ESTIMATION OF TRADE CREATING AND DIVERTING EFFECTS OF TURKEY - EC CUSTOMS UNION ON TURKISH AUTOMOTIVE INDUSTRY

A THESIS
SUBMITTED TO THE DEPARTMENT OF ECONOMICS
AND THE INSTITUTE OF ECONOMICS AND SOCIAL SCIENCES
OF BILKENT UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF ECONOMICS

By
Metin Çolebi
July, 1995

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Assist. Prof. Dr. Fatma Taşkın (Advisor)

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Assist. Prof. Dr. Kivilcim Metin

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Assist. Prof. Dr. Osman Zaim

Approved for the Institute of Economics and Social Sciences:

Prof. Ali Karaosmanoğlu
Director of Institute of Economics and Social Sciences

ABSTRACT

ESTIMATION OF TRADE CREATING AND DIVERTING EFFECTS OF TURKEY-EC CUSTOMS UNION ON TURKISH AUTOMOTIVE INDUSTRY

Metin Çelebi
Master of Economics
Supervisor: Assist. Prof. Dr. Fatma Taşkın
July, 1995

This study estimates trade creation and diversion effects of the forthcoming Turkey-EC customs union on Turkish Automotive Industry. The study employs a microeconomic-theory-based partial equilibrium approach. The product group included in the analysis is the automobiles with three differentiated goods: domestically produced, imported from member countries and imported from non-member countries. Estimation of demand elasticities to be used in the estimation of trade creation and diversion is performed by using the *Asymptotically Full Information Maximum Likelihood* method. Then, trade creation and diversion effects are estimated for five scenarios about the entrance date to and conditions of joining the customs union. The study concludes that trade creation and diversion effects lead to welfare improvements for each scenario defined, and joining the customs union reduces the demand for domestically produced automobiles in almost each scenario.

Key words: Customs Union, Trade Creation, Trade Diversion, Turkish Automotive Industry, Elasticity Estimation

ÖZET

TÜRKİYE-AT GÜMRÜK BİRLİĞİNİN TÜRK OTOMOTİV SANAYİİ ÜZERİNDEKİ TİCARET YARATICI VE SAPTIRICI ETKİLERİNİN ÖLÇÜLMESİ

Metin Çelebi
Ekonomi Bölümü Yüksek Lisans
Tez Yöneticisi: Assist. Prof. Dr. Fatma Taşkın
Temmuz, 1995

Bu çalışma, gerçekleşecek bir Türkiye-Avrupa Topluluğu gümrük birliğinin Türk Otomotiv Sanayii üzerindeki ticaret yaratıcı ve saptırıcı etkilerini ölçmeyi amaçlar. Çalışmada mikroekonomik teori tabanlı bir kısmi denge analizi kullanılmıştır. Analize dahil edilen mallar *otomobil* mal grubu içinde tanımlanan üç farklı malı içerir. Bunlar, yerli üretim malı, üye ülkelerden yapılan ithal malı ve üye olmayan ülkelerden yapılan ithal malıdır. Ticaret yaratıcı ve saptırıcı etkilerin ölçülmesinde kullanılan talep esneklikleri *Asymptotically Full Information Maximum Likelihood* metoduyla tahmin edilmiştir. Bundan sonra, ticaret yaratımı ve saptırımı, birliğe girişin tarihi ve şartlarına göre oluşturulmuş beş senaryo dahilinde ölçülmüştür. Çalışmanın sonuçları göstermiştir ki; gümrük birliğine girmek (otomobil malları çerçevesinde) Türkiye'nin refah düzeyini her senaryoda artıracaktır ve yerli üretilmiş otomobillere olan talep, senaryoların çoğunda azalacaktır.

Anahtar kelimeler: Gümrük Birliği, Ticaret Yaratımı, Ticaret Saptırımı, Türk Otomotiv Sanayii, Esneklik Tahmini

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Chapter 1

Introduction

The objective of this study is to estimate the static trade creation and diversion effects of forthcoming customs union with the European Community on Turkish Automative Industry. Turkey will most probably join the customs union at the beginning of year 1996. For many years, political and ideological aspects of joining the customs union and an EC membership have been discussed. Although there is less than six months to the starting date for entering customs union, economical aspects of joining have not received the attention which it deserves.

This study employs a microeconomic theory based demand approach to estimate trade and welfare effects of customs union. The product group covered in this study is automobiles and it is assumed that this product group includes three differentiated goods: domestically produced ones, imported ones from member countries and from non-member countries.

In Chapter 2, the first section includes the explanation of Turkey-EC relations with emphasis on customs union. Moreover, some possible scenarios for the entrance date to the union and for the date of alignment of external tariff to common external tariff are presented. The second section gives a brief discussion of the Turkish Automative Industry.

Chapter 3 covers the theory of customs union where trade creation and diversion effects are introduced using the partial equilibrium analysis. The relation between trade creation, trade diversion and welfare is explained and some likely cases of welfare gain from customs union formation are explained.

In chapter 4, a brief literature survey on estimation of trade creation and diversion is carried out with emphasis on ex-ante studies. Then, the model employed to estimate trade creation and diversion is presented in the first section in chapter 5. The results of the empirical estimates of the elasticities and trade creation and diversion are presented in other sections in chapter 5.

Chapter 2

Turkey-EC Relations and Turkish Automotive Industry

Under the globalisation atmosphere of the second half of twentieth century, many countries have formed different kinds of integration in order to gain advantages of economical and political partnerships. The European Community (EC) has evolved as a powerful economical and political block in this atmosphere.

Turkey, about thirty years ago, chose to be involved in this European block and almost continuously tried to be admitted into it. For many years, political aspects of joining EC were discussed, but economical effects and advantages have not been analyzed in detail. In this study, trade effects of a possible customs union with EC on Turkish Automotive Industry, TAI, will be examined.

This chapter includes introductory information on Turkey-EC relations and Turkish Automotive Industry.

2.1 Turkey-EC Relations

EEC (European Economic community) was formed in 1957 by Roma Agreement by six European countries: France, West Germany, Belgium, Italy, Netherlands and Luxembourg. With enlargements toward north Europe first, and south Europe next, EEC became a twelve-member community in 1990. In 1993, EEC and ECSC (European Coal and Steel Community) has combined and took the name, EC.

The main goals of EEC was to improve the welfare of citizens of member countries, to remove barriers on trade, to establish fair competition and to remove regional economic imbalances (Bozkurt [8]). In addition to goals of EEC, EC was formed to accomplish also monetary and political union. As the first chair of European Commission, W. Hallstein said, 'The mission of the community is not only related to economic activity but also politics.'(Holland [19]). Therefore, EC became a political and economic power which affects not only its members, but also outsiders. From the point of view of an outsider country, to take place in EC may create new opportunities for increasing growth rate, improving technology and for forming strong and profitable international relations with members.

Considering the economical advantages and as a result of the political aim to be in close relationship with western countries, Turkey has signed Ankara Agreement in 1964 with community to form a customs union mainly for industrial goods, with some exceptions such as textile goods. In 1973, Additional Protocol has been signed to arrange rules of transition to the customs union. All barriers on trade were decided to be fully removed in 11 years for some goods and in 22 years for others. The automotive industry goods were in the 22-year-list.

For the 22-year list, it can be said that Turkey has obeyed the conditions of agreement and reduced tariffs according to the planned schedule. Planned and actual percentage tariff removals for the 22-year list from 1988 up to now

	1994	01/01/1995	01/01/1996	01/01/2000
Member	36	27.5	0	0
Non-member	44.5	27.2	27.2	10

Table 2.2: Percentage tariff rates on automobiles

Therefore, to estimate trade creation and diversion effects of customs union on Turkish Automotive Industry (particularly on automobiles), this study will analyze five scenarios in order to cover possible entrance dates to customs union.In the first scenario, it is assumed that Turkey joins customs union in the beginning of 1995 and does not align tariffs on imported automobiles from non-member countries to CET. Indeed, the external tariff rate is taken as the one in table 2.2. In the second scenario, the entrance date is again the beginning of 1995, but external tariffs are aligned to CET. In the third and fourth scenarios, the entrance date is assumed to be the beginning of 1996, but external tariffs are not aligned to CET and remains constant at its 1995 value in the former and aligned to CET in the latter scenarios. In the fifth scenario,it is assumed that tariffs on member countries are removed at the beginning of 1996 and tariffs on non-member countries are aligned to CET at the beginning of 2000. Note that this scenario will most probably be the imlemented one. These five scenarios will be used in section 5.5 in order to estimate trade creation and diversion effects for possible scenarios of entering customs union.

No doubt, entering such a big union will affect all industries in Turkey to varying degrees. Since the focus of the study is on automative industry, first, the Turkish Automative Industry (TAI) is introduced in the following section, before examining the effects of customs union on it in later chapters.

2.2 Turkish Automative Industry

The history of Turkish economy does not extend too far. The first automobile plants were founded about 30 years ago (Tofas and Oyak in 1968). Although there were some pilot productions before this date, those were less than ten

are given in table 2.1. [1]

	..-1988	1988	1989	1990	1991	1992	1993	1994	1995
Planned	40	50	50	60	70	70	80	90	100
Actual	10	20	30	40	50	60	70	80	

Table 2.1: Tariff removals for the 22-year list

In 1993, all barriers on trade imposed by Turkey have been reduced into tariff and *public housing fund* figures in order to reduce other protectionist instruments into the controllable two barriers on trade.

For common external tariffs (CET), community gave Turkey the right to preserve pre-union rates up to year 2000. But then, these rates will be reduced for Turkish imports to the level (10% for automobiles) determined by the community. CET will be applied to all countries except sixteen EC members: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden and UK.

According to the Additional Protocol signed in 1973, Turkey was supposed to join the customs union in the beginning of 1995. However, due to some political reasons which are out of the scope of this study, the entrance date has been postponed.

For the time being, the entrance date has not been exactly determined yet. Depending on the decision of EC, Turkey will most probably join the customs union at the beginning of 1996. However, alignment of tariffs on imported *automobiles* from non-member countries to the CET have decided to be postponed to the beginning of 2000. This means that Turkey is free to apply any tariff rate on automobiles from non-member countries until 2000, but after this date the CET (10% for automobiles) will be applied. Actual and planned tariff rates (including all duties) between 1994 and 2000 to be applied on imported automobiles from member and non-member countries are in table 2.2.[2]

[1] See Tore [18] p.13

[2] Obtained from Automotive Manufacturers Association (AMA) [2]

	1994	01/01/1995	01/01/1996	01/01/2000
Member	36	27.5	0	0
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2.2 Turkish Automative Industry

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automobiles. But the industry grown very fast: average growth rate of production between 1987-1992 was 12.5% (from production size of 174,893 in 1987 to 344,482 in 1992) compared to 4.6% for the food industry and 4% for textile industry (Tezer [29] p. 4).

Today, the TAI includes 18 firms, five of which produces automobiles. All of these automobile plants make production under the license of foreign producers: three of them with European, one of them with American and one of them with Japanese license. Hence, TAI has a close relationship with foreign automative industry, although tehnology and models are relatively old compared to foreign ones.

The industry is very important for the Turkish economy. The direct and indirect employment in the sector was around 500,000 and production value was $ 4.6 billion in 1992 (3% of GNP). Like in other countries, the TAI gained importance by its final production, usage of diversified inputs, its natural importance in highway transportation, its usage of high technology and improved production methods (Aksoy [1] pg.20). It is widely named as the locomotive sector of the economy since it works with many side industries, such as steel&iron, glass, motor industries, etc.

Main problems of the TAI, while entering to customs union, are worth mentioning in order to make a brief but complete introduction to the industry. Insufficiency of demand is the greatest one. The income level of Turkish consumers are very much below (give GNP per capita figures if necessary) the European consumers. Moreover, taxes on automobiles imposed by Turkey are about 2.5 times greater than the ones in Europe (about 20% in Europe compared to 45-50% in Turkey). These two factors lower the demand for automobiles considerably.

Moreover, TAI has major supply side problems. First of all, financial costs are high due to high interest rates. Furthermore, labor productivity is low relative to foreign labor. According to the McKinsey report submitted only to the firms in industry, the productivity of TAI firms is 68% lower than that of FEAI (Far East Automative Industry). Moreover, cost disadvantage is about

22% more than that of FEAI (Tezer [29] pg.10). One may think that TAI has a comparative advantage due to lower real wages, but it is offset by much lower labor productivity.

Production is done below the capacity and much more under the optimal production size. The capacity utilization ratio for the whole motor vehicle industry was 77% in 1992 and production capacity of the largest Turkish automobile plant is 70% of and that of the side industry is about 40-50% of the optimal production size in Europe(Tore [18] pg.15). This is mainly due to insufficient demand. Number of automobiles per thousand person is 40 in Turkey, compared to the world average of 86 (Tezer [29] pg.7).

All in all, it cannot be argued that TAI is completely ready to and has an advantage in joining customs union with EC members. Hence, the probable effects of customs union on TAI should be estimated carefully to make rational subsidy programs for the sector.

Chapter 3

Customs Union Theory

The concept of economic integration is used to denote the combination of separate economies into larger groupings. The degree of combination leads to different types of integration schemes: preferential tariff cuts, free trade area, customs union, common market and economic union.

The weakest type of integration is the use of *preferential tariffs*. A pertinent concept here is that of the Most Favored Nation (MFN). A MFN clause in a treaty specifies that any tariff reduction on the goods concerned that is subsequently given to other nations will also be applied to the first nation.

The next step in economic integration is the *free trade area*. A free trade area reduces tariffs to zero between members within the area, with each country applying its own tariffs to external imports.

The next degree of integration is the *customs union*, that we are analyzing in this study. A customs union also has zero internal tariff, but agrees to apply a Common External Tariff (CET) to the outside world.

A further step toward integration is to include factor integration. A *common market*, in addition to being a customs union, also allows for the free flow of factors of production between countries.

The last step in economic integration is the *economic union*, in which policy integration is added in addition to common market.

Since this study analyzes the effects of joining customs union on Turkish Automotive Industry, we will focus on this type of integration. In the first section, gains from the free trade will be examined with emphasis on specialization of production. In the second section, effects of customs union is analyzed using concepts of trade creation and diversion, and in the last section, likely cases of gain from union formation and theory of second best is discussed.

3.1 Gains From Free Trade

Most of the theoretical effort has been put into attempting to demonstrate that the establishment of a customs union leads necessarily to an improvement in welfare, along the lines of the gains associated with moving from a state of no trade to free international trade. This may be called as the optimistic view on the effects of customs union. A major argument by Bhagwati [6], which supports the optimistic view about the effects of customs union, states that there exists a trade vector and lump-sum compensatory payments such that all countries will not be worse-off after the union. Although this proposition does not say anything on welfare of individual countries in the absence of compensation, it asserts that world welfare improves (or remains constant) for some trade vector and compensatory payments after the formation of union. The direct application of the traditional theory regarding the gains from trade would appear to be clear-cut, but it turns out that such a gain cannot be presumed a priori for the establishment of a customs union.

In order to demonstrate this notion, it is important to review the traditional theory as it applies to the gains involved with removing tariff on a good on which tariff was applied previously. The partial equilibrium analysis for such a situation is presented in figure 3.1, where D and S are the domestic demand and supply curves, respectively for the good.

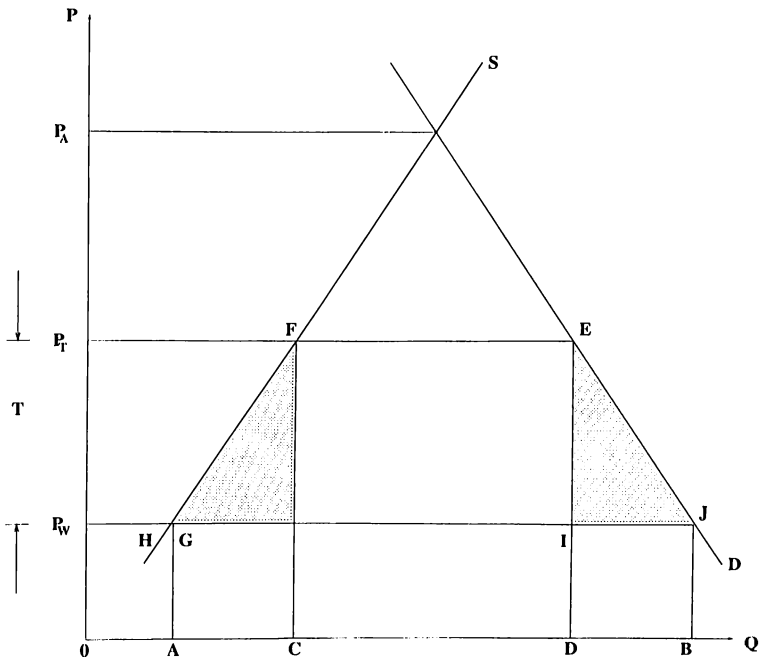

Figure 3.1: Tariff removal

The autarky (no trade) price for this good (P_A) is relatively high compared to the world price (P_W), thus demonstrating that the country does not have a comparative advantage in the production of the good. Once again according to standard international trade theory, this is probably due to the fact that the country is relatively insufficiently endowed with the factors of production that are used relatively intensively in the production of the good. Allowance of free trade would, by competition, make P_W the domestic as well as the world price (of course by assuming that the good in question is perfectly homogeneous), generating total quantity demanded (OB), domestic production (OA), and imports (AB). The establishment of the world as the domestic price in this case allows for greater welfare through increased consumption and a shifting of resources to some other, presumably more efficient use, thus taking advantage of specialization.

These gains from trade will be reduced if an import tax was imposed on the good in question before the implementation of free trade. Say that a specific tariff equal to the distance between P_W and P_T was imposed by the importing country, and that this country's imports are small compared to world trade in

this commodity. In this case the country faces a perfectly elastic (flat) supply schedule for the good, and the domestic price of the good decreases by the full amount of the tariff to P_W. Consumption rises to OB, domestic production decreases to OA, and imports rise to AB.

In this situation the country experiences a net gain in welfare. There is a gain in consumer welfare since consumers will pay a lower price for the good and will, therefore increase their quantity demanded (by DB). In figure 3.1, there is thus a gain in consumer welfare of the area $P_W P_T EJ$, since the price has dropped to P_W. However, removing tariffs will lead to a loss in producer surplus by the area $P_W P_T FH$ since at world prices, profits of domestic firms will shrink. Moreover, there is the loss of tariff revenue which was collected on CD portion of imported goods before the abolishment of tariff rates. The loss in tariff revenue is the area $GFEI$. The net welfare change is the sum of these three effects. Hence, triangles HFG and IEJ in figure 3.1 represents the net gain from free trade.

With this type of analysis it would appear to be a simple extension to conclude that formation of a customs union, as long as the average tariff wall to the outside world was not increased upon formation of the union, would be an unambiguous gain to the members and world welfare. In fact, this was the presumption when the notion of a postwar European union was being intended. However, such an optimistic view is not necessarily warranted due to trade creating and trade diverting effects of customs unions.

3.2 Trade Creation and Trade Diversion

Before 1950's, it was generally believed that the formation of the customs union was a step toward free trade and therefore it tended to increase welfare. But in 1950, Viner [30] showed that this is not necessarily correct. In particular, he showed that the formation of customs union combines elements of freer trade with elements of greater protection and may either improve or worsen resource

allocation and welfare.

Trade creation is defined as the increase in imports of a tariff reducing country (due to switching from high-cost domestic products to low-cost imports) from partners. Trade diversion is the increase in imports of a tariff reducing country (due to switching from low-cost non-member products to high-cost member products) from member countries [25, 26].

These definitions are quite general and hence different interpretations has been made in the literature. The interpretation by Meade [23] is the most widely used one. He perceived trade creation to be resulted from the *creation of trade* that was not existed before the formation of customs union. This definition includes the increase in imports from member countries both due to replacement of domestically produced goods and due to expansion of imports resulting from the fall in price. The second part, expansion of trade because price fall, was not accounted for by Viner [30], who put forward the distinction between trade creation and diversion first in the literature. He thought that trade creation is only due to replacement of domestically produced goods by imports from member countries since he has implicitly assumed that demand function is inelastic.[1]

The trade diversion, in Meade's terms, can be defined as the result of switching from lower cost imports from non-member countries to higher cost imports from member countries. Viner has the same definition for it, but the amount of diversion is smaller in Viner's terms due to implicit assumption of inelastic demand curve.

The two approaches can be illustrated by an example in figure 3.2. Suppose there are three countries: the non-member country, Z, is the lowest cost producer; the member country, Y, is a higher-cost producer; and the home country, X, is the highest-cost producer of a commodity. i.e.

$$P_Z < P_Y < P_X$$

[1]See details in [12]

where P_i represents the cost of producing that good in country i, ($i = X, Y, Z$) and suppose tariff inclusive prices are such that P_{ZT} (for non-member country) is lower than P_{YT} (for member countries), i.e.

$$P_{ZT} < P_{YT} < P_X$$

Hence, for a homogeneous good, home country makes all of its imports from the non-member country, Z, before the formation of customs union.

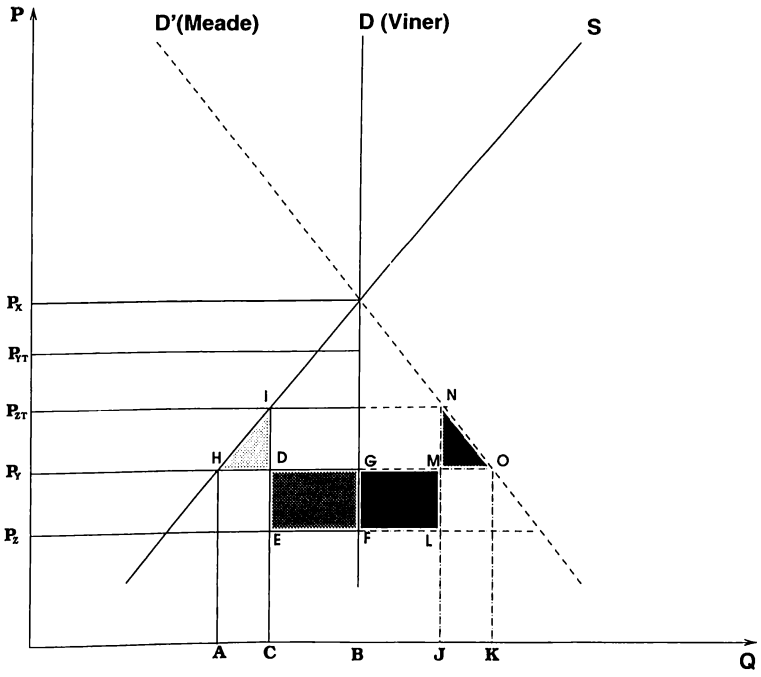

Figure 3.2: Comparison of Meade's and Viner's Trade Creation-Trade Diversion concepts

Then, removing tariffs on member country, Y, will divert trade from low cost non-member, Z, products to high cost Y. Viner defined this case as trade diversion and it is the rectangle $EFGD$ which represents the net loss from diverting the initial amount of imports from lower-cost source (country Z) to higher-cost source (country Y), in figure 3.2. But Meade argued that this would be the complete definition of trade diversion if the price elasticity of demand were zero (represented by the demand curve D). Hence, according to Meade, as seen in figure 3.2 , there is also a trade expansion, the line segment JK, due to non-zero demand elasticity (represented by the demand curve D').

Hence, trade diversion in Meade's terms becomes the rectangle $DELM$ which is greater than Viner's trade diversion by the rectangle $FGLM$.

Removing tariffs will lead to trade creation in both Viner and Meade, but with different amounts. Trade creation of Viner is the triangle on the left, HID, which results from the replacement of high-cost domestic products. However, trade creation is the triangle HID plus the right triangle MNO in Meade's terms, the difference comes from the non-zero demand elasticity and hence due to trade expansion, JK.

Note that trade creation is a welfare improving effect as seen in figure 2. The two triangles representing the trade creation are parts of net welfare increase coming from consumer and producer surplus. However, trade diversion represented by the rectangle $EDML$ is the part of welfare worsening tariff revenue loss.

From now on, further analysis will use trade creation and diversion concepts of Meade, which is widely used and more realistic than those of Viner.

In figure 3.2, both trade creation and diversion were observed due to the particular setup of prices. With a different combination of prices, as in figure 3.3, trade diversion will be zero and one can observe the pure trade creation.

Again assume that the good in consideration is a homogeneous one. Initially, the domestic price of the good is P_{YT}, which is country Y's export price (P_Y) plus the specific tariff. Country Z does not enter into trade since its (inclusive of tariff) price, P_{ZT}, lies above P_{YT} (P_{ZT} ¿ P_{YT}). If, then, the union is established, the price in X drops to P_Y, consumption expands to OD, domestic production drops to OC, and imports expand to CD. The shaded triangles represent the exact obverse of the losses incurred through tariff imposition; this is a pure case of what is termed *trade creation*, and there is an absolute gain in welfare. In fact, the gain might have been even more obvious and dramatic had the pre-union tariff been high enough to place both P_Y and P_Z above the autarky price P_X. Then no trade would have taken place prior to the union, and trade would have been literally created as opposed to merely increased.

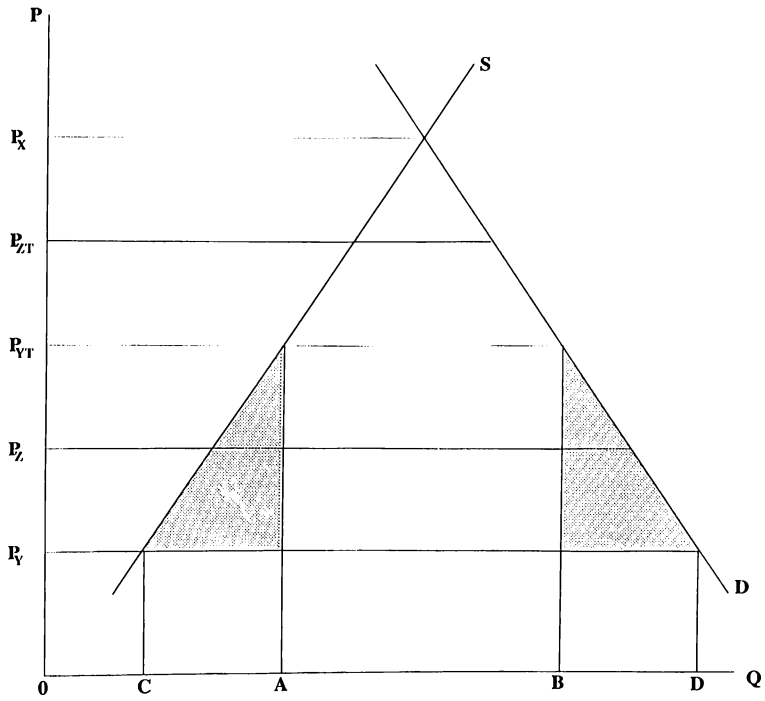

Figure 3.3: Pure Trade Creation

An example applied to an extreme case may be used to demonstrate the nature of trade diversion. Figure 3.4 shows a case similar to that in figure 2, in Meade's terms, except that there are perfectly inelastic supply and demand curves over the relevant range in country X for the commodity (thus yielding neither quantity changes nor trade creation upon tariff reduction). Such a case should be called one of pure trade diversion.

Say that the product is coming in at a price of 10 $ per unit from country Z, a 4 $ tariff is being imposed (which results in a pre-union price of 14 $), and that 1,000 units are being imported. The tariff revenues (4,000 $) are then refunded to consumers in lower income and/or commodity taxes. The net cost to the society is 10,000 $, and the tariff only changes relative prices, with (in this case) neither reallocation nor consumption effects. If, then, a customs union is formed with Y, the tariff is dropped (on Y) and goods come in at 12 $, for a total country cost of 12,000 $. The difference (2,000 $) is the rectangle shown in figure 3.4, and is, again, a pure loss to the country for forming a union.

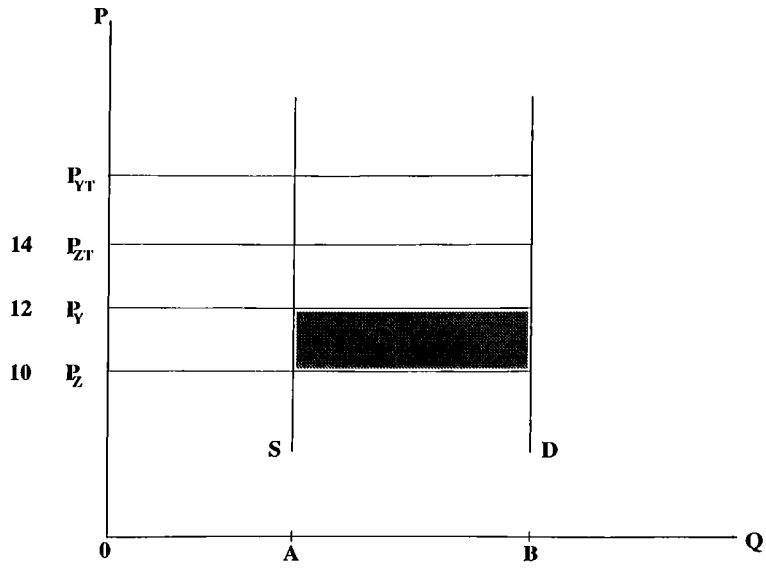

Figure 3.4: Pure Trade Diversion

Looking at the less extreme case, then, whether or not a union will be beneficial depends on the balance between the two effects -trade creation and trade diversion. It is, therefore, at least theoretically possible that freer trade may not be optimal in the sense of increasing either the country's welfare or the overall productive efficiency of the world.

In this analysis of trade creation and diversion, it is implicitly assumed that the tariff rate imposed after the formation of customs union on non-member country Z is at the same level that that the customs union agreement requires for CET (Common External Tariff rate). If the home country has a different pre-union tariff rate for country Z, then there are two cases: either the CET included price of imports from country Z, P_{ZC}, is lower than P_Y or higher than P_Y. In the latter case, there is no change in results (even in amounts) for a homogeneous good, since P_Y will still be the lowest price.

However, in the former case in which CET included price of imports from country Z is lower than P_Y, trade creation increases (See figure 3.5).

In this case, domestic production drops from OC (which results from a customs union without aligning CET) to OC' and imports from country Z

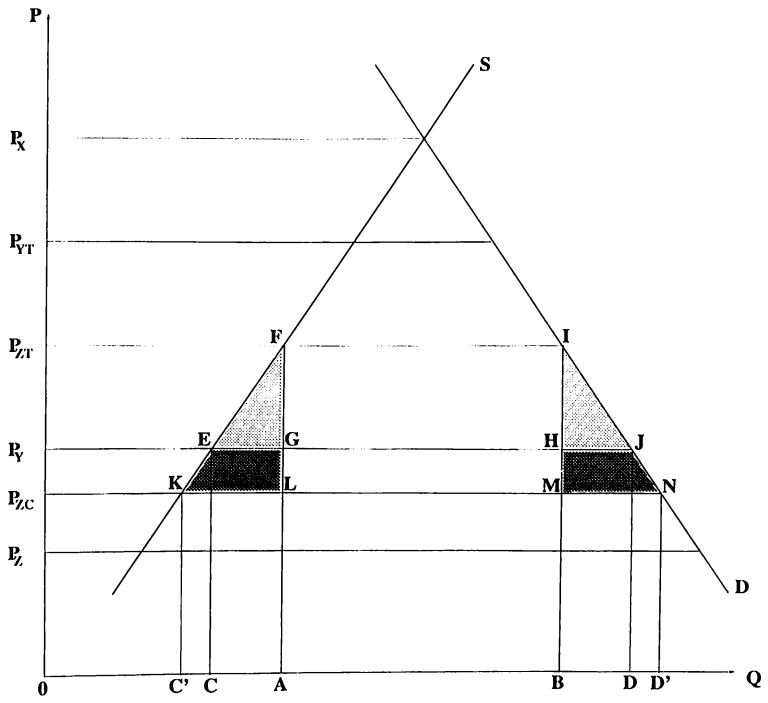

Figure 3.5: Trade Creation with Common External Tariff

increases from CD to $C'D'$. Hence, trade creation increases from sum of the areas of triangles EFG and HIJ to KFL and MIN. There is no switching in source of imports, and hence there will be no trade diversion. Empirically, however, this is not a usual situation since CET is determined not to improve the world welfare but to improve welfare of member countries.

For non-homogeneous goods, in the latter case, results depend on elasticities of substitution between differentiated goods. In the former case, there will be no trade diversion, but the result for trade creation is ambiguous and depends on elasticities of substitution again.

3.3 Likely Cases of Gain From Union Formation

As mentioned above, there is no certainty on gains from joining a customs union. This does not mean, however, that no guidance can be given as to the type of situations that are likely to involve a net gain from union formation, and various assertions have been made in this regard.

Unfortunately the customs union literature has used rather vague concepts of *competition* and *complementary commodities*, and drawn conflicting, and often rather confusing conclusions about the likelihood for gain from union formation, depending on the nature of the commodities produced by potential members. The problem here is one of definition and specifying tariff levels upon formation. A similar, more useful, and certainly clear concept is one of relative efficiencies, as employed by Overturf [24], between potential union members. He suggests that the more dissimilar are the cost ratios between potential union members, the greater the potential gain from union formation.

This may be demonstrated in figure 3.6, which shows a high cost producer X entering into a union with relatively low-cost producer Y, with resultant significant trade creation outweighing trade diversion. Of course, it is possible the Z may be so much more efficient than Y that this result does not hold, but a significant divergence between P_X and P_Y makes this less likely to occur.

The converse also appears to hold, as long as the union partner in fact picks up the trade upon formation. That is, the more similar are the cost ratios between potential union members, and the more dissimilar these are with respect to the outside world, the greater the potential loss from the union formation.

This is demonstrated in figure 3.7, which has high-cost producer X importing from low-cost Z before union, but similarly high-cost Y after union. Trade diversion in this case significantly outweighs trade creation.

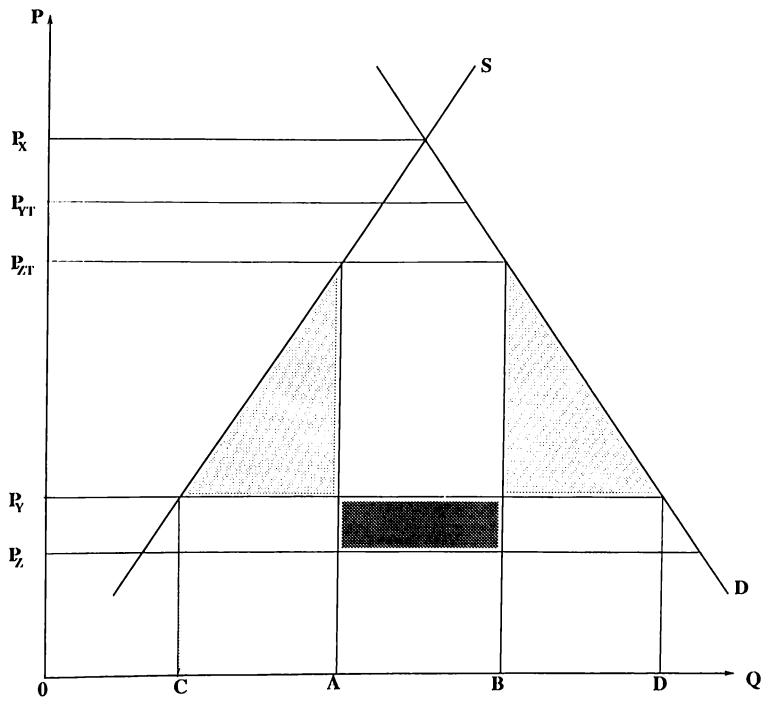

Figure 3.6: Dissimilar cost ratios between members

Given the above, it can be said, in addition, that the higher the original tariffs on potential partners, the greater the probability of significant gain upon the elimination of those duties. Of course, if a reduction of duties would involve net cost due to trade diversion, a large reduction in tariffs would simply entail large trade diversion.

The notion of trade creation and diversion, which was first developed in consideration of customs union formation, has far reaching implications for the science of economics. It suggests that, in general, any change seeming to move toward a global optimal situation may not, in fact, be an optimal move in a non-optimal world. This, the *Theory of Second Best*, means that there is always a large degree of uncertainty about the positive results of any suggestion made regarding economic policy.[2]Economists cannot, in other words, state with certainty that piecemeal movements toward greater competition, for example, are an absolute good.

[2]See Bhagwati [6] pg.284 and Overturf [24] pg. 27 for details.

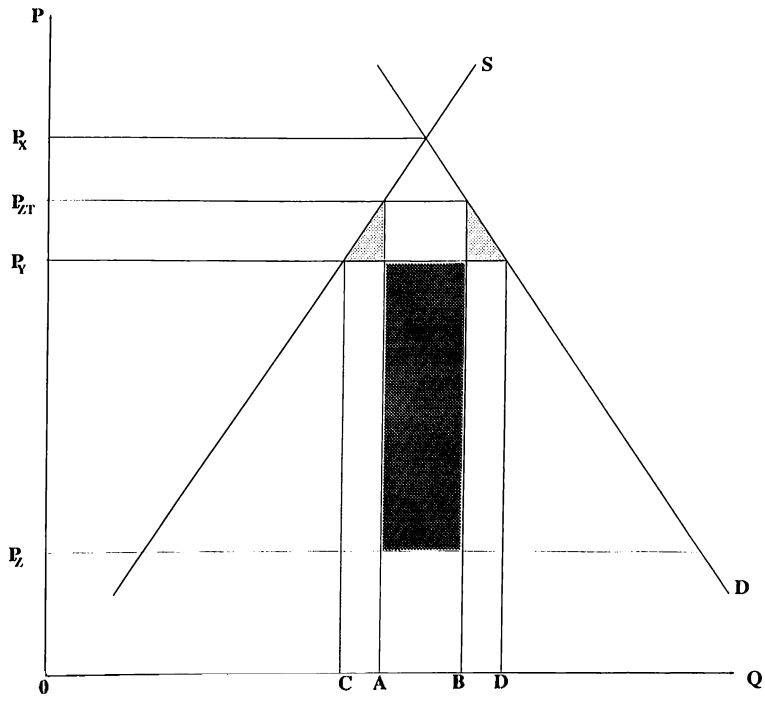

Figure 3.7: Similar cost ratios between members

Specifically with regard to customs unions, this meant that a categorical approval could no longer be given to their formation, since it had previously been assumed that, even though it might take a long time to reach absolute free trade, gradual expansion of customs union participation would always lead to improvement. Each case would have to be decided on its own merits, by balancing costs against benefits, both of which are, by their very nature, very difficult to measure.

Besides the static effects of trade creation and diversion, customs unions have some interesting *dynamic effects*, such as increased competition, stimulus to technical change, stimulus to investment, and economies of scale. These so-called dynamic effects do not lend themselves easily to systematic analysis and are out of the scope of this study. Hence, these effects will not be analyzedfurther in this study.[3]

Finally, two general conclusions follow from the Theory of Second Best.

[3]For more information, see Chacholiades [9] pp.270-1.

These are that a union will be more likely to raise welfare (1) the greater the amount of total trade that takes place between potential members, and (2) the smaller trade is as a proportion of total expenditures in each potential member. The rationale behind both of these is that the smaller the distortion of relative prices caused by having tariff barriers to the outside world, the smaller the probability that these will significantly skew production and consumption decisions.

Chapter 4

A Brief Literature Survey on Estimation of Trade Creation and Trade Diversion

Models for estimating trade creation and diversion are mainly classified into two categories: ex-ante and ex-post models. The former ones make forecasting for trade flows before the establishment of customs union and then estimate trade creation and diversion using these forecasts, while the others have the realized trade flows on hand and just estimate trade creation and diversion. In the customs union literature, some of major contributions to the application of customs union theory which are related to the framework of this study can be classified as , Baldwin&Murray [5], Cline et al. [11], Ginman et al. [17] and Rahman [25] among ex-ante studies; and Balassa [4], EFTA Secretariat [27], Kreinin [20] and Dayal and Dayal [12] among ex-post studies. Studies in each category will be examined in the chronological order, beginning with ex-post studies.

4.1 Ex-Post Studies

Balassa (1967), in his study analyzing the impact of EEC on trade creation and trade diversion, argued that assuming income elasticities of import demand remains unchanged in the absence of customs union, if income elasticity of demand for imports from all sources of supply increases, there is a trade creation. The logic of this approach is that when tariff is reduced for the partner country, there is a rise in demand due to income expansion.[1] This is accompanied by an increase in the gross income elasticity.

Balassa also computed, instead of income elasticities, the growth rates of imports into the common market in the pre-integration and post-integration periods separately, and then derived the two estimates of post-integration imports by applying the two growth rates to the pre-integration imports. The difference between the two estimated imports was ascribed to integration.

EFTA Secretariat (1969) employed the share of imports in consumption to estimate trade creation. This ex-post study assumed that where there is a significant protective tariff on some commodity, this is because domestic production costs are higher than those of some potential foreign suppliers. Hence, trade creation takes place when share of imports in consumption rises. On the other hand, when share of imports in consumption falls, there is trade diversion.[2]

In both Balassa and EFTA Secretariat studies, some drawbacks are observed. First of all, integration effects are assumed to be the difference between pre-union and post-union values. However, this is not the case in general. There may be other factors such as autonomous changes in prices, technological changes and estimation errors in regressions. Moreover, it is assumed in both of the studies that the price of the imported product in the domestic market of the importing country changes by the full amount of the tariff change. However, this is a process with two steps. Firstly, tariff changes effect prices

[1] See [12, 28] for details.
[2] See [12] for details

and price changes (if any) effect trade flows. If foreign producers have some market power (monopolistic or oligopolistic markets), tariff removals may have no effect on prices of imported goods. Hence, in order tariff removals to affect prices fully, there must be either competitive foreign markets or production is below the optimal production size, by which economies of scale is obtained optimally, for foreign firms.

The second major drawback is that changes in total imports into a member country are treated as trade creation in both of the studies. Actually, these import changes represent a mixture of trade creation and diversion in the sense that some part of change in imports from member countries represents the switching from domestic goods and some part represents the switching from imports from non-member countries.

Another often-quoted ex-post study to estimate trade creation and diversion is the one by Kreinin (1969). He argued that the influence of customs union on trade flows are mixed up with those of other factors including changes in cif prices. In order to seggregate the effect of these factors, he used import demand functions for each member of EEC, separately for its total imports, imports from partner countries and those from third countries, by regressing the index of volume of imports on real GNP and the ratio of the import price index to the domestic wholesale price index for the pre-integration period. From these functions, he derived estimated imports for each of the post integration years. The difference between the actual and estimated total imports was designated as trade creation; and the difference between the actual and estimated imports from non-member countries was taken as trade diversion. The main assumption of this study is that tariff reduction is fully conveyed into the price, as done in Balassa [4] and EFTA Secretariat [27]. Another drawback is that since relative prices are taken as an explanatory variable of demand, change in import due to absolute price changes is not taken into account.

In Dayal and Dayal (1977) paper, it was argued that trade creation and diversion concepts should lend themselves to proper econometric measurement. Hence, they made an anology with income effect and substitution effect to form

concepts of trade creation and diversion. In particular, if the price of imports from a member country falls, consumers' income seems to increase and demand from all sources increases. This is income effect and said to correspond to the trade creation. On the other hand, in that case, since relative price of imports from the member country decreases, demand from other sources decreases. This is the substitution effect and said to correspond to the trade diversion. Hence, it is implied that if income effect is greater than substitution effect, there is a net trade creation which improves the welfare of the society.

4.2 Ex-Ante Studies

Ex-ante studies made by Baldwin and Murray (1977), Ginman et al.(1980) and Cline et al.(1978) can be examined by using a common framework. The model appearing in all of these studies employs price elasticities of import demand to predict the trade creation effect of changes in the prices of imports relative to the prices of domestic products, and cross elasticities to predict the trade diversion effect of changes in relative prices among foreign suppliers of imported products. The main difference among these studies is the choice of values assumed for the cross elasticities. The values are usually chosen arbitrarily for lack of good, prior empirical estimates, and consequently, arguments over conflicting results generally boil down to questions about the reasonableness of the cross elasticities.

The partial equilibrium model of the import market employed in these studies assumes product differentiation among suppliers, iso-elastic import demand functions, infinite supply elasticities, and no changes in income, exchange rates or cif prices. The import demand equation for a given product from one set of foreign suppliers (denoted by subscript 1) is usually rewritten as a differential expenditure function. The change in prices of this good relative to the prices of domestically produced substitues (later denoted by subscript 3) and relative to the prices of substitues from other foreign suppliers (later denoted by subscript 2) is $T_1 = \frac{dt_1}{1+t_1}$ following a preferential reduction in the ad-valorem tariff rate

t_1.

Hence, it is implicitly assumed that tariff rate reduction is fully conveyed into price reduction. This is a preferential tariff cut because it is applied only to imports of product (1) supplied by the beneficiaries of the preference, while product (2) produced by non-beneficiary foreign suppliers is subject to the same rate as before, i.e. $t_2 = t_1$. Although this is not conformed to an analysis of customs union where tariff rate on non-member products are changed so as to align with CET (Common External Tariff), such a framework can give reasonable estimation methods for trade creation and diversion.

The combined trade creation and diversion effects of this preferential tariff cut equal the following change in the tariff exclusive value of imports (M_1) from beneficiaries of the tariff preference:

$$dM_1 = M_1 T_1 (n_1 - n_{12}) \tag{4.1}$$

where

n_1 : own price elasticity of import demand

n_{12} :cross price elasticity of import demand.

In the case of a MFN (Most Favoured Nation) tariff cut where $T_1 = T_2$, the relative price change among suppliers is zero and the cross price elasticity drops from equation 4.1. The import expansion is due solely to to trade creation, which is written for product 1 as :

$$dM_1 = M_1 T_1 n_1$$

Now if we assume a well-behaved and separable utility function as done in Clague [10], we can obtain trade creation and diversion with a micro-based analysis. In this way, we can define the degree of substitution among differentiated products, the issue which is at the core of disagreements over appropriate values for cross elasticities.

Let us denote M_i $(i = 1, \ldots, x)$ as the expenditures of a country on any foreign or domestic product i. For simplification, aggregate $(x - 3)$ products

into a group denoted by the subscript (4), and focus on the remaining three products. Then, Clague's demand equation for the beneficiary product (1) may be written in the following differential expenditure form:

$$dM_1 = M_1 T_1 [\frac{-h_2 s_{12} - h_3 s_{13} - h_1 h_4 s_{14} - (h_1 + h_2 + h_3) h_1 s_1}{h_1 + h_2 + h_3}] \quad (4.2)$$

where

h_i : the share of product i in total expenditures $(i = 1, \ldots, 4)$
$= \frac{M_i}{(\sum_{i=1}^{4} M_i)}$

s_{ij} : the elasticity of substitution between good i and j
and $s_{14} = a$ is a constant, indicating equal substitutability of products (1,2,3) for all other products (4), $(i, j = 1, \ldots, 4; i \neq j)$

s_1 : the income elasticity of demand for product (1), assumed to be the same for products (1,2,3).

In the case of an identical MFN tariff cut where $T_1 = T_2$ and there is no change in relative price among foreign suppliers, the trade creation would be :

$$TC = dM_1 = M_1 T_1 [\frac{-h_3 s_{13} - (h_1 + h_2) h_4 s_{14} - (h_1 + h_2 + h_3)(h_1 + h_2) s_1}{h_1 + h_2 + h_3}] \quad (4.3)$$

The bracketed expressions in equation 4.2 and equation 4.3 define $(n_1 - n_{12})$ and n_1, respectively.

Then, cross price elasticity becomes,

$$n_{12} = \frac{h_2 (s_{12} - n_{14})}{h_1 + h_2 + h_3}$$

where

$$n_{14} = h_4 s_{14} + (h_1 + h_2 + h_3) s_1$$

which is the absolute value of the elasticity of demand for the aggregate of products (1,2,3) since all s_{i4} are equal.

Now, with this framework on hand, we can determine whether or not the prediction techniques of Baldwin and Murray [5], the UNCTAD Secreteriat ginman and the Brookings study [11] were consistent with the assumptions underlying their models.

Baldwin and Murray (1977) adopted an ad-hoc method to estimate trade diversion in the absence of good estimates for cross price elaasticity, n_{12}. They assume that substitutability between domestic and non-beneficiary product is similar to the substitutability between domestic and beneficiary product. Since the latter substitutability is the trade creation (TC), and can be rewritten as a share of domestic production, trade diversion (TD) becomes trade creation weighted by the ratio of imports from non-beneficiaries , M_2, to the domestic production, M_3. Hence,

$$\begin{aligned} \text{TD} &= \text{TC}\ \tfrac{M_2}{M_3} \\ &= M_1 T_1 n_1 \tfrac{M_2}{M_3} \end{aligned}$$

The standard formula for trade diversion was

$$\text{TD} = M_1 T_1 n_{12}$$

Hence, Baldwin and Murray has implicitly defined

$$n_{12} = n_1 \tfrac{M_2}{M_3}$$

Here, the implicit assumption is zero elasticity of domestic demand for the aggregated product group. It can be seen by precisely putting $s_{12} = s_{13}$ and using Clague's analysis that

$$n_{12} = \tfrac{-h_2(n_1 - n_{14})}{h_3} = -n_1 \tfrac{M_2}{M_3} + n_{14} \tfrac{M_2}{M_3}$$

If n_{14} is different from zero, TD in Baldwin and Murray analysis will be underestimated.[3]

Brookings study performed by Cline et al.(1978) also uses n interchangeably for n_1 and n_2, hence $s_{13} = s_{23}$. The cross elasticity, n_{12}, is defined in terms of

[3]See [17, 22] for details.

the relationship between import shares and the elasticity of substitution. The change in imports, dM_1, is now interpreted to mean only that change resulting from the reduction in beneficiary prices, holding total imports constant.[4] The cross elasticity is estimated to be

$$n_{12} = \frac{h_2 s_{12}}{h_2 + h_1(1+s_{12}T_1)}$$

But Cline et al. calculated it as

$$n_{12} = \frac{h_2 s_{12}}{h_2 + h_1}$$

although they did not mention of the fact that this implies the relative price change, T_1 is zero.

Therefore, their study is consistent with Clague's framework only if tariff change is negligible, domestic demand elasticity is zero and domestic production is zero. These assumptions will yield an exaggerated cross elasticity estimate and underestimate the welfare improving effects of tariff reduction.

In UNCTAD analysis done by Ginman et al.(1980), the basic assumption is that non-beneficiary products will be displaced by beneficiary products on a one-for-one basis, i.e. $s_{13} = s_{23}$, and that $n = n_1 = n_2$ is an appropriate estimate of n_{12}. Then,

$$\text{TD} = M_2 T_1 n_1 \qquad \text{and}$$

$$n_{12} = -n_1 \frac{M_2}{M_1}$$

Here, the implicit assumption is zero demand elasticity and market share equality for beneficiaries and domestic producers.

Rahman et al.(1981) made a study to estimate the static trade effects of a probable customs union in South Asia comprising Bengladesh, India, Nepal, Pakistan and Sri Lanka. This study is important due to considering the effect of aligning the CET (Common External Tariff) -an important aspect which has been ignored in the empirical literature- in addition to normal tariff removals

[4]See [22] for details.

for partner countries. They have constructed the model based on Bhuyan [7] and Viner [30]. The model assumes that tariffs are the only barrier to trade; the price effects on trade have no lag; the production methods, factor supplies and tastes remain unaltered; other induced changes on imports are non-existent; and the export supply of the union is infinitely elastic.

The two basic equations representing the change in imports are

$$\Delta M_i = \sum_{i=1}^{m} e_i\left(\frac{-t_i}{1+t_i} M_{u,i}\right) + \sum_{i=1}^{m} e_i\left(\frac{-(t_i - c_i)}{1+t_i} M_{v,i}\right) \tag{4.4}$$

$$\Delta M_{v,i} = \sum_{i=1}^{m} \frac{\Delta M_i}{M_i} M_{v,i} - \sum_{i=1}^{m} \eta_i\left(\frac{-t_i}{1+t_i} - \left(\frac{-(t_i - c_i)}{1+t_i}\right)\right) \frac{M_{u,i} M_{v,i}}{M_i} \tag{4.5}$$

where

M_i : volume of imports of the i'th commodity ($i = 1, \ldots, m$)

$M_{u,i}$: initial (pre-union) intra-regional import of the i'th commodity

$M_{v,i}$: initial extra-regional import of the i'th commodity

t_i : initial tariff rate on i'th commodity

c_i : rates of common external tariff on i'th commodity

e_i : price elasticity of import demand for i'th commodity of a member concerned.

η_i : elasticity of substitution for i'th commodity.

Here $\frac{t_i}{1+t_i}$ refers to removal of tariffs for member countries and $\frac{-(t_i - c_i)}{1+t_i}$ refers to aligning tariffs to c_i for non-member countries and these two expressions are the percentage changes in tariff inclusive prices.

Equation 4.4 shows the direct price effects of a customs union on a member's total imports including trade creation and trade diversion. Equation 4.5 represents the trade diversion if negative and trade expansion if positive. The first term in equation 4.4 is the trade creation since it indicates the change in member's imports from inside the union as a result of tariff elimination.

Therefore, we have summarized some important works on the estimation of trade creation and trade diversion. In the following chapter, the model used in this study will be built which will be based on microeconomic theory foundations.

Chapter 5

Estimation of Trade Creation and Trade Diversion for Turkish Automotive Industry

In the previous chapter, a background has been given for the Turkish Automotive Industry (TAI)and for the theoretical and empirical analysis of trade creation and diversion.

This chapter will formulate the estimation procedure and give empirical estimation results for trade creation and diversion, focusing on automobiles, one of the product groups in TAI products. The *automobiles* product group is chosen since it is the most important final product of the industry with its 80% share in total industry production (number of vehicles) in 1994.[1]

The model for estimation of trade creation and diversion is given in section 1. Then, the model for estimating demand elasticities are given in section 2. Section 3 contains information on data used for estimations and section 4 contains regression results. Section 5 presents empirical estimation results of trade creation and diversion for each scenario defined in section 2.1. The chapter ends with the concluding remarks.

[1]Obtained from [3] pg.23

5.1 The Model For Estimation of Trade Creation and Diversion

In this section, first the change in trade flows of automobiles resulting from the Turkey-EC customs union will be formulated by employing a demand based partial equilibrium approach. Then, trade creation and trade diversion will be defined depending on change in trade flows.

The model assumes a country which will join a customs union, and is initially importing the differentiated good from two different sources: member and non-member countries. It is assumed that imports from preferred countries, non-preferred countries and domestic goods are differentiated goods of a general good (the general good in this study is automobile); and tariff reductions and increases have no effect on exchange rates or money incomes. All changes in trade flows are assumed to be due to joining the customs union.

It is assumed that changes in tariff rates are fully reflected into prices. This assumption is justified by assuming competitive or non-cooperative oligopolistic foreign markets. In case of a tariff reduction, if these markets were monopolistic or cooperative oligopolistic, foreign producers would find it profitable (and possible) to increase the exports prices up to the point where the price of their products after tariff reduction is equal to the one before tariffs. But by assuming competitive or non-cooperative foreign markets, producers cannot increase their export prices due to competition among them.

Moreover, supply functions for imported goods are assumed as infinitely elastic, since imports of the home country is small compared to the world trade on this commodity. The demand functions of all goods are assumed to take the log-linear form.

It is also assumed that consumers carry out utility maximization with a two stage budgeting and a separable utility function, i.e. consumers first choose the expenditure on each group of goods, then choose consumption of each

differentiated good according to prices of goods in that group of goods and expenditure on that group of commodities.

Throughout the study, only effects of changes in prices of goods imported from member countries and from non-member countries are considered. Hence it is assumed that entering customs union does not affect prices of domestically produced goods.

Now define good 1 as the good imported from preferred countries, good 2 as the good imported from non-preferred countries, and good 3 as the good produced domestically.

Then, using the assumption of log-linear demand functions and two-stage budgeting, demand functions for good 1, 2 and 3 can be written as

$$logQ_1 = a_1 + \epsilon_{11}logp_1 + \epsilon_{12}logp_2 + \epsilon_{13}logp_3 + \eta_1 logY_A \quad (5.1)$$

$$logQ_2 = a_2 + \epsilon_{21}logp_1 + \epsilon_{22}logp_2 + \epsilon_{23}logp_3 + \eta_2 logY_A \quad (5.2)$$

$$logQ_3 = a_3 + \epsilon_{31}logp_1 + \epsilon_{32}logp_2 + \epsilon_{33}logp_3 + \eta_3 logY_A \quad (5.3)$$

where

Q_i: quantity demanded of good i (i=1, 2, 3)

a_i : a constant (i=1, 2, 3)

p_i : tariff included price of good i (i=1, 2, 3)

ϵ_{ij} : price elasticity of a change in price of good j to import demand of good i. (i,j=1, 2, 3)

η_i : income elasticity of a change in total expenditure on group of commodities (automobiles) on demand of good i.

Y_A :total expenditure on group of commodities.

Now, we will carry out the calculations on one of demand functions since calculations are the same for each equation. Focusing on equation 5.1, if we totally differentiate the equation 5.1,

$$\frac{dQ_1}{Q_1} = \epsilon_{11}\frac{dp_1}{p_1} + \epsilon_{12}\frac{dp_2}{p_2} + \epsilon_{13}\frac{dp_3}{p_3} + \eta_1\frac{dY_A}{Y_A}$$

To calculate $\frac{dY_A}{Y_A}$, consider the open form of expenditure and its total derivative,

$$Y_A = Q_1p_1 + Q_2p_2 + Q_3p_3$$

$$dY_A = Q_1dp_1 + Q_2dp_2 + Q_3dp_3 + p_1dQ_1 + p_2dQ_2 + p_3dQ_3$$

Since $dp_3 = 0$ (by the assumption that there is no change in price of good 3) and $dQ_i = 0$ (effects of only price changes are considered), change in expenditure can be written as

$$dY_A = Q_1dp_1 + Q_2dp_2$$

Then, percentage change in demand of good 1 becomes

$$\frac{dQ_1}{Q_1} = \epsilon_{11}\frac{dp_1}{p_1} + \epsilon_{12}\frac{dp_2}{p_2} + \eta_1\frac{(Q_1dp_1+Q_2dp_2)}{Y_A}$$

After some manipulations,[2]

$$\frac{dQ_1}{Q_1} = (\epsilon_{11} + \eta_1k_1)\frac{dp_1}{p_1} + (\epsilon_{12} + \eta_1k_2)\frac{dp_2}{p_2} \qquad (5.4)$$

where $k_i = \frac{p_iQ_i}{Y_A}$ is the expenditure share of good i.

Now recall that ϵ_{ij} is the price elasticity of the Marshallian demand curve. We can convert this to the price elasticity of the compensated demand curve, μ_{ij} by the relationship

$$\epsilon_{ij} = \mu_{ij} - \eta_ik_j$$

where μ_{ij} is the compensated price elasticity of a change in price of good j

[2]The last term can be opened as

$$\eta_1\frac{Q_1dp_1}{Y_A} + \eta_1\frac{Q_2dp_2}{Y_A}$$

Multiplying the first term by $\frac{p_1}{p_1}$ and the second term by $\frac{p_2}{p_2}$, it becomes

$$\eta_1\frac{p_1Q_1}{Y_A}\frac{dp_1}{p_1} + \eta_1\frac{p_2Q_2}{Y_A}\frac{dp_2}{p_2} \qquad \text{or}$$

$$\eta_1k_1\frac{dp_1}{p_1} + \eta_1k_2\frac{dp_2}{p_2}$$

Hence, the equation 5.4 follows from this.

on demand of good i.

Then,

$$\frac{dQ_1}{Q_1} = \mu_{11}\frac{dp_1}{p_1} + \mu_{12}\frac{dp_2}{p_2} \tag{5.5}$$

In the same manner,

$$\frac{dQ_2}{Q_2} = \mu_{21}\frac{dp_1}{p_1} + \mu_{22}\frac{dp_2}{p_2} \tag{5.6}$$

$$\frac{dQ_3}{Q_3} = \mu_{31}\frac{dp_1}{p_1} + \mu_{32}\frac{dp_2}{p_2} \tag{5.7}$$

In these expressions, if we assume prices of imported goods are determined in competitive foreign markets, percentage changes in tariff inclusive prices of imported goods can be calculated as follows:

Let ${p_1}^e$ and ${p_2}^e$ be the export prices of imports from member and non-member countries, respectively. Then, assuming ad-valorem tariffs, pre-union (tariff inclusive) prices of good 1 and good 2 are

$$\begin{aligned} p_1 &= {p_1}^e(1+t_1) \\ p_2 &= {p_2}^e(1+t_2)\ , \qquad \text{respectively.} \end{aligned}$$

After the establishment of customs union, prices of good 1 and good 2 becomes ${p_1}^e$ and ${p_2}^e(1+CET)$, respectively, where CET is the common external tariff. Hence, percentage changes in prices of good 1 and good 2 due to joining customs union are[3]:

$$\begin{aligned} \frac{dp_1}{p_1} &= \frac{{p_1}^e - {p_1}^e(1+t_1)}{{p_1}^e(1+t_1)} = \frac{0-t_1}{1+t_1} \\ &= \frac{dt_1}{1+t_1} \end{aligned}$$

$$\begin{aligned} \frac{dp_2}{p_2} &= \frac{{p_2}^e(1+CET) - {p_2}^e(1+t_2)}{{p_2}^e(1+t_2)} = \frac{CET-t_2}{1+t_2} \\ &= \frac{dt_2}{1+t_2} \end{aligned}$$

[3]Since the after-union tariff is zero for good 1 and CET for good 2, dt_1 represents the change in tariffs due to joining the customs union.

where t_1 and t_2 are tariff rates including all the import duties for member and non-member countries, respectively.

Since expressions for changes in trade flows are obtained in equations 5.5, 5.6 and 5.7, we can define the trade creation and diversion using these expressions. Trade creation occurs when there is an increase in imports from member countries that is not existent before the formation of customs union. The measure of it is taken as the value of that increase in imports calculated by using the after-union price of good 1.[4] Now recall that the change in imports from member countries was found to be in equation 5.5 as

$$dQ_1 = (\mu_{11}\frac{dp_1}{p_1} + \mu_{12}\frac{dp_2}{p_2})Q_1$$

Inserting equivalents of $\frac{dp_1}{p_1}$ and $\frac{dp_2}{p_2}$,

$$dQ_1 = (\mu_{11}\frac{dt_1}{1+t_1} + \mu_{12}\frac{dt_2}{1+t_2})Q_1$$

Then, trade creation becomes,

$$TC = \frac{p_1}{1+t_1}(\mu_{11}\frac{dt_1}{1+t_1} + \mu_{12}\frac{dt_2}{1+t_2})Q_1$$

where t_1 represents the pre-union tariff rate on good 1 and $\frac{p_1}{1+t_1}$ represents the after-union price of good 1, or export price of good 1 since tariffs on imports from member countries will be removed.

Trade diversion takes place when there is a switching of imports from non-member countries to imports from member countries (or from good 2 to good 1). If the good in consideration were a homogeneous one, then trade diversion would be the value of pre-union imports from non-member countries, if after union price of imports from member countries is less than the tariff included price of imports from non-member countries. However, the good in consideration is a differentiated one. Then, trade diversion becomes the value of change in imports from non-member countries which is calculated using the after-union prices of good 2. The after union price of good 2 is therefore

$$p_2{}^e(1 + t_2') = \frac{p_2}{1+t_2}(1 + t_2')$$

[4]See also [22]

where t_2' is the after-union tariff rate on good 2.

Recall that the change in imports from non-member countries was calculated in equation (5) as

$$dQ_2 = (\mu_{21}\frac{dp_1}{p_1} + \mu_{22}\frac{dp_2}{p_2})Q_2$$

Then, trade diversion becomes

$$\begin{aligned} TD &= \frac{p_2}{1+t_2}(1+t_2')dQ_2 \\ &= \frac{p_2}{1+t_2}(1+t_2')(\mu_{21}\frac{dt_1}{1+t_1} + \mu_{22}\frac{dt_2}{1+t_2})Q_2 \end{aligned}$$

The empirical estimation of trade creation and diversion will involve estimates for compensated price elasticities. In the following section, these elasticities will be estimated by making regression for demand functions.

5.2 The Model for Estimating Elasticities

In order to estimate demand elasticities, in an n good economy, one possible way is to estimate a demand function for good i of the form

$$Q_i = c_i m^{\eta_i} e^{rt} \prod_{j=1}^{n} p_j^{\epsilon_{ij}} \qquad (i,j = 1,\ldots,n) \qquad (5.8)$$

where

Q_i : quantity demanded of good i

c_i : a constant $(i = 1,...,n)$

p_j : price of good j $(j = 1,...,n)$

ϵ_{ij} : price elasticities $(i,j = 1,...,n)$

r : time elasticity of demand

m : total expenditure

η_i : income elasticity of demand for good i $(i = 1,...,n)$

t : time

In estimating such a system of demand equations, we may have the simultaneous equation bias since price is also determined by supply side in reality. This is a drawback of such an estimation. However, this problem can be resolved if demand equation can be identified from the data. Demand equation can be identified if (i) factors other than prices in demand function varies less than the corresponding factors of supply equation, or (ii) market is not in equilibrium such that demand is less than supply at market price, or (iii) supply curve is infinitely elastic.

In this study, it is assumed that the market for domestically produced goods is not in equilibrium due to insufficient demand; and in the market for imported goods, supply curves for imported goods are infinitely elastic. Therefore, there will be no simultaneous equation bias in estimations. As seen in figure 5.1, since the market for domestically produced goods is not in equilibrium (quantity demanded, Q_D, is less than the quantity supplied, Q_S, at the market price P_M, quantity sold in market represents the quantity demanded. For imported goods, as in figure 5.2, quantity imported does not affect prices since supply curve is infinitely elastic, and quantity demanded (Q^*) at equilibrium price (P^*) represents the quantity sold in the market.

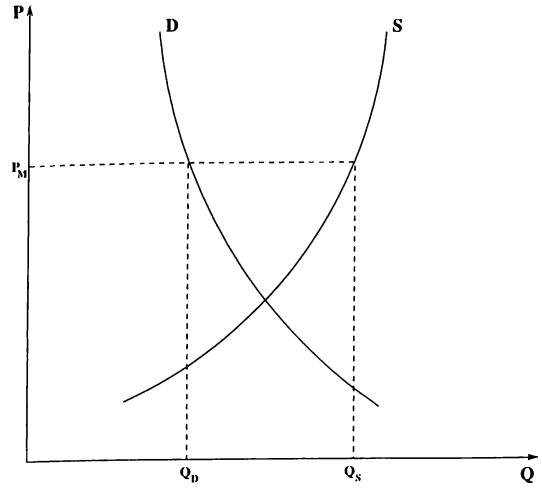

Figure 5.1: Insufficient demand for domestically produced goods

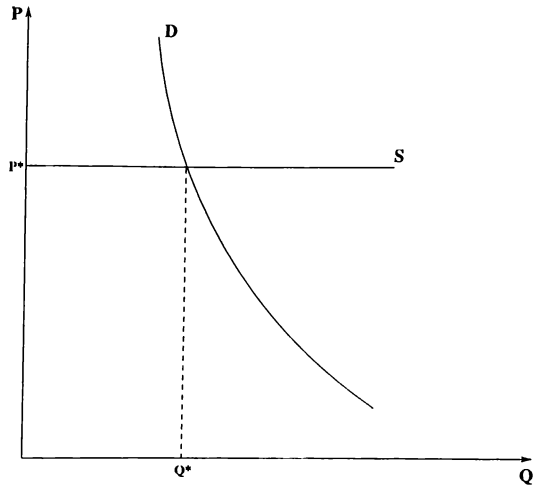

Figure 5.2: Infinitely elastic supply curve for imported goods

Throughout the estimation, for demand equations of each good, a form such as in equation 5.8 will be used except the time variable. It is assumed that there is no change in tastes during the period analyzed. Taking the logarithm of equation 5.8, the demand function for good i is

$$logQ_i = c_i + \eta_i logm + \sum_{j=1}^{n} \epsilon_{ij} logp_j \qquad (i,j = 1,\ldots,n) \qquad (5.9)$$

Among n commodities, some unrelated goods can be excluded from the analysis of good i due to negligible cross price elasticities. However, their total income effect is not negligible. Therefore, we should proceed by defining the Slutsky[5]

$$\epsilon_{ij} = \mu_{ij} - \eta_i k_j \qquad (i,j = 1,\ldots,n) \qquad (5.10)$$

where

μ_{ij} : compensated price elasticity.

k_j : expenditure share of good j.

Note that the condition of being homogeneous of degree zero for compensated elasticities can be written by using only price elasticities as:

$$\sum_{j=1}^{n} \mu_{ij} = 0$$

[5]See Stone(1954) for details

Then inserting equation 5.10 into equation 5.9 yields,

$$logQ_i = c_i + \eta_i(logm - \sum_{j=1}^{n} k_j logp_j) + \sum_{j=1}^{n} \mu_{ij} logp_j$$

We can think

$$\sum_{j=1}^{n} k_j logp_j$$

term as the weighted mean of log prices, hence it can be perceived as the price index, p. Then

$$logQ_i = c_i + \eta_i log(\frac{m}{p}) + \sum_{j=1}^{n} \mu_{ij} logp_j$$

Now we can eliminate unrelated goods because we have included the income effect of such price changes by using the Slutsky formula.

Now take a group of commodities, automobiles, which contains three goods. Then demand of automobile i is only affected by prices of automobiles and total expenditure on n goods in the economy. In fact we can extend this by saying we have only three types of automobiles that are the ones from group of countries 1, group of countries 2 and group of countries 3. By defining the first, the second and the third group of countries as member, non-member countries and home country, respectively, this analysis becomes compatible with the model of trade creation and diversion. Hence there are three demand equations to be estimated:

$$logQ_1 = c_1 + \mu_{11} logp_1 + \mu_{12} logp_2 + \mu_{13} logp_3 + \eta_1 log(\frac{m}{p}) \tag{5.11}$$

$$logQ_2 = c_2 + \mu_{21} logp_1 + \mu_{22} logp_2 + \mu_{23} logp_3 + \eta_2 log(\frac{m}{p}) \tag{5.12}$$

$$logQ_3 = c_3 + \mu_{31} logp_1 + \mu_{32} logp_2 + \mu_{33} logp_3 + \eta_3 log(\frac{m}{p}) \tag{5.13}$$

where $\frac{m}{p}$ is the index of real expenditures.

We should have the condition that demand function is homogeneous of degree zero in prices, i.e. compensated price elasticities for each good should sum to zero:

$$\sum_{j=1}^{n} \mu_{ij} = 0 \qquad (i = 1, \ldots, n)$$

After the estimation procedure, this condition should be checked for each good to exclude the money illusion from demand function.

Regression is carried out with quarterly data of variables for periods between 1982 and 1994, and data is seasonally adjusted.

Since there are three equations to be estimated and these are demand functions of related goods, the regression is done simultaneously for three equations. The main advantage of such a system regression is that since errors of each equation is most probably correlated with each other, system regression allows one to take into account this relationship and improve the efficiency of estimation. Hence the regression procedure employed in this model is the SUR (Seemingly Unrelated Regression) method applied to the three demand equations simultaneously. The SUR method first carry out OLS estimation procedure applied to each equation separately, and from those first iteration coefficient estimates residuals are constructed. The coefficients are then revised in a second iteration to take into account the covariance between equation residuals. Results of this regression is tested for significance using t-statistic. In order to determine the degree of collinearity in the regression, R^2, is checked. It measures the percentage of variability in the data explained or accounted for by the regression model. Moreover, test of autocorrelation is done by using Durbin-Watson statistic and Box-Pierce Q-statistic.

The next section includes information on data used for empirical estimations.

5.3 Data

The estimation of trade creation and diversion involves the use of quarterly data on tariffs, prices, quantities for automobile group and on real GNP. The sample period is chosen to be 1982-1994. Prices and quantities are collected for three groups of countries: member countries, non-member countries and the home country, Turkey.

For the import data, quantities measured in number of automobiles and values of imports in USD for each country is obtained from State Institute of Statistics (SIS) [13]. For periods 1982-1985, products in category *87.02.11* is chosen for the product group used in this study. Categories for periods 1985-1988 and 1988-1994 are chosen to be *87.02.22* and *87.03*, respectively. The switching in categories is due to changes in numbering system of SIS. Import prices from different sources are calculated by dividing the value of imports by quantity of imports from each group of country.

For domestically produced automobiles, values in TL and quantities are obtained from SIS [15] under the category 3843. Values are converted to USD using the exchange rate series (186..RF.ZF...) in International Financial Statistics published by IMF [16]. Prices of domestically produces automobiles are calculated using the same method for imported goods.

Actual and planned tariff rates on automobiles imported from member and non-member countries are obtained from Automotive Manufacturers Association (AMA) [2]. Tariff rates include public housing fund on imported goods.

The general production index is used as the proximate for real GNP, since quarterly GNP data for Turkey is not published between 1982-1987. The general production index series are obtained from SSI [14].

Series for prices, quantities and production index are given in appendix A.

5.4 Regression Results

In table 5.1, empirical results of the regression on system of demand equations 5.11, 5.12 and 5.13 are summarized:

Equation	Coefficient	Value	t-statistic	R^2	Durbin-Watson
5.11	c_1	-1.59	-1.59	70%	1.36
	μ_{11}	-1.91	-6.95		
	μ_{12}	-0.82	-3.66		
	μ_{13}	2.38	4.98		
	η_1	3.09	5.05		
5.12	c_2	-8.63	-4.73	79%	1.02
	μ_{21}	-1.34	-2.66		
	μ_{22}	-2.15	-5.24		
	μ_{23}	3.59	4.12		
	η_2	5.57	4.98		
5.13	c_3	-1.91	-5.78	95%	1.56
	μ_{31}	-0.09	-0.98		
	μ_{32}	-0.15	-1.96		
	μ_{33}	0.47	2.96		
	η_3	2.68	13.2		

Table 5.1: Regression results

As seen in table 5.1, there is autocorrelation in equation 5.11 and 5.12. DW-statistics for these equations are below the lower limit of DW (D_L=1.40). For equation 5.13, regression yielded the DW-statistic which is in between the lower and upper limits of DW (D_U=1.72). Hence, the test is inconclusive for equation 5.13.

The autocorrelation problem is solved by taking the difference of each equation. The demand for good 1 can be rewritten using time subscripts as

$$logQ_{1,t} = c_1 + \mu_{11} logp_{1,t} + \mu_{12} logp_{2,t} + \mu_{13} logp_{3,t} + \eta_1 log(\frac{m}{p}),_t \qquad (5.14)$$

If we carry this equation one period backward and multiply with ρ_1 (the correlation coefficient for good 1),

$$\begin{aligned} \rho_1 logQ_{1,t-1} &= \rho_1 c_1 + \rho_1 \mu_{11} logp_{1,t-1} + \rho_1 \mu_{12} logp_{2,t-1} + \rho_1 \mu_{13} logp_{3,t-1} + \\ &\quad \rho_1 \eta_1 log(\frac{m}{p}),_{t-1} \end{aligned} \qquad (5.15)$$

Now subtracting equation 5.15 from equation 5.14 yields the following difference equation:

$$\begin{aligned} logQ_{1,t} &= \rho_1 logQ_{1,t-1} + c_1(1-\rho_1) + \mu_{11} logp_{1,t} - \rho_1\mu_{11} logp_{1,t-1} + \mu_{12} logp_{2,t} - \\ &\quad \rho_1\mu_{12} logp_{2,t-1} + \mu_{13} logp_{3,t} - \rho_1\mu_{13} logp_{3,t-1} + \eta_1 log(\frac{m}{p})_{,t} - \\ &\quad \rho_1\eta_1 log(\frac{m}{p})_{,t-1} \end{aligned} \tag{5.16}$$

Similarly, difference equations for good 2 and 3 are:

$$\begin{aligned} logQ_{2,t} &= \rho_2 logQ_{2,t-1} + c_2(1-\rho_2) + \mu_{21} logp_{1,t} - \rho_2\mu_{21} logp_{1,t-1} + \mu_{22} logp_{2,t} - \\ &\quad \rho_2\mu_{22} logp_{2,t-1} + \mu_{23} logp_{3,t} - \rho_2\mu_{23} logp_{3,t-1} + \eta_2 log(\frac{m}{p})_{,t} - \\ &\quad \rho_2\eta_2 log(\frac{m}{p})_{,t-1} \end{aligned} \tag{5.17}$$

$$\begin{aligned} logQ_{3,t} &= \rho_3 logQ_{3,t-1} + c_3(1-\rho_3) + \mu_{31} logp_{1,t} - \rho_3\mu_{31} logp_{1,t-1} + \mu_{32} logp_{2,t} - \\ &\quad \rho_3\mu_{32} logp_{2,t-1} + \mu_{33} logp_{3,t} - \rho_3\mu_{33} logp_{3,t-1} + \eta_3 log(\frac{m}{p})_{,t} - \\ &\quad \rho_3\eta_3 log(\frac{m}{p})_{,t-1} \end{aligned} \tag{5.18}$$

This system of demand equations is estimated by using the iterative SUR method which corresponds to the *Asymptotically Full Information Maximum Likelihood* (FIML) estimation in the literature. In this method, SUR method is applied to the non-linear system of equations as previously but number of iterations is more than two in order to achieve convergence for estimates. Table 5.2 represents the estimation results for equations 5.16, 5.17 and 5.17.

Note that the Box-Pierce Q-statistic is included in results instead of DW-statistic to test for autocorrelation since DW-statistic cannot be used for equations with autoregressive terms. The critical values for Q-test are found using the χ^2 values under the null hypothesis of zero autocorrelation with 12 lags and 95% confidence as 4.4 and 23.3. Since Q-statistics for each equation lies in between critical values, the hypothesis of zero autocorrelation is accepted.

Note also that the aim of the regression is just to find reasonable estimates for elasticities to be used in the estimation of trade creation and diversion.

Equation	Coefficient	Value	t-statistic	R^2	Q-statistic(for 12 lags)
5.16	ρ_1	0.46	4.04	74%	20.88
	c_1	-2.73	-1.88		
	μ_{11}	-1.45	-4.69		
	μ_{12}	-0.33	-1.43		
	μ_{13}	1.99	3.33		
	η_1	2.59	3.21		
5.17	ρ_2	0.8	10.94	88%	7.53
	c_2	-15.93	-3.84		
	μ_{21}	0.26	0.58		
	μ_{22}	-0.84	-2.72		
	μ_{23}	3.26	2.92		
	η_2	4.22	2.35		
5.18	ρ_3	0.53	4.08	96%	5.65
	c_3	-2.53	-4.59		
	μ_{31}	0.07	0.74		
	μ_{32}	-0.02	-0.2		
	μ_{33}	0.80	3.25		
	η_3	1.8	4.79		

Table 5.2: Regression results for autoregressive model

Therefore, variables with low t-statistics will not be excluded from the set of explanatory variables in order to obtain at least approximate values for elasticities.

Therefore, we can proceed to test for significance and collinearity in each equation. It will be appropriate to start with equation 5.16.

For imports from member countries, good 1, it is seen in table 5.2 that all of the variables are found to be significant, except for $logp_2$, with a t-statistic of -1.43. This low t-statistic may be interpreted as good 2 is a weak complement for good 1. The autocorrelation coefficient, ρ_1 is found to be significant with an estimate of 0.46. It means that the quantity demanded of the last period affects the quantity demanded this period in such a way that about the half of the demand for previous period enters into the demand function of this period. The coefficient of determination, R^2, for equation 5.16 has been calculated as 74% which is an acceptable result.

As seen in table 5.2, price elasticities are consistent with downward sloping demand curve convention. The own price elasticity is negative and cross price elasticity for an increase in price of imports from non-member countries is negative which means that imported goods from different sources are complements. In fact, imported goods being complements is contrary to the general belief. The cross price elasticity for an increase in price of domestically produced goods came out to be positive which means that imports from member countries and domestically produced goods are imperfect substitutes.

Considering the regression procedure for demand of imports from non-member countries (good 2), which corresponds to the equation 5.17 in the model, all of the variables have found to be significant except for $logp_1$, with a t-statistic of 0.58. This term corresponds to the cross price elasticity between good 1 and good 2, but now the results show that good 1 is a weak substitute for good 2. This is a contradiction with the complementarity result found in equation 5.16. Hence, a Wald test has been carried out to test for the equality of signs of μ_{12} and μ_{21}. Results of the Wald test has shown that compensated cross price elasticities for good 1 and good 2 are symmetric and has a negative value. Therefore, we can say from the result of the Wald test that good 1 and good 2 are complements of each other. The autocorrelation coefficient, ρ_2 is estimated to be 0.8. Moreover, the coefficient of determination is high, with a value of 88%.

In equation 5.18, as seen in table 5.2, the correlation coefficient, ρ_3 is found to be significant with an estimate of 0.53. Among other variables, only $logp_1$ and $logp_2$ have low t-statistics (0.74 and -0.20, respectively). Hence the coefficient of $logp_2$ in the equation for good 3 is came out to be negative, which means that good 2 and good 3 are complements. But in regression results for equation 5.17, we can see that the coefficient of $logp_3$ is positive. Hence, we have again a contradictory result for signs of cross price elasticities. The equality of signes of μ_{23} and μ_{32} is tested using the Wald test and results of the test showed that signs of these coefficients are equal and have a positive value. Therefore, we can say that good 2 and good 3 are substitutes. The measure of collinearity, R^2, has been found to be 96% which is a very high value.

There is a puzzling point in regression results for equation 5.18. The compensated own price elasticity came out to be positive which means that good 3 is estimated to be a *giffen good.* This is contrary to the downward sloping demand curve assumption of the microeconomic theory.

Note that the own price elasticity is positive but small in magnitude (0.8). Hence, we are not in so much trouble. This small positiveness may be due to behavioral misspecifications or violations of ceteris paribus assumptions.

The main behavioral assumption is that consumers are rational and maximize their utilities which depend only on consumption amounts of different goods. However, utility function may also depend on qualitative variables which are hard to include in the analysis. For instance, the utility of an individual may increase if he/she consumes more of a commodity, whose price is increasing, due to some kind of competition among consumers. In particular, the reason may be the Veblen effect[6], in which the quantity demanded is a function of both real and conspicuous prices.

The second possibility is that some ceteris paribus assumptions may be violated. Note that price elasticities are calculated by partially differentiating the demand function with respect to a particular price and other prices and variables are assumed to be constant (ceteris paribus). However, it may be the case that some variables change so as to increase the demand of that good.

According to regression results, therefore, it can be said that good 1 and good 2 are complements of each other,and good 3 is an imperfect substitute for both good 1 and good 2.

In section 5.2, it was mentioned that the sum of compensated price elasticities for a particular good should be equal to zero if money illusion is ruled out. However, regression results reveal that this is not the case. In fact,

$$\mu_{11} + \mu_{12} + \mu_{13} = 0.21$$

$$\mu_{21} + \mu_{22} + \mu_{23} = 2.68$$

[6]See [21] pg.27-27

$$\mu_{31} + \mu_{32} + \mu_{33} = 0.85$$

This result implies that there is money illusion in the demand for all goods. We can say that the demand of imports from non-member countries is the least well-behaved demand function in the sense that sum of compensated price elasticities is the largest one among other demand functions.

In addition to the analysis of results equation by equation, there is the result on the correlation among residuals of equations: It can be seen in ta-

	Eqn. 5.16	Eqn. 5.17	Eqn. 5.18
Eqn. 5.16	1	0.54	0.34
Eqn. 5.17		1	0.24
Eqn. 5.18			1

Table 5.3: Correlation among equations

ble 5.3 that errors of the equation 5.16 and equation 5.17 are fairly positively correlated with a correlation coefficient of 0.54. Hence, some of the causes of regression errors (possibly omitted explanatory variables, random shocks, etc.) in equation 5.16 and equation 5.17 are most probably the same for these two demand functions. In fact, this is not a surprise and an intuitive result since both of these equations are import demand functions. Other relations among equations are weaker than this, with 0.24 for equations 5.17 and 5.18, and 0.34 for equations 5.16 and 5.18.

For all of the goods, income elasticities turned out to be positive and greater than unity, implying that automobiles are luxury goods for the Turkish consumer.

In sum, we have obtained estimates of compensated price elasticities and income elasticities to be used in the estimation of trade creation and diversion. The following section includes empirical results and interpretations for trade creation and diversion.

5.5 Results and Comments

In section 5.1, formulas for estimates of trade creation (TC) and diversion (TD) were derived as

$$TC = \frac{p_1}{1+t_1}(\mu_{11}\frac{dt_1}{1+t_1} + \mu_{12}\frac{dt_2}{1+t_2})Q_1$$

$$TD = \frac{p_2}{1+t_2}(1+t_2')(\mu_{21}\frac{dt_1}{1+t_1} + \mu_{22}\frac{dt_2}{1+t_2})Q_2$$

where Q_1 and Q_2 refers to pre-union quantities for good 1 and good 2; and p_1 and p_2 refers to pre-union prices for good 1 and good 2.

Compensated elasticities, μ_{ij}'s, were estimated in section 5.4 and they are assumed to be constant for the time period analyzed in this study. Hence, in order to calculate trade creation and diversion, we need pre-union values of prices, tariffs and quantities.

As discussed in section 2.1 that estimation of trade creation and diversion will be done for five scenarios about the entrance date and alignment to CET.

Now each scenario will be analyzed starting from the first one.

Scenario 1

In the first scenario, entrance date was assumed to be the beginning of 1995 and external tariffs on imports from non-member countries are not aligned to CET (=10%). For this scenario, pre-union and after-union tariff rates on member and non-member countries are $t_1 = 0.36$, $t_1' = 0$; and $t_2 = 0.445$, $t_2' = 0.272$[7], respectively. Prices of imported goods just before the entrance date, fourth quarter of 1994, are $p_1 = \$20933$ and $p_2 = \$7923$, respectively.

The pre-union quantities of imports, Q_1 and Q_2, correspond to imported quantities in the last quarter of 1994. Since we estimate trade creation and diversion for the first quarter of 1995, these values are adjusted for the first quarter using seasonality factors and yielded $Q_1 = 1230$ and $Q_2 = 2138$.

[7]Actual tariff rate on 01/01/1995

Therefore, trade creation and diversion in the first quarter following the entrance to customs union for the first scenario are

$$TC = \$8.01 \text{ million}$$

$$TD = \$0.47\text{million}$$

Note that trade diversion is calculated to be positive which means that there is no welfare worsening diversion of imports. A positive trade diversion is observed here since good 1 and good 2 are found to be complements. If automobiles were homogeneous goods, then trade diversion would become negative in each case since goods would be perfect substitutes of each other and all price changes are negative. Indeed, the positive trade diversion improves the welfare by \$0.47 m. Therefore, net welfare change, ΔW, is equivalent to

$$\Delta W = TC + TD = \$8.48 \text{ million}$$

Scenario 2

In the second scenario, it was assumed that the entrance date is the beginning of 1995 and external tariffs are aligned to CET.Hence, $t_1 = 0.36, \quad t_1' = 0$;and $t_2 = 0.445, \quad t_2' = CET = 0.10.$

Pre-union prices and quantities are the same as in the first scenario. Therefore, trade creation and diversion are

$$TC = \$8.76 \text{ million}$$

$$TD = \$1.70 \text{ million}$$

Again trade diversion becomes positive which implies trade expansion instead of diversion. The net welfare change, is equivalent to

$$\Delta W = \$10.46 \text{ million}$$

Note that aligning the CET improves welfare compared to not aligning.

Scenario 3

In the third scenario, it was assumed that the entrance date is the beginning of 1996 and external tariffs are not aligned to CET and remains constant at its 1995 value. Hence, $t_1 = 0.275, \quad t_1' = 0$; and $t_2 = 0.272, \quad t_2' = 0.272$.

Pre-union prices corresponding to the fourth quarter of 1995 (pre-union prices) are estimated by regressing prices on time and then these estimates are seasonally adjusted for the first quarter. Hence, pre-union prices are $p_1 = \$9550$ and $p_2 = \$2188$.

Pre-union quantities are forecasted using the regression on demand equations 5.16, 5.17 and 5.18. After being seasonally adjusted, pre-union quantities become $Q_1 = 14454$ and $Q_2 = 30200$.

Then, trade creation and diversion for the first quarter of 1996 become

$$TC = \$33.86 \text{ million}$$

$$TD = \$ - 3.71 \text{ million}$$

Note that trade diversion for this scenario came out to be negative. It means that there is a welfare worsening switch from good 2.

Hence, net welfare change can be measured as

$$\Delta W = \$30.15 \text{ million}$$

Scenario 4

In the fourth scenario, the entrance date is again the beginning of 1996, but external tariffs are aligned to CET. Therefore, pre-union and after-union tariffs are $t_1 = 0.275, \quad t_1' = 0$; and $t_2 = 0.272, \quad t_2' = 0.10$. Initial prices and quantities are the same as in the third scenario.

Therefore, trade creation and diversion are

$$TC = \$38.69 \text{ million}$$

$$TD = \$3.32 \text{ million}$$

Trade diversion is yielded to be positive (contrary to the case for the third scenario) which improves the welfare. Hence, net change in welfare for the first quarter of 1996 is

$$\Delta W = \$42.01 \text{ million}$$

Scenario 5

In the fifth scenario, it was assumed that tariffs on member countries were removed at the beginning of 1996 and tariffs on non-member countries are aligned to CET at the beginning of 2000. Hence, $t_1 = 0$, $t_1' = 0$; and $t_2 = 0.272$, $t_2' = 0.10$

Pre-union prices and quantities are estimated by the same method employed for the third scenario. Estimated prices and quantities for the fourth quarter of 1999 are

$$p_1 = \$1778,\ p_2 = \$2291$$
$$Q_1 = 446684,\ Q_2 = 112202$$

Therefore, trade creation and diversion for the first quarter of 2000 are

$$TC = \$35.44 \text{ million}$$

$$TD = \$25.25 \text{ million}$$

Then, net welfare change for the first quarter of 2000 is equivalent to

$$\Delta W = \$60.69 \text{ million}$$

Therefore, we have estimated trade creation and diversion for each scenario. Comparison of these scenarios will be based on quantities demanded and welfare changes which are adjusted to prices of 1995 with an average inflation rate of 3% for USD. Table 5.4 summarizes the results of this section:

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
t_1	36	36	27.5	27.5	0
t'_1	0	0	0	0	0
t_2	44.5	44.5	27.2	27.2	27.2
t'_2	27.2	10	27.2	10	10
$p_1(\$)$	20933	20933	9550	9550	1778
$p_2(\$)$	7923	7923	2188	2188	2188
Q_1	1230	1230	14454	14454	446684
Q_2	2138	2138	30200	30200	112202
dQ_1	520	569	4520	5165	19993
dQ_2	86	310	-2157	1930	14019
dQ_3	-790	-673	-1285	-1055	373
TC(\$ m.)	8.01	8.76	33.86	38.69	35.44
TD(\$ m.)	0.47	1.70	-3.71	3.32	25.25
ΔW(\$ m.)	8.48	10.46	29.27	40.79	52.35

Table 5.4: Comparison of trade and welfare changes among scenarios

It can be seen in table 5.4 that change in demands of imported goods are positive for all scenarios except the third one. Recall that tariffs on non-member countries are not reduced in this scenario so as to align to CET. Moreover, demand of domestically produced goods decreases in all scenarios except the fifth one. This result is intuitive since it is assumed that there is no change in prices of good 3 in all scenarios. The positive change in demand of good 3 in scenario five seems to be due to a smooth entrance to customs union with four year delay for alignment to CET.

As seen in table 5.4, net welfare change is the largest for the fifth scenario. Therefore, within the framework of this study, it can be concluded that the fifth scenario which involves tariff removals for imports from member countries in 1996, and alignment to CET for imports from non-member countries in 2000 is the most appropriate one among other scenarios if welfare effects are considered.

5.6 Concluding Remarks

This study has shown that customs union of Turkey and EC in automobiles will yield a substantial gain in welfare for Turkey in all of scenarios about the entrance date and alignment of external tariffs to CET. The largest gain in welfare is in the fifth scenario in which tariffs on members are removed in the beginning of 1996 and tariffs on non-members are aligned to CET in the beginning of 2000. In fact, this is the most expected scenario to be implemented by Turkey and EC on automobiles.

Moreover, estimated changes in quantities demanded has shown that the change in quantity demanded for domestically produced automobiles is positive only in the fifth scenario. This can be interpreted as a policy implication that, there is no need to subsidize the TAI only in scenario five. In other scenarios, the TAI should be subsidized in such a manner that the fall in demand for domestically produced automobiles in the short-term will not increase average cost of production further.

However, one should note that this study examines only static effects of customs union on TAI and does not take into account changes in prices of domestically produces goods due to dynamic effects such as increased competition, stimulus to technical change, etc. If price of domestically produced goods also decreases, then net welfare changes in all scenarios will fall due to decreased trade creation effects.

Within the framework of this study, results indicate that the establishment of customs union in automobiles will lead to welfare improvements for Turkey, contrary to the general belief that customs union will worsen the welfare position of Turkey.

Appendix A

Data Used in Estimations

Quarter	Q_1	Q_2	Q_3	p_1	p_2	p_3	$\frac{m}{p}$ (Production Index)
1982-1	660	148	5158	5359	9571	6303	65.10
2	433	111	10792	5493	9554	6147	67.10
3	729	47	7797	4902	7094	5936	69.00
4	610	56	6904	5016	5216	5695	80.20
1983-1	736	155	8984	5340	9601	5787	71.90
2	502	154	11717	5864	10456	5766	73.40
3	872	32	9669	4478	5579	5463	73.90
4	715	51	12237	4380	5920	4947	85.50
1984-1	1170	52	13693	4248	4294	4487	80.80
2	1151	211	15647	5847	3551	4309	79.90
3	1950	1523	11108	4082	3030	4206	81.60
4	1530	1260	14330	4395	3248	4033	95.90
1985-1	1667	1099	13817	4642	2733	4214	80.50
2	1877	1272	16083	5386	2651	3649	84.10
3	1624	2343	13571	6006	2243	4573	90.40
4	1004	1794	16806	7692	2922	4622	103.00
1986-1	837	1948	18361	7866	4019	5028	90.50
2	379	790	21774	10385	4191	4927	94.50
3	812	826	17547	9800	4278	5238	102.50
4	562	811	24335	12077	3718	5400	112.50
1987-1	375	208	25211	11675	6403	5516	99.00
2	276	348	27707	12377	4528	5709	104.80
3	915	746	23095	10834	8089	6159	109.30
4	986	1239	32220	14771	5106	6336	129.00

1988-1	732	1495	33146	12809	3066	7034	112.70
2	600	374	33712	14416	5311	7226	107.70
3	530	188	23891	11852	7817	6606	110.50
4	453	220	28996	13361	5313	6470	118.50
1989-1	346	108	25486	11494	10125	7062	108.60
2	559	426	30209	14813	5175	6864	109.50
3	765	644	23885	14324	4367	7461	119.50
4	2762	1239	38781	17988	5583	7631	127.90
1990-1	3495	2974	41889	17693	4795	8572	120.70
2	6629	11602	43397	14246	4280	9060	120.10
3	6169	18552	32499	12079	5478	9020	130.20
4	8058	14736	47952	9584	6470	9882	139.70
1991-1	1211	8621	33524	16358	5868	9513	117.80
2	2241	6103	50494	11981	6332	8708	122.10
3	1068	5892	46733	14738	6717	8349	138.70
4	1815	6738	64582	17530	5310	8909	144.40
1992-1	1503	6161	66082	14923	5587	8952	129.70
2	2046	8501	66018	13693	5358	8672	128.00
3	1515	10687	54427	14025	5371	9375	143.60
4	2703	17381	78702	19464	5480	9436	147.70
1993-1	2215	15334	79188	14057	5254	10024	134.00
2	4683	21338	86245	13088	5508	10068	143.90
3	5044	20092	71583	11093	5504	9955	156.30
4	10198	23732	106427	12316	6416	9740	161.10
1994-1	4326	9057	74196	10642	5248	8076	142.10
2	2832	678	37285	6923	10168	5875	131.40
3	931	2768	42440	17362	9265	7750	142.60
4	1709	2939	53345	20933	7923	7893	153.20

Table A.1: Quarterly data on quantities, prices and production index

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