Department of Economics

Effects of the EU-Turkish Customs Union on the Intra-EU Trade Flows

NEKN01 Economics: Master Essay I

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Abstract

The increased possibilities for geographical separation of the production process have given rise to a growing interest for trade in intermediate goods in the international trade literature. Thanks to trade in parts and components, but also in services and other immaterial products, developing countries have been able to enter the global trade scene to a greater extent than before. This paper analyzes the trade effects of the customs union between the European Union and Turkey, implemented in 1996. Specifically, a set of gravity equations are used in order to analyze how the intra-EU export flows of intermediate- vis-à-vis other goods have been affected. That is, how the integration of Turkey into the EU market has affected the trade flows between a selection of Southern- and Northern EU member countries. The results reveal that the intra-EU exports of the Southern EU have experienced a greater reduction in its exports compared to the Northern EU, especially in exports of other than intermediate goods.

Keywords: Intermediate goods, customs union, gravity equation, internal trade effects, technological differences, European Union, Turkey.

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1. Introduction

In late December 1995, the European Union (EU) and Turkey signed a customs union (CU) agreement with each other. The agreement, in effect since January 1996, implied that the EU and Turkey removed their respective tariffs and levies on imports of manufactured goods between each other. The agreement also covers trade in processed agricultural products[1], but it does not cover agricultural products, nor does it cover trade in services. In addition to the tariff removal, Turkey was obliged to adopt the EU's common external tariff (which they did in 2001) on imports from the rest of the world (i.e. countries outside the EU), to further integrate Turkey as part of the EU market. Thus, countries outside the EU were given the same access to the Turkish market as they were given to the EU market. The CU led Turkey to become a relatively open economy, at least in non-agricultural products. Furthermore, the CU has helped to remove technical barriers to trade, since Turkey agreed to align its product quality standards to those of the EU.

The trade effects of the EU-Turkey customs union have been the concern of many papers (see for example Harrison *et. al* (1997), Mercenier and Yeldan (1997), Adam and Moutos (2008), Lejour and de Moij (2004)). Previous literature has concerned the welfare effects (primarily for the Turkish economy) as well as the trade effects, but little attention has been given to the effect on intermediate goods trade vis-à-vis trade in other types of goods.

Trade in intermediate goods has attracted much attention recently (see for example Baldwin (2012) and Grossman and Rossi-Hansberg (2006)). Improved possibilities for firms to offshore certain parts of their production process to remote locations have led to internationalized production chains. Firms seek to reap the benefits of differences in factor endowments (and thus costs) between countries, and it is possible that such a setting is prevalent in the EU-Turkey case. Firms in technologically sophisticated countries, such as a number of the EU member countries, could gain from offshoring the parts of their production that requires lower technological sophistication to countries where the costs for the required (lower technological) inputs are lower, such as Turkey (who has a relatively lower technological level index value than some EU countries (Adam and Moutos, 2008, p. 697)). It is therefore interesting to examine whether there are specific effects to expect from forming a

[1] See http://ec.europa.eu/enterprise/sectors/food/eu-market/processed-products/ for a description of which agricultural products that are considered as processed.

customs union between technologically different countries, for example if intermediate goods trade is affected differently compared to trade flows of other goods. This paper aims to account for the CU's effect on the respective trade flows of intermediate- and other goods between the EU countries (and briefly between the EU and Turkey) from 1992 until 2008, i.e. how the CU has affected intra-EU trade.

The next section of the paper will provide a review of previous literature concerning the EU-Turkey customs union, but also trade in intermediate goods and the internationalization of production chains. The third section contains the theoretical framework for the analysis, including the theory behind the gravity equation. The data and method that will be used is presented in the fourth section, with the results and analysis presented in section five. The last section summarizes.

2. Background

Turkey's exports to the EU have experienced a stable increase from 1992 through 2008, with a more dramatic increase in the 21st century, regardless of the state of the Turkish economy. Turkish imports from the EU, on the other hand, have been more sensitive to the country's GDP. Figure 1 shows the development of the Turkish GDP and figure 2 shows the development of the trade between Turkey and the EU, from 1992 to 2008.

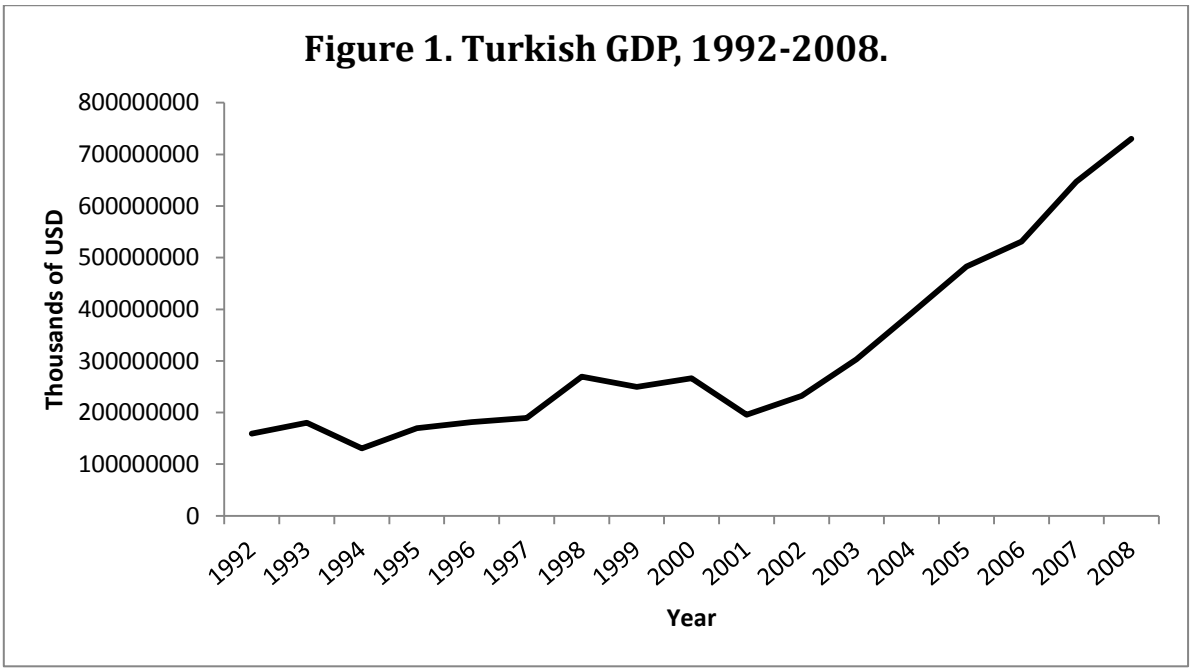

Figure 1. Source: The World Bank.

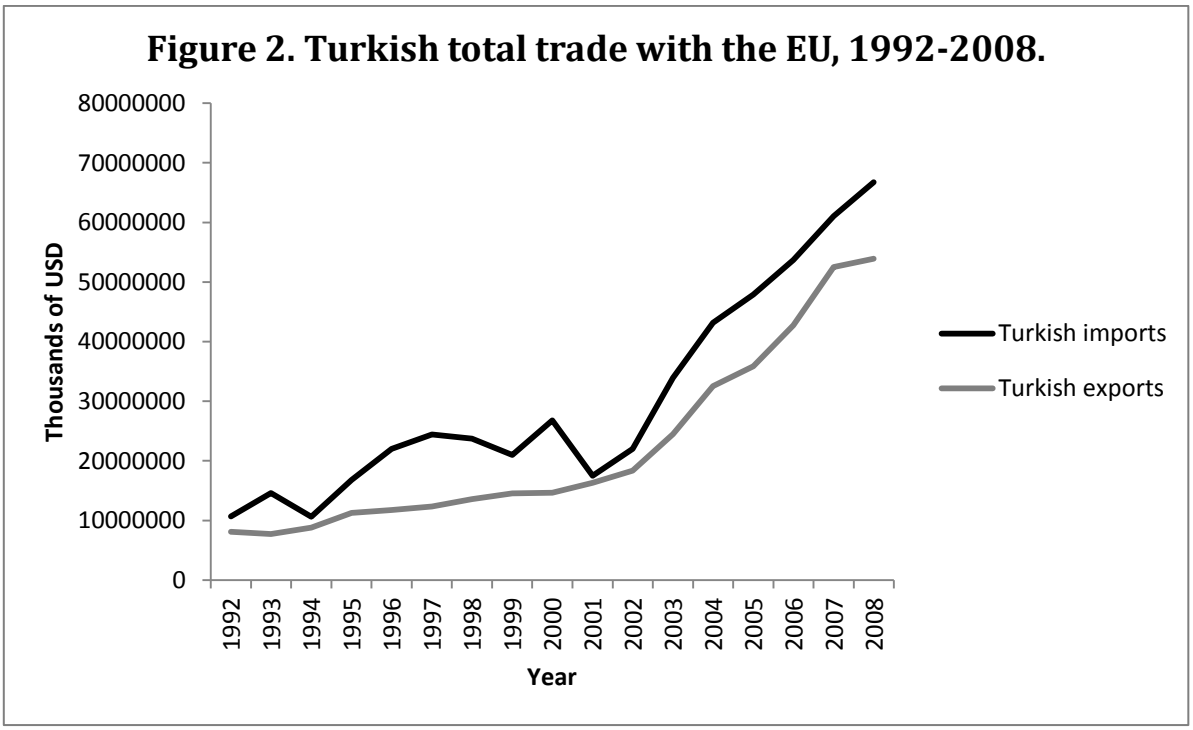

Figure 2. Source: The World Bank.

The earlier, *ex ante*, literature regarding the CU agreement in question has predominantly focused on the effects on the Turkish economy, primarily the welfare effects. Harrison *et al.* (1997) expected a positive welfare effect, whereas Mercenier and Yeldan (1997) expected it to be negative, unless further integration with the EU was implemented. While welfare effects of a customs union of course are important to study, the aim of this paper is to focus on the various trade flow effects of the CU and leaving the welfare effects to other papers.

2.1 Trade effects of the Turkish integration

Recent, *ex post*, literature on the subject has focused more on the trade effects, rather than trade's effect on welfare, of the CU. Adam and Moutos (2008) use a gravity model to find that the trade effects of the EU-Turkey CU are asymmetric. In the initial stage, a number of countries are members of a free trade area, e.g. a customs union (such as the members of the European Union). When another country joins the union (such as Turkey did in 1996), the more technologically similar the initial member countries are to the joining country, the more they experience a drop in exports to the other member countries. Conversely, countries that are technologically dissimilar to the joining country, do not experience the same drop in exports to other countries within the customs union.

Adam and Moutos (2008) use 24 OECD countries, and divide them into four regions: Northern EU, Southern EU, Turkey, and the rest of the world. They then turn to investigate the effects on the trade flows between the three former regions, over the years 1988-2004. They find that both the Southern EU's and the Northern EU's exports to Turkey increased thanks to the customs union, and that Turkish exports to them both also increased. However, the Southern EU's exports to the Northern EU decreased, whereas the effect on the Northern EU's exports to the Southern EU was insignificant.

In addition to this, a technology index (mentioned in the introduction of this paper) ranking reveals that the countries in the Southern EU group are more technologically similar (i.e. have more similar factor endowments) to Turkey than the countries in the Northern EU group (who have the highest index ranking). In such a setting, the Southern EU countries initially have a comparative advantage in producing (and thus exporting) products of lower technological sophistication than the Northern EU countries. When Turkey, who has a lower technology ranking than the Southern EU countries, is integrated into the market, the Northern EU countries will import products of the lowest technology from Turkey instead of the Southern EU (since Turkey has a comparative advantage in such products). In other words, Turkish firms will compete with firms from the Southern EU to a greater extent than they will with Northern EU firms. As for the intra-EU trade, this means that the Northern firms will switch from Southern EU imports to Turkish imports to a greater extent than the Southern EU will switch from Northern EU imports. Hence, the effect of the expansion of the CU to include Turkey had asymmetric effects on the total exports of the initial members. This paper will analyze if one can see a similar development for the exports of intermediate vis-à-vis other goods flows (and if the effect is of equal size for both types of flows).

2.2 Globalization and trade in intermediate goods

A larger share of today's international trade can be described as intermediate goods trade. Feenstra (2004) notes that rather than focusing on industries with different skill intensities, as the Heckscher-Ohlin (HO) model does, one should focus on the different activities *within* each industry. These activities, which require different factor intensities, make up the entire production chain for a certain product. Since the factor endowments are different between different locations (e.g. countries), it is desirable for a producer to locate each production activity in a location where the factor that is intensely required is abundant and therefore

cheaper. Activities of a particular industry are traded between countries – intermediate goods trade.

Prior to the industrial revolution, it was costly and practically difficult (impossible) to fragment the production process (Grossman and Rossi-Hansberg, 2006). Transportation and coordination consumed both time and money. Although Adam Smith (1776) had noted that division of labor was cost- and time-effective, with the famous pin factory example (p. 11f), transportation- and communication costs kept geographical proximity between the factors of production a necessity. Production activities could be divided between workers, as long as they stayed under the same roof. In addition, producers had to be in close proximity to their consumers.

2.2.1 Historical progress of intermediate goods trade

The invention of the steam power engine revolutionized the conditions for industrial production. Railroads and steamships cut transportation costs, which is one of the two major obstacles to production fragmentation. However, communication still required geographical proximity (the telegraph was indeed invented in the mid-19th century, but there were limits to its usefulness other than transmitting just basic messages). The new, cheap transportation favored large-scale production, which is very complex and therefore requires coordination. Hence, the industrial revolution led to a paradox, as Baldwin (2012) notes. While transportation costs were drastically lowered, production clustered into factories in industrial districts. Large-scale production and comparative advantages required coordination, which had not experienced the same technological improvement as transportation. The key to success for a country was to have a "deep" domestic industrial base. While production spread all over the (western) world, it still clustered in certain separate locations. Production fragmentation had to wait roughly one and a half century until the next revolutionary step was taken.

In order to perform successful large-scale production, there is a need for a two-way flow of material, people, information etc. While the steam revolution lowered the transportation costs, the information- and communication revolution lowered communication costs. Improvements in information- and communication technology (ICT), in the mid 1980's, made telecommunication reliable and cheap, alongside with improvements in computer power, software capabilities etc.

Since direct communication with remote locations became readily available, firms found it economical to disperse production activities into geographically remote locations, to exploit differences in factor prices. It is not unusual that production activities are "outsourced" to foreign locations. Often, firms in highly developed countries (with an abundance of high-skilled labor) decide to outsource (offshore) activities that require low-skilled labor to countries where low-skilled labor is abundant. Hence, the richer countries of the world can combine the high technology at home with lower wages abroad (Baldwin, 2012).

When the steps of a production chain are undertaken in different countries, the product of each production site (i.e. their part of the production chain and not the final product) is traded with the other countries in the production network. Such trade, in parts and components, but also services of different kinds, is known as intermediate trade, and it is generally regarded that trade in intermediates, as a share of world trade, is becoming increasingly significant (see for example Grossman and Rossi-Hansberg (2006) and Baldwin (2012)).

This paper sets out to examine whether this is present for the EU-Turkish trade relations and if the CU agreement has had a different effect on intermediate trade compared to other kinds of trade – primarily for the intra-EU trade relations.

2.3 EU-Turkish intermediate goods trade

The role of intermediate goods trade in Turkey was investigated by Türkcan (2005). He found that its share (approximately 20% in 2000) in Turkish trade with nine selected OECD countries (of which seven are EU members[2]) had increased since 1980, whereas its share in Turkish trade with the rest of the world remained fairly stable. In addition, he also concluded that the determinants of such trade are of country-specific character (such as GDP or trade openness), rather than industry-specific character (such as returns to scale or advertising-to-sales ratios).

According to Kaminski and Ng (2006), Turkey has been deeply integrated into a network of production fragmentation (or a "producer driven network" as they call it), since the mid-1980s. In order for a country to take part of such a network and benefit from a globalized division of labor, three key features need to be in place: macroeconomic stability, competitive

[2] Austria, Germany, Italy, the Netherlands, Spain, Sweden and the UK. The other two countries in his paper are the USA and Japan.

domestic markets (i.e. open to foreign competition), and well-functioning "backbone services" (e.g. road-, telephone-, Internet-, banking-, insurance- and legal system).

It is only in the recent years Turkey has achieved to fulfill all three goals. The Turkish economy has been steadily growing in the 2000's, as can be seen in figure 1. The CU opened up the Turkish market for competition from EU firms and it also provided aid for Turkish policy makers to pursue reforms of the country's financial- and legal systems (primarily competition laws, for example to curb corruption) and it has led Turkey to adopt European quality standards. Hence, there is reason to believe that the trade in intermediate goods between the EU and Turkey has increased after the CU's implementation.

3. Theory – the gravity equation

The major theoretical foundation of this paper will be the gravity equation, which departs from a model of monopolistic competition. The use of the gravity equation was disregarded between the 1960's (i.e. right after its introduction by Tinbergen in 1962) until the late 1980's, due to its lack of theoretical foundation at the time (Kepaptsoglou *et al*., 2010). The gravity equation performed well at explaining trade flows between countries, especially compared to other models of trade. However, the lack of theory behind it posed difficulties when one should interpret the results, and the gravity equation fell into temporary oblivion since one failed to make economical inferences from the statistical results.

However, the emergence of new trade theories has led the gravity equation to return as a widely used method when international trade flows are analyzed. Increasing returns to scale, imperfect competition, and nation-level product differentiation are examples of such theories. This paper will primarily use the latter two as its theoretical foundation.

The gravity equation in this paper takes its departure from the monopolistic competition model (see for example Feenstra (2004), Anderson and van Wincoop (2003), and Carrère (2006)). The model is characterized by a market with a large number of firms, where there is freedom of entry and exit. In addition, which separates the monopolistic market from the perfectly competitive market, each firm produces a unique variety of a differentiated product (i.e., the products of different firms are *not* perfect substitutes).

If two identical countries move from autarky to free trade, the monopolistic competition model predicts that they will start to trade with each other. Since each firm in the two countries produces a differentiated product, they will begin to export to the other country when trade is possible. Consequently, they will also face new competition in their home market, from foreign firms, and countries will specialize in producing different varieties. When trade is possible, it is profit maximizing for firms to produce unique varieties of a differentiated product, rather than producing the same variety within each country. Hence, countries both export and import products within the same industry.

3.1 Border effects in the gravity equation

If we develop the gravity equation, by leaving the simplifying assumption of no transaction costs, prices are no longer equalized across different countries (which they are when there are no transaction costs). The gravity equation in this analysis, with border effects, is based on that of Anderson and van Wincoop (2003) and Feenstra (2004).

If one denotes exports of good *k* from country *i* to country *j* with c_k^{ij}, then c_k^{ij} also denotes the total consumption of good *k* in country *j*, since all countries produce unique product varieties. Country $i = 1, \dots, C$ produces N^i products, which means that country *j*'s utility is given by

$$U^j = \sum_{i=1}^{C} \sum_{k=1}^{N^i} \left(c_k^{ij}\right)^{(\sigma-1)/\sigma}. \quad (1)$$

We assume that all products that country *i* exports to country *j* are sold for the same c.i.f. (cost, insurance, freight) price, p^{ij}, in country *j*. The price for the same goods in country *i* are p^i, and are free from transaction costs (since they are not exported). Furthermore, the price in country *j* is related to the price in country *i* in the following way: $p^{ij} = T^{ij}p^i$, where $T^{ij} \geq 1$.

T^{ij} is the transportation costs that occur when a good is exported from country *i* to country *j*. It can be viewed as T^{ij} units of a good must be shipped for one unit of the good to arrive to the market in country *j*. This is commonly referred to as "iceberg transportation costs"[3], since $\left(T^{ij} + 1\right)$ units of the good are shipped from country *i*, but T^{ij} "melts" away during the transportation so that only one unit of the good arrives in country *j*.

[3] Formulation introduced by Samuelson (1952).

Since the prices in country *j* are equal across all imported products from country *i*, the consumption of country *i*'s products in country *j* is equalized over all products $k = 1, \dots, N^i$. Hence, $c_k^{ij} = c^{ij}$ and the utility function (1) can be simplified into

$$U^j = \sum_{i=1}^{C} N^i \left(c^{ij}\right)^{(\sigma-1)/\sigma}. \quad (2)$$

It is assumed that trade is balanced, so the representative consumer of country *j* maximizes the utility function (2) subject to his budget constraint (Y^j is aggregate income in country *j*):

$$Y^j = \sum_{i=1}^{C} N^i p^{ij} c^{ij}. \quad (3)$$

Thus, one can obtain the demand for each product, c^{ij}, when the representative consumer maximizes (2) subject to (3):

$$c^{ij} = \left(p^{ij}/P^j\right)^{-\sigma}\left(Y^j/P^j\right), \quad (4)$$

where P^j is the price index of country *j* which is defined as

$$P^j = \left(\sum_{i=1}^{C} N^i \left(p^{ij}\right)^{(1-\sigma)}\right)^{1/(1-\sigma)}. \quad (5)$$

The gravity equation including border effects (specifically transport costs) can then be expressed as:

$$X^{ij} = \frac{Y_i Y_j}{Y_w}\left(\frac{T_{ij}}{P_i P_j}\right)^{1-\sigma}. \quad (6)$$

Equation (6) states that the trade between two countries *i* and *j* depends on their respective GDP's and their respective price indexes as well as transaction costs.

3.1.1 Distance and other "fixed" variables in the gravity equation

There is, however, a problem related to the usage of a gravity equation such as (6) (Feenstra, 2004). Often, the variables P_i and P_j are estimated using official price indexes, which may not be an accurate reflection of the actual border effects between two countries. Price indexes are unlikely to reflect other important transaction costs apart from transportation costs, such as the time it takes for shipments to reach their destination or risks related to the macroeconomic- and/or monetary environment of a country's trading partner.

One solution to such a problem is to measure the difference between the price of country *i*'s good when it is sold in country *i* to the price when the same good is sold (exported) in country *j*, i.e. T^{ij}, by including distance and other factors into the "iceberg cost":

$$(7) \qquad lnT^{ij} = \tau^{ij} + \rho lnd^{ij} + \varepsilon_{ij}.$$

In (7), lnd^{ij} represents the logarithmized distance between country *i* and country *j*, where ρ is the coefficient that determines the effect of the distance on the logarithmized transaction cost, lnT^{ij}. All other transaction costs, or "barrier-to-trade" costs, between the two specific countries *i* and *j* are captured in τ^{ij}, whereas ε_{ij} is the random error (Feenstra, 2004).

Carrère (2006), who develops a similar gravity equation as Feenstra, suggests that in order to properly account for the "barrier-to-trade" function between two countries, one should account for the distance between the two countries, whether or not they share a common border, if they are landlocked and also the level of infrastructure in the two countries. The distance effect on the trade has thus been extended to include additional measures which are likely to affect the level of trade between country *i* and country *j*.

In sum, the theoretical foundation of the gravity equation relies on the assumption that the economic mass (i.e. GDP) of the trading partners enhances trade, whereas the distance (both geographical and other types) between the countries has an opposite effect.

3.1.2 Customs unions in the gravity equation

The gravity equation is often used as a tool to analyze the effects of various types of regional trade agreements (RTA's), including CU agreements. Most of the theory regarding RTA's and the gravity equation concerns trade- creation or diversion, which is not the concern of this paper. Often, the gravity equation is used to *ex-post* assess the effects of a RTA on the member countries *vis-à-vis* non-members, e.g. the RTA's effect on trade between the members compared to its effect on the members' trade with non-members. This paper analyzes the CU's effect on different types of goods' trade flows *within* a RTA. The perspective of the CU's trade effect on non-member countries is beyond the scope of this paper and is thus absent.

However, there is no reason to believe that the gravity equation is unsuitable for an analysis such as this paper's. As Carrère (2006, p. 228) puts it, "*..., the gravity equation suggests a "normal" level of bilateral trade for the sample. Then, dummy variables can be used to capture the "atypical" levels resulting from an RTA*". The gravity equation should thus serve

the purpose of assessing the CU's effect on the trade flows between countries within the union.

As mentioned earlier in this paper, Türkcan (2005) found that country-specific variables are the most appropriate for analyzing intra-industry trade in both final- and intermediate goods. This further supports the choice of the gravity equation with country-specific variables as the theoretical framework for analyzing the trade flow effects of the CU between the EU and Turkey. The specifics on how this is done in the current paper will be presented in the following section.

4. Data/Method

In order to assess the effect of the CU on the intra-EU trade, several gravity equations will be estimated and compared. The trade effects of the CU will, in the first step, be broken down into three different regressions, in order to separate the effects of the CU on the three respective intra-EU trade flows of total-, intermediate- and other goods.

4.1 Data and variables

The 15 sample countries are Turkey and the 14 earliest members of the European Union[4], except Luxembourg (due to lack of sufficient data). The trade data is collected from the OECD's STAN Bilateral Trade Database by Industry and End-use Category, where the value of bilateral total- and intermediate exports data of each country is available. The export flow of other goods is the difference between total exports and intermediate exports, and contains household consumption-, capital- and mixed end-use goods.

The sample period is 1992 to 2008, in order to provide reference years prior to the CU (which was implemented in 1996), as well as a sufficient number of "post-CU" years. Each sample country has 14 trading partners per year, which gives a total of 3570 observations per trade flow (15 exporting countries * 14 importing countries (for each exporter) * 17 years). Since there are three different trade flows included (total, intermediate and other), the total number of export observations amounts to 10710.

[4] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Data for each country's GDP and GDP per capita is extracted from the World Bank's World Development Indicators and Global Development Finance database. The economic mass of each bilateral trading pair is then calculated as the product of the countries' GDP's, for each year. In other words, the (three) export flows from country *i* to country *j* in year *t* is matched with the product of country *i*'s GDP and country *j*'s GDP in year *t*. The difference in GDP per capita is the absolute difference between the countries' GDP per capita, for each specific year.

In addition to the trade- and mass variables, the CU is represented by a dummy variable, which takes the value of one from the year 1996 and onwards, and zero for the years prior to the implementation of the CU (i.e. 1992-1995).

In 2005, the EU and Turkey initiated negotiations for full Turkish membership of the European Union. According to Özdemir (2010), trade between Turkey and the EU increased dramatically after the accession negotiations started, rather than as an effect of the CU nine years earlier. A dummy variable (which takes the value of one from 2005 and onwards, zero otherwise), is therefore included in order to control for the potential effects of the accession negotiations. If the accession negotiations had a significant effect on EU-Turkish trade, not including it in the regression would lead to a biased estimate of the CU's effect.

Lastly, eight dummy variables are included in order to identify each export flow (North-North, South-South, North-South, South-North, North-Turkey, South-Turkey, Turkey-North and Turkey-South). For example, the North-North dummy takes the value of one if both the exporter and the importer are from the Northern EU, zero otherwise. If the exporter is from the Northern EU and the importer is from the Southern EU, the North-South dummy takes the value of one, zero otherwise, and so forth.

These dummy variables will be interacted with the CU- and the accession negotiations variables which enables one to identify how each of the eight export flows has been affected by the CU and the accession negotiations. This will be thoroughly discussed in section 4.2.3.

The division of the EU countries into North and South follows Adam and Moutos' (2008) technological specification. Greece, Italy, Portugal and Spain are not only geographically located in the Southern Europe, they are also the countries with the lowest technology index (Adam and Moutos, 2008, p. 697). Furthermore, the figure in the current paper's appendix A reveals that they have the lowest GDP per capita in the sample (except for Turkey).

Hence, the Southern EU consists of Greece, Italy, Portugal and Spain, whereas the Northern EU consists of Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Sweden and the UK. There will thus be three regions in the analysis: the Northern EU, the Southern EU, and Turkey.

4.2 Empirical specification

The gravity equations take the following form in the empirical analysis:

(8) $$lnX_{k,i,j,t} = \alpha_0 + ln\beta_1 Mass_{i,j,t} + ln\beta_2 Diff_{i,j,t} + \beta_3 CU_{I,J} + \beta_4 EUaccess_{I,J} + \mu_{i,j} + \lambda_t + \varepsilon_{i,j,t}.$$

Variable	Description
$X_{k,i,j,t}$	*k* (total, intermediate or other) exports from country *i* to country *j* in year *t*.
α_0	Constant.
$Mass_{i,j,t}$	The product of country *i*'s and country *j*'s GDP in year *t*.
$Diff_{i,j,t}$	The absolute difference between country *i*'s and country *j*'s GDP per capita in year *t*.
$CU_{I,J}$	Interaction variable. Dummy variable equal to 1 if the CU is in effect, 0 otherwise, multiplied with a dummy variable equal to 1 if the trade flow is between region *I* and region *J*, zero otherwise.
$EUaccess_{I,J}$	Interaction variable. Dummy variable equal to 1 if accession negotiations are initiated, 0 otherwise, multiplied with a dummy variable equal to 1 if the trade flow is between region *I* and region *J*, zero otherwise.
$\mu_{i,j}$	Fixed bilateral effects between country *i* and country *j*.
λ_t	Time effect for year *t*.
$\varepsilon_{i,j,t}$	Error term for country *i* and country *j* in year *t*.

In order to estimate and compare the CU's effect on the intra-EU trade flows, three separate regressions of (8) will be estimated (the results will be presented in section 5). The dependent variable in the first regression is total exports. Hence, we will obtain an estimation of the effect of the CU on the total trade flow between the Northern EU and the Southern EU, using the other trade flows (i.e. Northern EU-Turkey, Southern EU-Turkey, intra-Northern EU and intra-Southern EU) as benchmarks. The first regression is thus:

$$lnX_{TOT,i,j,t} = \alpha_0 + ln\beta_1 Mass_{i,j,t} + ln\beta_2 Diff_{i,j,t} + \beta_3 CU_{N,S} + \beta_4 EUaccess_{N,S} + \mu_{i,j} + \lambda_t + \varepsilon_{i,j,t}.$$

The subscript "*TOT*" indicates total exports. In the second regression, the right hand side of the equality sign will remain unchanged, but the dependent variable will be the export flow of intermediate goods instead of the total export flow:

$$lnX_{INT,i,j,t} = \alpha_0 + ln\beta_1 Mass_{i,j,t} + ln\beta_2 Diff_{i,j,t} + \beta_3 CU_{N,S} + \beta_4 EUaccess_{N,S} + \mu_{i,j} + \lambda_t + \varepsilon_{i,j,t}.$$

Accordingly, the third regression estimates the CU's effect on the trade flow of other goods:

$$lnX_{OTH,i,j,t} = \alpha_0 + ln\beta_1 Mass_{i,j,t} + ln\beta_2 Diff_{i,j,t} + \beta_3 CU_{N,S} + \beta_4 EUaccess_{N,S} + \mu_{i,j} + \lambda_t + \varepsilon_{i,j,t}.$$

After estimating these three regressions, one is able to compare the coefficient of the CU variable, i.e. β_3, in each regression. Hence, it is possible to see how the CU has affected the trade flow of intermediate goods, compared to the trade flow of other goods, between the Northern- and the Southern EU. The results of the total trade flows will also be presented, in order to highlight the CU's "general" trade effect. The main focus of the paper is although, as stated earlier, to analyze and compare the CU's coefficient in the two latter regressions above.

4.2.1 Bilateral fixed effects

Equation (8) is a logarithmic regression with fixed effects, which will be estimated with robust standard errors. In using a fixed effects regression, all variables that do not vary over the sample period are controlled for; each pair of trading partners is assigned a unique dummy variable, $\mu_{i,j}$, which controls for any fixed parameter that might influence the trade between the bilateral trading partners. Hence, there is no explicit distance variable in equation (8) – it is controlled for by the bilateral dummies for fixed effects. The same goes for other constant parameters that might affect trade (i.e. through the price indexes of equation (6)), such as cultural-, historical-, and language ties.

The choice of a fixed effects model for an analysis such as the one in this paper is suggested by Feenstra (2004). He concludes that a model with fixed effects perform consistently well compared to more customized methods, such as Anderson and van Wincoop's (2003). Since this paper do not specifically set out to analyze the trade effect of any constant parameter (e.g. distance), merely controlling for them, a fixed effects approach is more suitable thanks to its simplicity. Furthermore, the sample covers 17 years, which makes it unlikely that any "cultural" barrier to trade between the EU and Turkey has changed in a way that were not manifested in the implementation of the CU or the accession negotiations.

4.2.2 Time effects

The inclusion of a time effect, λ_t, controls for time-specific shocks on the trade flows within the sample. The intuition is to control for parameters that vary over the sample period that may affect the trade between the sample countries. For example, a global (or regional) economic slowdown is likely to have a negative impact on international trade. Not controlling for the time effects could in such a case lead to an undervalued trade effect of the parameters of interest. Adam and Moutos (2008) furthermore note that the emergence of China (and other developing countries) as a trading partner for the EU and Turkey is another "shock" that is controlled for by the time variable. This is especially important in the current analysis, since the rapid growth of the East Asian economies is assumed to have had a major impact on the international trade in intermediate goods (see for example Grossman and Rossi-Hansberg (2006) or Baldwin (2012)).

Mátyás (1997) compares two gravity models over the same dataset; one of them controls for fixed bilateral- and time effects, the other one does not. He found that the coefficients of the essential variables (GDP, distance, etc.) in the two regressions are much different from each other. Additionally, the majority of the fixed- and time parameters are statistically significant. Hence, by including fixed- and time effects, a panel data gravity equation (such as (8)), is more properly estimated.

4.2.3 The customs union- and the EU accession variables

In order to identify the effects of the CU an interaction variable, specified as follows, is used: $CU_{I,J} = CU * IJ\_JI$, where CU is a dummy variable which takes the value of one if the CU is in effect, zero otherwise. The starting year of the CU is 1996; the variable is hence equal to one from 1996 and onwards. The latter variable, IJ_JI, is also a dummy variable, which takes the value of 1 if the trade flow is between region *I* and region *J* (the three regions being Northern EU, Southern EU, and Turkey), i.e. if IJ *or* JI is equal to one . Hence, when the CU's effect on the trade between region *I* and region *J* is estimated, the other trade flows (i.e. region *I* to region *K*, and region *J* to region *K*, as well as intra-regional trade flows) serve as control variables. For example, the CU's effect on the trade between Northern EU and the Southern EU will be estimated in comparison with the Northern EU's trade with Turkey, Southern EU's trade with Turkey, as well as the intra-regional trade of the Northern- and the Southern EU. The coefficient on the CU interaction dummy variable, $CU_{I,J}$, will thus be the coefficient of primary interest in the current analysis.

The EU accession negotiations variable, $EUaccess_{I,J}$, is developed in the same way as the CU variable: $EUaccess_{I,J} = EUaccess * IJ\_JI$. The latter variable is the same as in the previous paragraph, whereas $EUaccess$ is a dummy variable that takes the value of one if the Turkish accession negotiations with the EU had begun (which they did in 2005), zero otherwise.

5. Results and analysis

In the first part of this section, the results of the intra-EU regressions are presented (table 1). The second part breaks down the intra-EU trade in order to identify the CU's effect on Northern EU's exports to the Southern EU, and Southern EU's exports to the Northern EU (table 2). The last part briefly summarizes the results of the CU in the same way as table 2, but with the addition of the exports from the Northern EU and Turkey, the Southern EU and Turkey, as well as Turkey's exports to both EU regions. The complete result tables of the Northern EU-Turkey and the Southern EU-Turkey regressions can be found in Appendix B and Appendix C, respectively (they are not included in the main text since the analysis focuses on intra-EU trade).

5.1 Northern EU-Southern EU trade

Starting with the CU's "general" gravity variables, it is evident that the mass variables are positively correlated with all the three trade flows, with high statistical significance. The larger the trading partners are, the more they trade with each other, as the gravity equation theory predicts. On the contrary, the difference in GDP per capita between trading partners is insignificant for all three trade flows. This holds true for the EU-Turkish trade flows as well (see Appendix B and Appendix C).

The CU has had a negative effect on total intra-EU trade of 12.8% ($\approx e^{.1201128}$). The effect of the EU accession negotiations' effect is less, but significantly, negative: 9.3%. As for the flow of intermediate goods, the CU has had a decreasing effect of 10.3%, while the accession negotiations lowered it by 9.4%. Trade in other goods has also been negatively affected by the CU and the negotiations – a 15% decrease from the CU and an 8.8% decrease from the accession negotiations. In all three regressions, the coefficient on the CU variable is found to be significantly negative. Hence, it is concluded that the implementation of the CU has affected the intra-EU trade negatively.

Table 1. Trade between the Northern EU and the Southern EU

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Total exports			
ln Mass	.6597772***	.0269964	24.44
ln GDP/capita difference	.0032579†	.0053546	0.61
CU North ↔ South	-.1201128***	.0185921	-6.46
EU North ↔ South	-.0893669***	.0163151	-5.48
Number of observations	3570	F(20,3340)	555.89
R^2	0.7143		
Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Intermediate exports			
ln Mass	.6125765***	.0297807	20.57
ln GDP/capita difference	-.0041181†	.006483	-0.64
CU North ↔ South	-.0976732***	.0193642	-5.04
EU North ↔ South	-.0900924***	.0188136	-4.79
Number of observations	3570	F(20,3340)	473.35
R^2	0.6654		
Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Other exports			
ln Mass	.7335777***	.0326652	22.46
ln GDP/capita difference	.00793†	.0063169	1.26
CU North ↔ South	-.1395651***	.0254365	-5.49
EU North ↔ South	-.0845988***	.0212879	-3.97
Number of observations	3570	F(20,3340)	376.18
R^2	0.7272		

*** significant at the 1% level, ** significant at the 5% level, † insignificant at the conventional test levels. Fixed effects regression, where the constant- and the time variables are not reported in order to save space.

The results of table 1 furthermore suggest that the CU has affected trade in other goods more than it has affected trade in intermediate goods. Turkey has been integrated into the other goods market to a greater extent than it has been into the intermediate goods market. Since trade in services (i.e. a type of intermediate goods trade) was not covered by the CU, the findings are perhaps not very surprising.

5.2 Asymmetric effects on the EU countries

In order to enrich the analysis of the CU's effect on intra-EU trade, table 2 presents the results of two regressions which are similar to those in table 1 but there are now two CU dummy

variables and two EU accession dummy variables; one where the dependent variable is intermediate exports and one where other exports is the dependent variable. These regressions will show whether the CU has had a similar or different effect on the two EU regions' intra-EU exports.

For example, the intermediate exports regression will look as follows:

$$lnX_{INT,i,j,t} = \alpha_0 + ln\beta_1 Mass_{i,j,t} + ln\beta_2 Diff_{i,j,t} + \beta_3 CU_{N\ to\ S} + \beta_4 CU_{S\ to\ N} + \beta_5 EUaccess_{N\ to\ S} + \beta_6 EUaccess_{S\ to\ N} + \mu_{i,j} + \lambda_t + \varepsilon_{i,j,t}.$$

In doing so, the analysis of the CU's effect becomes more multifaceted, in comparison with analyzing the effect on the EU countries as a whole. Furthermore, following Adam and Moutos' (2008) analysis, there seems to be a scope for asymmetric effects of the CU for the two EU regions.

Table 2. Intra-EU trade effects

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Intermediate exports			
ln Mass	.6124332***	.0297238	20.60
ln GDP/capita difference	-.0041309†	.0064809	-0.64
CU North to South	-.0673666***	.0232587	-2.90
CU South to North	-.1280831***	.0252467	-5.07
EU North to South	-.0986839***	.0212958	-4.63
EU South to North	-.0800509***	.0254707	-3.14
Number of observations	3570	F(22,3338)	432.88
R^2	0.6685		

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Other exports			
ln Mass	.7334903***	.0328054	22.36
ln GDP/capita difference	.0079545†	.0064147	1.24
CU North to South	-.0302768†	.0318394	-0.95
CU South to North	-.2498805***	.0307647	-8.12
EU North to South	.0083364†	.0254627	0.33
EU South to North	-.1732435***	.0259197	-6.68
Number of observations	3570	F(22,3338)	361.13
R^2	0.7329		

*** significant at the 1% level, ** significant at the 5% level, † insignificant at the conventional test levels. Fixed effects regression, where the constant- and the time variables are not reported in order to save space.

What is particularly striking about the results in table 2 is the CU's asymmetric effect on trade in other goods. While the CU (and the accession negotiations) has not had any significant effect on Northern EU's exports to the Southern EU, the reverse flow of goods has been decreased by 28.4% (whereas the accession negotiations decreased the Southern EU's exports by 18.9%). Further asymmetry is evident in the flow of intermediate exports - the CU has decreased the Northern EU's exports by 7%, whereas the Southern EU has experienced a decrease of 13.7%. The accession negotiations lowered the Northern EU's exports by 10.4% (i.e. more than the CU), whereas the Southern EU's exports were reduced by 8.3%.

In sum, it is clear that the integration of Turkey into the EU market has reduced Southern EU's exports to the Northern EU, while the reverse trade flow has remained relatively stable. Firms from the Southern EU have faced competition from Turkish firms when it comes to exporting other goods to the Northern EU. In relation with the statement mentioned in the second section of the current paper, it seems likely that the technological (i.e. factor endowments) similarity between the Southern EU and Turkey has had a diverting effect on the Southern EU's exports to the Northern EU, in favor of Turkey's ditto.

Since the Northern EU has the highest technological development of the sample (and thus a comparative advantage in higher-technology products), they will import lower-technology products (in which they have a comparative disadvantage) from countries with lower factor costs for such products. Prior to the CU with Turkey, the Southern EU was the exporter of such products to the Northern EU (in the current sample).

With the implementation of the CU, a country with a lower technological development than the Southern EU, Turkey, entered the market. Hence, Turkey has a comparative advantage in the lowest-technology products. Thus, the Northern EU will switch from the Southern EU as their provider of products of the lowest-technology standards, to Turkey (so will the Southern EU as well, to a certain extent). The Southern EU is, on the other hand, not likely to switch away from the Northern EU as their source of high-technology products, since the Northern EU still has the comparative advantage in such products. Hence, the Southern EU's exports to the Northern EU decreases, while the Northern EU's exports to the Southern EU remains more stable – just like the results in table 2 shows.

Further research is however necessary to investigate the role of the differences in technology (one can conclude that differences in GDP per capita is not a significant determinant, in the current sample) and factor endowments, as well as why the CU's effect on the flows of other

goods is stronger than the effect on the intermediate exports. Since trade in services is more present in intermediate- rather than other goods trade, one plausible reason for the latter result is that services were not included in the CU agreement.

5.3 Analysis including EU-Turkish trade effects

The aim of this paper was to analyze whether the CU between the EU and Turkey has had a particular effect on intermediate goods trade vis-à-vis other goods trade, for the intra-EU flows. Table 3 summarizes the results of the CU variables in all the regressions that have been run (i.e. both intra-EU as well as Turkish-EU trade flows). One cannot identify a distinct pattern in the CU's effects on the trade flows, since the effects on each type of trade flow is different depending on which bi-regional export flow one considers.

Table 3. Summary of the CU's trade effects

Trade flow	*Intermediate goods*	*Other goods*
Intra-EU trade	-10.3%	-15.0%
Northern EU-Turkish trade	30.8%	39.7%
Southern EU-Turkish trade	58.2%	45.8%
Northern EU to Southern EU	-7.0%	insignificant
Southern EU to Northern EU	-13.7%	-28.4%
Turkey to Northern EU	33.3%	34.7%
Northern EU to Turkey	28.3%	44.9%
Turkey to Southern EU	81.9%	46.4%
Southern EU to Turkey	37.6%	45.1%

The CU has had an expected negative effect on intra-EU trade – it experienced a larger decrease in other goods (-15%) than it did in intermediate goods (-10.3%). The major reason for this is the drop in Southern EU's exports, compared to Turkey's exports, of other goods to the Northern EU. In fact, the CU did not significantly affect the Northern EU countries' exports to the countries of the Southern EU. Additionally, the reduction of the Southern EU's intermediate exports was higher than the Northern EU's ditto. Hence, the CU had a more negative effect on intra-EU trade in other goods than trade in intermediate goods. The major decrease appeared in Southern EU's exports of other goods.

The Northern EU-Turkish trade flow experienced a higher increase in its trade of other goods (+39.7%) compared to the increase in intermediate goods trade (+30.8%, see Appendix B). As a whole, the CU had a similar effect on Turkish exports to the Northern EU for both intermediate- as well as other exports; whereas the CU increased Northern EU's other exports to Turkey to a higher extent than it increased their intermediate exports. Hence, the CU had a more positive effect on trade in other goods than trade in intermediate goods, between the Northern EU and Turkey. The major increase appeared in the Northern EU's exports of other goods.

In the case of the Southern EU and Turkey, the opposite effect was evident (see Appendix C). The increase in intermediate goods trade (+58.2%) exceeded that of the increase in other goods trade (+45.8%). The major reason for that has been the increase in Turkish intermediate exports. While the CU's effect on exports of other goods was similar for the two regions, Turkish intermediate exports to the Southern EU rose to a substantially higher extent than the increase in the reverse flow. Hence, the CU had a more positive effect on trade in intermediate goods than trade in other goods, between the Southern EU and Turkey. The major increase appeared in Turkey's intermediate exports.

6. Summary

This paper has given an account of the intra-EU intermediate- and other goods trade effects after the CU agreement between the EU and Turkey of 1996. Firstly, the "overall" effect (table 1) showed that the CU had lowered the intra-EU other goods trade to a higher extent than it lowered the intermediate goods trade. The second step of the analysis broke down the trade flows in order to identify possible asymmetric effects for the two groups Northern- and Southern EU. It was showed (table 2), that the CU lowered the Southern EU's exports to the Northern EU to a greater extent than it lowered the reverse flow of goods. The effect was especially strong for the flow of other goods, where the Northern EU's exports were not significantly affected by the CU, whereas the Southern EU's exports to the Northern EU dropped by almost 30%, compared to the Turkish exports of other goods (to the Northern EU). This paper presented the hypothesis that the CU's effect was mainly due to the fact that the Southern EU's level of technology (i.e. factor endowments) was more similar to Turkey's ditto, compared to the Northern EU's. Further research is however necessary in order to

explore whether that is actually the case, and if so, why it affected the exports of other goods differently from the exports of intermediate goods - this analysis clearly shows that it has.

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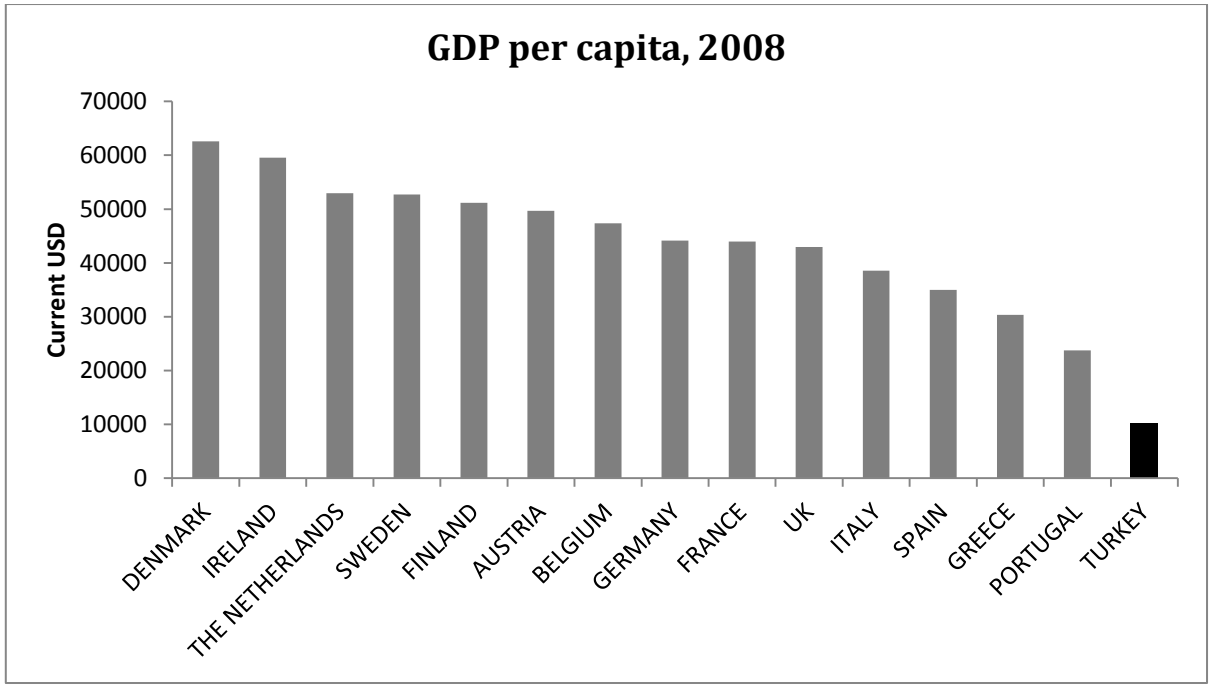
Databases

OECD STAN Bilateral Trade Database by Industry and End-use Category

The World Bank World Development Indicators and Global Development Finance

Appendix A.



Source: The World Bank.

Appendix B.

Trade between the Northern EU and Turkey

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Total exports			
ln Mass	.5629181***	.0278526	20.21
ln GDP/capita difference	-.0024885†	.0050093	-0.50
CU Turkey ↔ North	.3067781***	.0392135	7.82
EU Turkey ↔ North	.2293628***	.034751	6.60
Number of observations	3570	F(20,3340)	583.62
R^2	0.6604		

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Intermediate exports			
ln Mass	.5082129***	.030471	16.68
ln GDP/capita difference	-.0078824†	.0062025	-1.27
CU Turkey ↔ North	.2684341***	.0378139	7.10
EU Turkey ↔ North	.2811261***	.0338055	8.32
Number of observations	3570	F(20,3340)	518.09
R^2	0.6023		

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Other exports			
ln Mass	.6451585***	035478	18.18
ln GDP/capita difference	.0004197†	.0060778	0.07
CU Turkey ↔ North	.3345655***	.0511228	6.54
EU Turkey ↔ North	.1798495***	.0435047	4.13
Number of observations	3570	F(20,3340)	376.04
R^2	0.6878		

*** significant at the 1% level, ** significant at the 5% level, † insignificant at the conventional test levels. Fixed effects regression, where the constant- and the time variables are not reported in order to save space.

Appendix C.

Trade between the Southern EU and Turkey

Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Total exports			
ln Mass	.6154132***	.0290604	21.18
ln GDP/capita difference	-.002747†	.0050669	-0.54
CU Turkey ↔ South	.4169798***	.0598674	6.97
EU Turkey ↔ South	.2365228***	.0577796	4.09
Number of observations	3570	F(20,3340)	568.69
R^2	0.6836		
Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Intermediate exports			
ln Mass	.5752202***	.0318329	18.07
ln GDP/capita difference	-.0092599†	.0062624	-1.48
CU Turkey ↔ South	.4588443***	.0628264	7.30
EU Turkey ↔ South	.1238337**	.0522548	2.37
Number of observations	3570	F(20,3340)	489.04
R^2	0.6369		
Variable	*Coefficient*	*Robust std. error*	*t-value*
ln Other exports			
ln Mass	.6791193***	.0344923	19.69
ln GDP/capita difference	.0012963†	.0061096	0.21
CU Turkey ↔ South	.3768017***	.0812416	4.64
EU Turkey ↔ South	.3690454***	.0820692	4.50
Number of observations	3570	F(20,3340)	373.69
R^2	0.6973		

*** significant at the 1% level, ** significant at the 5% level, † insignificant at the conventional test levels. Fixed effects regression, where the constant- and the time variables are not reported in order to save space.