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TRADE IMPLICATIONS OF EXTENDING THE TURKEY-EU CUSTOMS UNION TO AGRICULTURAL PRODUCTS *

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ABSTRACT

Turkey's membership of EU will lead to the enlargement of already established customs union between EU and Turkey to the agro-food products. This involves not only a full liberalization of agricultural trade within the EU but also the implementation of a common external tariff. Trade diversion and creation effects for agro-food trade will emerge. According to the article XXIV of GATT, the possible results of these counteracting effects are important. In this paper, the trade diversion and creation effects of the membership of Turkey to the EU for the agro-food trade will be calculated and analyzed using the Armington assumption.

Keywords: Elasticities of Substitution, Armington Elasticities, Fixed and Random Effect Panels, Trade Creation, Trade Diversion, EU Membership of Turkey.

JEL Codes: C50, F15, F17, Q17

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I. INTRODUCTION

Extending Turkey-EU customs union agreement to agricultural products will imply the adoption of a common external tariff (CET) and abolition of trade barriers between Turkey and EU. The bilateral full liberalization of trade in agro-food products and the establishment of common external tariff will have trade implications not only for Turkey and EU, but also for the non-EU trading partners of Turkey. In this new situation, trade diversion and creation effects for agro-food trade will emerge. According to the article XXIV of GATT, the possible results of these counteracting effects are important.

The core of the global trading system is the most favored nation (MFN) principle covered in Article I of GATT (1994). According to this principle, if a country grants a concession to another country, it must automatically grant the same concession to all other WTO members. Hence, a WTO member country must treat all WTO members on equal terms with his most favored trading partner.

However, the WTO agreements include some of violations of the MFN principle. One major of them is the case of customs union (CU) and free trade areas (FTA). Article XXVI of GATT permits the formation of free trade areas, hence allows two or more WTO members to eliminate trade barriers among them but not on third countries. Under such customs union, as in the case of European Union, the member countries adopt a common external tariff (CET) on each product. In order to allow for such arrangements, Article XXIV requires three main conditions to be satisfied by customs union and free trade areas. First, the trade barriers on third countries should not increase on average. Second, tariffs and other trade restrictions must be removed on substantially all intra-region trade within a reasonable period of time. Third, the arrangements must be notified to WTO which may choose to found a working party to verify if these conditions are fulfilled.

The Uruguay Round Understanding on the Interpretation of Article XXIV (1994) modified the first condition about the tariffs as one of the trade barriers by requiring that the *import-weighted*[1] of all tariffs *applied* should not increase following an accession to a customs union

[1] Quantity or value weighted average.

or free trade areas (Uruguay Round Understanding on the Interpretation of Article XXVI:5/2). Another additional requirement that the Uruguay Understanding imposed further is that countries entering to a customs union should not increase tariffs beyond their bound levels (Uruguay Round Understanding on the Interpretation of Article XXVI:6/4). Notice that this provision does not precisely specify that a weighted average of applied tariffs should be used for the assessment. However, as Tangermann (2003, p.72) rightly points out, in practice the assessment may come close to this.

The Uruguay Understanding also requires a customs union to compensate the third countries which are negatively affected by one or more members increasing their tariffs by adopting common external tariff (CET) schedule of the union. Such compensation could in principle happen in different forms. According to the Uruguay Round Understanding on the Interpretation of Article XXIV:6/5, in the negotiations to achieve mutually satisfactory compensatory adjustment, "due account shall be taken of reductions of duties on the same tariff line made by other constituent of the customs union upon its formation". If such reductions are not sufficient to provide the necessary compensatory adjustment, the customs union would offer compensation which may take the form of reductions of duties on other tariff lines. Tangermann (2003, p.72) points out that, based on experience gained during the Northern enlargement of EU, the most typical solution is to offer tariff-reduced access to the EU market, in the form of country-specific tariff rate quotas to the exporting third countries adversely affected. However, this solution may only work where market access conditions deteriorate as did during the Northern enlargement. Chevassus (2001, p.4) states that, at the time of EU's enlargement to Spain and Portugal, the United States were granted within-quotas null tariffs of corn and sorghum for their export on Spanish and Portuguese markets.

The Uruguay Understanding also states that for the purpose of the overall assessment of the incidence of other regulations of commerce for which quantification and aggregation are difficult, the examination of individual measures, regulations, products covered and *trade flows* affected may be required (Uruguay Round Understanding on the Interpretation of Article XXIV:5/2)

All these mean that enlargement should not have any negative impacts on the traditional trade flows within third countries, if this is the case the union should compensate the losses of

these non-member countries. In addition, notice that according to the Uruguay Understanding of Article XXIV (:6/4), the concessions should be negotiated before the implementation of common external tariff (CET) of customs union. Hence, this will make easier for third countries to rapidly mitigate possible short term effects of trade diversion resulting from the enlargement of union (Chevassus, 2003, p.3). Finally, one should notice that in the case of failure to compensate, adversely affected third countries can retaliate thought the withdrawal of an equivalent concession.

The estimation of the Armington elasticities are described in the following section. The third section reports the simulation results about trade diversion and creation due to the application of CET. The final section is reserved for concluding remarks.

CHANGE ON THE PROTECTION LEVEL AFTER THE ADOPTION OF EU COMMON EXTERNAL TARIFF (CET)

In this part, we will briefly investigate the change on the protection level on Turkish agro-food products after the adoption of the EU's common external tariff (CET) schedule.

The Figure ***6.2*** shows the current structure of Turkey's tariff schedule for the Harmonized System Combined Nomenclature chapters (at 6 digits) and for the WTO commitments. As can be seen the highest WTO commitments are for the Meat products and then Dairy and Cereal products comes. Note that the graph shows the tariff rates at 6 digit product details. Hence, from the graph a detailed view of tariff structure can be seen.

In Table 1, we compared the EU Common External Tariff (CET) with Turkey's current (2005) applied tariff schedule. The table covers products of Harmonized System Combined Nomenclature, Chapters 01-24. The figures in the table are representing the percentage tariff rates. However, as known, the CET of EU involves several specific tariff rates instead of ad-valorem rates. Therefore, in order to be able to produce comparable tariff rates, it is necessary to calculate the av-valorem equivalents (AVE) for specific tariffs. The ad-valorem equivalents (at 8 digits) used in this study are due Shirotori (2004)[2].

[2] The AVE (ad-valorem equivalents) formula can be given as: AVE(%)=Tariff Rate(%)+[Specific Tariffs/Import Price]

In constructing the Table 1, the average tariff rates for 2 digit CN product definitions are calculated using mainly three methods. The first one which is less preferable but gives some information as well is to take the simple average of tariff rates of the products at 8-digit detail in order to obtain a simple arithmetic mean of tariff rates at 2-digit product aggregation.

The first two column of Table 1 represents these figures both for the current applied tariff rates of Turkey ("Before EU accession" labeled) and for EU's Common External Tariff (CET) schedule (that Turkey should adopt after EU accession. Therefore labeled as "After EU accession"). Recalling that the Uruguay Round Understanding on the Interpretation of Article XXIV states that the "general incidence" of duties should be calculated as a product quantity or value weighted average of applied tariffs, the second and third blocks of columns in Table 1 represent the average tariff rates calculated using import quantity and then value weights in order to obtain the average tariff rates (from 8 digit of CN product definitions) for 2 digit CN product aggregation. In the calculation of weights the import quantity and import value figures do not involve EU25 countries since our aim in this table is to produce average tariff rate schedule which represents the protection for the third countries.

From the evaluation of Table 1, we see that for *animal feed* product category (Chapter 23 of HSCN) there would be an increase for Turkey in the applied tariff rates which implies an increase in protection for this product. All of the three methods confirm the same conclusion with different levels. Hence, at 2 digit CN product detail we see that *animal feed* product category represents a negative finding in terms of Article XXIV of WTO since all three methods point out an increase in applied tariffs following the EU accession of Turkey. A similar finding can be seen in the case of CN-Chaper 19 but only volume-weighted method shows an increase in its applied tariff rates hence this result is open to discussion.

Apart from these two cases, the estimations given in Table 1 show that weighted average of the tariffs applied to third parties excluding EU25 will decrease for Turkey adopting the CET schedule of EU.

In the Figures A and B, a more aggregated results for weighted (volume and value based) average of the tariffs are represented by distinguishing the products of CH-Chapters 01-24

into *Raw* and *Processed* products following the definition of EUROSTAT. From the figure, one can observe that the protection against the third countries excluding EU will decrease at about 4.5 % for processed products, and 8.5-9.0 % for raw products. For all products the decrease rates are about 9 %. All of these represent positive findings in terms of Article XXIV of WTO since the adoption of the EU tariffs will diminish tariff protection in Turkey for third countries.

Table 1. Tariff Rates (%) Before and After EU Accession for Third Countries, by Turkish Agro-Food Sectors. (Arithmetic and Weighted Average, by Import Volume and Value, in 2003, excluding EU25)

	Simple Arithmetic		Volume Weighted		Value Weighted	
Products in Harmonized System Codes	**Before EU Acc.**	**After EU Acc.**	**Before EU Acc.**	**After EU Acc.**	**Before EU Acc.**	**After EU Acc.**
01 live animals	*34.9*	*9.8*	*0.0*	*0.0*	*0.0*	*0.0*
02 meat & edible meat offal	*100.6*	*21.9*	*65.0*	*38.1*	*65.0*	*36.6*
04 dairy, eggs, honey, & ed. Products	*120.0*	*50.0*	*138.0*	*47.2*	*130.8*	*40.3*
05 products of animal origin	*3.8*	*0.2*	*8.4*	*0.0*	*8.6*	*0.0*
06 live trees & other plants	*12.9*	*6.0*	*7.9*	*6.9*	*11.1*	*7.3*
07 edible vegetables	*19.8*	*8.5*	*20.8*	*2.8*	*19.2*	*3.6*
08 ed. fruits & nuts, peel of citrus/melons	*47.8*	*11.6*	*102.3*	*27.1*	*96.6*	*21.7*
09 coffee, tea, mate & spices	*43.1*	*4.2*	*34.7*	*0.3*	*43.6*	*0.5*
10 cereals	*39.9*	*41.8*	*76.5*	*64.8*	*73.5*	*65.6*
11 milling industry products	*33.0*	*22.0*	*30.7*	*15.3*	*31.5*	*15.2*
12 oil seeds/misc. grains/med. plants/straw	*17.3*	*1.6*	*9.6*	*0.4*	*10.6*	*0.2*
13 lac, gums, resins, etc.	*2.6*	*1.9*	*0.3*	*0.2*	*1.4*	*1.1*
14 vegetable plaiting materials	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
15 animal or vegetable fats, oils & waxes	*18.9*	*8.3*	*14.3*	*6.9*	*16.3*	*6.9*
16 ed. prep. of meat, fish, crustaceans, etc	*97.9*	*27.3*	*54.0*	*12.8*	*54.0*	*12.8*
17 sugars & sugar confectionery	*103.9*	*30.7*	*54.9*	*5.6*	*89.0*	*7.5*
18 cocoa & cocoa preparations	*8.9*	*8.9*	*0.2*	*0.2*	*0.2*	*0.2*
19 preps. of cereals, flour, starch or milk	*13.4*	*21.7*	***9.6***	***16.2***	*17.8*	*14.5*
20 preps of vegs, fruits, nuts, etc.	*55.3*	*19.0*	*58.6*	*20.7*	*58.1*	*20.1*
21 misc. edible preparations	*12.1*	*10.0*	*15.0*	*9.9*	*11.5*	*10.7*
22 beverages, spirits & vinegar	*2.1*	*2.1*	*4.6*	*4.6*	*4.1*	*4.1*
23 residues from food industries, animal feed	***7.0***	***11.4***	***1.9***	***7.9***	***2.1***	***3.9***
24 tobacco & manuf. tobacco substitutes	*31.6*	*23.5*	*23.0*	*10.0*	*24.1*	*7.3*

Figure A.

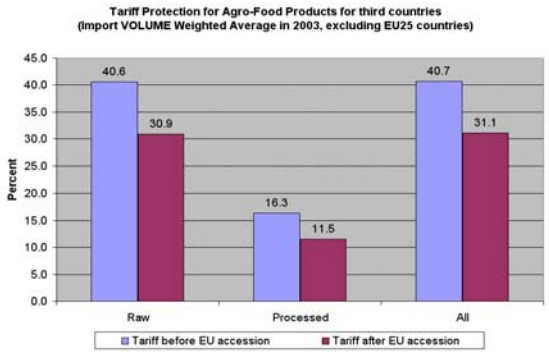
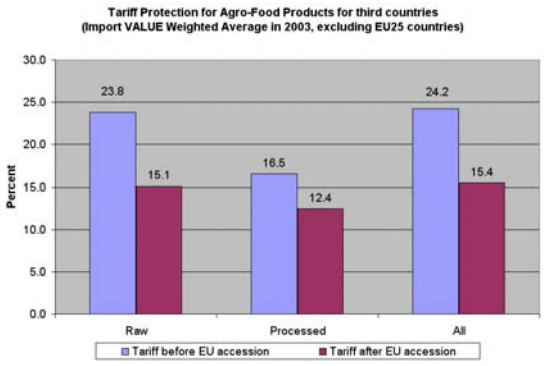


Figure B.



Another important point in terms of Article XXIV of WTO, as stated in the introduction part, is the issue of *binding tariff rates*. In general Turkey's tariff bindings for agricultural products are higher than those of the EU. Therefore, Turkey's adoption of EU's CET schedule would result in to a lowering of these tariffs and therefore there would be no problems in terms of Article XXIV. However, Grethe (2003, p.80) gives a list of agricultural products or product categories for which EU tariff bindings in the WTO exceed those of the Turkey.[3] The complete list can be found in Appendix 4A. Some of the products for which Turkey's bindings are lower than those of the EU are: tomatoes (fresh or chilled), olive oil, cucumbers, sweet potatoes, sugar, *animal feed* and *various animal feed ingredients*. As ***Wageningen*** (2003, p.132) rightly points out, the first two products are important exports for Turkey, but imports have been minimal for several years. The case of *Animal Feed* product is representing again a problem in terms of Article XXIV since the bindings of EU for this product is higher than those of Turkey.

[3] Grethe states (2003, p.80) that the EU has bound many specific tariffs. For comparison with Turkish bindings, their ad-valorem equivalents using "best guess" assumptions, in his own words, about world market prices has been estimated roughly.

II. ARMINGTON MODEL AND ESTIMATION OF ELASTICITIES

a. Armington Model Setup

The Armington model assumes imperfect substitution among goods from different geographical areas. The model uses a CES aggregation function[4] which implies that the substitution of imports between any two pairs of importing partners are identical. According to the choice of the CES functional form, *two* different specifications can be considered.

The *first* specification can be called as the *non-nested* specification (Shiells C. R. and Reinert K. A., 1993, p.303) which assumes that imports from regions or countries, as well as competing *domestic production* all enter in the sub-utility function for a sector *i*:

$$U_i = \left[\sum_k b_{ki} M_{ki}^{-\rho_i} \right]^{-\frac{1}{\rho_i}} \qquad (1)$$

where ρ_i is a constant greater than -1, and $\rho_i = \frac{1-\sigma_i}{\sigma_i}$. Note that, ρ_i is the CES exponent and σ_i is the *elasticity of substitution* where $0 < \sigma_i < \infty$.[5] In this CES functional form, M_{ki} includes the quantity of domestic production for good *i*, as well.

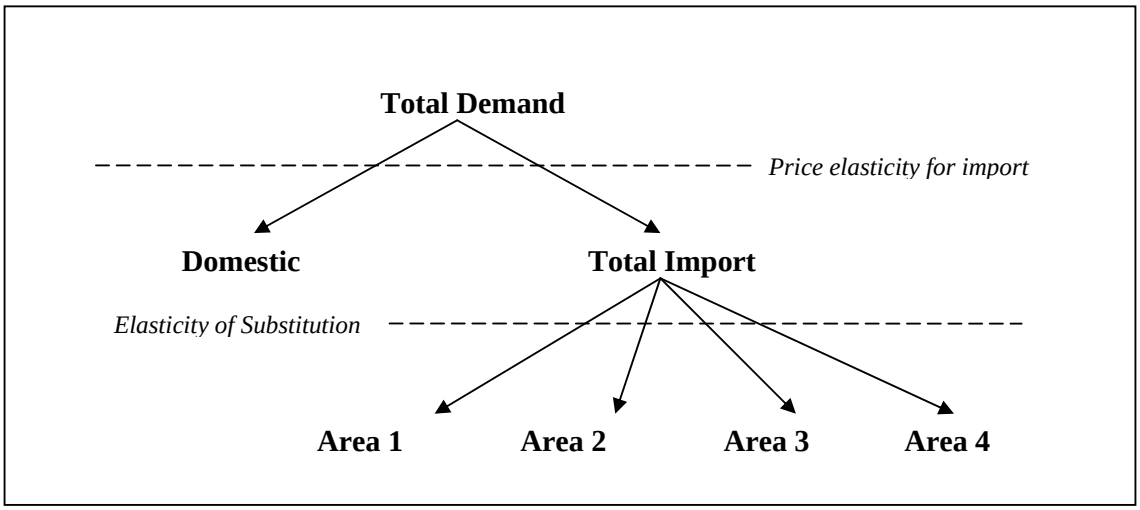
The *second* alternative that Shiells *et al* (1993) called *nested* specification assumes that imports from different sources are differentiated products. In other worlds, in this alternative formulation, M_{ki} *does not include* the quantity of *domestic production* for good *i*. This second form is generally used in order to analyze the preferential trade arrangements and/or customs unions. This nested specification is exactly what has been used in this study.

Notice that the *Armington* model imposes a *two-step budgeting* procedure. In the first stage, the importer decides how much of a particular commodity to import. In this stage the decision

[4] The CES utility function, as a well-behaved function, embraces a set of demand equations, which are less restrictive than any other linear logarithmic utility functions such like the Stone-Geary function.

[5] If $\sigma_i = 0$, then the products are perfect complements, if $\sigma_i = \infty$ then the products are perfect substitutes.

is determined according to the *import demand function*, M_i, of the importer country, in other words, by the *price elasticity for total import* demand for product *i*; η_i. In the second stage given the total amount imported, the importer decides how much to import from each supplier. This decision is based on the elasticity of substitution, σ_i .



Following Armington (1969), assume that there is a quantity index of imports with CES form[6]:

$$M_i = f_i(M_{i1}, M_{i2}, ..., M_{im}) = \left[\sum_{k=1}^{m} b_{ki} M_{ki}^{-\rho_i} \right]^{-\frac{1}{\rho_i}} \qquad (2)$$

Notice that in equation (2), *k* represents the trading partner, M_{ki} is the quantity of imports of product "*i*" originating from "*k*", b_{ki} is a constant representing the level of preference for imports originating from "*k*" with $\sum_k b_{ki} = 1$.

[6] The basic assumptions for the existence of such a quantity index are (1) *independence*, i.e., the marginal rate of substitution between imports from any two countries is independent of the level of imports of any other country, or, for that matter, the level of domestic consumption; and (2) *homotheticity*, i.e., the relative composition of imports is independent of the level of total imports, for a given set of prices. In fact, the CES quantity index is the only quantity index that satisfies both conditions (1) and (2) (Hickman and Lau, 1973, p.350).

The demand for any *product*[7] competing in the i^{th} market (demand for imports of good "*i*" originating from "*k*"), M_{ki} can be obtained by minimizing the cost of purchasing the quantity of M_i (which is $\sum_{k=1}^{m} p_{ik} M_{ki}$) subject to the constraint $M_i=f_i(.)$. The solution of this problem produces the following equation which determines import volume by sector (good "*i*") and region (import source "*k*"), M_{ki} ; [8]

$$M_{\mathrm{ki}} = b_{ki}^{\sigma_i} M_i \left[\frac{P_{ki}}{P_i} \right]^{-\sigma_i} \qquad \text{(X)}$$

where P_{ki} is the partner specific import price including tariffs [9], M_i is the total import volume of good *i*, P_i is the index of import prices representing a price for total imports from all sources.

Note that the Armington elasticity, σ_i, captures the degree of substitutability between import sources of supply. The higher the value of this parameter, the higher the degree of substitution. In other words, a high value of this Armington elasticity of substitution implies that imports from different areas are considered by consumers to be approximately identical. They would be exactly identical if the parameter was infinite which is the case of prefect substitution. On the other hand, a low value for this parameter points out that the two products are weak substitutes.

Equation (X) can also be written as:

$$\frac{P_{ki} M_{\mathrm{ki}}}{P_i M_i} = b_{ki}^{\sigma_i} \left[\frac{P_{ki}}{P_i} \right]^{1-\sigma_i} \qquad \text{(Y)}$$

---

[7] Note that Armington (1969, p.160) makes a distinction between "*goods*" and "*products*". "*Goods*" are distinguished only by kind (that is, by the kinds of wants or needs they serve), whereas "*products*" are distinguished by both kind and by place of production. Hence, any "good" refers to group of "products", each supplied by a different country or region.

[8] Equation (X) is often referred to as the *Armington equation*.

[9] Algebraically, $P_{ki} = \widehat{P}_{ki}(1+t)$ where $\widehat{P}_{ki}$ is import price of good *i* from source *k* and *t* is tariff rate.

which expresses the market share (in value) as the dependent variable. Following Armington (1969, p.168) and from equation (Y) notice that the value shares are constant if σ_i=1.[10] If σ_i>1, a relative fall in P_{ki} leads to an increase in the market share of M_{ki}. Armington (1969, p.168) claims that it would be expected that σ_i exceeds unity: an "*improvement in competitiveness*" should yield an increased share, and vice versa.

Following Hickman and Lau (1973, p.351), let us define a base year and in the base year let all import prices are set to unity by dividing all import prices to the associated base year values. Hence, the import prices becomes $P_{ki}^{*} = P_{ki} / P_{ki}^{\circ}$ and $P_i^{*} = P_i / P_i^{\circ}$. It is clear from equation X that, in the base year we have $M_{ki}^{\circ} = b_{ki}^{\sigma_i} . M_i^{\circ}$ where M_{ki}° and M_i° are the base year values for M_{ki} and M_i, respectively. Within this setup, if we represent the base year import quantity share of country k as $\alpha_{ik}^{\circ} = M_{ki}^{\circ} / M_i^{\circ}$, we see that $\alpha_{ik}^{\circ} = b_{ki}^{\sigma_i}$. Similar to α_{ik}°, one can also define the quantity market share of country k for each year as $\alpha_{ik} = M_{ki} / M_i$. Hence, one can rewrite equation X as:

$$\alpha_{ki}^{*} = \left[\frac{P_{ki}^{*}}{P_i^{*}} \right]^{-\sigma_i} \tag{3}$$

where $\alpha_{ik}^{*} = \alpha_{ik} / \alpha_{ik}^{\circ}$ and $P_i = \sum_k \alpha_{ki}^{0} P_{ki}$.

Armington (1969, p.174) showed that taking the differential of both sides of $P_i = \sum_k \alpha_{ki}^{0} P_{ki}$ will lead to:

$$\frac{dP_i}{P_i} = \sum_k S_{ki}^{o} \frac{dP_{ki}}{P_{ki}} \tag{5}$$

[10] In this special case the quantity index functions becomes Cobb-Douglass function with parameters b_{ki}.

where $S_{ki}^{o} = \frac{M_{ik}^{0}}{M_{i}^{0}} . \frac{P_{ik}}{P_{i}}$. Note that in this study, it is assumed that the price changes will result from tariff changes[11], so it is possible to write $\frac{dP_{ki}}{P_{ki}} = \frac{t_{ki}^{new} - t_{ki}^{old}}{1 + t_{ki}^{old}}$. In addition, taking the differential of equation (3), Armington (1969, p.174) showed also that

$$\frac{dM_{ki}}{M_{ki}} = \underbrace{\frac{dM_{i}}{M_{i}}}_{(Effect1)} + \underbrace{\sigma_{i}\left[\frac{dP_{i}}{P_{i}} - \frac{dP_{ki}}{P_{ki}}\right]}_{(Effect2)} \tag{6}$$

where $\frac{dM_{i}}{M_{i}} = -\eta_{i}\frac{dP_{i}}{P_{i}}$. The first term represents the growth of the market for M_{ki} because of the price change. Following Unguru and Lozza (2001, p.12), this effect implies that the change in total imports will be distributed according to the initial share of each partner. The second term represents the effect of relative price changes, or in other words the *substitution effect*. The substitution effect allows to estimate the trade diversion and to determine the winners and losers of the CET across the trading partners. This is the *effect of substitutions* between partner countries.

b. A discussion about Armington Model

Winters (1984) and Alston et al (1990) have shown that the assumptions implied by the CES model, such as homotheticity and separability are rejected by the data. Therefore, they proposed to use the almost ideal demand system (AIDS) due Muellbauer (1980a, 1980b) in order to estimate the behavioral parameters. However, following the arguments of Shiells and Reinert (1993, p.302-303), we think that results in Winters (1984) and Alston et al. (1990) studies may not be directly applicable to Turkish agro-food disaggregated at 2 digit CN product definitions. The study of Winters (1984) analyzed aggregate manufacturing imports into the United Kingdom. One can not have a priori expectations that the conclusions drawn from these studies can be applied to the Turkish data set used in this paper. In addition, as Shiells and Reinert (1993, p.303) rightly point out, the disaggregated Turkish agro-food data

[11] When Turkey enters to EU, a Common External Tariff (CET) of EU will be applied by Turkey instead of Turkey's current tariff rates.

are expected to be very noisy and therefore the estimates based on the AIDS model may not fulfill the regularity conditions of demand. Therefore, a well-behaved and parsimonious functional specification such as CES function has district advantages in this framework.[12]

In addition, within the model setup of current paper, we can not use any AIDS model for estimation of elasticity of substitution parameters. The AIDS model uses a share equation for each region specified in the following form:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log(M / P) \qquad i=1,2,\ldots n. \qquad (Z)$$

where *i* represents the number of regions which is 7 in our paper. Taking into account the fact that our data covers only the period of 1992-2003 because of the data unavailability and incompatibility with HS Combined Nomenclature definitions, we see that the AIDS model becomes inapplicable for our study.

In addition, note that, Eruygur (2005) has tested the separability and homotheticity assumptions of Armington setup following Alston et al (1990). Two methods are used in this study. First, an extended model nesting the Armington model is estimated and the Armington CES specification were tested directly. Second, an AIDS model was used and the separability and homotheticity assumptions of Armington model were tested parametrically. Note that, because of the degrees of freedom problem just stated about the AIDS specification, Eruygur (2005) has used only 3 regional areas such as EU, USA and ROW. The tests were done only for the Cereals and Milling Industry products sector (Chapter 10 and 11 of HS Combined Nomenclature). The results show that, in the tests based on AIDS model, in most cases the Armington assumptions are statistically supported. However, the tests based on the extended model generally have rejected the CES specification but as Alston et al (1990) rightly noticed this direct testing procedure has a drawback that we are testing against an alternative that cannot ve fully compatible with the adding up restrictions from demand theory unless preferences are restricted to be homthetic (e.g., See Deaton and Muellbauer, 1980b, pp.17-

[12] CES function is the most economical in terms of degrees of freedom since it requires only one estimated parameter.

18). Hence the tests based on AIDS model are more appropriate since the model are estimated imposing the demand system conditions. The AIDS model results have supported the Armington assumptions at least for Cereals and Milling Industry sector of Turkey.

Recently, Edgerton (1997) reviewed the necessary conditions for multistage budgeting to be at least approximately justified and investigated the plausibility of these assumptions including weak separability. Carrying out a three-stage model for Swedish food consumptions, Edgerton (1997) has tested the assumptions and has shown that the assumptions are not inappropriate.

Furthermore, as Lopes and Pagoulatos (XX, p.250, footnote 3) noticed, several studies have proved that the CES specification can perform at least as well as the other alternatives used in the literature. For example, Roland-Holst (1992) presented estimated for 163 mining and manufacturing commodities in the US and obtained better results for the elasticity of substitution coefficients with a CES function that with other specifications which included trend terms, lagged variables etc. In addition, Richardson (1993) and Lächler (1985) concluded that the CES function performed as least as well as the other specifications that included variables for cross-price effects and income. Some other studies used CES specifications in the analysis of international trade literature are: Mutti (1977), Corado and DeMelo (1986), DeMelo and Robinson (1989), Brenton and Winters (1993) and (1994), etc.

Before finishing this part, as for the famous critic of homotheticity assumption, since we are only dealing with food products we should notice that there is no room for Engel's law critic for our case.

c. Estimation and Data

Equation (4) has been used for the estimation. We also adopted the assumption that Turkey is a small country implying that the supply curves of their trading partners are perfectly elastic.

We will get the following equation by taking the natural logarithm of equation (4)[13].

$$\ln\left[\frac{\alpha_{ki}}{\alpha^{o}_{ki}}\right] = -\sigma_i . \ln\left[\frac{p_{ki} / p^{0}_{ki}}{P_i / p^{0}_{i}}\right] \qquad (7)$$

In order to estimate this equation, we used the *fixed* and *random effect models* of *panel data*. We performed Hausman tests in order to choose the preferred model for each product, *i*. Our approach is similar to that of Unguru and Lozza (2001). The main difference is the fact that we performed Hausman tests in order to decide to *fixed* or *random effect models* of panel data, since in some cases random effect model can be much more preferred to fixed model. Unguru and Lozza (2001, p.26) used fixed effect model for all products. Notice that the estimations are performed adding a *trend term* (*trend*) to equation (7) both in Fixed Effect and Random Effect specifications.

For the panel data estimation, the cross section dimension is regions, *k*, in other worlds country groups submitted to the same duty regime. The cross section elements used in our study are *k*=EU15, EU10, USA, China, Latin America, MENA and Rest of the World (ROW). The time series dimension is *t*, that is years from 1992 until 2003. The model is estimated for each agro-food product group of our study, *i*=1,2,…14 (for details, see the Appendix). Following Unguru and Lozza (2001), in addition to the 14 different agro-food products, we defined also the *product groups* such as *Raw* and *Processed* products. This extra classification, in fact, increases the number of products.

Following the terminology of Armington (1969), commodities distinguished by kind (vegetables, cereals, sugar, etc..) are called "goods", and commodities distinguished by geographical place of production are called "products". Thus our model includes 19 goods (14 Raw plus 5 Processed) each comprising 7 products (imports from EU15, EU10, USA, CHINA, Lat. AM., MENA and ROW).

For the definition of raw and processed products, we followed the definition of EU.[14] The definitions are based on the Harmonized System Combined Nomenclature since the tariff

[13] We used the *unit-value of imports* as a proxy for import prices.
[14] http://europa.eu.int/comm/agriculture/agrista/tradestats/2003/annexes/annex4.htm.

data (Common External Tarif of EU) is based on this coding system.[15] The ad-valorem equivalents of the CET (Common External Tariff) data are obtained from UNCTAD database at 8 digits of the Combined Nomenclature. The Turkish tariff data is obtained from the Undersecretariat of Foreign Trade.

The price elasticities of import, η_i, are estimated using the simple specification of:

$$\ln M_i = \text{constant} - \eta_i \ln P_i \tag{8}$$

The reason to adopt such a simple specification is low sample size (12) of the model. The estimated Armington elasticities and elasticities of imports can be seen in Appendix. Notice that all the estimated elasticities of substitution are of correct sign. The values for these elasticities used in our simulation study are provided in Table 1. All of the regressions are performed by Stata 8 ™ and 2003 is our base year.

Table 1. Values for Elasticities of Substitution and Price Elasticities of Import.

	Elasticity of Substitution, σ_i		**Price Elasticity of Import, η_i**	
Product Codes[a]	**Raw**	**Processed**	**Raw**	**Processed**
1	0.922475		1.062360	
2	0.84898		1.158311	
3	1.247402		1.158311	
4	0.579521		1.982507	
5	1.479229		0.504372	
6	1.430463		1.492812	
7	2.55914		1.158311	
8	1.207758	1.239984	1.158311	1.407466
9	0.681448	0.526173	0.254448	1.407466
10	1.312761	1.353257	1.158311	1.407466
11	1.312761	1.091098	1.158311	1.407466
12	1.788322	1.24498	1.158311	
13	1.695643		1.158311	
14	1.312761		1.653367	

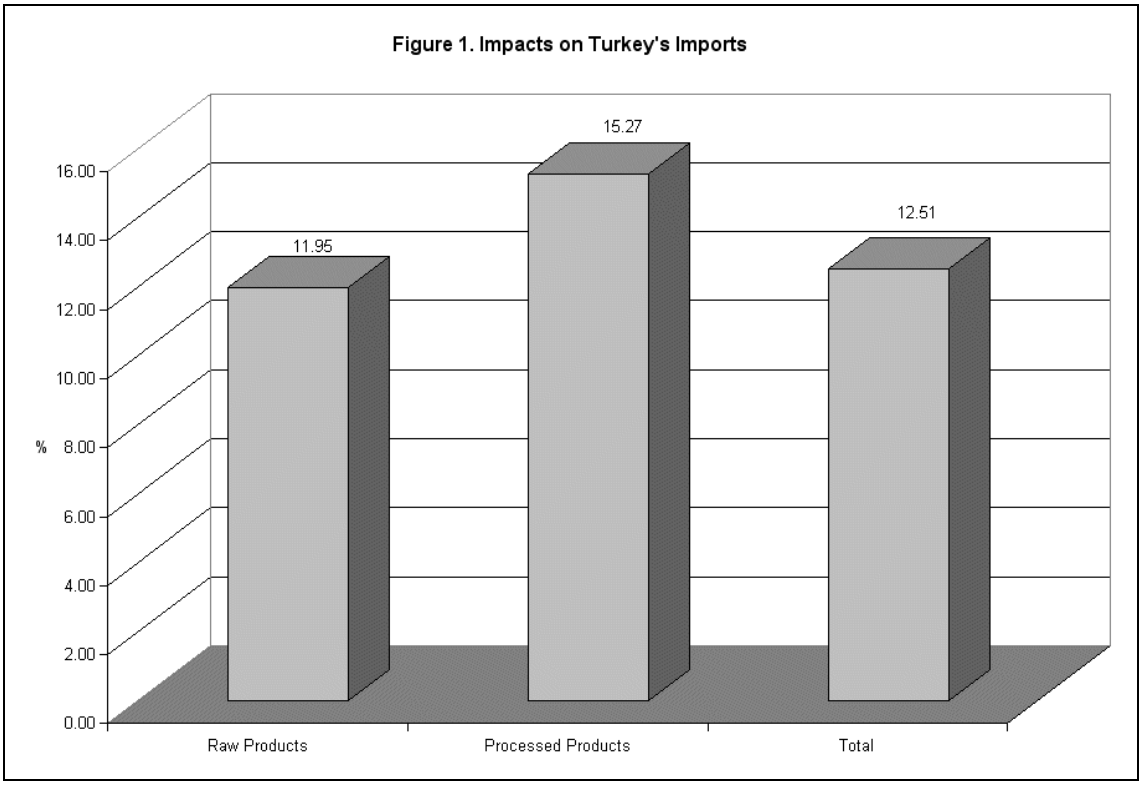
Notes: [a] See Appendix Table A1 for the product names. The confidence interval for all the elasticities in the table is 0.05. In the case that the estimated elasticity did not fulfill this requirement, we used the average elasticity obtained from group of products.
Source: Authors' calculations.

15 http://europa.eu.int/comm/taxation_customs/customs/customs_duties/tariff_aspects/combined_nomenclature/index_en.htm

III. SIMULATION RESULTS

Before the representation of simulation results, one should be aware of the fact that the findings should be taken as the short term simulation results based on the changes in tariff rates, hence our model does not include dynamic effects of a possible economic integration of Turkey with EU. Following Chevassus (2003, p.21) notice that, according to the past EU enlargements experienced, the economic integration effects might stimulate the trade flows between the new incumbents.

The adoption of the CET increases the total agro-food imports of Turkey by 12.5 percent (Figure 1). The surge in processed products are higher with 15.3 percent, compared to the raw products that remains around 12 percent.

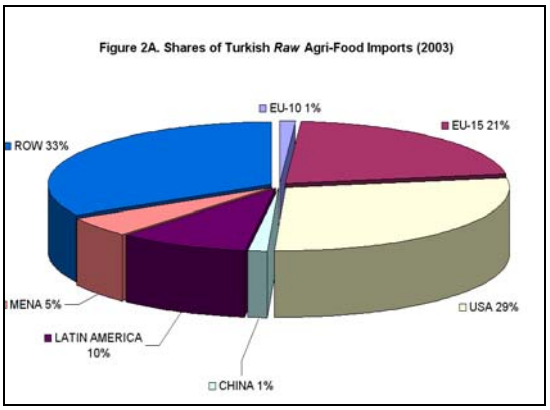


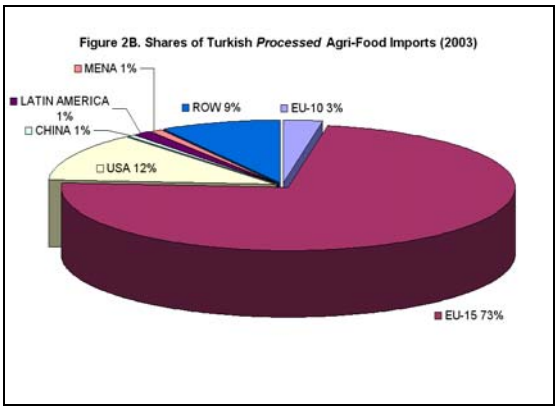
TOTAL IMPORTS OF TURKEY BY REGIONS (1 000 $)

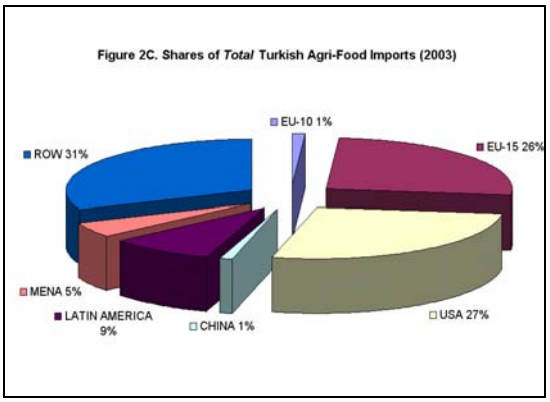
	Raw	Processed	Total
EU15	*732,348*	*241,574*	*973,922*
EU10	*36,013*	*9,259*	*45,272*
USA	*1,056,088*	*40,707*	*1,096,796*
CHINA	*29,880*	*1,887*	*31,767*
LAT.AM.	*345,918*	*4,713*	*350,631*
MENA	*182,475*	*3,264*	*185,739*
ROW	*1,156,231*	*28,009*	*1,184,240*
World	*3,538,953*	*329,414*	*3,868,367*

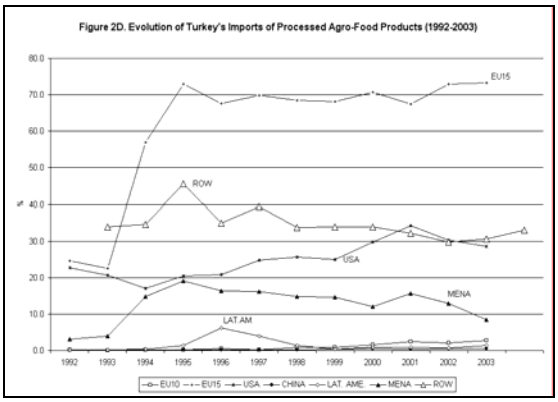
At this point, it may be informative to look at the recent distribution (with 2003 data) of Turkey's total agro-food product imports by their country of origin. Figure 2A, 2B, 2C and 2D are prepared for this purpose. Figure 2C represents that the two major import partners of Turkey are USA and EU-15 with similar percentages (26-27 %). Although a similar pattern can be seen in raw agro-food products (Figure 2A), the picture for processed agro-food products is highly different and reveals an important feature of Turkey's current agro-food import structure (Figure 2B). In the case of processed products, we see that EU15 is the leading importer with 73 % while the share of USA drops drastically to 12 %. In Figure 2D, one can see the evolution of the import structure of Turkey for processed agro-food products from 1992 until 2003. After 1993 there is a drastic increase in the share of EU15 and from 1994 till 2003 we see a stationary fluctuation around 70 percent.

In fact, returning back to Figure 1, the total increase of 12.51 % obtained from our simulations for the agro-food products used in this study is distributed unequally according to the origins of importation.



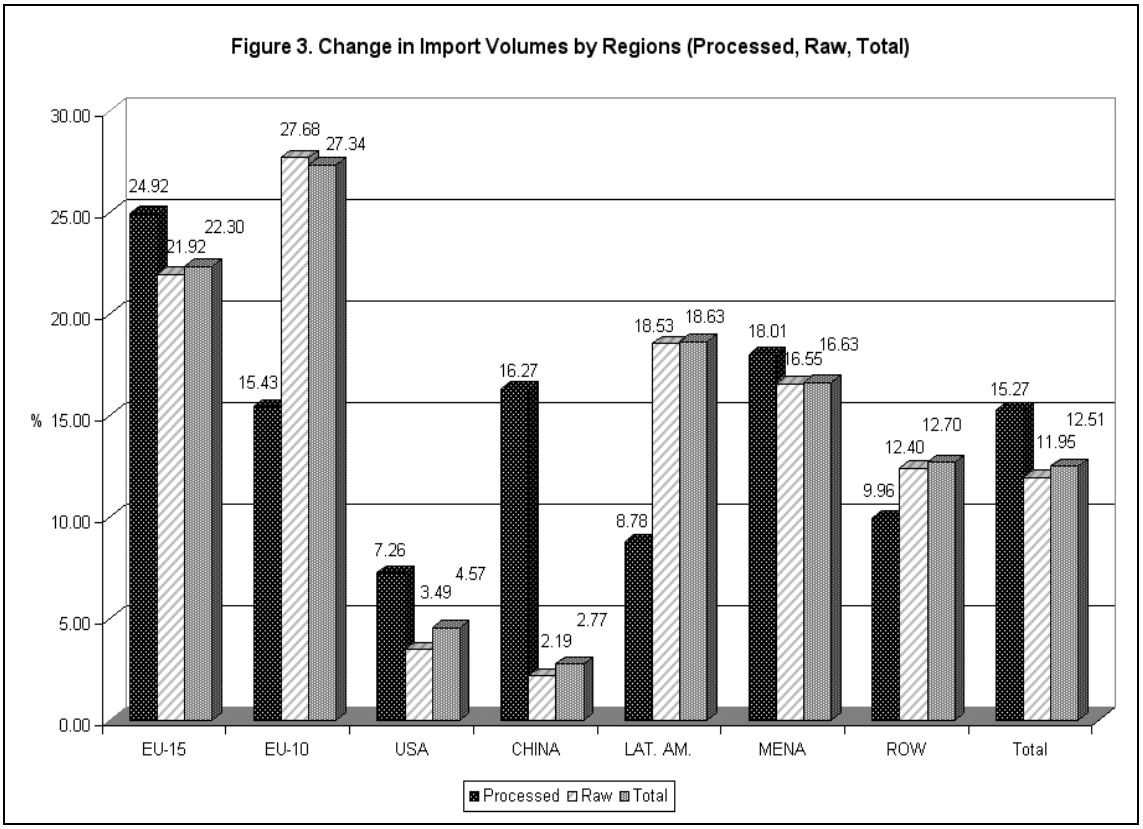




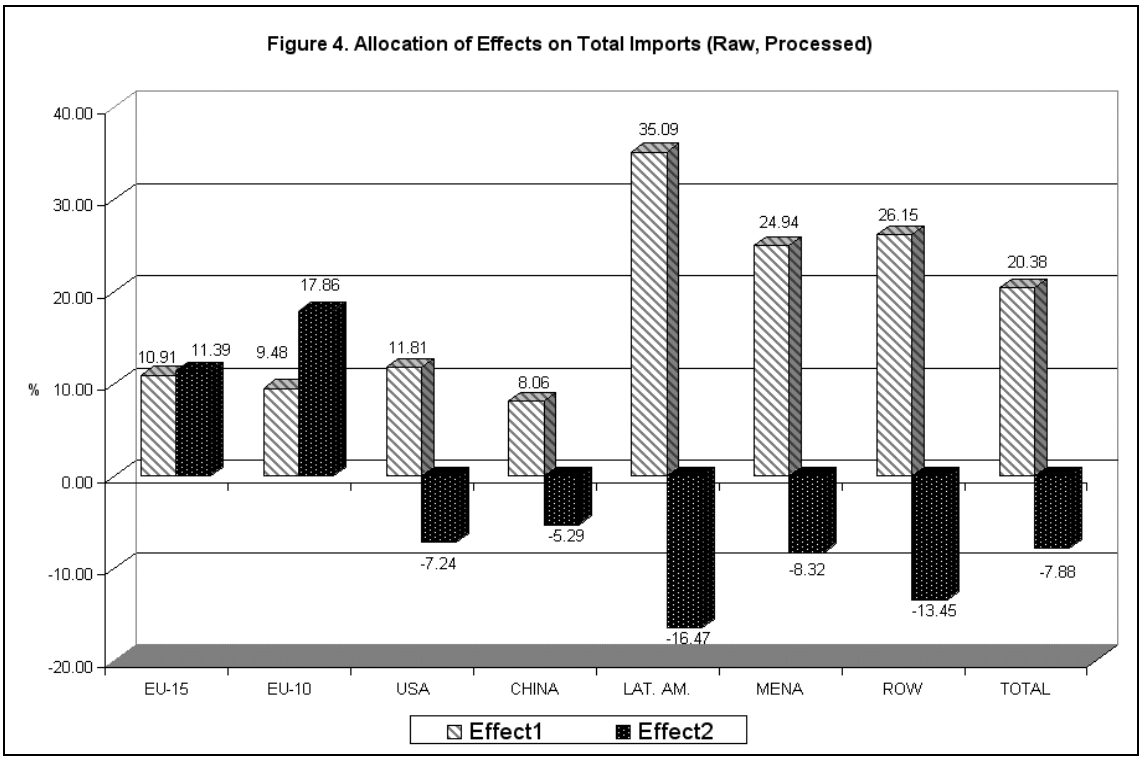


The change in Turkey's imports of agro-food products according to the country of origin is presented in Figure 3. It is clear from the figure that the EU countries would gain the most. The results indicate that the EU-15 countries would increase their exports of agro-food products to Turkey by 22.3 percent compared to the year 2003. According to the product type (Raw or Processed), the Turkey's imports of processed products will increase by 25 percent. Within the EU member countries, the new members (EU10) countries would increase their exports the most. The overall increase of 27 percent reveals this situation. However, the main difference between the EU15 and EU10 countries' performance is the fact that the main share of EU15's increase would be due to the processed products (24.9 percent) whereas for EU10 countries this increase will result mainly from raw agro-food products (27.7 percent). This result reveals the difference of the structure of the agro-food sectors in EU15 and EU10 countries. EU15's 24.9 percent increase in processed agro-food products is really striking, considering the fact that the share of the EU15 in processed products imports of Turkey has been 73 percent despite rather low base for the processed products imports. These results disclose the fact that these sectors in Turkey should improve their competitiveness in order to

survive with the increasing foreign competition which would result from the enlargement of Turkey-EU customs union agreement to agro-food products.



From Figure 3, it can be observed that the two least beneficiaries of a possible EU accession of Turkey would be USA and China. Latin American and MENA countries arise as the medium beneficiaries. Another interesting finding of the simulation results is the fact that although China would not benefit too much in total the increase in their exports of processed agro-food products is really high with an increase of 16.3 percent compared to its overall increase of 2.8 percent.



In Figure 4, we see the allocation of effects that are discussed in equation (6) on total (raw and processed) imports of agro-food products of our study. Recall that the Effect 2 representing the substitution effect because of the change in the relative prices between partner countries whereas the Effect 1 represents the change (enlargement or shrinkage) in market because of the price change. In Figure 4, the most important point is that, except EU10 and EU15, the substitutions between partner countries will negatively affect exports to Turkey. In other words, all countries except EU members would experience a really high negative substitution effects due to the change in Turkey's import prices in favor of EU agro-food products in the case of a possible accession of Turkey to EU. Effect 2 allows us to estimate the trade diversion and to determine the losers and winners of trade substitution (Unguru and Lozza, p.12). The simulation results indicate that the most important trade diversion would take place for Latin American countries (with 16.5 percent). If there is no change in relative prices, the increase of Turkey's imports from Latin American countries would be 35.1 percent, however, because of the change in relative prices of partner countries in favor of EU the substitution effect would moderate this increase at a rate of 18.63 percent. This rate is representing, in fact, the total net trade creation. Similar situations can be seen for all importer regions except EU in Figure 4. USA will experience a trade diversion at a

degree of 7.24 % but end up with a net positive trade creation of 4.57 %. MENA countries would likely experience a trade diversion at a rate of 8.32 % with a total net trade creation of 16.63 %. If we look at the sum of imports from all countries to Turkey, for the agro-food products of our study, a trade diversion of 7.88 % with a 20.38 % trade creation will likely result in a total net trade creation at a rate of 12.51 %. The winners of the substitution effect, not surprisingly, would be the EU countries. EU10 countries would be the most winners of this substitution effects with a rate of 17.86 percent while EU15 countries would be the second winners of the substitution effect resulting from reaching Turkish agro-food market without any tariffs. Lastly, rest of the world (ROW) would also experience a trade diversion at a rate of 13.45 percent with a final total net trade creation of 12.70 percent.

IV. CONCLUSION

Turkey's membership of EU will lead to the enlargement of already established customs union between EU and Turkey for the agricultural products. This involves not only a full liberalization of agricultural trade within the EU but also the implementation of a Common external tariff. In this new situation, trade diversion and creation effects for agro-food trade will emerge. In terms of article XXIV of GATT, the possible results of these counteracting effects are important. In the first part of the paper, we estimated the Armington elasticities for Turkey for agro-food products of our study. Then, using the Armington assumption, the trade diversion and creation effects of Turkey's membership for the agricultural trade are calculated and analyzed. Our simulation findings show that the winners of a possible enlargement of Turkey-EU customs union to agricultural products are, not surprisingly, EU countries. Turkey's imports for agro-food products of our study will increase by 12.51 percent in total. The other countries will also increase their exports to Turkey, however, except EU, all of these countries will be subject to some degrees of substitution effects implying trade diversions for these regions.

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APPENDIX TABLES

A1. Products used, and definitions

Our Codes, *i*	**Descriptions**	**Harmonized System Codes**
1	Live animals, meat & edible meat offal	01+02
2	Dairy, eggs, honey, & ed. Products	04
3	Edible Vegetables	07
4	Ed. Fruits & Nuts, Peel Of Citrus/Melons	08
5	Cereals and Milling Industry Products	10+11
6	Oil Seeds/Misc. Grains/Med. Plants/Straw	12
7	Animal Or Vegetable Fats, Oils & Waxes	15
8	Sugars & Sugar Confectionery	17
9	Preps. Of Cereals, Flour, Starch Or Milk	19
10	Preps Of Vegs, Fruits, Nuts, Etc	20
11	Tobacco & Manuf. Tobacco Substitutes	24
12	Other Foodstuffs	16+18+21+22+23
13	Raw Hides & Skins & Leather	41
14	Cotton, Inc. Yarns & Woven Fabrics Thereof	52

A2. Estimation Results for Elasticities of Substitution (-σ) by Product Groups

	Raw			Processed		
i	**Fixed Effect Model**	**Random Effect Model**	**Haussman Test**	**Fixed Effect Model**	**Random Effect Model**	**Haussman Test**
1	-.8973717 (-4.87)	**-.9224748 (-5.30)**	0.9196			
2	**-.8489801 (-4.65)**	-.7681831 (-4.14)	0.028			
3	-.8596542 (-3.11)	**-1.247402 (-6.76)**	0.1727			
4	-.6112683 (-4.25)	**-.579521 (-4.12)**	0.3326			
5	**-1.479229 (-7.61)**	-1.656002 (-9.11)	0.0377			
6	-1.432075 (-6.40)	**-1.430463 (-6.66)**	0.9997			
7	**-2.55914 (-8.99)**	-2.398587 (-8.60)	0.0202			
8	-1.146992 (-3.81)	**-1.207758 (-4.41)**	0.7662	-1.19222 (-2.94)	**-1.239984 (-3.51)**	0.9046
9	-.7757594 (-3.60)	**-.6814476 (-3.66)**	0.6858	**-.5261737 (-2.64)**	-.5506384 (-2.79)	0.0141
10	-.4773368 (-1.17)	-.6095287 (-1.73)	0.6973	-1.297197 (-4.39)	**-1.353257 (-5.52)**	0.9571
11	-.6968264 (-1.38)	.5020997 (1.02)	0.0000	-.5530628 (-1.52)	-.1733515 (-0.65)	0.017
12	**-1.788322 (-9.71)**	-2.135752 (-14.88)	0.0109	**-1.24498 (-5.21)**	-1.275651 (-5.49)	0.034
13	**-1.695643 (-9.64)**	-1.62876 (-8.29)	0.041			
14	-.3671566 (-0.60)	-.3287746 (-0.60)	0.9734			

**Values in parenthesis are t values. The bold values are used in the simulations of our study since they are significant and theory consistent. In order to decide between fixed effect and random effect models, we performed Hausman tests. The values in the Hausman test column are the prob. values. Hence if these values are less than 0.05 (a significance level), then according to the test the fixed effect model is preffered.*

A3. Estimation Results for Price Elasticities of Imports (-η) by Product Groups

i	RAW	PROCESSED
1	**-1.06236 (-2.63)**	
2	-.1028952 (-0.22)	
3	-.121545 (-0.17)	
4	**-1.982507 (-4.28)**	
5	**-.5043715 (-2.09)**	
6	**-1.492812 (-2.61)**	
7	-.343755 (-1.84)	
8	-16.93904 (-0.69)	1.015575 (1.11)
9	**-.2544475 (-2.53)**	-1.696033 (-1.49)
10	-.6027999 (-0.91)	1.538852 (1.20)
11	-.0063906 (-0.01)	**-1.407466 (-7.27)**
12	-.6061369 (-1.89)	-.2784262 (-0.18)
13	.8611577 (1.46)	
14	**-1.653367 (-4.32)**	

**Values in parenthesis are t values. The bold values are used in the simulations of our study since they are significant and theory consistent. Note that, degrees of freedom is low for the estimation of these elasticity values since we can not use panel data models.*