their research, the EU-Turkey Customs Union harms Turkish exports but benefits its imports. Their additional estimates for specifically selected time intervals strengthen results from the overall estimates.

Another notable heterogeneity of the present paper is the method they applied in the model. Most studies estimate a log-linearized gravity model with pooled OLS and FEM (Antonucci and Manzocchi, 2006; Akan and Balin, 2016). Although the fixed effects model with various settings can absorb different influencing factors to take unobservable multilateral resistance and endogenous into consideration (Yotov et al., 2016), zero trade flows are ignored. Some experts try to handle this difficulty by combining estimation of FEM and a self-selection correction (Bilici et al., 2008; World Bank, 2014). But this procedure faces the challenge of choosing a variable that enters the first-stage equation but was excluded from the gravity model. Besides, the two stage-approach does not account for the heteroscedasticity issue. Therefore, PPML is suggested to be a reliable approach under these circumstances (Santos Silva and Tenreyro, 2006). Among recent studies, Larch, Schmeißer and Wanner (2020), BKP, Panteia, and AESA (2016) and Magee (2016) are the only contributions that use the PPML estimator. Thus, the PPML method, a newly popular approach when using the gravity model, should be tested more in the future.

Table 1. Literature on Trade Effects of the Customs Union between the EU and Turkey

Article	**Data Included**	**Estimation Methods**	**Variables**	**Conclusions**
Larch, Schmeißer and Wanner(2020)	Bilateral trade in the manufacturing sector for 69 countries, 1988–2006	PPML	Trade flow, CU, RTAs, WTO, MFN tariff, Distance, Contiguity, Common language, Colony	A significantly positive effect of the EU-Turkey CU on their bilateral trade.
Frede and Yetkiner (2017)	Turkey's bilateral trade with 180 countries, 1960-2012	Log-linear (FEM)	GDP, Distance, Contig, Lang, FTA, distance, Contiguity, language	A negative effect on Turkey's exports to the EU and a positive impact on its imports from the EU.
Ketenci (2017)	OECD countries and quarterly data from 1980 to 2012	log-linear (Unit root, GMM)	Trade flow, trade balance, GDP, real exchange rate,	The CU improved Turkey's trade balance with EU countries but decreased its trade balance with non-EU countries (ROW).
Mertzanis(2017)	Turkey's bilateral trade with15 EU countries and 5 non-EU countries, 1990-2016.	log-linear (FEM, GMM)	trade flow, GDP, distance, population, FTA, etc	A positive but not as strong as expected effect of this agreement on trade flows.
BKP, Panteia, and AESA (2016)	Turkey's bilateral trade, 1990-2014	PPML	GDP, Distance, RTA, Contiguity, CU	A strongly negative effect on bilateral trade over the whole period.
Magee (2016)	Turkey's sectoral imports (6-digit HS) from 125 countries, 1993 and 1996-2010	PPML	GDP, trade flows, and tariff data	The CU has generated more than twice as much trade creation as trade diversion, but that the overall impact of the customs union has been relatively small.
Akan and Balin (2016)	Turkey's bilateral trade with EU-15 countries, 1980-2013	Log-linear (FEM)	GDP, Population, distance, CU	No significant effect.

World Bank (2014)	Bilateral trade of 150 countries, 1990-2010	Log-linear; 2-stage procedure of Helpman et al. (2008)	GDP, GDP p.c, Distance, Contig, Lang, Colony, Remoteness indexes	Positive but not significant.
Adam and Moutos (2008)	Bilateral manufacturing trade of 24 OECD countries, 1988-2004	Log-linear (FEM)	GDP, Population, real exchange rate	The CU has a positive impact on both Turkey's and the EU's manufacturing export, different in exports/imports.
Bilici et al. (2008)	Turkey's trade with a time period from 1992 to 2006	Log-linear (OLS, FEM, 2 STEP)	Total trade, GDP, Population, distance, contiguity, EU, BSEC	The CU increased the EU's importance in Turkey's trade flows only marginally.
Neyapti, Taskin, and Üngör (2007)	Turkey's bilateral trade with more than 150 countries, 1980-2001	Log-linear(OLS)	GDP_i / GDP_j , Real exchange rate	The CU between Turkey and the EU affected Turkey's trade flow positively, but the effects are different in different sectors.
Nowak-Lehmann et.al. (2007)	Turkey's exports to the EU in 16 sectors, 1988-2002	Log-linear; SUR, GMM, pooled OLS	Sum of GDP, Difference in GDP, Real effective exchange, Transport costs	The effects are not significant, the trade for some industrial goods increased slightly after the CU.
Antonucci and Manzocchi (2006)	Turkey's bilateral trade with 45 countries, 1967-2001, over GDP	Log-linear(FEM, 2-Stage, GMM)	Sum of GDP, Size similarity, Difference in GDP per capita, CU, FTA, DISTANCE, CONTIGUITY	There is no additional trade increase between the EU and Turkey because of the CU.

Source: Author's collection

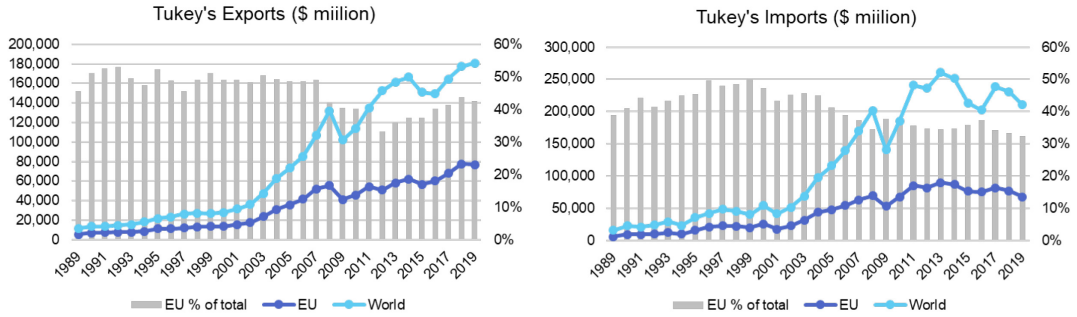
4. Current Trade Between the EU and Turkey

4.1 Turkey-EU Trade Overview

In order to measure the trade effects of the customs union, the current trade situation and changes between Tukey and the EU are firstly reviewed. Based on Figure 4, Turkey experienced dramatic growth in exports and imports, especially to the EU countries, with the introduction of the Customs Union. In 1989, Turkey's export to the world was only $11.8 billion and grew to $21.6 billion in 1995 (one year before the CU). In 2019, the total exports reached $180.8 billion with a growth rate of 733% compared to 25 years ago (IMF, 2021), making it the number 29 exporter globally. Similarly, Turkey's imports from the world increased from $35.8 billion in 1995 to $210.3 billion in 2019. Turkish exports to the EU stayed below $10 billion before 1995 but have grown almost tenfold to $76.7 billion in 2019. And its imports to the EU have increased by nearly 600%, from $9.5 billion to $68 billion.

The trade volume does not increase significantly in the first few years after the CU in terms of growth trends. The compounded annual growth rate of exports between 1996 and 2000 was 4.1% compared to an 11.3% growth rate between 1990 and 1995, which can be attributed to the fact that some of the tariffs between the EU and Turkey had already been removed on imports from Turkey long before the CU went into effect (Frede and Yetkiner, 2017). In addition, despite the CU, the EU continued to reserve the right to impose anti-dumping duties on Turkish exports to the EU and keep technical barriers. Besides, the value of lira increased at that time, so it is not surprising that Turkish exports did not surge to the EU countries immediately after the CU. The impact of the CU on Turkish exports was delayed until the 2001 crisis. Due to the depreciation of the Turkish Lira, the shrinking domestic demand, and a stable political environment, trade revenues with the EU increased around 15% in 2002, over 30% in 2003-2004. However, this high increase did not stay for a long time. Turkey started to trade increasingly with other countries outside the CU after around 2005. But the share of trade volume to the European domestic market has remained at a high level, with the fact that the EU is always a major trade partner of Turkey.

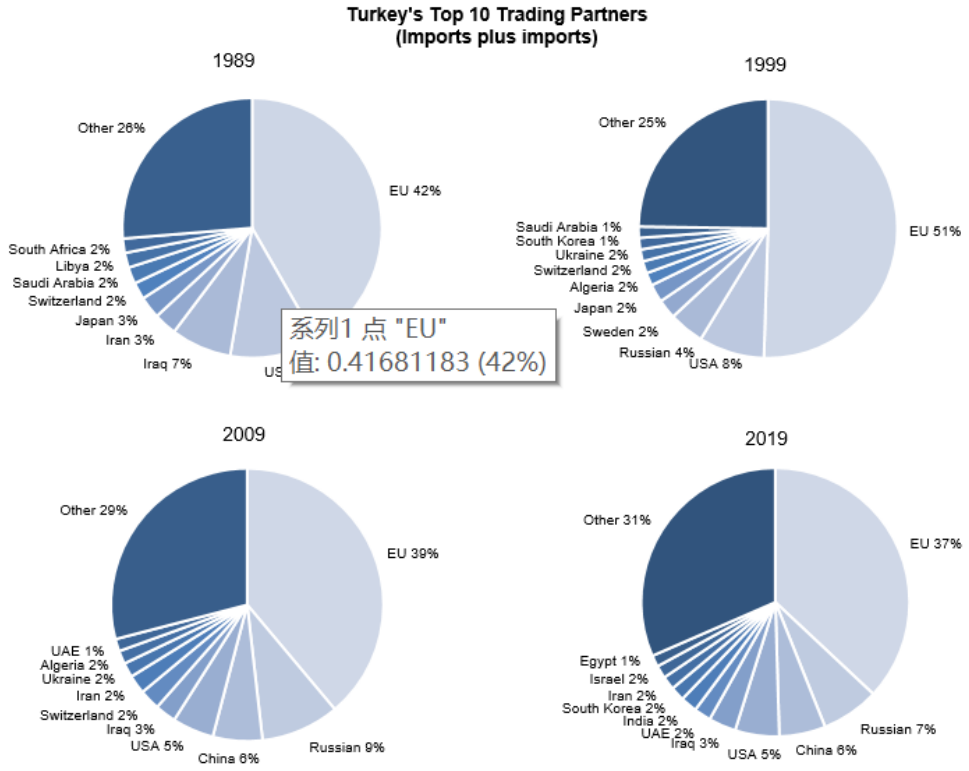
Figure 4. Turkey's Exports and Imports, 1989-2019 ($ Million)



Sources: DOTS database, IMF

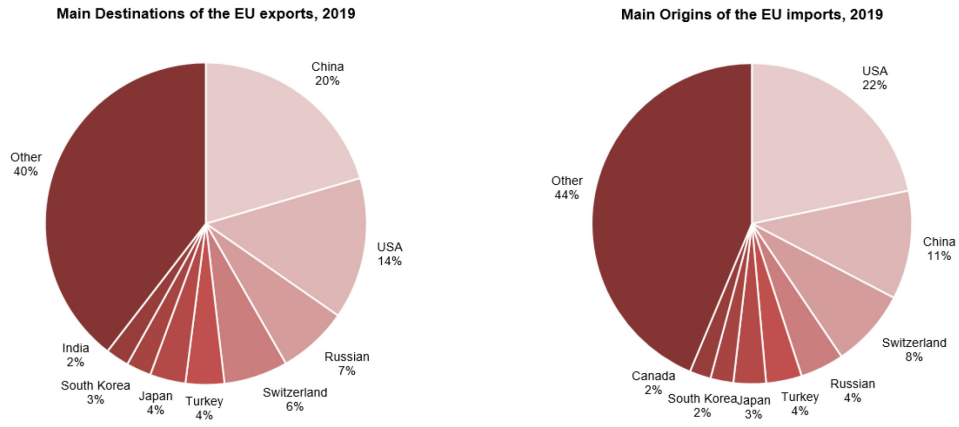
Looking at Turkey's top-10 trading partners for four different years (1989, 1999, 2009, 2019), it can be proved that the EU is always the largest trade partner of Turkey, though other players are gaining increasing importance recently. More specifically, the EU accounts for 42% of Turkey's trade flows in 1989, much higher than the second player USA (11%). And this number climbs to 51% in 1999, capturing half of the total trade. After the 21st century, the share of the EU's trade gradually decreased, but it is still the most important trading partner of Tukey. As for the EU, Turkey has also become one of its largest trading countries. In 2019, Tukey became the fifth largest importer (4%) and exporter (4%) to the EU, only behind China, the USA, Russian, and Switzerland.

Figure 5. Turkey's Top 10 Trading Partners



Source: DOTS database, IMF

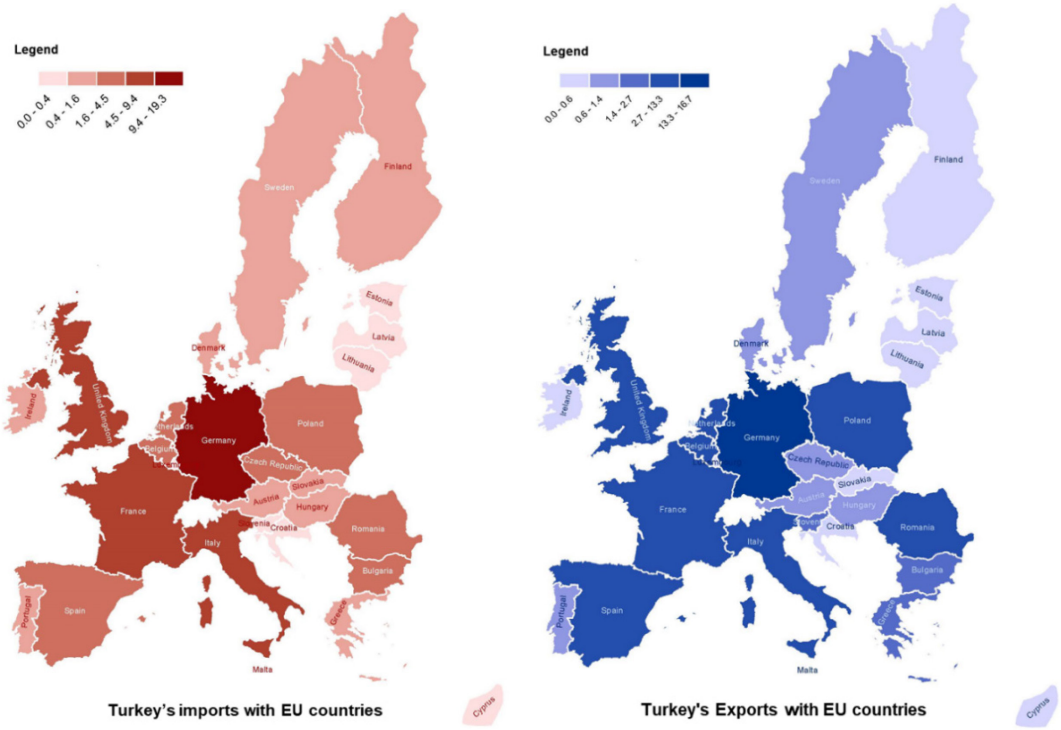
Figure 6. The EU's Top 10 Trading Partners, 2019



Source: Eurostat

As regards Turkish export volumes with the EU for 2019, Germany is by far the most important export market of the EU ($16 billion), followed by the UK ($11.2 billion, no EU member now), Italy ($9.7 billion), Spain ($8.1 billion) and France ($7.9 billion). For Turkey's imports from the EU, Germany equally turns out to be the most critical trading partner, with a trade volume of $19 billion, followed by Italy ($9.4 billion), France ($6.8 billion), and the UK ($5.6 billion) with significantly lower export volumes to Turkey. And this pattern prevails also in the earlier years.

Figure 7. Turkey's exports and imports to EU countries ($ Billion)



Source: DOTS database, Author's calculation, the data is listed in Appendix 11

Therefore, it can be proved that firstly Turkey has improved remarkably in the volume of trade imports and exports after the customs union. Besides, international trade relations between Turkey and the EU remained strong over the past 30 years, although economic communications outside the customs union have gradually increased with an openness of globalization (which may lead to trade diversion). The considerable trade exchange volume between these two regions with the promotion of the customs union will make both remain irreplaceably important to each other for a short period of time in the future.

4.2 Analysis by Sectoral Structure

In the following section, the product structure of the EU-Turkey trade will be discussed. The data is obtained from EUROSTAT, UN COMTRADE, and CEPII BACI databases, and products are defined as items from the Harmonized System (1992) listed in the Appendix 1.

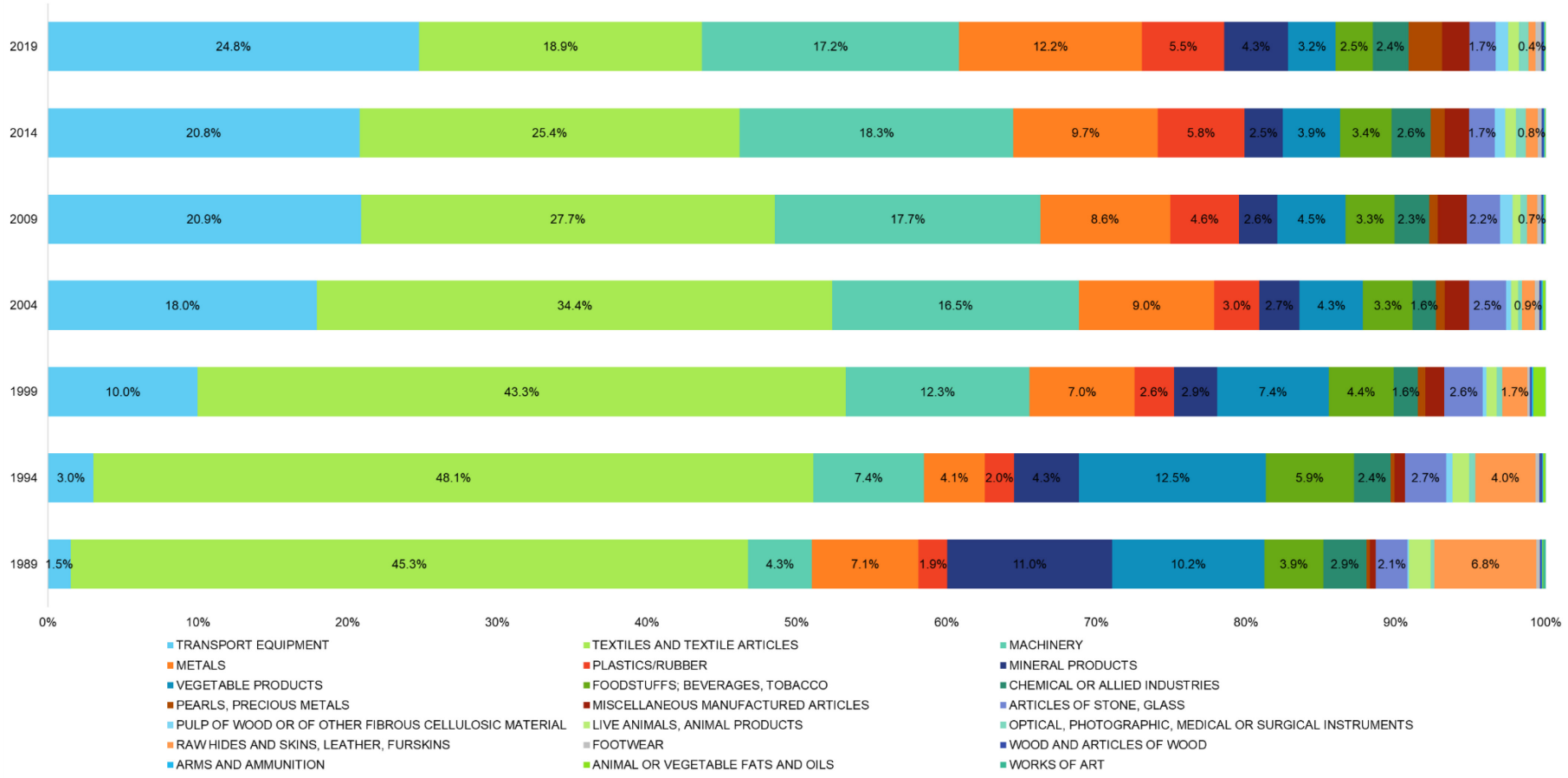
Looking at Turkey's export industries for the past few years (Figure 8), it can be proved that textiles products mostly stand for the leading position in exports, although its share of total exports dropped from 45.3% in 1989 and 48.1% in 1994 to 18.9% 2019. While

the export of industrial products (such as transport equipment, machinery, and metals) showed a significant upward trend in both trade volume and proportion after the CU, becoming the most important component of exports. In 2019, the largest export product from Turkey to the EU was transport equipment, amounting to about $15.8 billion, followed by textiles, machinery, metals, and mineral products. On the other side, industries such as timber, arms, ammunition, animal or vegetable fats, and oils, work of arts are the least traded products from Turkey to the EU. Besides, it can be shown that the proportion of vegetable exports, which related agriculture industry, decreased gradually after the CU, from 10.2% in 1989 to 3.2% in 2019. This trend can also be observed for industry of foodstuff (from 3.9% to 2.5%), rawhides/leather (from 6.8% to 0.4%) and animal products (1.5% to 0.7%). In summary, Turkey mainly exported labor-intensive textiles, together with raw hides and skins, and plant products (labor- and resource-intensive sectors) in the early 1990s, while capital-intensive export industries (metals, transport, machinery) multiplied after entering the EU-Turkey Customs Union.

For Turkey's importing sectors from the EU (Figure 9), the ranking of the share of commodities imported from the EU did not change much. Industrial products (machinery, transport equipment, chemicals, metals, and plastics/robbers) account for a significant proportion of the imported volume, which is much larger than other industries. Among them, machinery is the most extensive importing product, with an import volume of $17.04 billion (26.3%) in 2019. In contrast, the smallest trading goods are raw hides and skins, live animals and related products, wood, arms and ammunition, woods, animal or vegetable fats and oils, work of arts, which is similar to the most miniature export products from Turkey to the EU. Together, we can conclude that traditional labor- and resource-intensive products without complex technology are gradually becoming small parts of trade between the EU and Turkey. Also, the decreasing trend of agricultural-related products can be observed in this table.

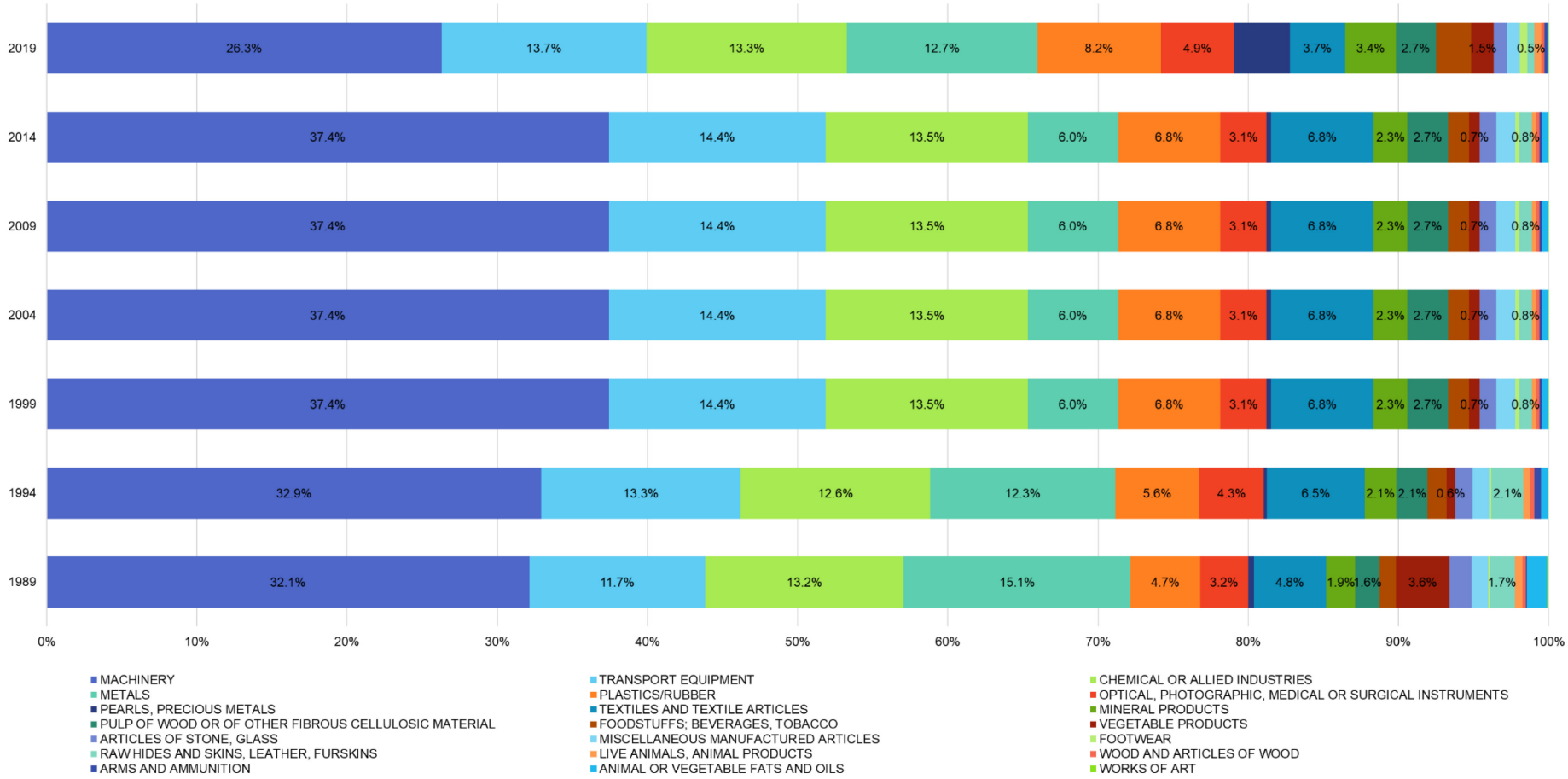
To summary, an essential development in bilateral trade between Turkey and the EU is the growing share of industrial sectors like metals, chemicals, and machinery, with the decreased share of traditional textiles and vegetable sectors.

Figure 8. Turkey's Exports to the EU (by industry sectors)



Source: UN COMTRADE. The whole data is listed in the Appendix 2.

Figure 9. Turkey's Imports from the EU (by industry sectors)



Source: UN COMTRADE. The whole data is listed in the Appendix 3.

Booming industries like machinery, chemicals, transportation belong to intermediate goods, indicating the participation of Turkish companies in European value chains. Over the past two decades, Turkey has attracted a considerable amount of foreign direct investment, thanks not only to the trend of globalization and integration but to the Customs Union. For example, the Turkish automotive and chemical industry has integrated into the network of European enterprises (Yalcin, 2016). This may be partly attributed to the alignment of Turkish trade rules/laws with the EU (e.g., CCT and EU *acquis*. Therefore, European companies treat Turkey as an environment similar to the EU domestic market with huge potential, enabling the exchange of intermediate goods at lower costs compared to third countries. In the case of the chemical or metals sector, which are the two largest importing sectors of EU goods in Turkey, the share of intermediate goods amounts to around 80%-85% of total trade.

In addition, plant products, animal products, and agriculture-related sectors showed a downward trend in both imports and exports, indicating the impact of the CU restrictions. Although the EU-Turkey preferential agreement is applied later, the requirements on agricultural products are asymmetric. For example, the EU eliminated ad valorem duty on almost all agricultural and fishery. And the CU has reduced the majority of Turkish products imported to the EU. According to World Bank evaluation (2011), over eighty percent of Turkish agricultural products exported to the EU are duty-free from 2008 to 2011. On the contrary, Turkey applies very few preferential tariffs and even puts high tariffs or other restrictive measures on agricultural and fishery imports from the EU. For a selected number of processed agricultural products, Turkey still imposes specific duties on their 'agricultural components' (European Parliament, 2017) which can be reflected in the reducing roles of the vegetable products. Therefore, the EU's import from Turkey is still among the most prominent trading industries, but the exports to Turkey decreased.

In addition to the international trade factors, since the upgrade trends of trading structure is more significant in Turkey's exports to the EU than its imports from other EU countries, it can be more obviously connected with Turkish domestic industry improvement. This is so say, Turkey has changed from only specializing in low-tech labor-intensive and resource-intensive production patterns to capital-intensive and

technology-intensive production patterns. It implies that its internal national science and technology promotion, talent encouragement, and grown competitiveness have greatly benefited the country.

(1) RCA index

To further understand the competitiveness of Tukey and the EU's export products in the international arena, the revealed comparative advantage index (Balassa, 1965) is used. This index is based on the Ricardian theory of comparative advantage, which proposes that by producing and exporting the good in which it is relatively efficient and importing the other goods, each country can gain benefits. According to the International trade theory (e.g. H-O theory, Ricardo Theory), countries with higher difference of RCA index (which refers to greater comparative advantages) have more opportunities for trade with each other when comparing with those that share higher similarity in factor endowments. This is to say, the more significant the difference between the two countries in this index for a specific commodity, they would be having more possibilities to trade. When discussing the transaction between the EU and Turkey, Utkulu and Seymen (2004) also use the RCA index to support that the customs union process significantly affects trade patterns, comparative advantages, and competitiveness.

The RCA formula is demonstrated as follows:

$$\mathrm{RCA}_k^i = \frac{\mathrm{X}_k^i / X^i}{X_k / X} \tag{2}$$

where X_k^i is country *i*'s exports of sector k, X^i is county *i*'s total exports, X_k is world exports of sector *k,* and *X* is total world exports. Theoretically, if the value of RCA is greater than 1, the product of the export country is considered to be competitive (Kumar et al., 2014). Also basically, it should be noted that the RCA value gives only an indicative view of the results since the competitiveness of a particular product depends on many other factors, including the product's selling price, transaction costs, etc.

Based on the results from Figure 10, firstly, we can find that both Turkey and the EU do not have comparative advantages in works of art, miscellaneous articles, and

footwear since the value of the RCA index for these sectors is lower than 1. Secondly, significant differences in the RCA index value between the EU and Turkey can be found in industries of wood, vegetables, textiles, pulp of timber, optical photographic or medical or surgical instruments, mineral products, metals, live animal and related products, chemicals, articles of stone and glass, arms and ammunition. Therefore, Tukey and the EU have the potentials to export to each other products in which they have higher comparative advantages, thus generating trade creation effects. To be more specific, the EU has a more substantial comparative advantage in industries like wood, pulp of timber, optical photographic or medical or surgical instruments, metals, live animals, and related products and chemicals. While Turkey specializes its exports in vegetables, textiles, and articles of stone/glass sectors, which are also crucial in absolute terms: they make up more than 50% of all exports of Turkey. Besides, the highest value of the RCA index is shown in Tukey's textiles export. It equals 5.31 in 1995 and reaches 5.96 in 2000. Although this indicator is gradually declining recently, it still exceeds most other RCA values. The high value of RCA may suggest Turkey's dominance of the textile industry in the international market. At the same time, its decreasing trend can be partly attributed to the growing competitors (like China) after globalization and its domestic industry upgrade.

Furthermore, analysis of trends and changes in data suggests that the EU's comparative advantage index remains stable over the past few years. However, Turkey's value of the RCA index shows a dramatic variation. Turkish transport equipment, plastic, and rubbers, machinery have significantly increased after 1996 (or, in other words, after the CU). In contrast, its original comparative advantages in vegetable products, rawhides, and skins, foodstuffs, animal fats or oils (which are primarily labor-intensive industries) suffered a dramatic decline. The phenomenon of change once again proves the increase of competition in the international market for products with low-skill labor intensity and Turkey's own intention to transform to high-tech and manufacturing industries as we analyzed above.

(2) G-L Index (IIT Index)

While the RCA index helps measure the comparative competitiveness of the EU and Turkey's trade in different industries, in reality, instead of specialization in an entire

industry or activity, many countries may specialize in a narrow range of products within a given industry. Therefore, the G-L index (IIT index) is also tested in the paper to find the type of trade between the EU and Turkey, as well as evaluating the effects of the customs union.

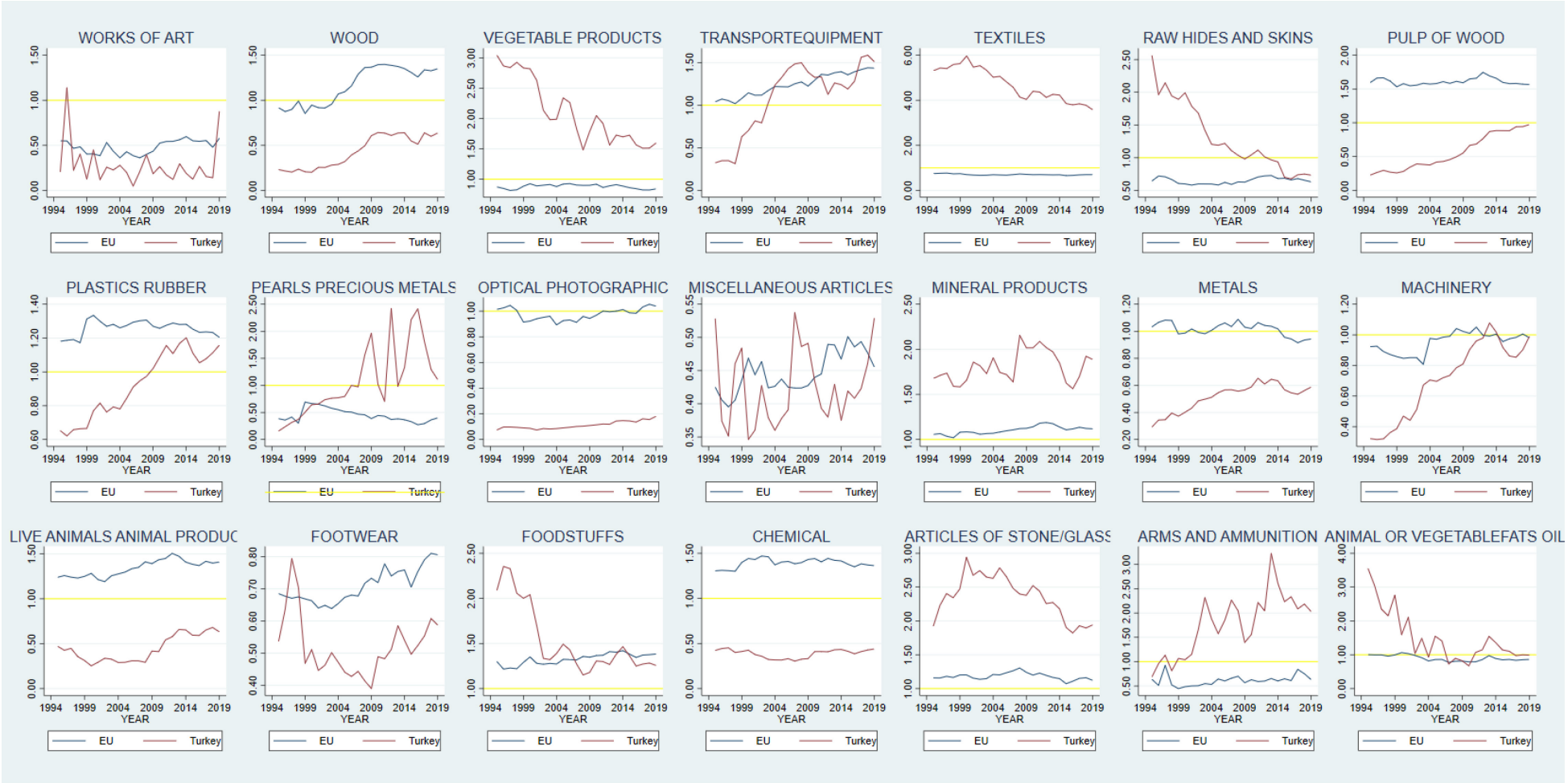
The "intra-industry trade" term was first used by Balassa (1966). And the index IIT arises from economies of scale together with the diversification of goods (ÇEŞTEPE et.al., 2016). If a country can achieve economies of scale, then to some extent the economies of scale can pave the way for the production of different products within an industry, enhancing specialization and foreign trade (Krugman, 1981). In addition, economies of scale can facilitate innovation of new products, including increasing the variety of existing products with more profits (Murshed, 2001). However, since economies of scale do not allow the production of every product domestically, the demand for other products will be met by imports from other countries. Thus, higher levels of IIT among countries with similar factor endowments can provide better profits for all parties than in the case of comparative advantage by giving countries the opportunity to take advantage of such trading opportunities to gain access to a wider market (Krugman and Obstfeld, 2009). Through the dynamic theory of customs union, it is proved that a customs union can promote the highest utilization of the factor productions, as well as promoting scale effects of both parties. Therefore, if the IIT is higher, it indicates that the country gains higher benefits from the customs union.

A widely used measure of the importance of intra-industry trade is the Grubel-Lloyd (GL) index:

$$GL_k^i = 1 - \frac{|X_k^i - M_k^{ij}|}{X_k^{ij} + M_k^{ij}} \quad (3)$$

where, similarly, X_k^{ij} is country *i*'s exports to *j* of good (or in sector) *k* and the bars refer to absolute values. By constructing the Grubel-Lloyd index varies in the interval between 0 and 1. An index value of 0 indicates complete inter-industry trade. The higher the index values, the greater proportion of the intra-industry trade in total trade. When the index value is equal to 1, it means that the exports and imports volume are equal.

Figure 10. Turkey and EU's RCA index in different Exporting Industries



Source: BACI database, Author's calculation. The whole data is listed in the Appendix 4.

Figure 11. Turkey's bilateral intra-industry trade (IIT) with EU countries

Source: UN COMTRADE database, Author's calculation. The whole data is listed in the Appendix 5.

The result in Figure 11 shows that most of the industries between Turkey and EU's trade are intra-industry trading sectors (the value of the IIT index is closer to 1), especially after the instigation of the Customs Union in 1996. Throughout the entire period, articles of stone/glass, pearls and precious metals, live animals and related products, raw hides and skins show the high degree of IIT index. For industries of animal/vegetable oil, foodstuffs, metals, machinery, mineral products, raw hides and skins, transport equipment, the GL index indicates the growing degree of IIT after Turkey's customs union agreement with the EU.

Therefore, it can be proved that the CU between Turkey and the EU in 1996 has strong increasing effects on the level of intra-industry trade, especially in industrial goods (e.g. metals, machinery, mineral products, transportations). Thanks to the removal of customs duties and quantitative restrictions on trade in industrial goods between the EU and Turkey, increasing Turkey's exports to the EU in sectors like machinery, transportation has been effective in reducing the foreign trade deficit in this sector and in increasing the level of intra-industry trade. Besides, this growth in IIT also accelerates Turkey's industrial transformation, especially concerning middle-technology products, if not high-technology products. As claimed by the Turkish Ministry of Economy, "following the establishment of the Customs Union, the product composition of Turkish exports transformed in parallel to changing production scales and structure due to the improved competition conditions and market access advantages gained from the Customs Union" (The Republic of Turkey, 2020).

On the other hand, chemicals, optical, photographic, medical, or surgical instruments; pulp of wood; textiles, and vegetable products show relatively lower IIT values, indicating the inter-industry trade between the EU and Turkey. Since they are mostly complementary industries, these products have the potential for trade with their own efficiency targets.

From the industry analysis in this section, we can conclude that 1) The textile industry is always the most important exporting sector of Turkey, whether looking at the Turkey-EU trade volume or Turkey's trade with ROW. Turkey's comparative solid advantage helps it gain more from this sector, though its competitiveness has gradually dropped

recently. 2) The growing importance of industrial products has been found in bilateral trade between the EU and Turkey after the implementation of the CU, showing Turkey's increasing participation in the global value chain due to the restriction eliminations. 3) The proportion of agriculture sectors trade (including vegetable products, foodstuffs, animal-related products, animal/vegetable oils) has decreased. This can possibly be attributed to the limitations of the CU and Turkish industry transformation from labor-, resource-intensive industry to capital-intensive (with technology). 4) The results from the comparative advantage analysis show that 50% of the trading industries between the EU and Turkey have high potentials to trade with each other because of their significant difference in the value of RCA. 5) Most of the industries between Turkey and EU's trade are intra-industry trading sectors (the value of the IIT index is closer to 1), especially after the instigation of the Customs Union in 1996, indicating the promoting effects of the CU.

5. Methodology and Data Description

5.1 Model Construction

5.1.1 Model I: Trade Effects between the EU and Turkey (intra-block)

In addition to the descriptive statistical analysis about trade developments after the EU and Turkey customs union in Section 4, the gravity model research is adopted in this paper further to understand the trade effects of the Turkey-EU customs union. And as discussed in Section 3.1, the theory of customs union indicates that the CU induces an increase in not only trade creation effects but also trade diversion effects. Therefore, both of them will be examined in the following section.

Firstly, the gravity model used in this paper is constructed. Generally speaking, the traditional equation is formed as follows.

$$X_{ij} = kY_iY_jD_{ij} \tag{4}$$

Where X_{ij} is the exports value from i to j, Y_i refers to all exporter-specific factors (e.g., the GDP of the exporter country), Y_j comprises all importer-specific factors (e.g., the importer's GDP), D_{ij} is a variable that indicates the ease of exporter i to access the destination market j (e.g., the inverse of trade costs), and finally, k is a variable that is independent on bilateral countries.

Anderson and van Wincoop (2003) have shown that bilateral trade can be determined by relative costs and added multilateral resistance terms to evaluate the comparative entry barriers of the trading countries. Following their theory, the gravity equation can be given by:

$$X_{ij} = \frac{Y_iY_j}{Y}\left(\frac{t_{ij}}{\Pi_iP_j}\right)^{1-\sigma} \tag{5}$$

In Equation (5), Y represents the world GDP, Y_i and Y_j is the GDP of countries i and j respectively together shows a size term as the hypothetical level of trade between i and j without trade costs. And $\frac{t_{ij}}{\Pi_iP_j}$ is a trade cost term, indicating the total effects of trade costs. To be more specific, σ >1 is the elasticity of substitution, t_{ij} is the cost variable for j to import goods from i, which can be expressed by bilateral distance, tariffs, RTA, etc. Π_i, P_j indicates country i's outward and country j's inward multilateral resistance

terms, which is also discussed in the study of Anderson and van Wincoop (2003), evaluating the ease of market access. It is essential to include MRTs in the empirical work; otherwise, the model will have a "Gold Medal Mistake" (Baldwin and Taglioni, 2006). Also, the equation can be transformed into a log-linear equation with the error term.

$$\ln X_{ij,t} = \ln Y_{j,t} + \ln Y_{i,t} - \ln Y_t + (1-\sigma)\ln P_{i,t} - (1-\sigma)\ln \Pi_{i,t} + \varepsilon_{ij,t} \quad (6)$$

where *t* is the given time.

This formula is the most popular version of the empirical gravity model. Therefore, following the model from BKP, Panteia, and AESA (2016), the baseline OLS model used in this paper will also be constructed based on Equation (7).

$$\ln X_{ij,t} = \beta_0 + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \varepsilon_{ij,t} \quad (7)$$

where $lnX_{ij,t}$ is the natural logarithm of the actual exports of country *i* to *j* at time *t*. $lnGDP_{i,t}$, $lnGDP_{j,t}$ is the logarithm of real GDP of country *i*, *j* at time *t*, which is used to evaluate the economic sizes of the trading countries. $lndist_{ij}$ is the log of the population-weighted distance between most populated cities.

$lang_{ij}$ is a dummy variable, equal to 1 if countries share a common language spoken by at least 9% of the population, representing one of the cultural distances between the EU and Turkey. Instead of using an official language dummy, this ethno-language variable is used because only Turkey and Cyprus treat Turkish as the official language. Some other smaller groups of Turkish speakers exist in Iraq, Syria, Germany, Austria, and Bulgaria, so using this variable can better examine the effects of the common language.

$contig_{ij}$ and $comcol_{ij}$ are also dummy variables to test the culture resistance between trading counties (Porojan, 2001; Glick and Rose, 2002; Kurihura, 2003). $contig_{ij}$ equals to 1 if countries are contiguous, $comcol_{ij}$ is 1 if countries share a common colonizer post-1945.

In addition to these traditional gravity explanatory variables, $conflict_{ij}$ and $religion_{ij}$ are also added to the study. $conflict_{ij}$ equals to 1 if countries had conflict in history. It is used for testing whether the disputes between Turkey with some European countries (like Cyprus, Greece) have deteriorated their trading activities. $religion_{ij}$ is referred to as the religious proximity index (Disdier and Mayer 2007). The model uses this dummy because the difference between the Turkish largest religion, Islam, and those in Europe may cause some human rights problems, which is what should be considered.

Besides, $CU_{ij,t}$, which is the most important variable in the paper, equals to 1 if country i and j are partners in the EU-Turkey customs union at time t. The coefficient and standard error of this variable from the regression will give us evidence of the trade effects of the CU. And $\varepsilon_{ij,t}$ is the error term.

In real empirical analysis, pooled OLS model sometimes may ignore the heterogeneity of time and variables. Therefore, many researchers turn to focus on the application of the fixed-effect model in running gravity equations. According to Hummels (2001) and Feenstra (2016), the model with exporter-time and importer-time fixed effects will control the unobservable multilateral resistance and remoteness terms. Besides, the pair-fixed effects are proposed with better measurements in bilateral trade costs in comparison with the standard set of gravity variables (Egger and Nigai, 2015; Agnosteva et.al., 2014). Therefore, the study follows their suggestion and tests the model by fixed effect model with above settings. The formula can be specified as:

$$\ln X_{ij,t} = \beta_0 + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \lambda_{ij} + \gamma_t + \varepsilon_{ij,t} \quad (8)$$

$$\ln X_{ij,t} = \beta_0 + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \mu_{it} + \delta_{jt} + \varepsilon_{ij,t} \quad (9)$$

and where λ_{ij}, γ_t donates for the pair-fixed and time-fixed effect, $\mu_{i,t}$, $\delta_{j,t}$ is the vector of exporter-time fixed effects and importer-time fixed effects.

Although the fixed effects model can give more reliable results, Santos Silva and Tenreyro (2006) point out that it may lead to inconsistent estimates in the presence of heteroscedasticity or zero trade flows problems when using trade data. In this way, the Poisson pseudo-maximum likelihood (PPML) estimator is proposed. Since the gravity model in PPML estimation is directly estimated from its multiplicative form, where the dependent variable is measured in levels instead of linearizing the model by using logarithms, the zero trade flow problem can be solved well. Moreover, in the presence of heteroskedasticity, this approach appears to yield more robust and consistent results than other econometric techniques. Therefore, PPML is served to be a new central tool to assess international trade, which is also supported by several recent empirical analyses on the gravity model (Westerlund and Wilhelmsson, 2011; Anderson and Yotov, 2012; Anderson and Yotov, 2016; Anderson, Larch, and Yotov, 2018).

In this way, our study will apply the gravity model with estimation by both the OLS and PPML estimators for a robustness check. The gravity specification for PPML can be re-formulated in multiplicative form (Yotov et al., 2016) as:

$$X_{ij,t} = \exp(\beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \lambda_{ij} + \gamma_t) \times \varepsilon_{ij,t} \quad (10)$$

$$X_{ij,t} = \exp(\beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \mu_{it} + \delta_{jt}) \times \varepsilon_{ij,t} \quad (11)$$

Finally, we combine the pair-fixed, importer-fixed and exporter-fixed effects for absorbing all time-invariant bilateral trade costs (Egger and Nigai, 2015; Agnosteva et al., 2014), which is shown in Equation (12).

$$X_{ij,t} = \exp(\beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \mu_{it} + \delta_{jt} + \lambda_{ij}) \times \varepsilon_{ijt} \quad (12)$$

Since only using Equation (12) cannot detect the effects of time-invariant bilateral determinants of trade flows that had been absorbed, all the fixed-effects models will be combined to support the final result.

5.1.2 Model II: Trade Creation and Diversion Effects (intra- and extra block)

According to what we discussed in Section 3.1, the effects of the CU includes not only trade creation in the intra-bloc regions($CU_{ij,t}$), but also trade diversion. Therefore, trade diversion effects in terms of export and import between intra-bloc countries and extra-bloc countries (*imp_cu_rest*), (*export_cu_rest*) are further added; these three indicators will together be used to the model in Model 2.

$$X_{ij,t} = \exp(\beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} + \beta_{10} \text{imp\_from\_rest}_{ij,t} + \beta_{11} \text{exp\_to\_rest}_{ij,t} + \lambda_{ij} + \varphi_t) \times \varepsilon_{ij,t} \quad (13)$$

It should be noted that the exporter-year and importer-year fixed effects are omitted in Equation 13 due to collinearity. According to Magee (2008), the importer fixed effect does not allow us to identify the modifications in the intra-CU imports and the change in the extra-CU imports because the latter two values constitute the total evolutions in the importer's total imports. Therefore, the importer-time fixed effect cannot be detected. And the exporter-year fixed effect behaves similarly.

In Equation (13), CU_{ijt}, *imp_from_rest*$_{ijt}$, and *export_to_rest*$_{ijt}$ are binary variables that measure the specific trade effects of the Turkey-EU customs union. CU_{ijt} equals to if both countries *i* and *j* in year *t* are both the Tukey-EU customs union members, which is the same as the dummy in Model 1. A significantly positive coefficient of CU_{ijt} indicates strong trade creation effects, showing that intra-trade has been promoted more by the CU than normal trade levels. The variable *imp_from_rest*$_{ijt}$ equals 1 if exporter *i* is a non-CU member in year *t* and the imported country *j* is a CU member. The positive value of its coefficient represents trade creation in terms of imports and indicates expanded imports from non-member countries to member countries. Otherwise, trade diversion effects will appear. Similarly, the variable *export_to_rest*$_{ijt}$ takes the value of 1 if exporter *i* is a CU member country and the destination country *j* is not among the CU during the time *t*. When its coefficient is positive, trade creation in terms of exports happens and indicates the establishment of CU leads to a switch of export activities from CU member countries to non-CU member countries.

To explain the total trade effects of the EU-Turkey customs union, when a customs union leads to an increase in intra-bloc trade combined with a growth of in extra-CU trade in terms of exports or imports of non-members, it determines whether the trade is generated in terms of export flows or import flows, respectively. On the contrary, if the increase in intra-CU trade is combined with a decrease in extra-CU trade in terms of exports or imports, this situation is determined by the export diversion effect or import diversion effect, respectively.

In the study, the relationship between β_9, β_{10}, and β_{11} would measure the trade creation/diversion. Assume that $\beta_9>0$ which denotes intra-bloc trade than predicted and maybe in substitution to domestic production or exports for the non-membership countries. If $\beta_{10}>0$, then there is a pure trade creation. If $\beta_{10}<0$, referring to a lower propensity to import from extra-bloc countries. At that time, if $|\beta_9|>|\beta_{10}|$, it suggests that despite trade creation effects being offset to a certain extent by export diversion effects, trade creation still prevails. In contrast, it reflects a dominant export diversion effect representing a welfare loss on behalf of non-member countries. Therefore, comparing these three coefficients can lead to understanding the trade effects of the CU. Such possible trade effects under the CU were specifically explained by Soloaga and Winters (2001), Carrère (2006), Martínez-Zarzoso et al. (2009) and are presented below in Table 2 as a summary.

Table 2. Trade creation and trade diversion effects of CU coefficients

Signs of the CU coefficients			Trade creation and Trade diversion effects	Overall (Welfare) Effects
β_9	β_{10}	β_{11}		
> 0	> 0	> 0	• Intra-bloc trade creation • Export creation • Import creation	TC+TC(M)+TC(X)
> 0	< 0	> 0	• Intra-bloc trade creation • Import diversion • Export creation	TC+TD(M)+TC(X)
> 0	> 0	< 0	• Intra-bloc trade creation • Import creation • Export diversion	TC+TC(M)+TD(X)
> 0	< 0	< 0	• Intra-bloc trade creation • Import diversion • Export diversion	TC+TD(M)+TD(X)

Notes: TC represents the trade creation effects, TD represents the trade diversion effects. M refers to the import impacts, while X refers to the export impacts.

5.2 Data

The model is estimated based on data covering 44 countries, including Turkey, 28 EU countries (plus the UK), and 15 non-EU countries (mostly Turkey's top 15 trading partners). Appendix 6 enumerates the countries used in the study. They are chosen due to significant geographical diversification (covering seven different regions) and account for nearly 75% of Turkey's total exports and 75% of Turkey's total imports.

The trade dataset in this study is derived from two different databases. The nominal aggregated export trade data (in thousand US$) are collected Direction of Trade Statistics (DOTS) from the International Monetary Fund (IMF), with the period of 1989 through 2019. In contrast, the disaggregated trade data (in thousand US$) are retrieved from the BACI-CEPII database (Gaulier and Zignago, 2010), including annual observations for 21 sectors identified by the HS92 system. The time is from 1995 to 2019 due to the data availability. The complete list for the sectors included is shown in Appendix 1. Nominal GDP (in thousand US$) is obtained from World Bank. Trade cost variables (*contig, dist, lang, comcol, religion, conflict*) are taken from the CEPII gravity database and information from the Turkish Statistics Institute. And the dummies for *CU, imp_from_rest, and export_to_rest are collected fro*m WTO Regional Trade Agreements Database. The descriptive statistics for the sample applied in the study is demonstrated in Appendix 7.

6. Empirical Research

In this section, the trade effects of the Turkey-EU customs union will be analyzed by using gravity model.

First, the aggregated data will be analyzed by pooled OLS, FEM, and PPML estimator to find the trade impact of the CU between the EU and Turkey (intra-bloc). Second, trade diversion effects will also be considered to exam the overall trade effects and the welfare results of the CU by using three different dummies. Third, the model will use the disaggregated data to test different sectoral effects on top 8 trading industies. Then the robustness check for the above analysis will be illustrated. Finally, the impact of CU on the direction of trade between the EU and Turkey will be provided, as well as the customs union's impact on individual EU countries.

6.1 Unit Root Test

Before the regression, a unit root test is required to investigate the stationarity of the data, as well as preventing the emergence of pseudo-regressions in the model. The results of the LLC (Levin et al.,2002) test are presented as follows. Since the dummy variables such as distance, language, and geographic location (for determining whether they are bordering or not) of two trading countries are fixed in the constructed gravity, the unit root tests for these explanatory variables are excluded. The results show that the null hypothesis of unit root is rejected, indicating the non-stationary of the dataset.

Table 3. Unit Root Test

	LLC		
Varibles	**statistic value**	**p-value**	**Process**
lntradeijt	-34.2333	0	Stationary
lngdpit	-24.8419	0	Stationary
lngdpjt	-24.8419	0	Stationary

6.2 Analyzing Trade Effects of the EU-Turkey CU by aggregate data

6.2.1 The Effects of the CU on Trade between the EU and Turkey

Table 4 presents estimates of the impacts of the EU-Turkey customs union on trade flows by aggregate data analysis. At first glance, Column (1) and Column (2) provide pooled OLS gravity model estimation results for the export of trading countries. The coefficients for the traditional gravity model explanatory variables are statistically

significant at a 1% level except for the dummy variable ‘common religion,’ suggesting that the existence of higher shares of common religion might have minor impacts on the trade creation. In addition, the effect of the EU-Turkey CU is also not significant at the 5% level. Fixed effects models with different settings were also tested considering year and country specific effects. The result of the F statistic (with zero p-value) indicates the null hypothesis that the dummies for all countries' coefficients are jointly equal to zero is rejected (The detailed results in demonstrated in Appendix 8). Therefore, the entity fixed effects model is needed in the study and is more precise than pooled OLS model.

The results in Columns (3) - (6) are for the fixed effect gravity model. First, the Hausman tests are given. The small P-value (close to 0) of the statistic proves that the null of RE specification is rejected at a 1 % significance level, and FE is more appropriate for estimation (The results are shown in Appendix 8). In Column (4), the bilateral fixed effect is included. The result indicates that a 1% increase in the size of the GDP of the exporting countries can significantly increase the intra-trade flow by 1.18%, and such promoting effect can also be found in the GDP of partner countries. Besides, joining the CU can significantly improve trade within the EU and Turkey by 63.2% ($(e^{0.490} -1) \times 100$). Column (5) puts the FE for each country pair and every year into the dissection (Equation 8). As mentioned in the previous section, the time-varying destination-country dummy variables can absorb most of the linkages between the endogenous trade policy variables, as well as control for potential endogeneity (Agnosteva et al., 2014; Egger and Nigai, 2015). The result, however, indicates that the effect of the CU member is not strong at a 5% significance level.

In Column (6), the exporter-time fixed and importer-time fixed dummies are included (Equation 9) to control for the unobservable multilateral trade resistance properly, which is one of our main results (Anderson and van Wincoop, 2003). The coefficients of the dummy variables common colonizer and conflict are not significant at the 5% level. But dummies like contiguity, common language, religious proximities, and geographic distance can greatly influence the trade between the EU and Turkey at a 5% significance level. To be more specific, a 1% increase in distance between two trading countries will lead to a 1.06% reduction in intra-bloc trade flows. Similar language,

contiguity and religion proximity can improve the trade by 72.3% (($e^{0.544}$ -1) × 100), 119% (($e^{0.778}$ -1) × 100), 11.7% (($e^{0.111}$ -1) × 100), respectively. Besides, the coefficient for the CU dummy surprisingly suggests that the customs union has negative effects on the trade flow, which is in contrast with Column (4). Finally, both exporter-time, importer-time, and country pair effects are all considered in the FE model in the setting of Equation 10. The result is shown in Column (7). Not surprisingly, the GDP and bilateral control variables are perfectly collinear with the country-year and bilateral FE set, respectively, and are thus not determined. The result is similar to Column (5), implying the insignificant impact of the CU on the EU and Turkey's bilateral trade.

To conclude, the effects of traditional gravity model coefficients like distance (-), common language (+), contiguity (+), and religion proximities (+) are consistent with what has been demonstrated in the past literature. However, the effects of sharing a common colonizer post 1945 is not significant if we control for import-time and exporter-time. As for the religious proximity index (Disdier and Mayer, 2007) and conflict history indicator, which is newly added in the study. The results indicate that the former can significantly benefit the trade performance between two countries, but the latter's effect is not as strong as expected. Besides, the effects of the customs union of the EU and Turkey, which is the primary focus of the study, is significantly positive in the OLS model and country pair fixed effect model, adverse when considering directional time-varying (importer and exporter) fixed effects and not significant in other fixed models. The varying results, which are pretty sensitive to FE choice, can partly be attributed to the problem of zero trade problem and heteroscedasticity (Nguyen, 2019).

Table 4. Results for OLS and FE

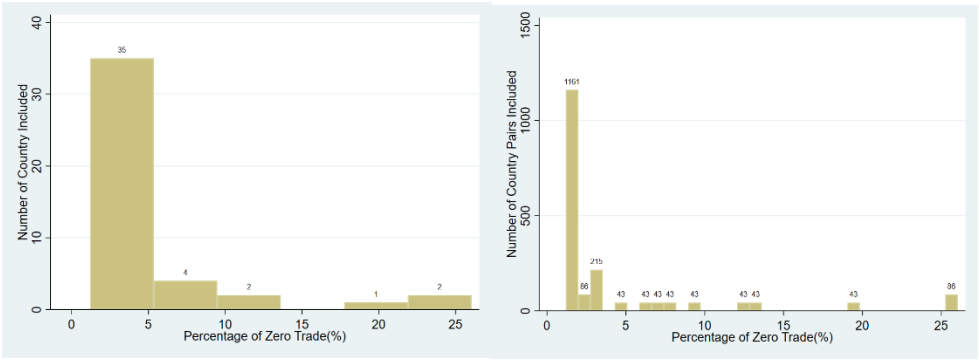
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Pooled OLS	**Pooled OLS**	**FE (t)**	**FE (ij)**	**FE (t,ij)**	**FE (it,jt)**	**FE (it,jt,ij)**
Varbailes				lntrade			
lngdpo	1.228	1.227	1.009	1.183	1.009		
	(0.024)***	(0.007)***	(0.027)***	(0.021)***	(0.089)***		
lngdpd	1.016	1.015	0.732	0.905	0.732		
	(0.025)***	(0.007)***	(0.027)***	(0.021)***	(0.080)***		
ln_D	-0.823	-0.780				-1.059	
	(0.048)***	(0.015)***				(0.073)***	
contig		0.732				0.544	

		(0.078)***				(0.221)**	
lang		1.159				0.788	
		(0.068)***				(0.335)**	
comcol		0.634				0.223	
		(0.084)***				(0.354)	
religion		0.065				0.111	
		(0.062)				(0.034)***	
conflict		-0.416				-0.210	
		(0.047)***				(0.161)	
CU		0.062	0.199	0.490	0.199	-0.546	-0.068
		(0.054)	(0.125)	(0.127)***	(0.482)	(0.207)***	(0.103)
_cons	-24.923	-25.208	-22.748	-28.674	-21.979	23.906	11.584
	(0.712)***	(0.199)***	(0.717)***	(0.262)***	(0.751)***	(0.847)***	(0.005)***
N	58652	58652	58652	58652	58652	58652	58652
R2	0.498	0.502	0.324	0.742	0.751	0.775	0.897
Time-Fixed	NO	NO	YES	NO	YES	NO	NO
Country-Pair Fixed	NO	NO	NO	YES	YES	NO	YES
Exporter-Time Fixed	NO	NO	NO	NO	NO	YES	YES
Importer-Time Fixed	NO	NO	NO	NO	NO	YES	YES

Note: *, **, and *** refer to the significance level of 10%, 5%, and 1%.

Figure 12 shows a histogram for the ratio of zero trade in the exports of 44 countries selected in the study. Among all these countries, 39 countries have total zero trade flows for under 10% of their potential export flows with trading partners from 1989 to 2019. Nonetheless, countries like Czech, Estonia, Belgium, Iraq, and Israel lack 10% to 30% of trading data, probably due to domestic political reasons (e.g., war conflict, national independence). On the country-pair level, 1161 country pairs of the 1892 pairs in the sample almost have no zero trade flow problem, and approximately 6.8% of the total country pairs have zero trade flows over 15% of the time.

Figure 12. Zero Trade in the dataset



In actual trading activities, zero bilateral trade increases when the potential for bilateral trade between the two countries is low, indicating that these zeros are actually correlated with the explanatory variables (Mnasri, Ayman, and Salem 2019). Therefore, omitting the observations with zero-valued dependent variables or including them without modification may result in biases. In order to handle the problem of zero trade, several approaches are proposed in the past paper, including replacement of small and random numbers (Head and Mayer, 2014), the Tobit estimation (Martin and Pham, 2008), the Poisson Pseudo Maximum Likelihood (PPML) estimation (Santos Silva and Tenreyro, 2006), and a two-step selection process (Helpman et al., 2008). As we suggested in Section 5, the PPML method is applied to improve the original model following many other experts (Anderson and Yotov 2012; Anderson, Larch, and Yotov 2018; Larch, Schmeißer and Wanner 2020).

At first glance, Column (1) gives the PPML results of the basic gravity model without any fixed controls, in which the size of GDP has significant promoting effects on the trade flow. The coefficient on distance is negative and statistically significant, showing a 1% increase in the geographical distance between trading countries will lead to 0.64% decrease in bilateral trade flows. In addition, the influence of sharing a common border, higher religion similarity is positive and significant as expected. However, impacts of the same language and conflict history become marginally significant. And the effects of the variable '*comcol*' stays insignificant. As for the impact of the EU-TUR CU on members' trade, the dummy of this customs union shows that joining the CU significantly decreases the trade flow by 30.02% ($(e^{-0.357} -1) \times 100$). Since this specification only gives a rough result display without considering the recent development in the theoretical foundations of the gravity model (fixed effects), these results may suffer from bias.

Following the process in the fixed effect model and Equation (10) - (12), Column (2) & (3) presents the results after including time-varying country pair fixed effects, export-time, and importer-time effects, respectively. Finally, Column (4) shows a specification where pair effects are also added to Column (3), addressing the potential endogeneity of the EU-Turkey CU by absorbing all trade costs (Baier and Bergstrand, 2007). Based on the value of the coefficient in these three columns, it can be concluded that the effects

of exporting and importing countries' GDP are in line with most literature and what supports in the previous section. 1% increase of the economic size of the original country can improve the trade volume by 0.77%, and a 0.70% increasing effect of the partner country's GDP is suggested. Besides, other explanatory variables show similar results with Column (1). Taking a closer look at the EU-TUR effects, the coefficient is positive and significant at a 1% level if time-varying country pair effects and exporter-, importer-time fixed effects are controlled. The increasing impact of the EU-TUR customs union on the members' intra-bloc trade is about 41.2% ($(e^{0.345} -1) \times 100$) to 49.8% ($(e^{0.404} -1) \times 100$), which is lower than the results from the FE model.

After the PPML model, the Ramsey RESET is used to test, detecting whether potential variables are omitted in the model specification (following the methods from Yotov, Piermartini, Monteiro, and Larch 2016). The null hypothesis states that the model does not suffer from misspecification errors suggesting the model is correctly specified. The results for the PPML regression of the study cannot reject the null hypothesis and pass the misspecification test since the p-value is smaller than the critical value (as shown at the bottom of Table 5).

In summary, the PPML estimations prove that the customs union can significantly improve the trade flows between the EU and Turkey by about 40% under a specific fixed effects model. And the results also provide similar effects of other explanatory variables with the previous section. However, the effects of language also become insignificant in the PPML model, which can be attributed to the fact that few countries show similar language with Turkey. Therefore, its effects may be negligible when considering more effects.

Table 5. Results for PPML

	(1) PPML	(2) PPML(ij,t)	(3) PPML(it,jt)	(4) PPML(it,jt,ij)
Variables	Trade			
lngdpi	0.758	0.777		
	(0.024)***	(0.034)***		
lngdpj	0.815	0.699		
	(0.031)***	(0.039)***		
ln_dist	-0.637		-0.719	
	(0.042)***		(0.033)***	

contig	0.509		0.463	
	(0.126)***		(0.116)***	
lang	0.074		0.019	
	(0.093)		(0.083)	
comcol	0.783		0.382	
	(0.123)		(0.351)	
comrelig	0.158		0.315	
	(0. 278)***		(0.115)***	
conflict	-0.328		-0.260	
	(0.295)		(0.317)	
CU	-0.357	0.345	0.404	0.065
	(0.093)***	(0.090)***	(0.141)***	(0.121)
_cons	-12.047	-14.627	22.060	
	(1.050)***	(1.171)***	(0.277)***	
N	58652	58590	57292	57292
R2	0.750	0.976	0.914	0.971
RESET (P-value)	0.0890	0.4421	0.0543	
Time-Fixed	NO	YES	NO	NO
Country-Pair Fixed	NO	YES	NO	YES
Exporter-Time Fixed	NO	NO	YES	YES
Importer-Time Fixed	NO	NO	YES	YES

Note: *, **, and *** refer to the significance level of 10%, 5%, and 1%.

6.2.2 Trade Creation and Diversion Effects of the TUR-EU CU

To further understand the effects of the Turkey-EU customs union, trade creation and trade diversion effects are examined by using three individual indexes (*CU*, *imp_from_rest,* and *export_to_rest*) in this section.

From Column (1), the significant effects of the GDP and distance are supported again. But the coefficients of variable $lngp_i$, $lngp_j$ and $lndist_{ij}$ is slightly higher the what we generated in intra-bloc PPML model. Besides, the EU-Turkey customs union witnessed export creation and import creation through significant positive coefficients on extra-block trade dummies and an increase in their intra-bloc trade. The results in Column (2), which absorb the specific effects of the country pair and time, also support the conclusion. The coefficient of intra-*CU* trade dummy is significantly positive, implying that the trade between the EU and Turkey receives additional growth by 66.7% (($e^{0.511}$ -1) × 100). The coefficients of *import_from_rest* and *export_to_rest* are also favorable at a 5% significance level, suggesting that the EU-Turkey customs union does not

decrease any exports or imports with non-member countries. The value of the coefficients indicates that participation of the Turkey- EU customs union boosts the member's export to ROW and imports from ROW by 16.2% (($e^{0.151}$ -1) × 100), 26.6% (($e^{0.236}$ -1) × 100). In contrast, trade diversion effects cannot be proved in this model, , suggesting the CU does not deteriorate the welfare for non-member states trade.

In addition, if we are taking a closer look at the value of *CU*'s coefficients, intra-trade between the EU and Turkey can be increased by 67% due to the CU, which is higher than the results provided in Table 5 (41.2%-49.8%). This is to say, the solid trade-promoting effect on intra-area trade is more potent if the estimation also takes extra-area trade into account. When the extra-area trade variables (*import_from_rest* and *export_to_rest*) are also regressed in the model, the point estimate on intra-area trade rises (from 0.3/0.4 to 0.5 of the coefficient, equally transformed to increase of trade flows by 22.9%). Therefore, it also advocates the claim that trade with the extra-area of the CU has also grown faster in relative terms (although with a lower degree), like intra-trade growth. Consequently, excluding extra-trade from the control group raises the estimated CU impact on trade between member states when measured relative to trade between partner countries sitting exclusively outside the member states (Faruqee, 2004). The difference of the coefficients in Section 6.2.1 and 6.2.2 is also in line with the positive effects of export/import creation, arguing that the CU's trade diversion effects are relatively small. These estimated impacts of the EU-Turkey CU in the study are consistent and comparable with the findings from Magee (2016), who proves that the CU has generated much more significant trade creation effects than trade diversion, also by using PPML estimator. Besides, the effects of the intra-trade creation (67%) exceeds extra-trade effects (16.2%, 26.65%), suggesting that the reduced tariffs from the CU between the EU and Turkey is more attractive for them to trade than from other countries.

These results imply that EU-Turkey's trade with the rest of the world also greatly improved along with the growth of intra-block trade thanks to the implementation of the customs union. In other words, the trade patterns of the EU and Turkey are actively oriented toward trade with the rest of the world, in addition to strengthening trading connections between each other. From their trade volume change and sectoral trade

analysis in Section 4, we can conclude that they have enormous potential to trade with the rest of the world due to their specific comparative advantages in the international market. Besides, with their increasing participation in the global value chains and higher integration in international economics, they have more opportunities to trade with third countries and benefit from it.

Table 6. Results of Trade Creation and Trade Diversion Effects

	(1)	**(2)**
	PPML(i, j, t)	**PPML(ij, t)**
Variables	Trade	
lngdpi	0.809	0.793
	(0.033)***	(0.030)***
lngdpj	0.732	0.714
	(0.045)***	(0.037)***
ln_dist	-0.835	
	(0.027)***	
CU	0.635	0.511
	(0.164)***	(0.093)***
imp_from_rest	0.237	0.236
	(0.060)***	(0.059)***
exp_to_rest	0.170	0.151
	(0.064)***	(0.056)***
_cons	-9.727	-15.406
	(1.381)***	(1.081)***
N	58652	58590
Time-Fixed	Yes	Yes
Exporter, Importer-Fixed	Yes	NO
Country-Pair Fixed	NO	Yes

Note: *, **, and *** are significance level of 10%, 5%, and 1%.

Based on the analysis of the signs of the RTA coefficient (Table 2), net effect of the EU-Tukey CU is calculated, it can promote significant net trade creation effects by 145%.

Table 7. Overall Effects of the CU

	CU	imp_from_rest	exp_to_rest	Overall Effects	%
Coefficient	0.511***	0.236***	0.151***	TC+XC(X)+TC(M)=0.898	145.469

Note: *, **, and *** are significance level of 10%, 5%, and 1%. The formula is based on the literature from Carrère 2006. Calculation by the author. TC represents to the trade creation effects, TD represents to the trade diversion effects. M refers to the import impacts, while X refers to the export impacts.

6.2.3 Robustness Check

In order to avoid the overreaction of domestic industries after the establishment of the customs union, the elimination of trade barriers and application of the customs union between member countries is not a quick fix. It often takes time for bilateral trade flows to adjust to changes in trade policies or trade costs. Therefore, the first robustness check uses panel data with 3-year in preference to data compiled over consecutive years, as proposed by Baier and Bergstrand (2007), Olivero and Yotov (2012), Kohl (2014), and Yotov (2016). Column (2) in Table 8 presents the results for this check; the consistent trade-promoting effects of intra-bloc and extra-bloc trade can be found, as obtained by the PPML estimator. And the value of coefficients of these three CU indicators obtained with 3-year intervals delivers consistent results concerning the baseline results built on consecutive years, which strongly supports the main results from the model above.

Secondly, as regional agreements potentially have a phase-in period, the model employ lagged CU variables to account for these dynamic effects of the EU-Turkey customs union. Following the proposition of Baier and Bergstrand (2007) and Anderson and Yotov (2011), the second robustness check includes one-, three-, six- and nine-year lags of the CU variables (including *CU*, *imp_from_cu*, *exp_to_cu*) in the estimation.

As reported in Column (3) – Column (6) in Table 8, firstly, the CU yields trade effects on members even after the implementation. To be more specific, the one-year lagged intra-CU trade (0.627) and export to ROW (0.179) coefficient is significantly higher than what has been estimated in the original model (with the coefficient of 0.511 and 0.151). That being said, about 20% increase in intra-CU trade and a 3.3% increase in export creation effect increase have been observed over one year after they came into force. In the following years, the intra-bloc trade creation effect remains significant up to nine years though the coefficient decreases almost three times compared to their peak value. As for the extra-trade effects, both export and import creation dummies stay

highly significant in lagged 1-year and 3-year periods, but the value of the coefficients becomes smaller. And the insignificant coefficients in 6-year and 9-year lags suggest that no more import or export creation for the EU-Tukey international trade after six years. Moreover, the overall results, including CU lagged variables, are consistent with our baseline model in the previous section, implying the robustness of the model.

Table 8. Robustness Test for aggregated data

	(1)	(2)	(3)	(4)	(5)	(6)
	Basline	3yr-interval	Lag1	lag3	lag6	lag9
Variables				Trade		
lngdpi	0.793	0.779	0.803	0.789	0.754	0.709
	(0.030)***	(0.031)***	(0.033)***	(0.034)***	(0.035)***	(0.038)***
lngdpj	0.714	0.704	0.728	0.714	0.697	0.672
	(0.037)***	(0.039)***	(0.045)***	(0.047)***	(0.052)***	(0.060)***
CU	0.511	0.536	0.627	0.535	0.331	0.244
	(0.093)***	(0.095)***	(0.163)***	(0.157)***	(0.147)**	(0.135)*
imp_from_rest	0.236	0.223	0.230	0.173	0.054	-0.002
	(0.059)***	(0.063)***	(0.060)***	(0.055)***	(0.047)	(0.037)
exp_to_rest	0.151	0.151	0.179	0.148	0.045	0.009
	(0.056)***	(0.060)**	(0.064)***	(0.060)**	(0.052)	(0.043)
_cons	-15.406	-14.918	-9.508	-8.894	-7.711	-6.186
	(1.081)***	(1.138)***	(1.375)***	(1.428)***	(1.508)***	(1.699)***
N	58590	20790	56760	52976	47300	41624

Notes: All estimations are performed with country-pair fixed and time fixed effects, using the PPML estimator. *, **, and *** are significance level of 10%, 5%, and 1%.

6.3 Analyzing Trade Effects of the TUR-EU CU by disaggregating data

6.3.1 Heterogeneous Effects across Different Sectors

In the above sections, we measure the overall trade effects of the EU-Turkey for aggregate trade data. However, the calculated RCA and IIT index in Section 4.2 implies that different tariff reduction policies in industries and trade costs adjustments have quite heterogeneous effects across the trading industry sectors. Therefore, the top-8 trading sectors between the EU and Turkey are analyzed in this section to handle this question.

Table 9 shows the results for the customs union effects across eight different industries;

each analyzed in a separate PPML regression (controlled for country pair and time). It reveals that the customs union has very different impacts across industries, as we assumed. Firstly, significantly positive intra-bloc trade creation effects of the EU and Turkey's CU are found for trade in textiles, transport equipment, machinery, metals, and plastics & rubbers. In contrast, marginal effects can be observed for industries of chemicals minerals, and agriculture.

The most substantial promoting effects of the CU can be found in two crucial industrial manufacturing sectors: transportation (199.2%) and machinery (189.8%), followed by the impacts on rubbers/plastics (121.2%). The significant development can partly be explained by abolishing tariffs in 1996 and eliminating the need for certificating 'Rules of Origin' between the EU and Turkey's trade. These manufacturing industries that feature deep integration with multiple border crossings along the global value chain tend to benefit disproportionately from this trade cost reduction. Besides, the results are also in line with the trade structure change from the primary trading sector analysis in Section 4, suggesting an improvement of Turkey's increasing involvement in the global value chain and growing technology developments.

Concerning the textiles industry, which is usually the most extensive trading sector between Tukey and the EU, the coefficient of its intra-bloc dummy suggests that the CU has dramatically improved the trade between the EU and Turkey by 116.2%. But the promoting effect is lower than that for transportation, machinery, and plastics/robbers. Besides, the negative *imp_from_rest* coefficient related to import diversion, can also be proved in the textile industry, although it is not significant. This potential trade diversion is connected with increasing competition from other labor-intensive countries like China. Due to the openness of the global markets, some member countries, especially some eastern EU countries, may choose to import textiles from China instead of Turkey after the Chinese "The Belt and Road Initiative".

As for the agricultural sector, the impact of intra-bloc trade is negative, although it is not significant. This result is not surprising because the customs union has very limited trade liberalization in these sectors. Agriculture was not covered in the initial customs union, which is the most important reason for this negligible impact. In 1998, a

'Preferential Agreement on Agriculture' was signed for both parties as an additional agreement to provide preferential access to many agricultural and fishery products that were excluded from the original CU. However, this method cannot clearly compensate for the original deficiencies of the customs union between the EU and Turkey. First, the newly applied agreement still asks for the preparation of a Certification of Origin for goods dropped in the CU (but not in the preferential agreements). As a result, it wastes a lot of time and costs in the certification process, thus reducing the effectiveness of the transactions. Moreover, as we analyzed in Section 4, Turkey continues to protect its agricultural sector by granting few preferential tariffs on food imports from the EU (BKP, Panteia, and AESA, 2016). Therefore, the customs union cannot be an effective catalyst for intra-agricultural industry trade.

However, the metal industry, which includes coal and steels that are is also listed as a restricted category in the original customs union, the intra-trade promoting effects of the agreement on it is shown to significant. Actually, the proportion of metals in the Turkish exports to the EU increases over the past 30 years from 4.1% to 12.2%, which also support metal's dramatic developments after the customs union.

In addition, the influence on the minerals and chemicals sectors is negligible. This result can be attributed to the existing technical barriers to trade because of the complex EU regulations. Although the CU requires Turkey to align all its trade laws with the EU, it is hard for Turkey to achieve compliance in a relatively short period due to its own legal histories, implementation efficiency issues, and national considerations about its own interests. And even until now, these two regions are still unable to reach full harmonization. Therefore, the compliance costs for Turkish companies are high, especially for some industries with high technical requirements and complex quality guides. For example, trade frictions still exist for pharmaceuticals due to the lack of recognition of good manufacturing practices and marketing authorization requirements on both sides (BKP, Panteia, and AESA, 2016).

Taking the ex-trade effects into account, it can be demonstrated that excessively high levels of net trade effects in terms of import creation and export creation trade can be found in industries of Transportation and Machinery. Besides, the results also report a

negative propensity to trade with the rest of the world for the mineral sector, with 17.9% import diversion and 17.7% export diversion, indicating that the CU makes members reduce trade with outside in mineral sectors. As a result, the welfare of the non-members is reduced since they can no longer trade products with the EU or Turkey as many as before. Besides, for Turkey and the EU, their internal welfare may also be reduced due to ineffective resource allocation.

The overall trade effects for each industry of the EU-Turkey CU are calculated in Table 10. From the value of the overall effects of the CU, the largest promoting trade impact are shown in transportation and machinery, followed by plastics and rubbers, textiles and metals, also indicating the strong trade creation effects (both intra and extra import/export). While the results cannot be calculated for the chemicals industry and agriculture industry since their effects are not significant. In addition, the effects of the minerals in negative, showing trade diversion appears in this sector.

Table 9. Trade Creation and Diversion Effects in Disaggregated Sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Textile	Transport Equipment	Machinery	Metals	Chemicals	Minerals	Agriculture	Plastics & Rubbers
CU	0.771	1.096	1.064	0.596	0.048	0.082	-0.315	0.794
	(0.420)*	(0.201)***	(0.240)***	(0.129)***	(0.155)	(0.210)	(0.326)	(0.146)***
imp_from_rest	-0.245	0.140	0.211	-0.080	0.073	-0.165	0.476	0.145
	(0.226)	(0.069)**	(0.117)*	(0.068)	(0.073)	(0.082)**	(0.187)	(0.103)
exp_to_rest	0.133	0.517	0.137	0.196	0.050	-0.163	0.439	0.082
	(0.598)	(0.081)***	(0.114)	(0.103)	(0.055)	(0.088)*	(0.184)	(0.076)
_cons	12.146	-17.066	15.616	14.315	14.787	15.572	11.29	13.929
	(0.000)***	(1.789)***	(0.087)***	(0.052)***	(0.052)***	(0.040)***	(2.426)***	(0.068)***
N	44586	42966	45725	44643	44840	42286	124912	44461

Note: The sector “Agriculture” includes sectors of live animals and animal products (HS01-05), vegetable products (HS06-14), animal or vegetable fats and oils (HS15), and Foodstuffs, beverages, tobacco (16-24), which are primarily among the EC-Turkey trade agreement for agricultural products list from the European Commission. *, **, and *** denote significance at the level of 10%, 5%, and 1%.

Table 10. Overall Effects of the CU (including trade creation and diversion effects)

	CU	imp_from_rest	exp_to_rest	Overall Effects	%
Textile	0.771*	-0.245	0.133	TC+TC(M)+TC(X)=0.771	116.19%
Transport Equipment	1.096***	0.14**	0.517***	TC+TC(M)+TC(X)=1.753	477.19%
Machinery	1.064***	0.211*	0.137***	TC+TC(M)+TC(X)=1.275	257.87%
Metals	0.596***	-0.08	0.196	TC=0.596	81.48%
Chemicals	0.048	0.073	0.05	No Siginificant Effects	/
Minerals	0.082	-0.165**	-0.163*	TC(D)+TC(D)=- 0.328	-38.82%
Agriculture	-0.315	0.476	0.439	No Siginificant Effects	/
Plastics & Rubbers	0.794***	0.145	0.082	TC=0.794	121.22%

Note: The sector “Agriculture” includes sectors of live animals and animal products (HS01-05), vegetable products (HS06-14), animal or vegetable fats and oils (HS15), and Foodstuffs, beverages, tobacco (16-24), which are mostly among the EC-Turkey trade agreement for agricultural products list from the European Commission. *, **, and *** denote significance at the level of 10%, 5%, and 1%. The formula is based on the literature from Carrère 2006. Calculation by the author. TC represents the trade creation effects, TD represents the trade diversion effects. M refers to the import impacts, while X refers to the export impacts.

6.3.2 Robustness Check

Similarly, to further support the results of the sectoral analysis, a robustness test includes one-, three-, six- and nine year lags of the CU variables (including *CU*, *imp_from_cu*, *exp_to_cu*) is investigated in the estimation. Since only transportation and machinery industries have a significant value of coefficients in both intra-bloc and extra-bloc trade dummies, the estimation of these two sectors is further modified to include various lags of the CU variables.

First, the estimated coefficients of the different CUs variables in Columns (2) – (5) reflect the specification of the Transportation sector. The estimates of intra-bloc trade creation effects remain significantly positive up to six years, even though they all decrease in magnitude. Furthermore, the import creation variable coefficient becomes higher in the first lag term, suggesting the phase-in effects of import creation in the transportation sector. As for the machinery sector, the intra-bloc trade creation effect is also statistically positive up to 6 years with the decrease of the value. While for the import creation effects, it is only significant in the first lagged variable. And the export creation coefficient is not significant after the year of entry. These results suggest that the effects of the machinery industry show a faster reaction to the CU. Moreover, what is the most important is that the results, including CU lagged variables have conflicting trade effects with the specification excluding the lagged terms, indicating the robustness of the previous baseline model.

Table 11. Robustness Test for aggregated data

	Transport Equipment					Machinery				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Baseline	lag1trans	lag3trans	lag6trans	lag9trans	Baseline	lag1trans	lag3trans	lag6trans	lag9trans
CU	1.096	1.089	0.801	0.215	0.136	1.064	0.745	0.451	0.344	-0.022
	(0.201)***	(0.165)***	(0.161)***	(0.124)*	(0.095)	(0.240)***	(0.241)***	(0.184)**	(0.141)**	(0.092)
imp_from_rest	0.140	0.411	0.256	0.108	0.079	0.211	0.148	0.052	-0.014	-0.084
	(0.069)**	(0.063)***	(0.068)***	(0.063)*	(0.050)	(0.117)*	(0.112)	(0.102)	(0.082)	(0.056)
exp_to_rest	0.517	0.040	0.018	-0.100	-0.146	0.137	0.110	0.001	-0.060	-0.089
	(0.081)***	(0.077)	(0.064)	(0.057)*	(0.053)	(0.114)	(0.108)	(0.101)	(0.081)	(0.056)
_cons	-17.066	15.149	15.274	15.444	15.499	15.616	15.677	15.807	15.926	16.045
	(1.789)***	(0.053)***	(0.055)***	(0.045)***	(0.035)***	(0.087)***	(0.082)***	(0.073)***	(0.058)***	(0.036)***
N	42966	40129	36610	31380	26199	45725	43347	39623	34028	28445

Note: *, **, and *** denote significance at the level of 10%, 5%, and 1%.

6.4 Extension Analysis

6.4.1 The effects of the CU on Trade Direction

In order to understand more about the intra-CU trade effects between the EU and Turkey, another two dummy variables that for exports from Turkish exports and imports to and from the EU after 1996 are created. The variable *CU-EU to TUR* equals to 1 if the exporter is an EU country, while the importer is Turkey; and on the other hand, the variable *CU-TUR to EU* is 1 if the exporter is Turkey and importer is a EU member.

Column (2) of Table 12 shows the possible asymmetry of trade effects of the customs union in the direction of trade, that is, for EU versus Turkish exports. The results show that while the CU has increased EU exports to Turkey by 14.5% ($e^{0.136}$-1), while Turkish exports to the EU have risen by 11.5% ($e^{0.109}$-1). These results are in line with the findings from Neyaptıet al. (2007), Adam and Moutos (2008) and Frede and Yetkiner (2017), who find larger benefits from the EU-Turkey customs union for EU exports than for Turkish exports. The limited benefits for Turkey exports to the EU can partly attributed to the restrictions and non-barrier tariffs for agricultural products. Besides, the fact that Turkey already had an established pattern of trade for some products before becoming a CU member, may also undermines the advantages of the CU (Frede and Yetkiner, 2017). In addition, both Turkey exports to the EU and EU exports to Turkey is significantly positive, reaffirming the main results that the CU have promoted the trade between them.

Table 12. Effects on Trade Direction

	(1)	**(2)**
	Baselline	Direction
EU-TUR CU	0.065	
	(0.121)	
CU-EU to TUR		0.136
		(0.068)**
CU-TUR to EU		0.109
		(0.054)**
N	57292	57292

Notes: All estimations are performed with exporter-fixed, importer-fixed, country-pair fixed, using the PPML estimator. *, **, and *** denote significance at the level of 10%, 5%, and 1%.

6.4.2 Effects of the CU on individual EU member countries

For further extension of the study, the effects of the CU on each EU member country are tested individually. European Union countries involved in the customs union may experience heterogeneous impacts on their trade with Turkey after the implementation of the agreement because they are different in economic, geographic and religion characteristics (i.e., GDP, distance to Turkey, religion proximity, etc.). Besides, some countries joined the EU member after 2000s (e.g. Croatia in 2013, Bulgaria and Croatia in 2007, Cyprus, Poland in 2004), so the identification of their dummies mainly rely on a post-CU observation.

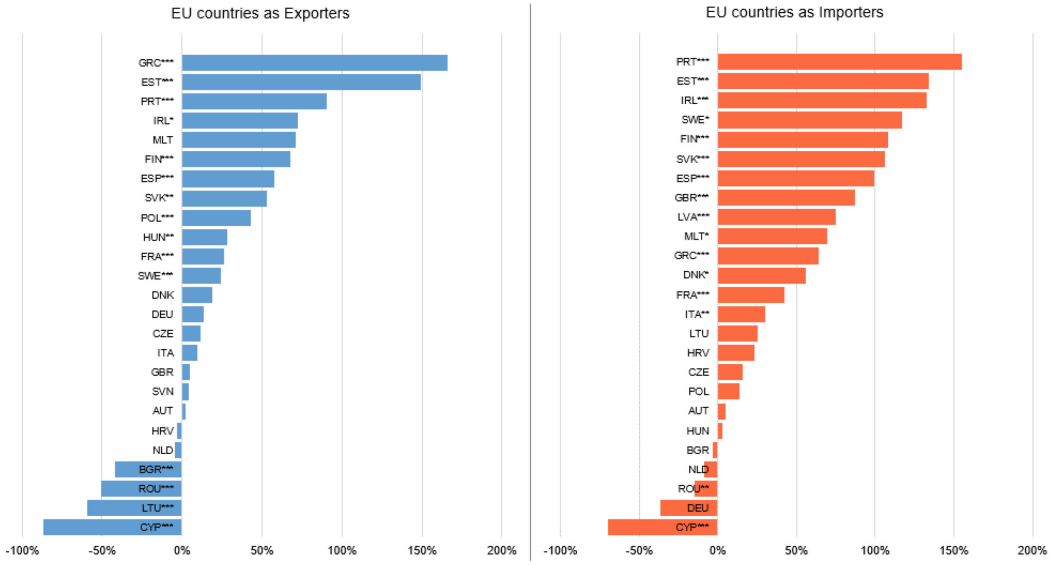
Based on the gravity Equation (12), a country dummy which suggested by Adam, Kosma, and McHugh (2003), Soete and Van Hove (2017) and Mitsuyo, et.al (2019) to estimate this individual effect for member countries. An interactive county and agreement dummies (country *i* * *CU*) is created to test this effect. This variable is used to isolate the impact of the EU-Turkey customs union on country *i*'s trade. In parallel, the aggregate CU dummy is redefined to exclude the country for which we estimate the individual effect. The estimation is repeated for each EU country, in order to identify the impact of the agreement on its individual trade performance. In addition, the export effect and import effect are separated. The equation uses an importer country dummy (C_{jt}) to understand the trade-promoting effects of the EU with regard to intra-bloc imports on a member country by means of a reduction in the importer's tariffs and other non-tariff barriers. On the other hand, an exporter country dummy (C_{it}) to obtain the effects of a trade agreement concerning intra-bloc exports. Therefore, the formula is constructed as follows (Nguyen, 2019). Therefore, the equation is formed as:

$$X_{ij,t} = \exp(\beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 \ln \text{dist}_{ij} + \beta_4 \text{contig}_{ij} + \beta_5 \text{lang}_{ij} + \beta_6 \text{comcol}_{ij} + \beta_7 \text{conflict}_{ij} + \beta_8 \text{religion}_{ij} + \beta_9 \text{CU}_{ij,t} \times Country_{it/jt} + \mu_{it} + \delta_{jt} + \lambda_{ij}) \times \varepsilon_{ij,t} \quad (14)$$

The estimates for the individual countries which demonstrated in Figure 13. It can be shown obviously that thee CU tends to increase the intra-bloc trade between the EU and Turkey, however, these trade-promoting effects are not significant nor are they experienced by every EU member. We notice that about 50% EU members' trade with

Turkey are significantly influenced by the customs union. In addition, great heterogeneity in the magnitude of the effects of the CU on intra-bloc imports and exports are found in the study. For instance, the CU increases Latvia's exports to Turkey by approximately 520% (which is the strongest effects), more than 110% for Greece and Estonia but nearly decrease Cyprus's exports by 100%. In addition, the agreement boost imports from Turkey by 150% for Portugal, more than 120% for Estonia and Ireland. But significant decrease intra-bloc trade is found in Romania and Cyprus. The negative effects on Cyprus can be explained by the continuous war conflict.

Figure 13. Effects of the CU on individual EU member countries



Notes: *, **, and *** are significance at the level of 10%, 5%, and 1%. The detailed data is listed in Appendix 9

7. Conclusions and Suggestions

Due to the complex politic tensions and economic changes, it is essential so modernize the EU-Turkey customs union. Therefore, this study re-examines the effects of the current CU by testing 44 countries (including Turkey, 28 EU and 15 non-EU countries) with aggregated data for time period from 1989 to 2019 and disaggregated sectoral trade data from 1995 to 2019. For estimation, the gravity model is used by combining OLS, FEM and PPML method with different settings. The results from the aggregated analysis confirm the significant trade-promoting effects of the EU-Turkey customs union on both trade between the members (intra-trade creation effects) and trade with non-members (import/export creation effects). But the trade diversion is not significantly proved in the model. The disaggregated data for top 8 industries of trade indicate the significant positive trade enhancing power in some industrial sectors (transportation equipment, machinery, metals and plastics/rubbers), implying that the CU can bring more profits to these high-tech or medium-tech products. On the other hand, the limited benefits influence impact of the customs union is proved on agriculture sectors, as well as chemicals, mineral products, which can be attributed to the hidden NTBs and the constraint product scopes of the current customs union. Furthermore, the study also evidences that the impact of the CU is stronger in EU's export to Turkey than Turkey's export to the EU. Finally, CU's different impacts for each EU members are also demonstrated. To be more specific, the detailed findings are listed as follows.

1) Based on the fundamental analysis of trade between the EU and Turkey in Section 4.1, it can be concluded that the customs union has greatly improved the trade flows between them over the past 30 years. Both Turkish exports and imports with the EU have grown over 400% in 2019 comparing with 1995. To be specific, the growth rate of the trade flow development is not significantly improved before 2000, which is only 4.1%. But with the stabilization of the Turkish politics and appreciation of the Lira, the trade within the EU and Turkey dramatically grown after 2002. However, the EU's share of the Turkish trade has gradually dropped recently with Turkey's growing trading activities with rest of world. But the EU is still the most important trading partners of Turkey (received 37% of Turkish total trade flows in

2019). And for the EU, Turkey is its 4th largest exporter and importer in 2019, which standing for an important role.

2) From the EU-Turkey's sectoral trade analysis with RCA and IIT index evaluation in Section 4.2, we can conclude that the industrial sectors with medium or high technology requirement (e.g. transportation, machinery) has become increasingly important in the trade within the EU and Turkey, especially after the entry of CU. But for the traditional labor-intensive industry like textiles, its share of the total trade has decreased although the total trade volume still ranked the highest. Besides, from the RCA index, the EU and Turkey's comparative advantage is strongly different in over 50% of the sectors, suggesting their high potential to trade with each other. To be more specific, the EU specialize in industries like wood, pulp of wood, optical photographic or medical or surgical instruments, metals, live animal and related products and chemicals. While Turkey specializes its exports in vegetables, textiles and articles of stone/glass sectors. And the increasing value of IIT index (which is closer to 1) after 1996 also implies the promoting trade effects of the CU.

3) The gravity model is applied for the main analysis and the results are shown in Section 6. After comparing the pooled OLS, RE and FE models by F-statistics and Hausman estimation, the FE model is the most appropriate model for regression among these three. Therefore, model with a) time and country-pair fixed effect; b) importer-time fixed and exporter-time fixed; c) importer-time fixed, exporter-time fixed together with pair fixed effect are applied following the suggestions from Yotov et al. (2016) and Larch et.al. (2020). The combination can not only test the time-invariant effects, but also solve the problem of unobservable multilateral resistance and potential endogenous. Later, in order to ignore the biases caused by zero trade flows, the PPML estimation is also tested for the model. The results of the gravity model show that:

(1) The effects of traditional gravity model explanatory variables like countries' GDP (+), distance (-), contiguity (+) are proved in both FE and PPML models. As for the religion proximity index, which is the newly added dummy in the study also shows

a significant positive effects on the trade. However, the effect results for indicators like language, sharing a common colonizer and conflict history are inconclusive.

(2) The effect of the CU on intra-bloc trade creation is inconclusive when using FE model. It is significantly positive if we control effects of country pair effects, strongly negative when controlling exporter-time and importer-time fixed effects, and negative but not significant if three-way fixed effects are considered. The results show that the effects of the CU is quite sensitive to the FE, which may partly because of the problem of zero trade flows.

(3) The PPML estimation which solved the zero trade flow and heteroskedasticity suggests a significantly positive effects of the CU when we fixed country-pair and time; exporter-time, importer time. The implementation of the CU can lead to 41.3% to 49.8% of the intra-bloc trade between the EU and Turkey.

(4) When the extra-bloc trade dummies are added to the PPML model to test the trade diversion effects, it should be noted that the model omitted the importer-time fixed and exporter-time fixed effects due to the collinearity. The results have proved that there are strong intra-trade creation effects as well as significant positive import creation and export creation impact due to the CU. This is to say, the customs union between the EU and Turkey does not decrease their trade with outside of the world and instead, the CU brings more benefits the social welfare. Besides, the intra-bloc trade creation can be raised by 66.7% due to the CU, import creation and export creation can be promoted by 26.6%, 16.2%, respectively. The estimated net effect of the CU for total trade is 145.47%.

(5) Heterogeneous effects across different sectors are tested also by PPML model. From the results, significant positive trade creation effects for intra-bloc members can be found in industries of transportation, machinery, plastics/rubbers, textiles and metals, respectively increased by 199.2%, 189.8%, 121.2%, 116.2% and 81.4% due to the customs union between the EU and Turkey. While the intra-bloc trade effects are not obvious in chemicals, minerals and agriculture. Taking extra-bloc trade effects into account, we find significant improving export creation and import

creation effects of the CU only for transportation equipment and machinery sectors. While export and import diversion effects appears in mineral products, suggesting its possible declined production and reduced trade with ROW. In general, the highest net effects for total trade is found in transportation sector, followed by machinery, plastics/rubbers. The effects for agriculture and chemicals are negligible, possibly due to the limitations of the customs union and NTB between the countries. And the machinery sectors experienced trade diversion.

(6) The customs union between the EU and Turkey bring more benefits to EU's export to Turkey than Turkish exports to the EU. To be more specific, the CU has increased EU exports to Turkey by 14.5%, while Turkish exports to the EU have risen by 11.5%. These results are in line with the findings from Neyaptıet al. (2007), Adam and Moutos (2008), Frede and Yetkiner (2017).

(7) About 50% EU members' trade with Turkey are significantly influenced by the customs union although there are great heterogeneities in the magnitude of the effects on intra-bloc imports and exports. The most significant positive effects of the intra-exports can be found in Latvia, its exports to Turkey increased by approximately 520%. While the agreement boost imports from Turkey by 150% for Portugal, which is the largest influence. Strong negative effects on exports and imports can be found for Cyprus, suggesting the destruction effect from the conflicts.

Therefore, several suggestions are provided based on the analysis above. First, the customs union between the EU and Turkey should be further deepened due to its significant positive trade enhancing effects in not only intra-bloc area, but also extra-bloc regions which had been proved by various models in the study. And the potential for both sides to trade is endless (from the RCA analysis).

Second, the CU needs to be widen into all areas of trade to reap more economic benefits. Since industries of agriculture and some chemicals have been proved to receive limited benefit from the CU, this restrictions of the customs union should be handled. For example, some FTA can be established in raw agricultural goods, and some new trade framework can be negotiated to reduce technology barriers (including NTBs like

complex regulations, product qualifications, etc.).

Third, the European Commission should propose the elimination of asymmetries by including Turkey in EU committees with respect to the FTA's with third countries. As a result, Turkey will no longer put additional tariffs on countries which signed FTAs with the EU but not include Turkey to protect its profits, thus avoiding negative welfare effects caused by trade diversion.

Forth, Turkey should be encouraged to solve the political and democracy problems with the EU. This is because that, for instance, the conflict with Cyprus has greatly damaged the CU trade effects which is supported in Section 6.4.2. And the better cultural harmonization, the better integration will be (which is also proved by the results from our explanatory variables). Besides, Turkey should also try to increase its GDP since a stable economic level is served to be one important part of the trade promotion (which is supported in our gravity model).

And for both parties, they should concentrate more on the high-tech industries with their growing domination in bilateral trade flows between the EU and Turkey. Turkey should continue to improve its technology capacity to get involved more in GVC, which has been proved that it will benefit more for their trade. As the global market competition increases in recent years, the competitive advantage of low-tech/labor intensive industries like agriculture and textiles for Turkey has decreased (supported by RCA analysis). Therefore, only by improving the influence of other sectors, the promotions of the customs union can be further optimized.

Finally, future study can focus more on the trade of service sectors since the paper mainly focus on the trade flows of goods. Beside, more indicators like international migration, foreign direct investment can be considered to yield a more complete picture of the effects of the customs union between the EU and Turkey. Besides, the inclusion of intra-national trade data is also desirable for the theoretically consistent identification of the effects of bilateral trade policies, enabling to control globalization effects.

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Appendix

Appendix 1. Industry Lists (HS92)

HS 15	ANIMAL OR VEGETABLE FATS AND OILS
HS 93	ARMS AND AMMUNITION
HS 68-70	ARTICLES OF STONE, GLASS
HS 28-38	CHEMICAL OR ALLIED INDUSTRIES
HS 16-24	FOODSTUFFS; BEVERAGES, TOBACCO
HS 64-67	FOOTWEAR
HS 01-05	LIVE ANIMALS, ANIMAL PRODUCTS
HS 94-96	MISCELLANEOUS MANUFACTURED ARTICLES
HS 84-85	MACHINERY
HS 72-83	BASE METALS AND ARTICLES OF BASE METAL
HS 25-27	METALS
HS 90-92	OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS
HS 71	PEARLS, PRECIOUS METALS
HS 39-40	PLASTICS/RUBBER
HS 47-49	PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL
HS 41-43	RAW HIDES AND SKINS, LEATHER, FURSKINS
HS 50-63	TEXTILES AND TEXTILE ARTICLES
HS 86-89	TRANSPORT EQUIPMENT
HS 06-14	VEGETABLE PRODUCTS
HS 97-98	WORKS OF ART
HS 44-46	WOOD AND ARTICLES OF WOOD

Appendix 2. Turkey's Export to the EU (1989, 1994, 1999, 2004, 2009, 2014, 2019)

Sectors/Year	1989(€)	1989(%)	1994(€)	1994(%)	1999(€)	1999(%)	2004(€)	2004(%)	2009(€)	2009(%)	2014(€)	2014(%)	2019(€)	2019(%)
TRANSPORT EQUIPMENT	82209192	1.5%	226263840	3.0%	1496233344	10.0%	5415787008	18.0%	7535815168	20.9%	11242800128	20.8%	19746918400	24.8%
TEXTILES AND TEXTILE ARTICLES	2482137344	45.3%	3597955328	48.1%	6495261696	43.3%	10368687104	34.4%	9976586240	27.7%	13723924480	25.4%	15051148288	18.9%
MACHINERY	233184208	4.3%	553376512	7.4%	1840868480	12.3%	4957715456	16.5%	6394789888	17.7%	9870683136	18.3%	13686091776	17.2%
METALS	390162848	7.1%	304559296	4.1%	1051152256	7.0%	2721984768	9.0%	3120207616	8.6%	5224545280	9.7%	9729753088	12.2%
PLASTICS/RUBBER	105305088	1.9%	146321776	2.0%	395470016	2.6%	915416448	3.0%	1666468352	4.6%	3136250112	5.8%	4385346048	5.5%
MINERAL PRODUCTS	603752000	11.0%	323470560	4.3%	430901696	2.9%	800854400	2.7%	923256320	2.6%	1362369920	2.5%	3390879232	4.3%
VEGETABLE PRODUCTS	557265600	10.2%	933192320	12.5%	1116495488	7.4%	1284866560	4.3%	1639430016	4.5%	2090219008	3.9%	2536003840	3.2%
FOODSTUFFS; BEVERAGES, TOBACCO	215361840	3.9%	440274752	5.9%	653823168	4.4%	989669696	3.3%	1181379328	3.3%	1857068160	3.4%	1963431936	2.5%
CHEMICAL OR ALLIED INDUSTRIES	159049568	2.9%	183267888	2.4%	242961984	1.6%	471208960	1.6%	836142016	2.3%	1413567360	2.6%	1907161728	2.4%
PEARLS, PRECIOUS METALS	11760025	0.2%	20059776	0.3%	71742744	0.5%	181329200	0.6%	208176832	0.6%	494175808	0.9%	1806276992	2.3%
MISCELLANEOUS MANUFACTURED ARTICLES	22619826	0.4%	53278312	0.7%	189965648	1.3%	489679776	1.6%	702546560	1.9%	876509888	1.6%	1443206912	1.8%
ARTICLES OF STONE, GLASS	116736592	2.1%	205204976	2.7%	389718720	2.6%	748758592	2.5%	796983872	2.2%	935056640	1.7%	1381411456	1.7%
PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL	3843895	0.1%	32247584	0.4%	31004468	0.2%	91445696	0.3%	297338400	0.8%	373506784	0.7%	679898432	0.9%
LIVE ANIMALS, ANIMAL PRODUCTS	79885576	1.5%	81854184	1.1%	103400728	0.7%	142831952	0.5%	198733568	0.6%	385724256	0.7%	558848384	0.7%
OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS	14211872	0.3%	31024150	0.4%	58852324	0.4%	76234320	0.3%	153376640	0.4%	368035456	0.7%	524480128	0.7%
RAW HIDES AND SKINS, LEATHER, FURSKINS	373599040	6.8%	299291104	4.0%	249475808	1.7%	266971472	0.9%	252193344	0.7%	418138656	0.8%	354705056	0.4%
FOOTWEAR	12044807	0.2%	19419754	0.3%	24518790	0.2%	88758512	0.3%	92516048	0.3%	150805872	0.3%	315021376	0.4%
WOOD AND ARTICLES OF WOOD	7419012	0.1%	15344773	0.2%	20128796	0.1%	40818632	0.1%	44869808	0.1%	63237064	0.1%	131509576	0.2%
ARMS AND AMMUNITION	2181153	0.0%	4187087	0.1%	16108919	0.1%	31516344	0.1%	27012070	0.1%	44405332	0.1%	54627720	0.1%
ANIMAL OR VEGETABLE FATS AND OILS	2775714	0.1%	10967109	0.1%	119628816	0.8%	47545320	0.2%	23226170	0.1%	17827988	0.0%	33441640	0.0%
WORKS OF ART	8631135	0.2%	1338084	0.0%	2541900	0.0%	3180809	0.0%	4244613	0.0%	7453605	0.0%	9072033	0.0%

Source: EUROSTAT, UN COMTRADE

Appendix 3. Turkey's Import from the EU (1989, 1994, 1999, 2004, 2009, 2014, 2019)

Sectors/Year	1989(€)	1989(%)	1994(€)	1994(%)	1999(€)	1999(%)	2004(€)	2004(%)	2009(€)	2009(%)	2014(€)	2014(%)	2019(€)	2019(%)
MACHINERY	1679799680	32.1%	2772447488	32.9%	7372970496	37.4%	11218325504	30.7%	12910954496	29.6%	19461828608	26.4%	19069462528	26.3%
TRANSPORT EQUIPMENT	611528704	11.7%	1117768320	13.3%	2838749696	14.4%	7835703808	21.5%	6264638464	14.4%	11812758528	16.0%	9899640832	13.7%
CHEMICAL OR ALLIED INDUSTRIES	690415808	13.2%	1063018432	12.6%	2656574208	13.5%	4499879936	12.3%	6196335616	14.2%	8557012992	11.6%	9651459072	13.3%
METALS	788018880	15.1%	1037898624	12.3%	1179759872	6.0%	2981997824	8.2%	5347956736	12.3%	9115348992	12.4%	9224017920	12.7%
PLASTICS/RUBBER	243424656	4.7%	469889408	5.6%	1337927040	6.8%	2861445632	7.8%	3284735744	7.5%	5908436992	8.0%	5939787776	8.2%
OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS	166636000	3.2%	361490592	4.3%	608780352	3.1%	1077124608	2.9%	1347770112	3.1%	2332043520	3.2%	2446695424	3.4%
PEARLS, PRECIOUS METALS	19111800	0.4%	18490664	0.2%	59842292	0.3%	152350656	0.4%	192447488	0.4%	1040068224	1.4%	2718473216	3.7%
TEXTILES AND TEXTILE ARTICLES	252050112	4.8%	549292416	6.5%	1341205248	6.8%	2073145216	5.7%	2065135872	4.7%	2575960576	3.5%	2655414784	3.7%
MINERAL PRODUCTS	101437448	1.9%	177162800	2.1%	445389952	2.3%	894140864	2.4%	1984148736	4.6%	5953907200	8.1%	3525375488	4.9%
PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL	84895144	1.6%	173431328	2.1%	534399136	2.7%	943341120	2.6%	1099877376	2.5%	1622931456	2.2%	1941456384	2.7%
FOODSTUFFS; BEVERAGES, TOBACCO	55681684	1.1%	107647512	1.3%	277885408	1.4%	423079008	1.2%	840158592	1.9%	1491515520	2.0%	1704950784	2.4%
VEGETABLE PRODUCTS	186738000	3.6%	46332836	0.6%	133880480	0.7%	141163888	0.4%	461478848	1.1%	774544704	1.1%	1073165504	1.5%
ARTICLES OF STONE, GLASS	77808272	1.5%	100080984	1.2%	221482624	1.1%	307929760	0.8%	344922784	0.8%	643298368	0.9%	621784192	0.9%
MISCELLANEOUS MANUFACTURED ARTICLES	56927244	1.1%	92825952	1.1%	246046560	1.2%	292996256	0.8%	442404800	1.0%	770745344	1.0%	640292736	0.9%
FOOTWEAR	5247550	0.1%	11902942	0.1%	51511256	0.3%	90125920	0.2%	269697216	0.6%	492839584	0.7%	320399360	0.4%
RAW HIDES AND SKINS, LEATHER, FURSKINS	86855936	1.7%	178035264	2.1%	164821680	0.8%	379031488	1.0%	217868464	0.5%	419441696	0.6%	371771552	0.5%
LIVE ANIMALS, ANIMAL PRODUCTS	26398252	0.5%	37819288	0.4%	55613008	0.3%	49981760	0.1%	63757804	0.1%	150830656	0.2%	346718624	0.5%
WOOD AND ARTICLES OF WOOD	12997908	0.2%	25516454	0.3%	45510340	0.2%	126035320	0.3%	206078704	0.5%	448303072	0.6%	151297344	0.2%
ARMS AND AMMUNITION	2507272	0.0%	36907612	0.4%	34114284	0.2%	128158648	0.4%	35042288	0.1%	33915020	0.0%	138184320	0.2%
ANIMAL OR VEGETABLE FATS AND OILS	70736592	1.4%	38654164	0.5%	82148456	0.4%	46126268	0.1%	20669162	0.0%	54669432	0.1%	54730908	0.1%
WORKS OF ART	6049242	0.1%	3814991	0.0%	5093227	0.0%	7636875	0.0%	11224346	0.0%	40623080	0.1%	17661800	0.0%

Source: EUROSTAT, UN COMTRADE

Appendix 4. The EU and Tukey's RCA index in different Exporting Industries

EU'S RCA INDEX (1990-2019)																				
YEAR	ANIMAL OR VEGETABLE FATS AND OILS	ARMS AND AMMUNITION	ARTICLES OF STONE, GLASS	CHEMICAL OR ALLIED INDUSTRIES	FOODSTUFFS; BEVERAGES, TOBACCO	FOOTWEAR	LIVE ANIMALS, ANIMAL PRODUCTS	MACHINERY	METALS	MINERAL PRODUCTS	MISCELLANEOUS MANUFACTURED ARTICLES	OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS	PEARLS, PRECIOUS METALS	PLASTICS/RUBBER	PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL	RAW HIDES AND SKINS, LEATHER, FURSKINS	TEXTILES AND TEXTILE ARTICLES	TRANSPORT EQUIPMENT	VEGETABLE PRODUCTS	WORKS OF ART	WOOD AND ARTICLES OF WOOD
1995	1.00	0.64	1.16	1.31	1.30	0.69	1.24	0.92	1.03	1.06	0.43	1.01	0.39	1.18	1.59	0.64	0.75	1.04	0.87	0.55	0.92
1996	1.00	0.51	1.16	1.31	1.22	0.68	1.26	0.93	1.07	1.07	0.41	1.03	0.36	1.19	1.66	0.72	0.76	1.07	0.85	0.55	0.87
1997	1.00	0.93	1.18	1.31	1.23	0.67	1.24	0.89	1.08	1.04	0.40	1.05	0.41	1.19	1.66	0.71	0.77	1.05	0.82	0.47	0.90
1998	0.96	0.52	1.17	1.30	1.22	0.68	1.23	0.87	1.08	1.02	0.41	1.01	0.30	1.17	1.62	0.67	0.73	1.02	0.83	0.48	0.99
1999	0.99	0.45	1.20	1.40	1.29	0.67	1.25	0.86	0.98	1.08	0.44	0.92	0.69	1.31	1.53	0.61	0.74	1.08	0.88	0.40	0.85
2000	1.06	0.48	1.20	1.44	1.35	0.66	1.28	0.85	0.99	1.09	0.47	0.92	0.66	1.33	1.58	0.60	0.70	1.14	0.93	0.41	0.95
2001	1.03	0.50	1.16	1.43	1.28	0.64	1.21	0.85	1.02	1.08	0.44	0.94	0.65	1.30	1.55	0.58	0.68	1.12	0.89	0.39	0.92
2002	0.98	0.50	1.14	1.47	1.27	0.65	1.19	0.85	0.99	1.06	0.46	0.95	0.62	1.27	1.56	0.60	0.67	1.12	0.90	0.53	0.91
2003	0.91	0.55	1.15	1.46	1.28	0.64	1.26	0.81	0.98	1.07	0.42	0.96	0.58	1.28	1.58	0.60	0.67	1.17	0.91	0.43	0.96
2004	0.82	0.53	1.21	1.37	1.27	0.65	1.28	0.98	1.01	1.07	0.43	0.89	0.55	1.26	1.57	0.60	0.70	1.22	0.88	0.36	1.07
2005	0.86	0.64	1.20	1.40	1.32	0.67	1.30	0.97	1.04	1.08	0.44	0.93	0.51	1.27	1.58	0.58	0.69	1.22	0.92	0.43	1.09
2006	0.86	0.60	1.23	1.41	1.32	0.68	1.33	0.98	1.06	1.10	0.43	0.93	0.51	1.29	1.61	0.62	0.68	1.22	0.93	0.39	1.16
2007	0.78	0.66	1.26	1.38	1.32	0.68	1.35	0.99	1.03	1.11	0.42	0.91	0.47	1.30	1.58	0.59	0.70	1.25	0.90	0.36	1.29
2008	0.81	0.70	1.30	1.40	1.36	0.72	1.41	1.04	1.09	1.12	0.42	0.96	0.46	1.31	1.61	0.63	0.73	1.27	0.90	0.40	1.36
2009	0.81	0.57	1.24	1.43	1.35	0.73	1.39	1.02	1.03	1.12	0.43	0.94	0.39	1.27	1.59	0.63	0.71	1.22	0.90	0.43	1.37
2010	0.79	0.63	1.20	1.44	1.37	0.72	1.43	1.01	1.02	1.14	0.44	0.97	0.44	1.26	1.65	0.67	0.70	1.29	0.92	0.52	1.39
2011	0.79	0.59	1.23	1.41	1.37	0.78	1.45	1.05	1.06	1.18	0.44	1.00	0.43	1.28	1.66	0.71	0.70	1.36	0.86	0.54	1.40
2012	0.86	0.60	1.20	1.44	1.41	0.74	1.51	1.00	1.04	1.19	0.49	1.00	0.37	1.29	1.75	0.72	0.70	1.35	0.89	0.54	1.39
2013	0.98	0.65	1.17	1.42	1.40	0.75	1.47	0.99	1.04	1.18	0.49	1.00	0.38	1.28	1.69	0.73	0.69	1.38	0.91	0.56	1.37
2014	0.89	0.60	1.15	1.42	1.42	0.76	1.41	1.01	1.02	1.14	0.47	1.01	0.37	1.28	1.66	0.68	0.69	1.39	0.89	0.60	1.35
2015	0.85	0.65	1.07	1.38	1.38	0.71	1.38	0.96	0.96	1.11	0.50	0.99	0.33	1.25	1.60	0.69	0.66	1.36	0.86	0.55	1.31
2016	0.86	0.61	1.11	1.35	1.35	0.75	1.37	0.97	0.94	1.12	0.49	0.98	0.27	1.23	1.58	0.66	0.67	1.39	0.84	0.54	1.26
2017	0.84	0.84	1.15	1.38	1.37	0.79	1.42	0.98	0.92	1.14	0.49	1.03	0.29	1.24	1.58	0.68	0.69	1.42	0.82	0.55	1.34
2018	0.85	0.75	1.16	1.37	1.38	0.81	1.40	1.01	0.94	1.12	0.48	1.05	0.36	1.23	1.57	0.66	0.70	1.44	0.82	0.48	1.33
2019	0.86	0.63	1.12	1.36	1.38	0.81	1.41	0.98	0.94	1.12	0.46	1.04	0.40	1.20	1.57	0.63	0.70	1.43	0.84	0.58	1.35

Source: BACI Database

TURKEY'S RCA INDEX (1990-2019)																				
YEAR	ANIMAL OR VEGETABLE FATS AND OILS	ARMS AND AMMUNITION	ARTICLES OF STONE, GLASS	CHEMICAL OR ALLIED INDUSTRIES	FOODSTUFFS; BEVERAGES, TOBACCO	FOOTWEAR	LIVE ANIMALS, ANIMAL PRODUCTS	MACHINERY	METALS	MINERAL PRODUCTS	MISCELLANEOUS MANUFACTURED ARTICLES	OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS	PEARLS, PRECIOUS METALS	PLASTICS/RUBBER	PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL	RAW HIDES AND SKINS, LEATHER, FURSKINS	TEXTILES AND TEXTILE ARTICLES	TRANSPORT EQUIPMENT	VEGETABLE PRODUCTS	WORKS OF ART	WOOD AND ARTICLES OF WOOD
1995	3.56	0.68	1.92	0.42	2.09	0.54	0.47	0.32	0.29	1.68	0.53	0.07	0.16	0.65	0.23	2.57	5.31	0.32	3.04	0.20	0.23
1996	3.04	0.96	2.23	0.44	2.35	0.64	0.43	0.32	0.34	1.71	0.37	0.10	0.24	0.62	0.27	1.96	5.43	0.35	2.87	1.14	0.22
1997	2.35	1.13	2.41	0.45	2.33	0.79	0.45	0.32	0.35	1.74	0.35	0.10	0.32	0.66	0.30	2.14	5.41	0.35	2.84	0.22	0.20
1998	2.15	0.81	2.34	0.40	2.06	0.70	0.36	0.36	0.40	1.59	0.46	0.09	0.37	0.66	0.27	1.94	5.59	0.31	2.93	0.40	0.24
1999	2.76	1.07	2.47	0.41	2.00	0.47	0.31	0.39	0.37	1.58	0.48	0.09	0.50	0.67	0.26	1.89	5.63	0.63	2.83	0.13	0.21
2000	1.59	1.04	2.94	0.43	2.04	0.51	0.25	0.47	0.40	1.66	0.35	0.09	0.64	0.77	0.28	1.99	5.96	0.70	2.82	0.45	0.20
2001	2.11	1.15	2.68	0.38	1.70	0.45	0.29	0.44	0.43	1.86	0.36	0.07	0.65	0.82	0.34	1.79	5.47	0.82	2.63	0.12	0.26
2002	1.04	1.66	2.74	0.36	1.33	0.46	0.34	0.51	0.49	1.82	0.43	0.09	0.74	0.76	0.39	1.68	5.53	0.79	2.14	0.26	0.26
2003	1.49	2.32	2.65	0.32	1.32	0.50	0.33	0.67	0.50	1.73	0.38	0.08	0.76	0.79	0.38	1.42	5.33	1.03	1.98	0.23	0.28
2004	0.93	1.88	2.63	0.32	1.39	0.47	0.29	0.71	0.51	1.91	0.36	0.09	0.77	0.78	0.38	1.20	5.02	1.23	1.99	0.28	0.29
2005	1.55	1.58	2.79	0.32	1.49	0.44	0.29	0.70	0.55	1.74	0.38	0.09	0.80	0.84	0.42	1.19	5.06	1.32	2.34	0.20	0.32
2006	1.41	1.85	2.66	0.33	1.43	0.43	0.31	0.72	0.57	1.72	0.39	0.10	1.00	0.91	0.43	1.22	4.81	1.43	2.26	0.05	0.39
2007	0.73	2.27	2.48	0.31	1.28	0.44	0.31	0.74	0.57	1.64	0.54	0.10	0.97	0.95	0.46	1.11	4.58	1.48	1.84	0.21	0.44
2008	0.89	2.05	2.40	0.33	1.15	0.41	0.29	0.79	0.56	2.16	0.49	0.10	1.56	0.97	0.50	1.04	4.14	1.50	1.48	0.40	0.50
2009	0.82	1.39	2.38	0.33	1.18	0.39	0.42	0.81	0.57	2.02	0.49	0.11	1.97	1.02	0.55	0.98	4.04	1.39	1.79	0.19	0.61
2010	0.67	1.56	2.52	0.41	1.31	0.49	0.41	0.90	0.59	2.02	0.43	0.11	1.02	1.09	0.67	1.04	4.40	1.33	2.05	0.26	0.64
2011	1.07	2.22	2.44	0.41	1.30	0.48	0.54	0.96	0.65	2.09	0.39	0.12	0.70	1.16	0.69	1.12	4.36	1.33	1.92	0.17	0.64
2012	1.15	2.05	2.26	0.41	1.27	0.51	0.58	0.98	0.61	2.02	0.38	0.12	2.42	1.11	0.77	1.01	4.13	1.13	1.56	0.12	0.61
2013	1.55	3.23	2.27	0.43	1.38	0.59	0.66	1.08	0.65	1.97	0.43	0.14	0.98	1.17	0.87	0.97	4.26	1.26	1.73	0.30	0.64
2014	1.36	2.61	2.18	0.43	1.47	0.54	0.65	1.02	0.63	1.85	0.38	0.15	1.33	1.20	0.89	0.94	4.23	1.24	1.70	0.19	0.64
2015	1.14	2.23	1.90	0.41	1.36	0.50	0.59	0.92	0.57	1.63	0.42	0.14	2.22	1.11	0.88	0.70	3.85	1.19	1.73	0.13	0.55
2016	1.10	2.34	1.82	0.39	1.25	0.52	0.59	0.86	0.55	1.56	0.41	0.14	2.42	1.05	0.88	0.68	3.80	1.28	1.57	0.27	0.51
2017	0.97	2.09	1.93	0.41	1.27	0.55	0.65	0.85	0.53	1.70	0.42	0.16	1.81	1.08	0.94	0.74	3.85	1.56	1.51	0.15	0.64
2018	1.00	2.18	1.90	0.43	1.28	0.61	0.68	0.90	0.56	1.92	0.46	0.16	1.29	1.11	0.94	0.75	3.78	1.59	1.51	0.14	0.60
2019	0.99	2.03	1.94	0.44	1.26	0.59	0.63	0.99	0.59	1.89	0.53	0.18	1.11	1.16	0.97	0.73	3.58	1.51	1.60	0.88	0.64

Source: BACI database

Appendix 5. Turkey's bilateral intra-industry trade (IIT) with EU countries

YEAR	ANIMAL OR VEGETABLE FATS AND OILS	ARMS AND AMMUNITION	ARTICLES OF STONE, GLASS	CHEMICAL OR ALLIED INDUSTRIES	FOODSTUFFS; BEVERAGES, TOBACCO	FOOTWEAR	LIVE ANIMALS, ANIMAL PRODUCTS	MACHINERY	METALS	MINERAL PRODUCTS	MISCELLANEOUS MANUFACTURED ARTICLES	OPTICAL, PHOTOGRAPHIC, MEDICAL OR SURGICAL INSTRUMENTS	PEARLS, PRECIOUS METALS	PLASTICS/RUBBER	PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL	RAW HIDES AND SKINS, LEATHER, FURSKINS	TEXTILES AND TEXTILE ARTICLES	TRANSPORT EQUIPMENT	VEGETABLE PRODUCTS	WORKS OF ART	WOOD AND ARTICLES OF WOOD
1989	0.08	0.93	0.80	0.37	0.41	0.61	0.50	0.57	0.24	0.66	0.29	0.16	0.76	0.60	0.09	0.38	0.18	0.24	0.50	0.82	0.73
1990	0.13	0.70	0.78	0.25	0.96	0.74	0.52	0.62	0.25	0.62	0.39	0.09	0.90	0.40	0.14	0.39	0.25	0.19	0.41	0.51	0.43
1991	0.42	0.84	0.70	0.24	0.48	0.73	0.89	0.60	0.28	0.38	0.86	0.11	0.96	0.45	0.14	0.40	0.22	0.22	0.10	0.71	0.37
1992	0.20	0.59	0.68	0.21	0.41	0.72	0.98	0.74	0.34	0.38	0.66	0.15	0.97	0.45	0.17	0.49	0.25	0.22	0.13	0.58	0.83
1993	0.34	0.47	0.80	0.18	0.57	0.97	0.97	0.52	0.22	0.23	0.77	0.10	0.95	0.33	0.13	0.67	0.30	0.15	0.26	0.98	0.27
1994	0.44	0.20	0.66	0.29	0.39	0.76	0.63	0.73	0.33	0.45	0.71	0.16	0.96	0.47	0.31	0.75	0.26	0.34	0.09	0.52	0.75
1995	0.97	0.24	0.80	0.22	0.74	0.95	0.53	0.64	0.30	0.53	0.60	0.13	0.79	0.45	0.15	0.97	0.32	0.50	0.15	0.59	0.68
1996	0.90	0.25	0.89	0.17	0.81	0.47	0.74	0.62	0.26	0.46	0.84	0.14	0.81	0.36	0.11	0.78	0.39	0.48	0.18	0.97	0.47
1997	0.73	0.32	0.81	0.16	0.76	0.42	0.78	0.63	0.29	0.55	0.88	0.12	0.69	0.34	0.09	0.71	0.42	0.31	0.23	0.32	0.49
1998	0.50	0.23	0.81	0.16	0.77	0.47	0.83	0.68	0.36	0.78	0.99	0.12	0.68	0.42	0.12	0.85	0.37	0.42	0.18	0.26	0.43
1999	0.81	0.64	0.72	0.17	0.60	0.64	0.70	0.87	0.40	0.94	0.98	0.18	0.91	0.46	0.11	0.80	0.34	0.69	0.21	0.67	0.61
2000	0.41	0.65	0.74	0.17	0.68	0.51	0.83	0.83	0.38	0.87	0.85	0.13	0.62	0.42	0.12	0.97	0.38	0.43	0.23	0.99	0.33
2001	0.70	0.69	0.55	0.19	0.54	0.78	0.51	0.88	0.60	0.98	0.67	0.17	0.90	0.60	0.23	0.97	0.32	0.96	0.12	0.53	0.67
2002	0.84	0.35	0.61	0.18	0.61	0.87	0.53	0.79	0.61	0.86	0.75	0.18	0.91	0.53	0.24	0.82	0.34	0.96	0.20	0.26	0.67
2003	0.74	0.43	0.58	0.17	0.63	0.97	0.47	0.70	0.60	0.85	0.95	0.16	0.96	0.52	0.20	0.81	0.32	0.84	0.25	0.34	0.62
2004	0.98	0.39	0.58	0.19	0.60	0.99	0.52	0.75	0.61	0.95	0.94	0.13	0.91	0.48	0.18	0.83	0.33	0.82	0.20	0.59	0.49
2005	0.67	0.77	0.62	0.18	0.65	0.91	0.59	0.86	0.61	0.85	0.88	0.15	0.88	0.50	0.20	0.88	0.30	0.88	0.20	0.72	0.32
2006	0.51	0.78	0.66	0.20	0.66	0.75	0.48	0.89	0.62	0.93	0.91	0.15	0.83	0.54	0.23	0.83	0.31	0.94	0.20	0.47	0.40
2007	1.00	0.92	0.68	0.23	0.73	0.95	0.48	0.81	0.65	0.91	0.93	0.17	0.85	0.67	0.40	0.90	0.29	0.92	0.42	0.38	0.44
2008	0.68	0.95	0.62	0.26	0.74	0.62	0.49	0.78	0.64	0.85	0.75	0.18	0.96	0.69	0.43	0.97	0.31	0.91	0.56	0.26	0.39
2009	0.94	0.87	0.60	0.24	0.83	0.51	0.49	0.77	0.66	0.74	0.64	0.20	0.96	0.67	0.43	0.93	0.34	0.91	0.44	0.55	0.36
2010	0.85	0.98	0.69	0.26	0.91	0.53	0.74	0.87	0.60	0.65	0.57	0.20	0.98	0.63	0.34	0.95	0.33	0.90	0.45	0.36	0.21
2011	0.90	0.99	0.72	0.26	0.92	0.47	0.50	0.87	0.59	0.74	0.50	0.19	0.89	0.66	0.36	0.90	0.33	0.85	0.53	0.20	0.18
2012	0.91	0.96	0.75	0.27	0.96	0.44	0.67	0.88	0.63	0.63	0.35	0.21	0.98	0.65	0.37	0.85	0.33	0.88	0.47	0.15	0.15
2013	0.58	0.85	0.80	0.27	0.94	0.41	0.58	0.99	0.61	0.68	0.49	0.23	0.51	0.64	0.35	0.83	0.35	0.87	0.53	0.17	0.15
2014	0.49	0.87	0.82	0.28	0.89	0.47	0.56	0.94	0.67	0.73	0.37	0.27	0.64	0.69	0.37	1.00	0.32	0.98	0.54	0.31	0.25
2015	0.54	0.67	0.80	0.29	0.86	0.62	0.99	0.84	0.68	0.80	0.61	0.26	0.72	0.73	0.44	0.90	0.31	0.91	0.51	0.55	0.27
2016	0.73	0.61	0.76	0.27	0.91	0.70	1.00	0.79	0.69	0.85	0.66	0.26	0.52	0.75	0.50	0.95	0.30	1.00	0.46	0.62	0.35
2017	0.76	0.84	0.75	0.30	0.93	0.75	0.89	0.77	0.70	0.87	0.55	0.30	0.35	0.74	0.47	0.99	0.30	0.88	0.56	0.36	0.40
2018	0.79	0.93	0.70	0.34	0.94	0.82	0.95	0.68	0.79	0.99	0.63	0.34	0.46	0.81	0.53	0.99	0.29	0.71	0.43	0.42	0.69
2019	0.76	0.57	0.62	0.33	0.93	0.99	0.77	0.61	0.84	0.97	0.98	0.35	0.80	0.85	0.52	0.98	0.30	0.67	0.59	0.68	0.93

Source: EuroSTAT database

Appendix 6. Country Lists

ISO3 Number	Full Name	Area	Time when joing the EU	Exp($)	Exp(%)	Imp($)	Imp(%)
TUR	Turkey						
ARE	United Arab Emirates	Middle East		3627237215	2.0%	4388996383	2.1%
AUT	Austria	EU28	January 1, 1995	1183798948	0.7%	1360986247	0.7%
BEL	Belgium	EU28	March 25, 1957	3396324080	1.9%	3229279703	1.5%
BGR	Bulgaria	EU28	January 1, 2007	2668332231	1.5%	2384901108	1.1%
BRA	Brazil	Latin America		494894886	0.3%	2655109120	1.3%
CHE	Switzerland	EUnot27		1042018388	0.6%	3377060832	1.6%
CHN	China	Eastern Asia		2726407095	1.5%	1.9128E+10	9.1%
CYP	Cyprus	EU28	May 1, 2004	1298170264	0.7%	62465208	0.0%
DEU	Germany	EU28	March 25, 1957	1.6617E+10	9.2%	1.9279E+10	9.2%
CZE	Czech Republic	EU28	May 1, 2004	1112601506	0.6%	2338350131	1.1%
DNK	Denmark	EU28	January 1, 1973	1038928628	0.6%	963142990	0.5%
EGY	Egypt	North Afica		3508812771	1.9%	1903804826	0.9%
ESP	Spain	EU28	January 1, 1986	8139094146	4.5%	4446112450	2.1%
EST	Estonia	EU28	May 1, 2004	90417681	0.1%	195646279	0.1%
FIN	Finland	EU28	January 1, 1995	334914825	0.2%	911244254	0.4%
FRA	France	EU28	March 25, 1957	7952061097	4.4%	6760062936	3.2%
GBR	United Kingdom	EU28		1.1279E+10	6.2%	5638296330	2.7%
GRC	Greece	EU28	January 1, 1981	2245332710	1.2%	1474999490	0.7%
HRV	Croatia	EU28	July 1, 2013	441835980	0.2%	224026943	0.1%
HUN	Hungary	EU28	May 1, 2004	1423206068	0.8%	1308084790	0.6%
IDN	Indonesia	Eastern Asia		289372281	0.2%	1352296393	0.6%
IRL	Ireland	EU28	January 1, 1973	619994687	0.3%	826109554	0.4%
IRN	Iran	Middle East		2737252376	1.5%	3608218512	1.7%

IRQ	Iraq	Middle East		1.0223E+10	5.7%	2678192909	1.3%
ISR	Israel	Middle East		4463830959	2.5%	1600818044	0.8%
ITA	Italy	EU28	March 25, 1957	9753403290	5.4%	9349566650	4.4%
JPN	Japan	Eastern Asia		502850599	0.3%	3647886145	1.7%
KOR	South Korea	Eastern Asia		943829784	0.5%	5777022349	2.8%
LTU	Lithuania	EU28	May 1, 2004	258331622	0.1%	304062078	0.2%
LUX	Luxembourg	EU28	March 25, 1957	70732821	0.0%	114563435	0.1%
LVA	Latvia	EU28	May 1, 2004	126578650	0.1%	166667157	0.1%
MLT	Malta	EU28	May 1, 2004	955345744	0.5%	72491832	0.0%
NLD	Netherlands	EU28	March 25, 1957	5761792372	3.2%	3202985033	1.5%
POL	Poland	EU28	May 1, 2004	3448859425	1.9%	2603243204	1.2%
PRT	Portugal	EU28	January 1, 1986	1147015166	0.6%	903201292	0.4%
ROU	Romania	EU28	January 1, 2007	4073195350	2.3%	2770907789	1.3%
RUS	Russia	EUnot27		4152137036	2.3%	2.3115E+10	11.0%
SAU	Saudi Arabia	Middle East		3292797077	1.8%	2005216796	1.0%
SVK	Slovakia	EU28	May 1, 2004	598836395	0.3%	771584493	0.4%
SVN	Slovenia	EU28	May 1, 2004	1843315618	1.0%	372143498	0.2%
SWE	Sweden	EU28	January 1, 1995	1432267647	0.8%	1578250645	0.8%
UKR	Ukraine	EUnot27		2156509575	1.2%	2725419185	1.3%
USA	United States of America	North America		8978403489	5.0%	1.1848E+10	5.6%
TOTAL					76.6%		77.7%

Appendix 7. Descriptive Statistics

Summary Statistics for the Aggregate Trade Dataset

Variable	Obs	Mean	Std. Dev.	Min	Max
year	58,652	2004	8.944348	1989	2019
trade	58,652	2612026	1.23E+07	0	4.81E+08
gdpi	58,652	9.01E+08	2.26E+09	2118655	2.14E+10
gdpj	58,652	9.01E+08	2.26E+09	2118655	2.14E+10
contig	58,652	0.038055	0.191331	0	1
dist	58,652	5289.813	4119.896	173.033	19097.63
language	58,652	0.118393	0.323076	0	1
comcol	58,652	0.02537	0.157248	0	1
religion	58,652	0.168126	0.286164	0	0.986
conflict	58,652	0.0074	0.085703	0	1
CU	58,652	0.014526	0.119648	0	1
exp_to_rest	58,652	0.315386	0.464673	0	1
imp_from_rest	58,652	0.315386	0.464673	0	1
eu_tur	58,652	0.007263	0.084915	0	1
tur_eu	58,652	0.007263	0.084915	0	1
rta	58,652	0.362648	0.480768	0	1

Summary Statistics for the Disaggregate Trade Dataset

Variable	Obs	Mean	Std. Dev.	Min	Max
year	855,659	2007.466	7.094627	1995	2019
trade	855,659	208963.4	1593239	0.001	2.43E+08
gdpi	855,659	1.20E+09	2.60E+09	3599683	2.14E+10
gdpj	855,659	1.17E+09	2.58E+09	3599683	2.14E+10
CU	855,659	0.021277	0.144307	0	1

Appendix 8. F test and Hausman Test for the model

(1) F-test for FE and pooled OLS Model

```
. testparm _Iyear*

 ( 1)  _Iyear_1990 = 0
 ( 2)  _Iyear_1991 = 0
 ( 3)  _Iyear_1992 = 0
 ( 4)  _Iyear_1993 = 0
 ( 5)  _Iyear_1994 = 0
 ( 6)  _Iyear_1995 = 0
 ( 7)  _Iyear_1996 = 0
 ( 8)  _Iyear_1997 = 0
 ( 9)  _Iyear_1998 = 0
 (10)  _Iyear_1999 = 0
 (11)  _Iyear_2000 = 0
 (12)  _Iyear_2001 = 0
 (13)  _Iyear_2002 = 0
 (14)  _Iyear_2003 = 0
 (15)  _Iyear_2004 = 0
 (16)  _Iyear_2005 = 0
 (17)  _Iyear_2006 = 0
 (18)  _Iyear_2007 = 0
 (19)  _Iyear_2008 = 0
 (20)  _Iyear_2009 = 0
 (21)  _Iyear_2010 = 0
 (22)  _Iyear_2011 = 0
 (23)  _Iyear_2012 = 0
 (24)  _Iyear_2013 = 0
 (25)  _Iyear_2014 = 0
 (26)  _Iyear_2015 = 0
 (27)  _Iyear_2016 = 0
 (28)  _Iyear_2017 = 0
 (29)  _Iyear_2018 = 0
 (30)  _Iyear_2019 = 0

       F( 30, 58612) =   34.02
            Prob > F =    0.0000



. testparm _Ipair*


       F(1885, 56757) =   25.92
            Prob > F =    0.0000

. testparm _Ipair* _Iyear*


       F(1915, 56727) =   29.66
            Prob > F =    0.0000
```

(2) Huasman Test for FE and RE model

```
. hausman feyear reyear

                 ---- Coefficients ----
              |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
              |   feyear       reyear       Difference          S.E.
--------------+----------------------------------------------------------------
      lngdpo  |   .2179722    .3659205       -.1479483        .0040561
      lngdpd  |   .1930831    .3099176       -.1168346        .0040561
          CU  |    .325748    .3667905       -.0410425        .0292445
        year  |
        1990  |   .2219931    .1802618        .0417313              .
        1991  |   .2760598    .2467217        .0293381              .
        1992  |   .3579166    .3103614        .0475552              .
        1993  |   .5689458    .6288191       -.0598733              .
        1994  |   .6572549    .6971637       -.0399088              .
        1995  |   .5540234    .4550003        .0990232              .
        1996  |    .540305    .4281156        .1121894              .
        1997  |   1.497815    1.380788        .1170266              .
        1998  |   1.559474    1.440002        .1194723              .
        1999  |   1.795092    1.666707        .1283849              .
        2000  |   1.928192     1.79023        .1379617              .
        2001  |   1.913045    1.776955        .1360899              .
        2002  |   2.007564    1.856447        .1511174              .
        2003  |   2.145708    1.954084        .1916232              .
        2004  |   2.365835    2.129598         .236237              .
        2005  |   2.478789    2.210244        .2685445              .
        2006  |   2.626114     2.32791        .2982037              .
        2007  |   2.727288    2.384057        .3432305              .
        2008  |   2.913189    2.532134        .3810546              .
        2009  |   2.723204    2.366796        .3564083              .
        2010  |   2.851247    2.472647        .3785998              .
        2011  |   2.921501      2.5164        .4051015              .
        2012  |   2.946057    2.538392        .4076653              .
        2013  |   2.976592    2.561685        .4149072              .
        2014  |   2.963005    2.540548        .4224566              .
        2015  |   2.851999    2.461802        .3901976              .
        2016  |   2.856581    2.464416        .3921647              .
        2017  |   2.936623      2.5229        .4137228              .
        2018  |   3.012045    2.577552         .434493              .
        2019  |   2.915191    2.483524        .4316661              .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(33) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =     2256.63
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Appendix 9. Effects on individual countries

(1) European countries as exporters

Country	Coefficient	P-value	%
CYP***	-2.03	(0.279)***	-0.86866
LTU***	-0.899	(0.119)***	-0.59302
ROU***	-0.705	(0.104)***	-0.50589
BGR***	-0.541	(0.103)***	-0.41783
NLD	-0.043	(0.16)	-0.04209
HRV	-0.031	(0.096)	-0.03052
AUT	0.023	(0.176)	0.023267
SVN	0.038	0.117	0.038731
GBR	0.048	(0.165)	0.049171
ITA	0.09	(0.158)	0.094174
CZE	0.108	(0.151)	0.114048
DEU	0.126	(0.128)	0.134282
DNK	0.17	(0.168)	0.185305
SWE***	0.218	0.081***	0.243587
FRA***	0.233	0.065***	0.262381
HUN**	0.247	(0.124)**	0.280179

POL***	0.357	(0.130)***	0.429036
SVK**	0.424	(0.164)**	0.528062
ESP***	0.454	(0.161)***	0.574598
FIN***	0.515	(0.167)***	0.673639
MLT	0.535	0.535	0.707448
IRL*	0.546	(0.296)*	0.726334
PRT***	0.644	(0.202)***	0.904082
EST***	0.912	(0.127)***	1.489296
GRC***	0.978	(0.175)***	1.659133
LVA***	1.837	(0.166)***	5.277677

(2) European countries as importers

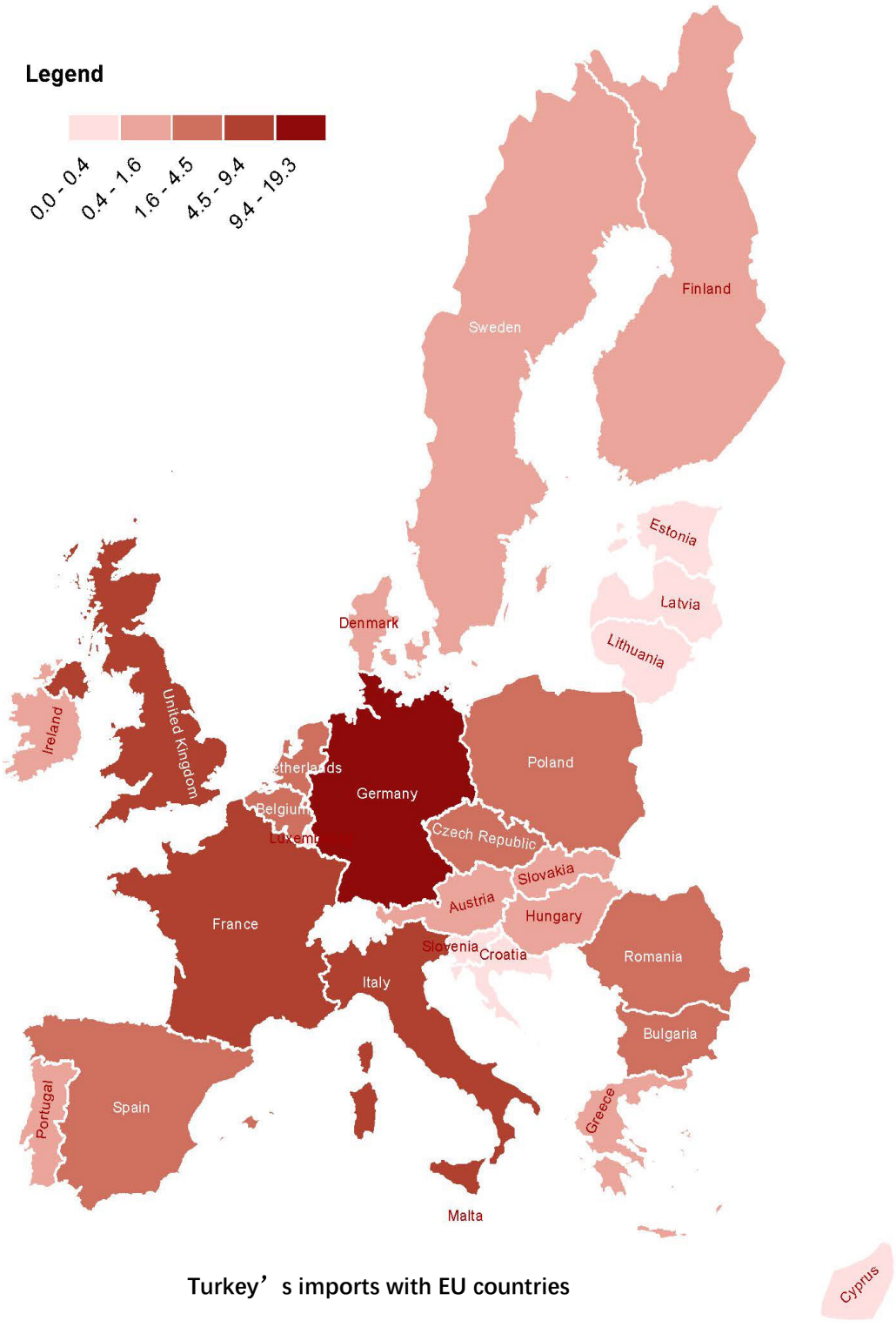
Country	Coefficient	P-value	%
CYP	-1.194	(0.293)***	-0.69699
DEU	-0.456	-0.093	-0.36619
ROU	-0.157	(0.065)**	-0.1453
NLD	-0.091	(0.135)	-0.08698
BGR	-0.032	(0.155)	-0.03149
HUN	0.03	(0.176）	0.030455
AUT	0.048	(0.244)	0.049171
POL	0.129	(0.322)	0.13769
CZE	0.146	(0.196)	0.157196
HRV	0.211	-0.094	0.234912
LTU	0.2265	(0.237)	0.254203
ITA	0.263	(0.118)**	0.300827
FRA	0.355	(0.117)***	0.426181
DNK	0.442	(0.055)*	0.555816
GRC	0.494	(0.190)***	0.638859
MLT	0.527	(0.229)*	0.693843
LVA	0.559	(0.173)***	0.748923
GBR	0.627	(0.160)***	0.871986
ESP	0.689	(0.169)***	0.991723
SVK	0.725	(0.092)***	1.064731
FIN	0.732	(0.137)***	1.079235
SWE	0.774	(0.130)*	1.168423
IRL	0.845	(0.134)***	1.327978
EST	0.849	(0.223)***	1.337308
PRT	0.937	(0.082)***	1.552313
SVN	1.19	(0.133)***	2.287081

Appendix 10. EIU data

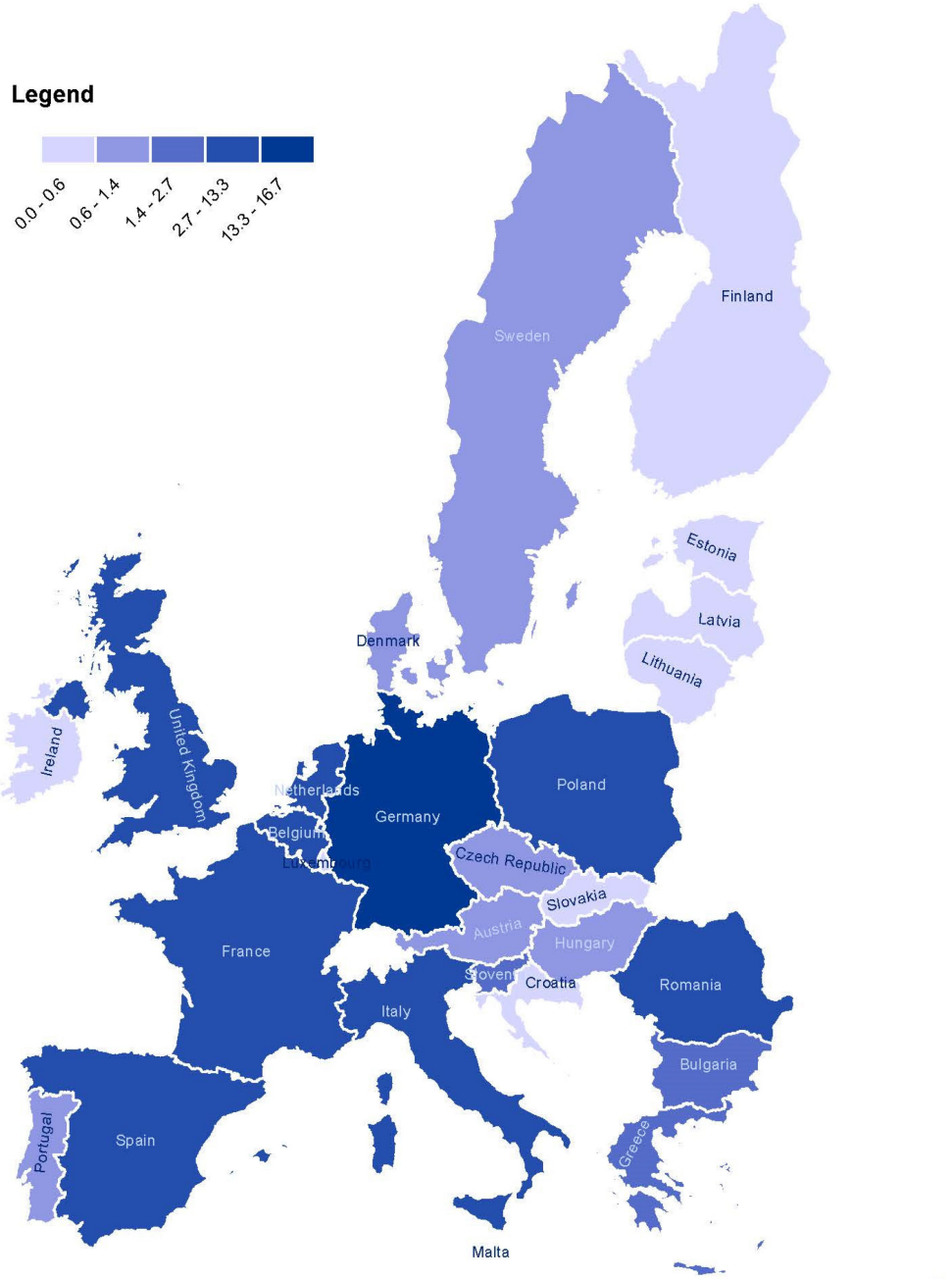
Turkey	Germany	Russia	India	EU-Average	Europe-Average	World-Average
5.7	8.82	5.02	7.68	8.17037	7.086	5.471
5.695	8.82	4.75	7.74	8.161852	7.05	5.477
5.69	8.82	4.48	7.8	8.153333	7.003	5.495
5.71	8.6	4.37	7.54	8.053889	6.897	5.423
5.73	8.38	4.26	7.28	7.954444	6.791	5.351
5.73	8.34	3.92	7.3	7.902222	6.688	5.371
5.76	8.34	3.74	7.52	7.93037	6.673	5.403
5.63	8.31	3.59	7.69	7.922593	6.633	5.431
5.12	8.64	3.39	7.92	7.955556	6.61	5.473
5.12	8.64	3.31	7.74	7.961111	6.587	5.481
5.04	8.63	3.24	7.81	7.914815	6.525	5.47
4.88	8.61	3.17	7.23	7.858148	6.442	5.278
4.37	8.68	2.94	7.23	7.862593	6.324	5.312
4.09	8.68	3.11	6.9	7.890741	6.353	5.028
4.48	8.67	3.31	6.61	7.807407	6.412	4.989

Appendix 11. Turkey's total Imports and Exports with each EU countries in 2019

(USD Billion)	Exports		(USD Billion)	Imports
Germany	16.62		Germany	19.28
United Kingdom	11.28		Italy	9.35
Italy	9.75		France	6.76
Spain	8.14		United Kingdom	5.64
France	7.95		Spain	4.45
Netherlands, The	5.76		Belgium	3.23
Romania	4.07		Netherlands, The	3.20
Poland	3.45		Romania	2.77
Belgium	3.40		Poland, Rep. of	2.60
Bulgaria	2.67		Bulgaria	2.38
Greece	2.25		Czech Rep.	2.34
Slovenia	1.84		Sweden	1.58
Sweden	1.43		Greece	1.47
Hungary	1.42		Austria	1.36
Austria	1.18		Hungary	1.31
Portugal	1.15		Denmark	0.96
Czech Rep.	1.11		Finland	0.91
Denmark	1.04		Portugal	0.90
Malta	0.96		Ireland	0.83
Ireland	0.62		Slovak Rep.	0.77
Slovak	0.60		Slovenia, Rep. of	0.37
Croatia	0.44		Lithuania	0.30
Finland	0.33		Croatia, Rep. of	0.22
Lithuania	0.26		Estonia, Rep. of	0.20
Latvia	0.13		Latvia	0.17
Estonia	0.09		Luxembourg	0.11
Luxembourg	0.07		Malta	0.07
Cyprus	0.01		Cyprus	0.01



Turkey’s imports with EU countries



Turkey's Exports with EU countries