THE J CURVE AT THE INDUSTRY LEVEL: AN EXAMINATION OF BILATERAL TRADE BETWEEN TURKEY AND GERMANY

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ABSTRACT

THE J CURVE AT THE INDUSTRY LEVEL:
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BETWEEN TURKEY AND GERMANY

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This thesis examines the relationship between the bilateral real exchange rate and the trade balances of 20 industries in which majority of the trade between Turkey and her leading partner Germany is carried out, both for the short and long run, in search of the existence of any J-curve effect. Using quarterly data over the period 1989:1-2011:3, the relationship is analyzed empirically through the bounds testing approach to cointegration and error correction modeling. The findings show that, although the pattern created by a depreciation does not follow the complete J curve in any of the industries, still the exchange rate as well as foreign and domestic real incomes are effective determinants of bilateral trade balance between Turkey and Germany in majority of the cases both in the short and in the long run. Moreover, this thesis provides strong support for the assertion that at the disaggregate level industries exhibit unique and distinct trade balance responses to exchange rate fluctuations, by showing that these responses vary significantly across different sectors both in the short and long run.

Keywords: Trade balance, exchange rate, sectoral J curve, HS chapters

ÖZ

ENDÜSTRİ SEVİYESİNDE J EĞRİSİ:
TÜRKİYE VE ALMANYA ARASINDAKİ
İKİLİ TİCARETİN BİR İNCELEMESİ

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Bu çalışma, ikili reel döviz kuru ve Türkiye'nin birinci ticaret ortağı Almanya ile ticaretinin büyük çoğunluğunun yapıldığı 20 endüstrideki ticaret dengesi arasındaki ilişkiyi, J eğrisi etkisinin varlığını araştırmak amacıyla, gerek kısa gerek uzun dönem için incelemektedir. Bu ilişki, 1989:1-2011:3 dönemi için çeyreklik veriler kullanarak, eşbütünleşme ve hata düzeltme modellerine sınır testi yaklaşımı aracılığıyla ampirik olarak analiz edilmiştir. Bulgular, devalüasyon neticesinde hiçbir endüstride tam bir J eğrisi oluşmamasına rağmen; döviz kuru, yerel ve yabancı reel gelirin, hem kısa hem de uzun dönemde bir çok endüstride Türkiye ve Almanya arasındaki ikili ticaret dengesi üzerinde etkili faktörler olduğunu göstermektedir. Ayrıca bu tez, ticaret dengesinde döviz kuru dalgalanmalarına karşı oluşan tepkinin endüstriler arasında özgün ve ayrı olduğu iddiasını, her sektörün gerek kısa gerekse uzun dönemde önemli farklılıklar sergilediğini göstererek, güçlü bir şekilde desteklemektedir.

Anahtar Kelimeler: Ticaret dengesi, döviz kuru, sektörel J eğrisi, HS fasılları

To my mom, up in the sky,

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CHAPTER 1

INTRODUCTION

Economies attempt to smooth out their trade deficits through the adoption of expenditure reducing policies, such as contractionary fiscal or monetary policies; or via expenditure switching policies such as devaluation of the currency or real depreciation (Bahmani-Oskooee and Ratha, 2008). Focusing on the latter economic policy tool, a real devaluation of the domestic currency is regarded as a remedy for the trade deficit according to the famous Marshall-Lerner (ML) condition under which a depreciation will result in an improvement in the trade balance in the long run, as long as export and import volumes are sufficiently elastic with respect to the real exchange rate.

This relationship between the trade balance and the exchange rate movements is of remarkable importance, especially for developing countries, as they experience balance of payments crises frequently which are generally accompanied by considerable real depreciations. For small open economies whose progresses are highly related to the export revenues, the link between these two variables becomes crucial as the variations in the export turnovers caused by adverse exchange rate changes may obstruct their economic growth. Moreover, competitiveness of these newly emerging countries in international trade is also massively affected by exchange rate changes, which directs them to adopt exchange rate policies with the aim of enhancing their competitiveness (Bahmani-Oskooee and Kutan, 2009). Thus, analyzing the interconnectedness between the exchange rates and the trade balance along with measuring the extent of this tie possess great importance, particularly for emerging economies such as Turkey[1].

As long as the ML condition holds, the trade balance is expected to improve following a real currency depreciation in the long run, as the export prices will decrease in the overvaluing foreign currency while the import prices will increase in the devalued domestic currency. The emergent favorable volume changes are expected to cause export revenues to exceed import expenses, and eventually the trade balance is anticipated to

[1] Turkey is classified as one of the 150 emerging and developing countries in International Money Fund's World Economic Outlook, April 2012.

improve. However, as primarily put forward by Magee (1973), the response of the trade balance in the very early periods of the depreciation may be disappointing due to some characteristics of the trade patterns of the country, before ending up favorably. To express briefly, if imports of the country are invoiced mostly in foreign currency on the previously signed contracts and exports are contracted in domestic currency, the imports will cost more in domestic currency after devaluation while the exports value does not change, as the contracted volumes remain constant. As a result, due to the stickiness of the pre-contracted prices, the trade balance initially deteriorates following a depreciation of the domestic currency. In time, the post devaluation contracts begin to be made under new exchange rate, volume adjustments start to take place and consequently quantity of imports decreases while that of exports rises, which in the end ameliorates the trade balance. The initial deterioration in the trade balance resulting from the price effect of depreciation which is pursued by the improvement dominated by the volume effect constitutes a path reminiscent of a J letter, and thus named as J-curve. Detecting whether the J letter shaped response is inherent in a country's trade balance would enable the policy makers to have insights about the timing of the expected improvement and the preceding worsening; and consequently to adjust the relevant policy actions accordingly. Therefore, the major area to focus on when implementing a trade policy is recommended to be this likely detrimental short run dynamics, rather than solely aiming at the long run favorable effect.

While the eventual impacts of the exchange rate movements on the trade balance can be assessed by estimating the ML condition[2] alone, the researchers have started to attach the short run dynamics to the long run analysis and examine the existence of the J curve empirically since the introduction of the phenomenon. The studies contributing to the foundation of the theory along with most of the earlier empirical works all employed trade data at aggregate level, i.e. studied the total trade flows of a country with the rest of the world[3]. However, as initially pointed by Rose and Yellen (1989), researchers have noticed that aggregation of the trade data may conceal the underlying individual and distinct dynamics of the two-sided relationships that may lead to false inferences at the general

[2] Rose (1990, 1991), Bahmani-Oskooee and Niroomand (1998).

[3] Junz and Rhomberg (1973), Miles (1979), Himarios (1985, 1989), Bahmani-Oskooee (1985, 1989, 1992, 1995), Krugman and Baldwin (1987), Felmingham (1988), Noland (1989), Rose (1990, 1991), Bahmani-Oskooee and Malixi (1992), Bahmani-Oskooee and Alse (1994), Kim (1995), Demirden and Pastine (1995), Zhang (1996), Gupta-Kapoor and Ramakrishnan (1999), Leonard and Stockman (2002), Bahmani-Oskooee and Kutan (2009).

level, obscuring the implications of the bilateral level. Hence, many of the relatively recent works preferred to employ bilateral trade data, measuring a country's trade balance with a single country or country group[4]. In addition, especially very recent studies have started to disaggregate the trade data further at industry or commodity level, with the purpose of discovering the differences in the industry/commodity specific response dynamics to the exchange rate movements, which are expected to vary significantly[5]. The majority of the existing literature on industry/commodity level studies is conducted bilaterally as well.

The studies examining the existence of the J curve for Turkey[6], which are few in number, are generally conducted at aggregate level, while only Halicioglu (2007, 2008a), Keskin (2008) and Celik and Kaya (2010) provide bilateral analysis. However, to the best of our knowledge, there exist solely two studies (Yazici and Klasra (2010), Keskin (2008)) which examine the Turkish trade data at industry level; but are regarded to be limited with respect to disaggregation, in the sense that only two or three sectors are investigated. Consequently, this study, acknowledging the disadvantages of aggregation, aims to take a step in filling the gap in the existing literature by conducting a relatively more elaborate J curve analysis on the Turkish trade balance which is disaggregated at both country and industry levels.

For the analysis of bilateral Turkish J curve at the industry level, the trade with Germany, which has traditionally been the leading trading partner of Turkey, is examined. Having at least around 10% annual shares each year in both Turkish imports and exports, and consequently in total trade, Germany is the number-one and the most influential trading partner of Turkey. Therefore, trade with Germany is thought to be a good representation of Turkey's trade pattern and thus analyzed to have insights about the responses of Turkish

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[4] Rose and Yellen (1989), Marwah and Klein (1996), Bahmani-Oskooee and Brooks (1999), Wilson and Tat (2001), Wilson (2001), Onafowora (2003), Arora, Bahmani-Oskooee and Goswami (2003), Bahmani-Oskooee and Goswami (2003), Bahmani-Oskooee and Ratha (2004b, 2007, 2008), Bahmani-Oskooee, Goswami and Talukdar (2005, 2008), Bahmani-Oskooee, Economidou and Goswami (2006), Bahmani-Oskooee and Harvey (2006), Bahmani-Oskooee and Wang (2006).

[5] Meade (1988), Carter and Pick (1989), Doroodian, Jung and Boyd (1999), Breuer and Clements (2003), Bahmani-Oskooee and Ardalani (2006, 2007), Baek (2006), Bahmani-Oskooee and Wang (2007a, 2007b, 2008), Bahmani-Oskooee and Mitra (2008, 2009), Bahmani-Oskooee and Hegerty (2008), Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee and Satawatananon (2010).

[6] Rose (1990), Bahmani-Oskooee and Malixi (1992), Bahmani-Oskooee and Alse (1994), Brada, Kutan and Zhou (1997), Kale (2001), Akbostanci (2004), Halicioglu (2007, 2008a, 2008b), Keskin (2008), Bahmani-Oskooee and Kutan (2009), Yazici and Klasra (2010), Celik and Kaya (2010).

trade balance to changes in the exchange rate. Moreover, the industry level is incorporated through the use of the commodity breakdown of the total trade with Germany according to the Harmonized System (HS). The top 20 HS chapters that have at least 1% share in total trade volume of Turkey with Germany is chosen to be analyzed, which altogether comprises 86% of the total trade realized between Turkey and Germany in the period 2000-2010. This study aims to reveal the short run dynamics as well as the long run relationship between the trade balances of these 20 chapters and the value of Turkish Lira against Euro. Through this analysis, the current study investigates the existence of J curve at the industry level for Turkey's trade with Germany.

In order to investigate the trade balance dynamics separately for each of the studied chapters, the trade balance equation is constructed following the commonly adopted partial reduced form model of Rose and Yellen (1989) where the trade balance is a function of real exchange rate, real foreign income and real domestic income. As long as the ML condition holds, the bilateral real exchange rate (defined as the units of domestic currency (Turkish Lira) per units of foreign currency (Euro)) is expected to have a significantly positive coefficient in the long run. However, the J curve phenomenon requires having significantly negative coefficients followed by positive ones in the short run, as real depreciation is expected to deteriorate the trade balance in the earlier periods but to ameliorate thereafter in time. Moreover, regarding the domestic and real income variables, no a-priori expectations are determined as they can either have negative or positive coefficients depending on whether demand side factors outweigh the supply side factors or vice versa in trade between Germany and Turkey.

For the estimation of this model for each of the 20 chapters in search of the J curve, the Autoregressive Distributed Lag (ARDL) approach to cointegration and error correction modeling developed by Pesaran, Shin and Smith (2001) which is called the ARDL bounds-testing approach is employed. ARDL bounds testing approach is advantageous as it does not require the variables to be integrated of the same order, thus suitable for stationary, integrated of order one or a combination of both variables. However, most importantly, bounds testing approach incorporates the short run dynamics into the long run model and enables them to be estimated simultaneously, which makes it an appropriate method for the analysis of J-curve. Estimations are carried out by employing the most appropriate values of parameters which are determined through voluminous grid searches by means of

E-views codes written especially for this purpose. Furthermore, results are subject to several diagnostic checks in order to assure validity to the greatest extent possible.

To sum up, this study is basically expected to carry out a J curve analysis examining the trade balance of a sufficiently high number of industries traded between Turkey and her outstanding partner Germany, which will constitute the most disaggregated study conducted up to now. To this end, the foundation of the theory of J curve and a detailed literature review with brief discussions on every phase of its history is presented in Chapter 2. In Chapter 3, the scope of the analysis regarding the selection of partner country and the industry group to be studied are explained, the model adopted is introduced as well as information on data characteristics are given. Chapter 4 provides the econometric technique followed and presents the obtained empirical results. Finally, the discussion and the concluding remarks are summarized in Chapter 5.

CHAPTER 2

A LITERATURE REVIEW: J CURVE

The relationship between the trade balance and the exchange rate fluctuations has been subject to noteworthy interest by researchers, while seeking for a remedy to eliminate the trade deficits. The intuition behind this lies in the well known Marshall-Lerner (ML) condition which asserts that a devaluation will result in an improvement in the trade balance in the long run, provided that the sum of the demand elasticities of imports and exports exceeds unity[7]. However, although the trade balance is anticipated to improve in response to a real currency depreciation, there are some circumstances that arises immediately after the depreciation and cause the trade balance to deteriorate initially before getting better eventually. To express shortly the common belief that is formed with the findings of the articles that are reviewed in this chapter, the very first effect of a depreciation is observed on the increased value of imports, as the export and import volumes are contracted in advance and cannot change immediately. Since the pre-contracted imports will cost more in domestic currency while the value of exports stay almost the same, the trade balance will deteriorate initially in response to a depreciation. However, as time goes by, both producers and consumers adjust to the new relative prices; volumes start to respond to the altered exchange rate once the new contracts are signed; and thus imports decline while exports rise ameliorating the trade balance ultimately. The initial worsening followed by improvement in the trade balance generates a time path where the preceding section resembles to a J letter and this phenomenon is consequently called the J curve.

The underlying set of reasons that give rise to the J shaped response in the trade balance is first raised by Magee (1973) and this theoretical basis is enlarged by the contributions of Junz and Rhomberg (1973) and Arndt and Dorrance (1987). These constitutive works created the abovementioned today's textbook definition of J curve and they are reviewed in detail in Section 2.1.

[7] Provided that the country in question initially has a balanced trade.

Although the long run effects of the exchange rate changes on the trade balance are traditionally assessed by estimating the abovementioned ML condition[8], the researchers have started to incorporate the short run response into the long run framework and investigate the J curve empirically beginning from the mid 1970's after the phenomenon is introduced. The literature now encapsulates various studies assessing the long run and the short run dynamics of the trade balance in relation to the changes in the exchange rate. These usually belong either to the category of studies employing the aggregate trade data or to the category of studies that disaggregate the data with respect to bilateral trade relations or with respect to commodity or industry levels. The studies that are regarded to be the theoretical initiators of the J curve phenomenon and the relatively earlier followers of them usually employ the trade data at aggregate level, while the studies employing disaggregate data happen to be the more recent works.

In this Chapter, firstly the theoretical fundamental studies of the J curve are presented, then the following empirical works at the aggregate level are reviewed in Section 2.2. In Section 2.3, the J curve studies at the disaggregate level are presented, classified as the studies employing bilateral trade data or the studies employing the trade data at industry/commodity levels. Finally, Section 2.4 conveys an overview of the articles examining the Turkish J curve.

2.1. The Theoretical Milestones

The roots of the J curve phenomenon, which can be defined using the motto 'things may get worse before they get better' by Arndt and Dorrance (1987), is regarded to be originated by the work of Magee (1973). Magee presents the primary analysis on the short run dynamics of the trade balance as a result of currency depreciation, while seeking answers to the empirical question of why the US trade balance deteriorated so much in 1972 despite the devaluation of the dollar in 1971. Although he tried to attribute the worsening in the trade balance to the fact that US industrial production growth was faster than that of foreign world, he also recognized the fact stated by Junz and Rhomberg (1973) which points to the lags needed for the real exports to expand and the real imports to retard. Thus, while explaining what happens in the short run following a devaluation, he defines three subsequent periods: a) *the currency contracts period* which refers to the time section that comes immediately after a devaluation in which the contracts signed before the

[8] Examples of the studies estimating ML condition: Rose (1990, 1991), Bahmani-Oskooee and Niroomand (1998).

devaluation fall due, b) *the pass through period* in which the prices on contracts that are signed following devaluation are reshaped but the quantities are not affected yet, and c) *the quantity adjustment period* in which quantities ordered are modified sluggishly.

The consequences of the currency contract period are ascribed to the choice of the economic agents about in which currency, foreign or the domestic one, to make the payments while signing the contracts. While a seller (an exporter) is expected to prefer to receive payments in the currency anticipated to strengthen, a buyer (an importer) is expected to make the imports in the currency anticipated to weaken in order to acquire a capital gain or to avoid a capital loss. Besides the impact of the expectations, the relative market power of the trading countries is also determinative of the currencies in which the contracts are denominated. Magee (1973) highlights the fact that as the countries are prone to have more specialization in their exports compared to that in their imports, they are expected to have more market power in their export markets than in import markets.

If the contracts are denominated in foreign currency, in the period when a devaluation takes place after the contracts are entered into but the payments hasn't been done yet (namely, the currency contract period), domestic exporters would gain as the price of exports rises in domestic currency while staying unchanged in foreign currency. However, if the contract is denominated in the domestic currency, then the foreign importers will gain by importing the same quantity for less foreign currency. In the imports side, if the contracts are signed in foreign currency, the domestic importers would need to pay much in domestic currency for the same amount of foreign currency. But if the contracts are in domestic currency, then the domestic importers will pay the same amount of domestic currency while the foreign exporters are gaining less.

Starting with this logic, Magee (1973) studies all possible outcomes of the trade balance in foreign or domestic currency as a result of all four binary combinations of exports and imports contracted in foreign and domestic currencies. As a result of this analysis, it is concluded that a necessary condition for the trade balance in domestic currency to decline initially, which corresponds to the necessary condition for the initial part of the J curve to occur, is that the domestic importers contract their orders in foreign currency. Regardless of whether the trade balance is defined in domestic or in foreign currencies, the devaluation of the domestic currency results in a deterioration in the trade balance if the imports are denominated in foreign currency whereas the exports are contracted in domestic currency. Consequently, it is stated that as the share of the import contracts denominated in foreign currency increases relative to that of export contracts, the likelihood that the trade balance deteriorates following a devaluation in the currency contract period rises.

Once the period of currency contracts are over, the international prices of the post-devaluation contracts start to reflect the impacts of the devaluation. For the devaluation to be regarded as 'successful', the domestic currency price index of imports is expected to rise in the countries whose currencies are devalued, and to fall in the overvaluing countries. Successful 'pass through' in a situation where the ordered quantities remain unchanged yet, implies a deterioration in the trade balance in the very short run which would result in a favorable outcome in the end.

The constancy of the quantities in the pass through period is attributed either to the perfectly inelastic supply as the exporters cannot instantly modify their sales abroad or to the perfectly inelastic demand as the importers feel the need to have some time in order to substitute their choice of commodities or change the flow of orders. After examining all the possible inelastic supply and demand conditions for the domestic exports and imports, it is concluded that the situation where both domestic import and export demand are perfectly inelastic causes a full pass through in both sides, preparing a favorable set up for the quantity adjustment period. On the other hand, the case where both export and import supplies are relatively inelastic in the short run would result in an improvement in the trade balance in the pass through period.

Finally, what happens in the pass through period determines the final response of the trade balance to the devaluation and the dynamics of this response. Since both the domestic import and export demand curves tend to be inelastic in the short run, following a devaluation export values in domestic currency will decrease while there will be a rise in the domestic currency import values. However, in the long run the elasticities improve enabling the ML condition to be met and cause the trade balance to ameliorate. In other words, the short run domestic import and foreign export demand elasticities are lower compared to the medium and long term ones; as a result, it takes time for devaluation to create expected improvement in the trade balance (Felmingham, 1988). Magee (1973) suggests that since the buying patterns of the countries do not change in the brief period right after the devaluation and since the trade balance may deteriorate initially as the price effects outweigh the volume effects; the time-path of the trade balance response to a devaluation could have a shape resembling the letter J.

Similar to Magee (1973), Junz and Rhomberg (1973) also address the retarded trade effects created by the changes in relative prices and in doing so, they claim that the timing of these effects can take longer than the expected 18 or 20 months as there exists some lags in the adjustment process. They define *the recognition lag* as it takes time for the traders to perceive the changed competitive situation because of obstacles to spread of information; *the decision lag* as new orders take time to be arranged and formed; *the delivery lag* occurring as the import payments are only made when the goods ordered are received; *the replacement lag* needed for the inventories to be used up before new goods are bought; and finally *the production lag* as the producers need some time to convince themselves that the new situation is profitable enough to produce again. As a result of these lags, they argue that the timing of the trade effects following relative price changes should be measured in years rather than in quarters.

On the other hand, Arndt and Dorrance (1987), in their paper where they discuss the phenomenon of J curve in an elaborate and unprecedented approach, take the event and explain what happens from the export and import sides separately. For the export side, the *small country* assumption is addressed which asserts that in a country which is so small to affect its foreign currency prices of exports and imports so that it is a price taker in the international trade, a devaluation of the domestic currency does not affect the terms of trade which in turn means that J curve does not occur in these countries. Since devaluation raises the foreign price of the small country's tradables, this stimulates the domestic production of the goods traded which in turn expands the export volume while contracting the import volume. This causes an improvement in the small country's balance of payments; however since the foreign currency prices of tradables do not change, no J curve effect occurs.

In light of this discussion, the J curve effect is stated to be relevant only for the *large countries*, and this case is explained from two different perspectives: *cost based export prices* brought forward by the British definition of the J curve, and *the forward contracts* referring to the currency contract period of Magee (1973). The former approach claims that if a large country exports manufactures of which they can price on a cost plus basis, following a devaluation although their domestic currency prices do not change, their foreign currency prices will cheapen. Although the countries will be encouraged to increase their exports volume with the expectation of expanded market shares, before the volume effect sets in, exports in decreased prices deteriorates the terms of trade and the balance of payments temporarily. On the other hand, according to the forward contracts approach, similar to the explanation of Magee (1973), occurrence of J curve is grounded on the *stickiness* of export prices in domestic currency appearing in former contracts. Thus, following a depreciation, if the export contract prices are denominated in domestic currency (and import contracts in foreign currency), then foreign currency import prices do not change but domestic importers will pay more in domestic currency; and since export prices in domestic currency do not change, country's terms of trade deteriorates until the exports volume expands sufficiently. At this point, similar to Magee (1973), they also relate the currency in which the contract price is denominated to the relative bargaining power and exchange rate expectations of buyers and sellers.

Arndt and Dorrance (1987) also mention that a devaluation happening in a country whose current account is already in deficit, widens the gap further as imports are initially greater than exports even if the domestic currency price of imports and exports rise proportionately, and a fortiori if the domestic price of exports rise less; which in turn raises the J curve effect even for the small countries.[9] Moreover, a J curve can be observed in a small country especially when the initial trade deficit is combined with sufficiently low short run demand and supply elasticities in the country[10] (Wilson and Tat, 2001).

The studies reviewed this far contribute by their implications and findings to the forming of the textbook definition of the J curve. The standard assumptions underlying the classic J curve definition then agreed to be: a) import prices increase instantly while the export prices remain unchanged, being sticky[11], b) import volumes begin to decrease after some lags while export volumes begin to rise after some lags similarly (Bahmani-Oskooee and Ratha, 2004a, p.1380). This classis definition also necessitates the export prices to be contracted in domestic currency while imports should be signed in foreign currency for the

[9] In addition, Arndt and Dorrance (1987) suggest that in order to close the external account gap resulted from the J curve, real domestic spending should be reduced.

[10] However, if there is initially surplus the conditions for a depreciation to improve trade balance holds regardless of the values of the elasticities.

[11] However, although the traditional approach of J curve assumes that after a devaluation, import prices increase immediately while imported quantities adjust gradually, Bacchetta and Gerlach (1994) rejects this approach. They oppose to this hypothesis by claiming first that the adjustment of the import prices are in fact slow and second that it is optimal for firms if there is gradual pass through of exchange rate changes to prices when demand adjusts slowly to price fluctuations. With this point of view, they show that J curves can also arise if import prices adjust slowly while quantities are adjusting freely. By this way, they claim that when import prices are sticky, consumers reallocate their purchases over time as they begin to expect future rises in import prices due to the devaluation, which in the end leads to the appearance of a J curve.

J curve to appear, as previously discussed. Nevertheless, for a *small* country such as Turkey whose exports and imports are contracted in foreign currency[12], occurrence of J curve still can be possible according to Arndt and Dorrance (1987), as Turkey has been experiencing trade deficits constantly each year since 1947.

2.2. Empirical Studies at the Aggregate Level

In the literature, there exist numerous studies which aimed at understanding the J curve phenomenon following the implications of the above mentioned constitutive papers and expanding them with their novel contributions. The prominent examples of the empirical studies employing aggregate level data are enlisted below chronologically in two groups, according to the number of countries under examination:

2.2.1. Aggregate Level Studies Examining A Set of Countries:

To begin with, in their empirical practice Junz and Rhomberg (1973) aim to figure out a) the timing of the relative price changes impacts on the export flows, b) whether there exists any different responses that occur when the price changes are of different kinds. By using annual data over the period 1953-1969 for 13 countries[13], they calculated the price elasticities of market shares by exploring lags of up to five years. They found that response of the trade flows to relative price changes take more time than often assumed which amounts generally up to 4-5 years. They also found that 50% of the effects occur during the first three years while 90% accumulates during the first five years. Finally, they noted that the response of the trade flows to the exchange rate changes is very similar to the response to price changes measured in local currency.

Miles (1979) criticizes the previous studies[14] for failing to show whether an improvement in the trade balance is temporary or permanent, for not comparing the periods before and after the devaluation and for not taking into account the effects of alternative variables such as government's monetary and fiscal policies to avoid holding responsible solely the devaluation for all of the changes in the foreign accounts. For these drawbacks,

[12] In 2010, 48% of Turkish exports were invoiced in Euro, while 45% were carried out in US dollars. Similarly, 34% of Turkish imports same year were contracted in Euro while 61% were signed in US dollars. Moreover, only 2% of the exports and 3% of imports in 2010 were conducted in domestic currency, Turkish Lira. (Authors calculations based on TURKSTAT data)

[13] Austria, Belgium-Luxemburg, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, UK, US.

[14] Examples to such studies as stated by Bahmani-Oskooee and Ratha (2004a): Cooper (1971), Connolly and Taylor (1972), Laffer (1976), Salant (1976).

Miles investigates not only the effects but also the longer run impacts of devaluation to compare with the dynamics of the accounts prior to the devaluation. Furthermore, he incorporates exogenous variables other than devaluation into the analysis.

Moreover, Miles (1979) argue that, if devaluation causes a noteworthy improvement in the trade balance, this should be statistically observable regardless of which theoretical approach is adopted. For this reason, he examines the relation of devaluation both with the trade balance and balance of payments regardless of any theoretical approach grounding with several tests by using annual data from 14[15] countries over the period 1956-1972. The test results indicate that devaluation does not improve trade balance but improves balance of payments. In addition, even including the leads and lags of the exchange rate variable does not provide evidence of a positive effect of devaluation on trade balance, while providing evidence of an improvement in balance of payments.

However, in contrast to Miles' findings, adopting a similar framework, Himarios (1985) manages to show that the devaluations have favorable effects on the trade balance as expected traditionally (Bahmani-Oskooee and Ratha, 2004a). Himarios (1985) criticizes Miles's work for several issues[16] and unlike Miles, adopts one of the approaches namely the absorption approach and models the trade balance in real terms in relation to domestic and foreign income, money, government expenditure, opportunity cost of money and real exchange rate using data over 10 countries[17]. His findings indicate that real devaluations do in fact improve the trade balance.

While these three studies examine the long run effects of a deprecation, Bahmani-Oskooee (1985) is regarded to be the first to present a method designed to detect the existence of the J curve phenomenon (Bahmani-Oskooee, Goswami and Talukdar, 2008). He tries to investigate the validity of the J curve event over 4 developing countries: Greece, India, Korea and Thailand which have different exchange rate regimes, using quarterly data for the 1973-1980 period. He extended Krueger's (1983, p.33) multiplier based model of

[15] Costa Rica, Denmark, Ecuador, Finland, France, Guyana, Iceland, Ireland, Israel, New Zealand, Philippines, Spain, Sri Lanka, UK

[16] Himarios (1985) criticizes Miles's work by claiming that a) the results are sensitive to measurement units, b) domestic and foreign variables may have different impacts on trade balance, c) real exchange rate is the one affecting the trade balance rather than the nominal counterpart, d) the lags of exchange rates does matter and finally e) examining the effects on the trade balance on the average does not reveal the same results by examining the effects on the average trade balance.

[17] Costa Rica, Ecuador, Finland, France, Iceland, Israel, Philippines, Spain, Sri Lanka, UK

exchange rate effects on trade balance by including world income and monetary variables representing both home and world. In order to assess the J curve phenomenon, he imposed an Almon lag structure on the exchange rate variable where the long run or the steady state effects of depreciation are gathered by the sum of the lag coefficients of exchange rate. Additionally, he defines the real exchange rate as units of foreign currency per unit of domestic currency, while most of the studies in the literature prefer to use the definition the other way around. The results indicate that J curve is observed in Greece, India, and Korea, while trade balances of these countries continue to deteriorate in the long run following a devaluation as well. Thailand's trade balance however improves in the short run following a devaluation and deteriorates in the long run.

Bahmani-Oskooee (1989) corrects the definition of the exchange rate of the previous article and redefines it as the number of domestic currency per unit of foreign currency as the exchange rate variable is deflated by the domestic price level. Therefore the sign of the real exchange rate variable is expected to be positive in the long run and to have negative signs in the short run to generate the J curve. He reestimates the same equation for the same time period using the new definition. It is found that the trade balances of all four countries improve first and then deteriorate following a devaluation forming a so called 'inverse J curve'. In addition, only for Thailand the long run relation between the devaluation and the trade balance is positive.

Later, Himarios (1989) provides new evidence about the effectiveness of devaluation in trade balance adjustment through two channels: a) whether a nominal devaluation successfully alters the real exchange rate and b) whether trade flows respond to real exchange rate changes so that volume responses can be induced. By this way, it can be determined whether an unsuccessful devaluation is due to its inability to change real exchange rate or because of inelasticity of trade flows. By employing trade data for two sample periods including different sets of countries, Himarios (1989) examines the relationship between real and nominal exchange rates through correlation coefficients and finds a close association between nominal and real exchange rates. Through further examination, Himarios found that the devaluations altered the real exchange rate over a policy-relevant two to three years in the two sample periods. In order to test the sensitivity of trade flows to relative price changes, Himarios employs a model where trade balance is explained by real incomes, real government expenditures, real money balances, opportunity cost of holding money of both domestic and foreign country, the real exchange rate and the expected devaluation for one unit further period.[18] In the first sample of Bretton Woods period 1953-1973, when the cumulative effects are in question, over 80% of the cases, the real exchange rate is found to have a significant effect on trade balance, where in majority of these cases this effect is positive. But, only for the UK, J curve is observed. Himarios also tested for the direct effects of nominal exchange and found that in over 85% of the cases, the cumulative nominal exchange rate has a significant effect on trade balance. As he found that no significant differences appear between the nominal and real specification of exchange rate, for the second sample period 1975-1984, he estimates the trade balance equation using nominal exchange rates for a different group of countries. In this period, similar to the first period, devaluation was found to significantly affect trade balance in over 80% of the cases while J curve evidence was found in Ecuador, France, Greece and Zambia.

On the other hand, Rose (1990) uses a nonstructural model which requires fewer assumptions than the structural approach does and produces estimates that can more easily be tested. He explains the trade balance as a function of the real exchange rate, measures of domestic and foreign incomes. Over the period 1970-1988, he investigates the impact of the real exchange rate changes and the sign of the cumulative effect of this change over the trade balances of 30 developing countries including Turkey. He found that the trade balance is not significantly affected by the real exchange rate changes for 28 countries, except for Tanzania and Tunisia; while the cumulative effect is different than zero for only Tanzania with a sign of deterioration on the trade balance in case of a depreciation. The change of data frequency from annual to quarterly, does not alter the conclusion.

In the subsequent work of Rose (1991), this time he broadens the econometric approaches employed and tests the hypothesis that the exchange rate is not a significant determinant of the trade balance in the Bickerdike-Robinson-Metzler model by means of conventional regression techniques along with some non parametric methods on the monthly data for 5 OECD countries: the UK, Canada, Germany, Japan and the US. In order to solve the simultaneity problem, narrow money and the short term interest rate are used as instrumental variables for the real exchange rate, while in order to solve the dynamics problem a variety of different lag lengths was employed. While the results do not reveal a

[18] Since Himarios (1985) had criticized Miles (1979) for using the ratio of trade balance to income as the dependent variable, in this work he draws attention to the use of the trade balance merely (Bahmani-Oskooee and Alse, 1994).

strong relationship between exchange rate and trade flows, it is found that these results do not stem from the unnecessary inclusion of short run dynamics in the equation that would mask the longer run tendencies. Even when a completely non-parametric approach is employed, still no evidence could be found indicating that the exchange rate is a significant determinant of the trade balance. In summary, despite the generality of the techniques used, the data do not seem to be able to reject the hypothesis that the generalized ML condition does not hold.

Criticizing the studies that have employed bilateral exchange rates while assessing the dynamics of the trade balance such as those of Miles (1979) and Himarios (1989), Bahmani-Oskooee and Malixi (1992) prefer to employ real effective exchange rates in the analysis of how the trade balance of 13 developing countries including Turkey[19] are affected by their movements. They relate the trade balance defined as the ratio of exports over imports to real domestic and world outputs, the real effective exchange rate, real domestic and world money supply. They include an Almon lag structure for the real exchange rate variable to account for the short run effects while the sum of these lag coefficients are giving the long run effect. For the period of 1973:1-1985:4, they found that the classic J curve is observed only for Brazil, Greece, India and Pakistan. Similar to Magee (1973), they also detected trade balance responses having shapes of different letters such as N, M, I, while an inverse N is detected for Turkish curve which shows that the Turkish trade balance deteriorates initially following a real depreciation and then improves for a while but concludes with deterioration in the end. They also found that including Turkey for 8 of the 13 countries depreciation has long run favorable effects on the trade balance.

Bahmani-Oskooee and Alse (1994) draws attention to the problematic use of macroeconomic variables with unit roots by comparing the examples of the study of Miles (1979) where first differenced, stationary data were employed against the study of Himarios (1989) using non-stationary level data. They claim that employing nonstationary data renders the use of standard critical values invalid in drawing conclusions; therefore the studies handling nonstationary data such as Himarios (1989), Bahmani-Oskooee (1985) and Moffett (1989) are suggested to be disregarded.

Bahmani-Oskooee and Alse (1994) reexamine the long run and the short run relation between the trade balance and the exchange rate for 19 developed and 22 less

[19] Brazil, Dominican Republic, Egypt, Greece, India, Korea, Mexico, Pakistan, Peru, Philippines, Portugal, Thailand, Turkey

developed countries including Turkey over the period 1971:1-1990:IV by using the Engle and Granger cointegration and error-correction modeling method. They define the trade balance variable as the ratio of imports over exports following Haynes and Stone (1982) and they justify this choice by stating that a) the ratio is not sensitive to measurement units and that b) it can be interpreted in real as well as in nominal terms as regardless of the choice of a price index, the ratio will not change. They found that devaluations have a long run favorable effect on the trade balance of Netherlands, Brazil, Costa Rica, Singapore, and Turkey, while a negative impact on Ireland's. From the error correction model estimates, they find evidence of J curve effect for Costa Rica, Ireland and Singapore by defining the phenomenon as observing some worsening of the trade balance before improving. However, Turkey possesses the characteristics of the exact definition of the J curve effect, having a trade balance which directly worsens following a depreciation and keeps improving in the subsequent periods.

A different approach compared to the previous empirical works was employed by Leonard and Stockman (2002) in order to examine the statistical relationships between exchange rates, current accounts and cross country ratios of GDP. They analyzed this relation using some basic statistical nonparametric methods rather than conventional econometrics analysis to allow for nonlinearities, and to minimize the statistical assumptions in order to deeply study the basic aspects of the data. They found some weak evidence of J curve, although it is not consistent with the theoretical J curve definition.

Lately, Bahmani-Oskooee and Kutan (2009) investigate the existence of J curve in 11 east European emerging economies mostly consisting of new European Union (EU) members or candidate countries[20], by using monthly aggregate data over the period 1990:1-2005:6. The countries are said to have the characteristics of small open economies which rely heavily on export turnovers in order to assist the economies' growth. Therefore, they claim that the relationship between exchange rates and trade flows is a very important concern, as the fluctuations in the export revenues resulting from detrimental exchange rate movements may pose an obstacle to their economic integration with the EU. They further mention that competitiveness is also massively affected by exchange rate changes in these newly emerging economies. They state that, especially the new member countries of the EU

[20] The countries are: Cyprus, the Czech Republic, Hungary, Poland and Slovakia which are EU members; Bulgaria, Croatia, Romania, and Turkey which are candidate countries to the EU in the study period, and Russia and Ukraine.

started to adopt exchange rate policies in order to enhance their competitiveness in their trade to the EU. Thus, they point to the importance of empirical studies trying to answer the question whether the exchange rate changes affected the trade flows or not. They found that only for Hungary, the J curve is observed. Moreover, when the J curve effect is defined as negative short run effects combined with long run positive effects, it is found that the short run effects last into the long run in a favorable form for only Bulgaria, Croatia and Russia.

2.2.2. Aggregate Level Studies Examining Single Countries

While the previous articles were examining the J curve at aggregate level, in this Chapter, the studies analyzing the phenomenon on a single country are presented. Among the single country studies, the majority consists of the articles investigating the US case, while there exist a few examples focusing on other countries merely.

2.2.2.1. Studies Examining the US

Similar to the starting point of Magee (1973), Krugman and Baldwin (1987) also analyzed the persistence of the US trade deficit in spite of devaluation. They examine three most influential explanations to the failure of trade deficit to improve despite the depreciation of the US dollar. They are a) that the dollar has not really fallen against a broad basket of currencies, b) that improvement of trade balance depends on a function of foreign economic growth rather than the dollar and finally c) that trade balances reflect differences between income and spending where exchange rates are irrelevant. By estimating some reduced form equations, Krugman and Baldwin (1987) concluded that most of the US trade deficit is due to faster demand growth in US than in other countries and the lagged effects of the strong dollar (Bahmani-Oskooee, 1992).

Another study which tries to explain the structure of US trade balance is the study of Bahmani-Oskooee (1992), where he tries to find out which of the three policy tools regarding a country's balance of payments explains the long run dynamics of the US trade balance while its relationship with many macroeconomic variables such as money supply, interest rate, exchange rate and terms of trade are also investigated. The approaches at issue are as follows: *Elasticity approach* identifies the exchange rate as a significant determinant of trade balance and regards the devaluation as a tool to handle the trade deficit. *The Keynesian income approach* sees the economic activity which is measured by domestic income as a major determinant of the trade balance and suggests to decrease the level of domestic income in order to reduce the trade deficit. Finally, *monetary approach* claims that any balance of payments deficit is a result of excess money supply and to reduce this deficit, offers the use of monetary policies. For the emprical analysis, in order to represent the external balance of US, trade balance and current account are employed. To stand for the fiscal policy, he choses the full employment budget; for monetary policy two definitions of money supply : M1 and M2 were used. Finally, in order to account for the elasticity approach he employed real and nominal effective exchange rate and terms of trade. Using Engle-Granger cointegration approach, it is found that full employment budget representing the fiscal policy has a positive long run relationship with the current account and the trade balance, while a rather weak sign of a negative long run relationship between M2 representing the money supply and the trade balance also was found. However, they found that neither nominal and real effective exchange rate nor the terms of trade have a long run relationship with either the current account or the trade balance. Therefore, they conclude that commercial policies such as import tariffs or export subsidies altering the terms of trade may have short run effects but they don't have any long run effects.

However, on a comment note written in response to Bahmani-Oskooee's (1992) paper, Kim (1995) argues that Bahmani-Oskooee (1992) used an hypothesis testing method which he found to be outdated and inefficient. Kim (1995), by employing more up-to-date methods concludes findings contrary to Bahmani-Oskooee's (1992). He criticizes the tests employed by Bahmani-Oskooee for having a bias towards the acceptance of the null hypothesis as well as having low power. By using a newer test of stationarity, out of 12 time series which are concluded to have unit roots by Bahmani-Oskooee (1992), 3 are found to be stationary. Furthermore, by applying a more up-to-date method of cointegration (Johansen and Juselius (1990)), he concluded that trade balance does not have a long run relationship with the full employment budget as Bahmani-Oskooee (1992) found, and that both current account and the trade balance have a long run relation with the money supply (M2) and the terms of trade, contrary to what Bahmani-Oskooee (1992) claimed.

In response to Kim (1995), Bahmani-Oskooee (1995) extends his previous work of 1992 by testing the stationarity of the time series with a different method and supports his previous findings. He then argues that Kim (1992) did not use the same data although the definitions adopted are the same. So Bahmani-Oskooee (1995) tested his data with Kim's (1995) Johansen-Juselius technique and found that, contrary to his own previous work, all three policies, fiscal, monetary and commercial, has long run relations with the current account, while the fiscal one (full employment budget) is the most significant determinant.

Another US J curve study, Demirden and Pastine (1995), draws attention to the correct estimation of J curve as it is of substantial importance considering the implications of the conclusions drawn from the outcomes. They state that although the Ordinary Least Squares (OLS) estimation is appropriate to test the J curve phenomenon, in a flexible exchange rate regime, the feedback effects of exchange rate on the other determinants of trade balance should also be taken into account. Since these feedback effects are not incorporated in OLS estimation, they offer a means of econometrics which includes these mutual effects of trade balance changes on exchange rate and other relevant explanatory variables. They offer Sim's (1980) vector autoregression (VAR) analysis since it explicitly endogenizes all variables with a model free method. In order to demonstrate the importance of conducting a method which includes the feedback effects, they employ an example using US quarterly data for 1978-1993 covering the flexible exchange rate period[21]. The OLS results reveal that no J curve pattern emerges for the data in hand, whereas VAR method shows a J curve pattern through impulse response function. They conclude that feedback effects can be economically important and can change the results of empirical studies.

On the other hand, some studies detected a response in the US trade balance that has the shape of a J letter only after a passage of some time, known to be the 'delayed J curve' phenomenon. Delayed J curve is attributed to the fact that certain assumptions of the classic J curve definition may not be met for the countries in hand for the study period reflecting that pass through of the devaluations to the prices, especially to the import prices, cannot be complete. Rosensweig and Koch (1988), Wassink and Carbaugh (1989) and Mahdavi and Sohrabian (1993) constitute examples of the studies finding evidence of the delayed J curve for the US (Bahmani-Oskooee and Ratha, 2004a).

2.2.2.2. Studies Examining Other Countries Separately

The following are the reviews of some sample studies concentrating on the J curve of a single country, such as Felmingham's (1988) examination on Australia. Although the Australian dollar depreciated against the currencies of major partners in 1984, trade deficit had not shown a sustained improvement for two years. Felmingham explains this by the J-curve notion and tests this by fitting an unrestricted distribution lag model relating the current Australian 'inverse' trade balance defined as a ratio of imports to exports, to the

[21] They construct an n^{th} order vector autoregression, by endogenizing trade balance, real exchange rate and domestic income while assuming foreign income as exogenous.

current and lagged values of terms of trade[22], domestic and foreign incomes, for the period 1965:1- 1985:2, using data in nominal terms. Moreover, similar to the definition by Arndt and Dorrance (1987), Felmingham regards Australia as a small country as the majority of export contracts are denominated in a foreign currency. In order to account for the structural changes and policy corrections during 1965:1-1985:2, Felmingham constructs three periods in which there exists the same exchange regime: fixed exchange rate era (1965:1-1974:3), managed floating era (1974:4 and 1983:4), and an extended period including the free floating from 1974:4 to 1985:2. For the fixed exchange rate period although there is some evidence of an Australian J curve, still it is not strong and the lagged improvement on trade balance is very long, taking more than 2 years. This can be regarded as an indication of a delayed J curve which is yet inconclusive. In the era of managed and free floating periods, there is no evidence of an Australian J curve. Felmingham reports the major result of the study as: the Australia's low import and export demand elasticities are responsible for the absence of an improvement in trade balance as a result of depreciation.

Noland (1989), one of the Japanese J curve studies, firstly states that most of the previous studies have 'misspecified' the adjustment of trade volumes to changes in relative prices by letting the income and price changes to affect trade models contemporaneously or to have the same lag pattern, which leads to small or statistically insignificant elasticities to be obtained. For this reason, he made use of gamma distributed lag models as they allow the price and income effects to be spread over time. Noland (1989) estimates export demand, export supply and import demand functions by using the incomes in each country, the domestic price levels and the rest of the world export price as the exogenous variables for the period 1970:1-1985:4 for the Japanese trade. It is found that the income variables tend to have short lags while the relative price variables have longer lag structure. Responses of import demand to the changes in relative prices are slower, with an average of 9 quarters. The reason for this thought is stated to be that raw materials constitute a large part of Japanese imports having relatively small short run price elasticities of substitution which would generate the slow adjustment of imports to changes in relative prices. It is expressed that the short run elasticity of trade balance with respect to currency devaluation shows a deterioration in trade balance in case of devaluation, while that of long run shows

[22] However, at this point the inclusion of the terms of trade variable could be subject to criticism as the changes in this variable may not attest the changes in the exchange rate. For this reason, Bahmani-Oskooee and Ratha (2004a) suggest the exchange rate to be included in the model estimated directly.

improvement in trade balance. Therefore, Japanese trade balance exhibits the J curve pattern, reaching balance in between 7 to 8 quarters.

Another study that also employs the Japanese trade data is the J curve estimation of Gupta-Kapoor and Ramakrishnan (1999). Using an error correction model, they try to determine whether Japanese exports and imports possess the J curve characteristics during the flexible exchange rate regime (1975:1-1996:4) while a VAR and impulse response function are used in order to take into account the feedback effects between the exchange rate and the trade balance. They use nominal variables by stating that 'the j curve is a nominal phenomenon'. Since the nominal effective exchange is defined as the value of the domestic currency in terms of units of foreign currency, an increase in this measure means an appreciation of the domestic currency yen. Thus, they investigate the effects of an appreciation rather than depreciation. Additionally, since the trade balance is constructed as a ratio of imports over exports, a currency appreciation is expected to result in a decrease in trade balance due to the *price effect* in the short run, while it is expected to turn positive in the long run due to the *volume effect*. The impulse response function indicates that the nominal data follow the J-curve pattern. The period of the short-run deterioration in the trade balance follows the conventional wisdom that it will last for about 1 year where by the sixth quarter the decline is fully recovered. The estimation of an error correction model with the real variables also indicates that a J-curve exits with the real variables as well.

On the other hand, Zhang (1996) investigates the relationship between the exchange value of the Chinese Renminbi (RMB) and Chinese trade balance in order to examine the causality between parties and the direction. They found that the exchange value of RMB is cointegrated with the trade balance, meaning a long run stable relationship exists between the variables. The results of the causality tests reveal that changes in the trade balance Granger-cause changes in the exchange rate supporting the modern theory which gives weight to intertemporal shocks and exogenous supply shocks in explaining trade imbalances rather than the J curve hypothesis. However, the results fail to provide support for the presence of J curve in China's trade balance as no evidence of exchange rate changes Granger-causing changes in trade balance was found. They also looked for the causal relationship between prices and export/import volumes as exchange rate affects volumes through prices but they could not find evidence of causal relation from the prices to the volumes but have found that the opposite holds. Additionally, they found strong bidirectional relation between the real exchange rate and the price components of the trade balance supporting the belief that devaluation of Chinese currency is rather inflationary such that it may not improve the exports.

2.2.3. Brief Discussion on the Aggregate Level Studies

The studies carried out at the aggregate level convey mixed results, but mostly show that the exact J curve is observed for a limited number of countries, corresponding generally to a small portion of the country-set under study. Moreover, while for some countries, more than one articles can reveal the same J curve effect such as for Greece and Japan[23]; for some countries the findings of different studies contradict, as is the case for Turkey, India and the US[24]. Thus, it can be said that time periods analyzed and the techniques used in the examination of J curve matters and leads to different inferences.

2.3. Empirical Studies Employing Trade Data at Disaggregate Level

All of the studies presented in the previous section conduct their analysis making use of aggregate data; in other words, they all employed measures belonging to macroeconomic indicators of a country vis-à-vis the rest of the world. However, the trade balance of a country can be positive in the trade with one country, while with the others trade deficits may be experienced (Bahmani-Oskooee and Brooks, 1999). On the other hand, the response of the trade balance to the real exchange rate changes may vary by country according to the nature of trade (Rose and Yellen, 1989). For these reasons, aggregating the trade data could mask the underlying individual and distinct dynamics of the two-sided relationships, which would lead to wrong conclusions at the general level, neglecting the implications of the bilateral level. With this motivation, the studies that are presented in the following section which are relatively recent works all prefer to employ bilateral data, measuring a country's trade balance with a single country or country group.

In addition, especially very recent studies have started to disaggregate the trade data further, by examining the bilateral trade relation of a country with her partner with respect to commodities or industries. Studying the bilateral trade data in the commodity level helps

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[23] The J curve effect was found for Greece by Himarios (1989) and Bahmani-Oskooee and Malixi (1992); and for Japan by Noland (1989) and Gupta-Kapoor and Ramakrishnan (1999).

[24] While Bahmani-Oskooee and Malixi (1992) find existence of an inverse J curve for Turkey, Bahmani-Oskooee and Alse (1994) find an exact J curve. While Bahmani-Oskooee (1989) finds evidence of inverse J curve for India, Bahmani-Oskooee and Malixi (1992) find support for J curve. Similarly, while Demirden and Pastine (1995) detect a J curve in US trade; several studies find existence of delayed J curve.

to lessen the aggregation bias one step further besides making it possible to draw more to-the-point conclusions. In the following second subsection, examples to the studies employing commodity/industry level data are presented.

2.3.1. The Studies Employing Bilateral Trade Data

The work of Rose and Yellen (1989) is regarded to be the first empirical study to employ the disaggregated, bilateral-level trade data. Besides lowering the aggregation bias, Rose and Yellen (1989) states that the bilateral analysis is advantageous further as constructing a proxy for the rest of the world variable is not required, which is considered to be ad hoc and misleading according to Bahmani-Oskooee and Brooks (1999). Additionally, Carter and Pick (1989) mentioned that the more disaggregate the better, because as Rose and Yellen (1989) argue, the fewer measurement problems occur when the J curve effect is estimated with disaggregate data compared to aggregate data. On the other hand, the advantage of the bilateral approach is expressed by Wilson and Tat (2001) as that it avoids the asymmetric response of trade flows to exchange rate changes across countries.

Rose and Yellen (1989) examines if the J curve exists for American bilateral trade with the other members of Group of Seven (G-7) in the period 1963-1988, while aggregate data was also employed for purposes of comparison. The equation of interest employed in the study is a partial reduced form model of trade balance, where it is determined by real exchange rate, real foreign and domestic incomes. Instead of estimating the effect of devaluation on trade by estimating and solving a set of structural equations for supply and demand of export and imports, Rose and Yellen (1989) prefer not to distinguish between price and volume effects of real depreciation and thus instead of estimating empirical structural volume and price equations, they prefer to estimate the mentioned reduced form.

Rose and Yellen (1989) state that, the effect of real exchange rate perturbation on trade balance depends on the sign of the partial derivative of trade balance with respect to real exchange rate in the equation of interest. Therefore, they bring along a 'new' perspective to the textbook explanation of the phenomenon, and define the J-curve as the combination of a negative short run derivative with a positive long run derivative. They enlist the assumption of the *perverse* part of the J curve as a) the short-run price elasticities of both domestic and foreign import demand are low, b) the domestic import prices change quickly in case of a devaluation, as it is assumed that there is relatively large foreign export supply elasticity.

At this point, it is worth noting that many of the following studies which empirically investigated the J curve adopt frequently this ‘new definition’ of Rose and Yellen (1989) in order to test for the existence of the phenomenon for a second time. For instance, Bahmani-Oskooee and Kovyryalova (2008) praised the ‘new definition’ of the J-Curve for being closer to theory than the old one, referring to the explanation of Magee (1973) who inferred that the trade balance can follow any pattern in the short run. Thus, it is argued that short-run fluctuations in the trade balance combined with long-run improvements could constitute an even better definition of the J-Curve.

As for the results, Rose and Yellen (1989) found that exchange rate does not significantly affect the US trade balance at all; and although the model reveals that trade balance improves in time, still there is no indication of statistically significant negative short run response that characterizes the J curve. For bilateral data, the choice of estimation technique does not create any differences in the results; however estimations with aggregate data show differences according to different estimation techniques. Although they could not find evidence of J curve in bilateral calculations, they could find weak support of J curve in aggregate level depending on the estimation technique employed. Rose and Yellen (1989) conclude that when some certain issues are taken into account, there is little evidence of a J curve or of a link between trade balance and real exchange rate. The first one of these issues is that potential simultaneity of trade balance with exchange rates and income should not be ignored. Secondly, when variables in question have unit roots, some transformation should be done to tackle nonstationary.

Marwah and Klein (1996) estimate and analyze the profile of the time lags in trade adjustments in response to changed relative prices for both Canada and US with the rest of the G-7 countries (except for Italy) that construct the greater part of Canadian and US trade. Trade accounts is explained by the respective world trade over GNP ratio and lagged values of the relative price of Canada and US to the price of each other as well as to that of France, Germany, Japan and UK for the period 1977:1-1992:1. In order to estimate the trade models, IV method combined with a polynomial distributed lag scheme and OLS is adopted. The results of the IV estimation reveal that while the US J curve becomes positive following a depreciation during the 3rd quarter, for Canada it takes just one quarter for the trade balance to improve. OLS generated parallel results as well.

Bahmani-Oskooee and Brooks (1999) criticize the earlier studies of Rose and Yellen (1989) and Marwah and Klein (1996) for their shortcomings, and they aim at taking into account those shortcomings. They criticize the work of Rose and Yellen (1989) a) for producing findings that are sensitive to measurement units, b) for using a cointegration technique that is based on a low power unit root test, c) for not using the error correction modeling in the lack of cointegration and for not using a standard criterion for lag selection. Moreover, the drawback associated with Marwah and Klein (1996) is stated to be the use of nonstationary data. Adopting a model similar to Rose and Yellen (1989), they define the trade balance as the ratio of imports over exports, which is not only a unit free measure, but also reflecting trade balance dynamics in both real and nominal terms (Bahmani-Oskooee and Ratha, 2004a). Moreover, Onafowora (2003) states that the logarithmic use of this measure gives the exact ML condition rather than an approximation. Adopting an error correction model and cointegration technique (autoregressive distributed lag (ARDL) approach of Pesaran and Shin (1995) and Pesaran, Shin and Smith (1996)) for the period 1973:1-1996:2 and employing bilateral data of the US and her six largest trading partners (Canada, France, Germany, Italy, Japan and the UK), they could not find any evidence of a certain short run pattern such as the J curve, but have concluded that a real depreciation of the dollar has a positive impact on the trade balance of the US.

Wilson and Tat (2001), by means of the model of Rose and Yellen (1989), examine the bilateral trade of Singapore with the US using quarterly data over 1970-1996. Wilson and Tat (2001) supports Arndt and Dorrance (1987) and claim that J curve is more plausible for advanced developed countries invoicing their exports and imports in seller's currency, but not for small open economies having low market power. Their findings suggest that real exchange rate does not have a significant effect on the real bilateral trade balance for Singapore and the US with little evidence of a J curve effect.

Wilson (2001) is another study who adopted the model of Rose and Yellen (1989) in order to examine the bilateral trade of Singapore, Malaysia and Korea with US and Japan[25] in search of whether the J curve exists. Similar to Wilson and Tat (2001), they address the small country case and mentioned that although a devaluation makes the value of both exports and imports to increase in such a small country, as other countries' exports are denominated in their domestic currency, the value of exports may stay the same. In order to test for the 'small country' assumption, or in other words to test whether exports

[25] However since the trading partners of these countries are selected to be the US and Japan merely, the study is criticized for being a very limited study in nature by Bahmani-Oskooee and Ratha (2004a).

increase in the short run, imports and exports are defined as separate regressands. In this way it is possible to find whether the J curve effect is masked because of country's being small or not. Using a log linear general ARDL model and the IV method to handle the possible simultaneity between variables, they found that real exchange rate is not a significant determinant of real trade balance except for Korea. Only for Korea the data proposes some evidence of J curve, however it is possible that the J curve effects of Korea's bilateral trade with both Japan and US are masked or muted by the 'small country' pricing of exports in foreign currency. In addition there is no evidence of imports falling over time following depreciation, which is required for the interpretation of the J curve. Using OLS or aggregate data for comparison do not create any improvement over the bilateral results.

The following papers constitute examples to the studies that have investigated the J curve effect in the bilateral trade of a variety of countries using different econometric techniques, generally adopting the model introduced by Rose and Yellen (1989):

Onafowora (2003) examines the relationship between the real trade balance and real exchange rate for Thailand, Malaysia, Indonesia in their bilateral trade with the US and Japan over 1980:1-2001:4 using cointegration analysis of Johansen and a vector error correction model (VECM) with generalized impulse response functions. He found that for Indonesia and Malaysia in their bilateral trade with the US and Japan, and for Thailand with the US, there are short run J curve effects. Overall, results suggest that ML condition holds in the long run for the countries with varying degrees of J curve effects in the short run.

Arora, Bahmani-Oskooee and Goswami (2003) test for the relation between the Indian bilateral trade balance with each 7 trading partners and exchange rate. Adopting the model of Rose and Yellen (198) and using ARDL on quarterly data for 1977:1-1998:4, they found that J curve effect is not observed in any of India's major trading partners, but the long run effect of the real depreciation of India rupee against the currencies of Australia, Germany, Italy and Japan is positive on India's trade balance with these countries.

The same ARDL approach is employed by Bahmani-Oskooee and Goswami (2003) as well. Emphasizing the importance of employing disaggregate data, they investigated the short and long run effect of real depreciation of Japanese yen on Japan's bilateral trade balance trade with each of her leading trading partners (Australia, Canada, France, Germany, Italy, Netherlands, Switzerland, the UK and the US). They found the J curve effect for only Italy and Germany, while long run positive relationships between real exchange rate changes and trade balance are found for Canada, the UK and the US.

Bahmani-Oskooee and Ratha (2004b) extends the work of Bahmani-Oskooee and Brooks (1999) and includes 18 industrial trading partners of US which constructs 54.29% of total US trade in 1999, using ARDL approach of cointegration proposed by Pesaran, Shin and Smith (2001) known as the bounds testing approach. Adopting the previously mentioned 'new definition'[26] of the J curve by Rose and Yellen (1989) which signifies the short run reverse effects of the devaluation on the trade balance combined with a positive long run effect, they found considerable support for J curve phenomenon in 10 of the countries; while the short run dynamics do not support the textbook definition of J curve.

Another application of the bounds testing approach for cointegration and the error correction modeling is the study of Bahmani-Oskooee, Goswami and Talukdar (2005). They test the short and long run effects of the depreciation of the Australian dollar on the Australian trade balance with her 23 major trading partners in a bilateral basis. Sticking to the 'new definition', J curve is detected only in trade with 3 countries, Denmark, Korea and New Zealand out of 23 countries.

The same method is applied to search for the effects of the depreciation on the trade balance of the UK with her 20 major trading partners by Bahmani-Oskooee, Economidou and Goswami (2006) over the period 1973:1-2001:3. They found that J curve effect can be observed for only 2 countries, Canada and the US, while the positive long run relationship between the depreciation and trade balance is observed for 6 countries which are Australia, Austria, Greece, South Africa, Singapore and Spain. Additionally, W-shaped short run responses are observed in the UK trade balance with Norway and Switzerland.

Bahmani-Oskooee and Harvey (2006) also employ the bounds testing approach in order to investigate the exchange rate sensitivity of trade flows of Malaysia with each of its 14 trading partners. They construct two separate equations for the value of Malaysia's exports and imports and relate them to the real bilateral exchange rate as well as on the foreign and domestic income. They use the nominal export and import values instead of the real ones in order to assess directly the effects of exchange rate changes on inpayments and

[26] From this point forward, the 'new definition' refers to the J curve definition of Rose and Yellen (1989) which describes the J curve as the combination of short run negative response of the trade balance to devaluation with a positive long run response.

outpayments. They found that while real depreciation has effects on exports and imports values in the short run, these effects do not last in the long run.

The previous pair of techniques, the model of Rose and Yellen (1989) and the bounds testing approach is once more employed by Bahmani-Oskooee and Wang (2006), and the responses of the Chinese bilateral trade with her 13 major trading partners over the period 1983:1-2002:2 are investigated. They found that the exchange rate is a significant determinant in the short run of the Chinese bilateral trade balance, but the J curve phenomenon is only observable in trade with Hong Kong and the UK. However in most cases, exchange rate does not have an effect on the trade balance in the long run. In order to take into account the feedback effects among variables under study, Johansen's (1988) cointegration method is applied. In light of the finding that there exists cointegration in all country cases, the list of China's trading partners for which the real exchange rate is significant in the long run expands. In order to search for the J curve effect when there is feedback among variables, they employed the generalized impulse response functions which reveal no specific response pattern of the trade balance except for Singapore.

In the same systematic, Bahmani-Oskooee and Ratha (2007) investigate the short and long run effects of the real depreciation of Swedish krona in her trade with her 17 trading partners bilaterally over 1980:1-2005:4 period, which constitute 74% of Sweden's total trade. They found that the bilateral real exchange rate is significant on the bilateral trade balance in trade with 14 out of 17 countries, while in Swedish trade with Austria, Denmark, Italy, Netherlands and the UK the response has the shape of a J letter. However in the long run, the trade balances only with six of the countries have a significant relationship with the real exchange rate changes. In particular, the negative short run effects last into adverse long run effects in the cases of Germany, Italy, Switzerland, UK and US.

Bahmani-Oskooee and Ratha (2008) claimed that, besides ML condition and the J curve phenomenon, another way of measuring the effect of currency depreciation on the trade balance is to estimate the effect on the inpayments and outpayments. In their paper, US inpayments and outpayments with her 19 partners constituting 54% of total US trade in 1999 is addressed over 1975:1-2000:2. By stating that the ML condition is not applicable in the bilateral level as there is no bilateral price data available, they construct two relations between import and export values separately with the real exchange rate. In both specifications, a measure of income is included as an indicator for the size of the US and the partner. By adopting the bounds testing approach, they found that neither the imports nor the export values respond to the exchange rate changes in a specific way, however in trade with Denmark, Germany, Sweden and Greece, exchange rate is a significant determinant of the trade balance affecting both the inpayments and outpayments in the long run. Aggregating the data across all countries, they found that while the exchange rate has a significant effect on imports on the aggregate level, it is ineffective on exports. This is attributed to the aggregation bias masking the favorable disaggregated results.

Finally, another application of the bounds testing approach is conducted by Bahmani-Oskooee, Goswami and Talukdar (2008), in order to test the J curve effect in the bilateral trade between Canada and her 20 major trading partners by employing the model introduced by Marwah and Klein (1996) and Rose and Yellen (1989) over the period 1973:1-2001. They could find evidence of J curve only in the trade with Norway and the UK. However, by adopting the 'new definition', J curve is observed in 11 cases.

2.3.2. The Studies Employing Trade Data at Commodity/Industry Level

Recognizing the shortcomings of employing aggregate data, some studies have further disaggregated the trade data in question at industry or commodity level, in an attempt to discover the differences in the industry/commodity specific response dynamics to the exchange rates movements. Since the exchange rate sensitivity of the trade pattern of different types of goods traded by the country are expected to show significant varieties, disaggregation of the trade data at industry/commodity level is a rewarding process, admitted by many researchers.

For instance, Meade (1988), in spite of conducting an aggregate data study, searches for the *sectoral J curves* of 3 groups: non-oil industrial supplies, capital goods excluding automobiles, and consumer goods which constituted 80% of non-agricultural exports and approximately 70% of non-oil imports of the US in 1987. She found that the responses of the trade balances associated with these 3 sectors vary dramatically. Therefore she concludes that the size and the timing of the aggregate adjustment of the trade balance depends on the size of changes in the exchange rate of the domestic currency against the currency of each trading partners, on the particular kind of trade carried out and on the characteristic of the response – rapid or sluggish – to changes in the exchange rate.

Carter and Pick (1989) investigate the short term response of the US agricultural trade balance to depreciation of the dollar by studying the impact on imports and exports separately, which are then converted to the trade balance effect. Referring to the contract and pass through effects of Magee (1973), they emphasize that majority of US agricultural imports and exports are denominated in US dollars while both US agricultural exports supply and import demand are inelastic in the short run. They expect a limited pass through of the depreciation to export prices as a result of the elastic foreign import demand, while a more complete one is expected for the import prices. They explain the export unit value by current and past export prices and exchange rates, a production cost variable and foreign income; while the import unit value is a function of current and past import suppliers' prices and exchange rates. They found that while 87% of the depreciation passes through the import unit value in 2 quarters, it takes 3 quarters for the exchange rate movements to change the export unit value by 32%. Thus, the cumulative impact of the depreciation on the US agricultural trade balance has the characteristics of the initial stages of the J curve.

Doroodian, Jung and Boyd (1999) conduct another study employing US sectoral trade data and claim that J curve effect is more pronounced for agricultural products compared to manufactured commodities as the payments are made after longer periods of delivery and there exists a production lag in agriculture. Thus, the agricultural goods are expected to respond to a devaluation after a far longer time than manufactured goods do. For this reason, they divide the data set into two and tested the J curve effect separately for agricultural and manufacturing goods. They explain the trade balance by the differential forms of real output level, budget deficit or surplus, monetary base and the real exchange rates, defined such as domestic minus the corresponding abroad value for agricultural and manufactures goods separately. Their findings support their claim that J curve effect exists for the agricultural goods while no such effect is observed for the manufactured goods. They attribute the lack of this finding in the literature to the use of aggregate data as well as studying countries whose foreign trade are dominated mostly by manufactured goods.

Bahmani-Oskooee and Ardalani (2006) employ aggregate US trade data as well. They adopted two separate equations to obtain import and export demand elasticities in order to better judge the effectiveness of currency devaluation in increasing a country's inpayments and reducing outpayments, and search for the sensitivity of import and export values of 66 American industries to a change in exchange rate. Using the ARDL cointegration method and error correction approach over the monthly period of 1991:1-2002:8, they found that in the short run industries do not follow any specific pattern such as J curve, however, in the long run results reveal that real depreciation improves the exports of many US industries with almost no impact on most of the importing ones. Therefore they expect a real depreciation to improve the US trade balance in the long run.[27]

Similarly, in a separate paper Bahmani-Oskooee and Ardalani (2007) again examine the US aggregate trade data of 66 industries. Using the monthly data over the period 1991:1-2002:8, and conducting error correction modeling, they found that the J curve is observable for only 6 industries, whereas a favorable long run relationship between the real depreciation of the dollar and the trade balance exists in the trade of 22 industries.

Breuer and Clements (2003) is perhaps the first study to disaggregate the bilateral trade data at commodity/industry level, as the previously mentioned papers all employed aggregate data. Breuer and Clements (2003) claim that 'the disaggregated nature of the data will allow to substantiate cross-commodity differences in exchange rate elasticities that are typically undetected in aggregate data studies'. They further emphasize the importance of using disaggregate data by claiming that 'differences in exchange rate elasticities across commodities help explain commodity specific trade behavior that could have implications for the overall trade balance'.

Breuer and Clements (2003) investigate the trade between Japan and the US using commodity level data and try to answer questions such as how the commodity composition of the trade between two countries has changed over time; what the exchange rate elasticities of each commodities are; whether they show any difference depending on the characteristics of the exchange rate change: devaluation or appreciation; and finally whether the elasticities are systematically related to commodity aspects such as durability or share of production costs that are fixed. Of the 58 commodities under study, for exports of 40 commodities the exchange rate elasticities are significant while for imports this reduces to 24. They found that exports are relatively more responsive to changes in exchange rate than the imports; and given that initially the US has a trade deficit, following a depreciation this situation will lead the trade gap to widen. Also they found modest evidence of asymmetry in the responsiveness of exports and imports to episodes of dollar appreciation versus dollar depreciation; moreover the exchange rate elasticity of majority of commodities did not change with episodes of appreciations or depreciations.

[27] They also investigated the response of industries to the real exchange rate changes defined in groups with respect to durability and size of the industries; however they could not support the claim that durables are more price elastic than nondurables.

Baek (2006) investigates the short run effects of exchange rate changes on US bilateral trade balance with Canada on forest products which are classified into softwood lumber, hardwood lumber, panel/plywood product, logs and chips, and other wood products. Employing the ARDL bounds testing approach to cointegration and the theoretical framework of Rose and Yellen (1989), they found that there exists significantly positive relationship between the real exchange rate changes and the trade balances of softwood lumber, panel/plywood, hardwood lumber and other wood products in the long run in the trade with Canada. However, a change in the value of the US dollar against the Canadian dollar is found not to create J curve effect.

The trade balance of the US was also examined in a series of papers where Bahmani-Oskooee and his colleagues study the impacts of exchange rate volatility on bilateral trade flows of a set of commodities with different countries, instead of investigating the effect of a depreciation. Referring to volatility, it is stated that any risk introduced by exchange rate fluctuations is believed to be detrimental to international trade, whereas traders may trade more under an uncertain environment to increase their current revenues due to an expected decline in future revenues. In bilateral trade between the US and China, Bahmani-Oskooee and Wang (2007a) showed that in almost half of the 88 industries, the import and export flows are affected by the exchange rate volatility. In bilateral trade of the US with India, Bahmani-Oskooee and Mitra (2008) found that exchange rate volatility has negative and positive short run effects in 40% of the 40 industries under study, which do not last into the long run in many cases. Likewise, Bahmani-Oskooee and Hegerty (2008) examine the bilateral trade between the US and Japan in 117 commodities and found that Japanese exports show a relatively large response to increased exchange rate uncertainty in more industries than do imports.

Bahmani-Oskooee and Wang (2007b) search for the J curve effect in the Australian trade balance with its second largest trading partner, the US, by examining the trade of 108 industries over the period 1962:2003. They claim that the previous studies could not prove evidence of a significant relationship between the trade balance and the real exchange rate for Australia because of aggregation bias. Using bounds testing approach, only in 15 cases, evidence of the J-curve is detected. However, according to the ‘new definition’, they find support for J curve in 35 industries. They concluded that these findings indicate that not all industries in the trade between Australia and the US are equally affected by depreciation.

Bahmani-Oskooee and Bolhasani (2008) investigate the effects of the real depreciation on the Canadian trade balance with the US through 152 commodities over the period 1962-2004 annually, using the bounds testing approach. In an earlier paper Bahmani-Oskooee and Niroomand (1998) have found that the ML condition for Canada did not hold, so the real depreciation of the Canadian dollar is not expected to improve the trade balance in the long run. The literature has also evidences for the lack of a long run effect of a real depreciation on the Canadian trade with US in the bilateral level. Searching for which industries this claim is valid, they found that while most of the industries (102 out of 152) are responsive to the real exchange rate changes in the short run, the J curve effect is observable in only 13 industries. However, according to the 'new definition', it becomes observable for 85 industries. Therefore, the real depreciation of the Canadian dollar has both a short and a long run effect on the trade balance of most industries.

In the same manner, Bahmani-Oskooee and Wang (2008) investigate how the trade balances of 88 US commodities with one of her major trading partners, China, respond to the real bilateral exchange rate changes over 1978-2002 period annually, using bounds testing approach. Although the starting point is the thought that disaggregating the data, evidence of J curve can be observed at least in some industries; they detected the J curve effect in only 3 cases. However, adopting the 'new definition' of the J curve by Rose and Yellen (1989), the J curve effect is seen on 22 commodities' trade. The long run effect of real exchange rate changes is significantly positive on the trade balance of 22 commodities.

Bahmani-Oskooee and Kovyryalova (2008) claim that the previous researches failed to possess any strong evidence on the significance of the relation between the UK trade balance and depreciation. Using the bounds testing approach, they investigate the UK trade data with one of her major trading partners, the US, in the commodity level by including 177 industries. By employing annual data over 1962-2003, they found that although in almost 60% of the cases real depreciation of the exchange rate has significant short run effects on the trade balance, there is no specific response pattern such as a J curve in majority of the commodities. However when the J curve notion is accepted according to the 'new definition', then evidence for J curve effect increases dramatically.

Although previous studies found that there was no significant relationship between the real depreciation of rupee and the bilateral trade balance between India and her major trading partners, Bahmani-Oskooee and Mitra (2009) investigate this finding by disaggregating the bilateral trade data between India and the US at the industry level for the period 1962-2006. In investigation of the response of 38 industries to the real depreciation of rupee, via bounds testing approach, they have found evidence of J curve for only 3 industries according to the classical definition of Magee (1973). However, when the ‘new definition’ is taken into account, then the number increases to 8 industries.

With the aim of assessing the response of the trade flows between Thailand and the US to the real exchange rate changes, Bahmani-Oskooee and Satawatananon (2010) disaggregate the trade data over 1971-2006 by commodity. However, since exporting and importing industries of the existing data do not match both in numbers and names, they estimate two separate models for US exports with 118 commodities and for US imports with 42 commodities instead of constructing a single model. By using the bounds testing approach, they found that the majority of the industries of which exports and imports are affected by the exchange rate changes were the industries having small trade shares.

2.3.3. Brief Discussion on the Disaggregate Level Studies

The studies disaggregating the data at bilateral level reveal that response of a country to depreciation varies significantly in two-sided relations with different trade partners. For instance, while J curve or at least delayed J curves could be found at aggregate level for the US, bilateral level studies show that J curve is observed in US trade only with her certain trading partners[28]. On the other hand, it draws attention that, the J shaped dynamics in response to a devaluation can be detected in the bilateral trade of the studied countries with only a few partners, corresponding generally to a small portion of the country set analyzed.

Among the industry/commodity level studies, it stands out that the US is either studied solely or taken as one of the countries in bilateral analysis. These studies mainly show that responses to exchange rate changes vary significantly among different industries or commodities. Similar to the case for bilateral studies, the commodities/industries for which the J curve effect is discovered constitute a very little part of the analyzed industry set, while the portion increases notably when the ‘new definition’ of Rose and Yellen (1989) is adopted. All in all, these conclusions justify the causes put forward in order to avoid the aggregation bias.

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[28] Bahmani-Oskooee and Ratha (2004b) finds evidence of J curve in bilateral trade of the US with Austria, Denmark, France, Germany, Ireland, Italy, Japan, New Zealand, Sweden, and Switzerland; while many studies failed to support bilateral J curve for the US.

2.4. The Studies Examining the Turkish Case

Although they are few in number, the relationship between the Turkish trade balance and the exchange rate movements is examined in some of the papers in the literature. While some of the studies employ Turkish data as one of the countries in the set of studied ones, some concentrates solely on Turkey. Similarly, while some employ aggregate data, some investigate the bilateral trade relations of Turkey. A review of the studies is presented below:

To the best of knowledge, Rose (1990) is the first study investigating the J curve phenomenon for Turkey. Rose (1990) investigates 30 developing countries including Turkey over the period 1970-1988 by means of the use of a nonstructural trade model. He tries to find out whether the real exchange rate changes affect the trade balance in the short or the long run and whether the cumulative effect of the exchange rate is positive on the trade balance. Rose (1990) found that although the effect of real exchange movements on the Turkish trade balance is found to be negligible, still the cumulative effect reflects that a depreciation would cause the trade balance to improve for the Turkish case.

Turkey is one of the 13 developing countries for which Bahmani-Oskooee and Malixi (1992) searched for the impacts of the real effective exchange rate changes on the trade balances. Using an Almon lag structure for the real exchange rate variable, for the period of 1973:1-1985:4, although they could not find a J curve effect on the Turkish trade balance, an inverse N shaped response is detected for Turkey, which shows that the Turkish trade balance deteriorates initially following a real depreciation and then improves for a while but concludes with deterioration in the end. Moreover, Turkey is one of the 8 countries for which depreciation is found to have long run favorable effects on the trade balance. In addition, Turkey was one of the countries whose trade balances were found to be positively affected from the increases in the income and money supply worldwide.

Likewise, Turkey takes place in the set of 22 less developed countries which Bahmani-Oskooee and Alse (1994) examined together with 19 developed countries over the period 1971:1-1990:4. Using the Engle and Granger cointegration and error-correction modeling method, Turkey is detected to be one of the 20 countries for which the real effective exchange rate and the trade balance variables are both integrated of order one and thus suitable for cointegration analysis. It is found that devaluations of the Turkish Lira have a long run positive effect on the Turkish trade balance. They mention that their findings are in accordance with the findings of Gylfason and Schmid (1983) and Gylfason and Risager (1984). Moreover, Turkish trade balance responds to depreciation following the exact J curve, which instantly deteriorates after a depreciation and improves eventually.

As pointed out by Akbostanci (2004) the abovementioned studies all employed a sample period, in between which Turkey witnessed a noteworthy structural change. As she mentions, in Turkey ‘until the 1980s, the exchange rates were fixed and were rarely devalued, and the foreign exchange market was under strict regulation. Beginning in 1980, Turkey experienced financial liberalization in which the previously overvalued Turkish lira was devalued, and Turkey started to take measures to promote exports’. Brada, Kutan and Zhou (1997) take this fact into account and break down the sample period 1969:1-1993:1 into two, as they expect no strong relationship between the trade balance and the real exchange rate prior to 1980, but the exact opposite for post-1980 as a result of an aggressive devaluation of the Turkish lira and export promoting measures. By employing the trade balance model of Rose and Yellen (1989), they investigate the short and long term responsiveness of Turkey’s trade balance to real depreciation. As far as is known, the study of Brada et al. (1997) constitutes the first study that investigates the Turkish case solely.

By means of cointegration tests Brada et al. (1997) found no cointegration among variables for the pre-1980 period, but found a stable long run relationship between variables. They attribute the lack of cointegration for the pre-1980 period to the fact that ‘trade controls imposed by Turkish government likely limited the ability of changes in the exchange rate to influence the volume of Turkish imports and exports and the responsiveness of post-1980 period to the liberalized trading regime’. In order to search for the short run dynamics they conducted error correction model via polynomial distributed lags and found that in the post-1980 period, exchange rate affects the trade balance but not exactly following the J curve pattern. Their results indicate that there was no relationship between the variables in 1970s, but in contrast the trade balance responds to the changes in exchange rate (positively) in 1980s together with changes in domestic and foreign income.

Another study of Turkish case is the paper of Kale (2001), where in order to assess the responses of the Turkish trade balance to a real depreciation, she uses a cointegration test to estimate the long run elasticities while employs an error correction model to figure out the short run dynamics, taking the trade balance model of Rose and Yellen’s (1989) as basis. She uses an aggregate data set over the period 1984:1-1996:2 that is unfiltered in order to reveal the short run movements. She found that the Turkish trade balance improves approximately 8% in the long run as a result of a 10% real depreciation. Moreover, she found that Turkish trade balance is highly and negatively responsive to domestic income increases which is grounded on the impacts of the trade liberalization efforts. Also, the trade balance is found to improve in the long run in response to increases in the foreign income, which signifies the degree of market integration. Moreover, the results indicate that a real depreciation causes a deterioration in the trade balance three quarters later. Although there is initially a favorable response in the trade balance to a real depreciation, Kale (2001) explains this by stating that as the intensively imported intermediate goods gets more expensive, the investment plans begin to be postponed, thus imports initially may shrink. However, since the trade balance experiences a worsening in the following third quarter of the devaluation, the outcome still may be interpreted as evidence of a delayed J curve.

Akbostanci (2004) investigates whether J curve effect exists in the Turkish trade balance responses to real exchange rate changes over the period 1987:1-2000:4 using general to specific VAR techniques (cointegration and vector error correction models as well as generalized impulse response analysis) and the model of Rose and Yellen (1989). She mentions that the classic definition of the J curve requires the export contracts to be denominated in domestic currency, while the contracts are heavily denominated in foreign currency in small countries such as Turkey. However, she states that a J curve can still be relevant for a small country, if it is running trade deficit, which has been constantly the case for Turkey in 1980's and 1990's. It is found that in the long run the real exchange rate is the fundamental component that determines the trade balance, while a real depreciation is detected to influence the trade balance positively, thus the ML condition holds for Turkey. Moreover, the short run determinants of the Turkish trade balance are found to be the real exchange rate as well as the domestic income. She also found that in the short run a real depreciation will result in an improvement in the trade balance, as it is the case in the long run. These results, when combined, indicate that there is no J curve occurring in the Turkish trade balance. However, when the feedback effects between the real exchange rates and the trade balance are investigated, it is found that an amelioration in the trade balance results in a real appreciation of the Turkish lira. Thus, the overall framework shows that a real depreciation causes improvement in trade balance, which in turn causes a real appreciation that would worsen the trade balance which in the end again causes a real depreciation. Therefore, the short run dynamics exhibits a much more complicated pattern than what the J curve definition would describe. This cyclical response is also evident from the impulse response analysis, which balances out in nearly five years.

Bahmani-Oskooee and Kutan (2009) investigate the existence of the J curve effect in Turkey as one of the 11 East European emerging economies, over 1990:1-2005:6. Through the adoption of the model of Rose and Yellen (1989) and use of bounds testing approach, they found that Turkey is one of the 11 countries for which currency depreciation has short run effects. However, any significant long run relationship between the exchange rate changes and the Turkish trade balance cannot be found. Moreover, the short and the long run coefficients derived for Turkey are found to be instable and this is attributed to the financial crises that took place in Turkey during the study period. Thus, they suggested that the policy makers in Turkey may not use the exchange rate policy tools to enhance trade balances and to improve the economic growth especially in the long run, which puts forward the use of monetary and fiscal policies for the same purposes.

Halicioglu (2007) presents the first study of Turkish J curve carried out by using disaggregated data in bilateral level, while still providing evidence at aggregate level as well. She examines the J curve dynamics of Turkey in her trade with nine major trading partners: Austria, Belgium, France, Germany, Holland, Italy, Switzerland, the UK and the US which are responsible for more than half of total Turkish trade (in 2000). By adopting the classic trade balance model, the results of Johansen and Juselius multivariate cointegration procedure reveal that, for only Germany, Holland, Italy, Switzerland and the US, there is long run positive relationship between the bilateral trade balance and the real depreciation of the Turkish lira against the currency of the trading partner. The same favorable impact of devaluation is also observable on the aggregate trade balance. Thus, ML condition holds for these cases. However, notably low long-run real exchange rate elasticities show that a depreciation of the Turkish lira would enhance the bilateral trade balance but would reach to the full equilibrium after a rather long time. Moreover, the generalized impulse response functions results suggest that J curve effect is not observable at either disaggregate or aggregate level. In addition, since some of the bilateral long-run equations are found to be instable; Halicioglu (2007) proposes the devaluation policy not to be utilized to overcome the trade deficits with countries such as Belgium, Italy and the UK.

In another study at bilateral level, Halicioglu (2008a) tests the bilateral J curve for Turkey with 13 partners over 1985:1-2005:4 using bounds testing and model of Rose and Yellen (1989). The 13 countries: Austria, Belgium, Canada, Denmark, France, Germany, Holland, Italy, Japan, Sweden, Switzerland, the UK and the US constitute nearly 47% of total Turkish trade (in 2005). She found that the J curve is not observable in any of the cases. However, a real depreciation of the Turkish lira improves the trade balance with the UK and the US in the long run.

Halicioglu (2008b), employing aggregate trade data this time, revisits the J curve effect in Turkey in the same systematic on an improved span (1980:1-2005:3). She aimed at investigating the existence of the J curve in Turkish trade balance as well as establishing the causal relationship between trade balance, real effective exchange rates and foreign and domestic incomes. She found that although there is no long run impact of a depreciation on the Turkish trade balance, J curve phenomenon exists in the short run. Her findings on general contradict to the results of existing literature associated with Turkey; however they are in accordance with those of Bahmani-Oskooee and Kutan (2009) in some ways.

Using the same model and estimation method, Keskin (2008) analyzes Turkey's bilateral trade with Germany, Italy and USA for consumption, capital and intermediate goods over 1987:1-2005:4. It is found that the real exchange rate is not a significant variable either in the long run, except for USA in consumption goods, or in the short run.

In a recent study, Yazici and Klasra (2010) argue that, in contrast to the assumptions of classic J curve definition, when the imported goods are used extensively as inputs in the production of exportables, as the devaluation increases the import prices instantly, this will boost the export prices sooner than the textbook definition of the J curve phenomenon predicts. To continue producing exports, import volumes will not decrease as a result of devaluation. In total, these affects may cause the J curve not to occur. Thus, they focus on the presence of imported inputs in the production of exportables; and examine the J curve effect in the manufacturing and mining sectors having different ratios of imported inputs, separately. For the period 1986:1-1998:3, use of the model of Bahmani-Oskooee (1985) and the Almon lag technique shows that both in mining and in manufacturing, the trade balance first improves, and then worsens which is followed by deterioration again in case of depreciation. This lack of exact J curve was interpreted as a delayed J curve where the delay is much longer for the manufacturing sector which use imported inputs more extensively compared to mining. It is found that devaluation improves the trade balance in the long run in both sectors. Use of a vector error correction model reaches similar findings. They conclude that, the lack of a J curve in Turkish manufacturing sector confirms their claim that using more imported inputs results in a violation of a J curve.

Finally, Celik and Kaya (2010) emphasizing the growing role of emerging markets in the world economy, investigate the J curve effect for one of the main emerging markets, Turkey, in her bilateral trade with France, Germany, the Netherlands, Italy, Japan, the US and the UK (which corresponds to 60% of total Turkish trade) over the period 1985:1-2006:4. They consider the monthly foreign trade weights and employ panel cointegration technique on the model of Rose and Yellen's (1989) to this end. They found that a real depreciation of the Turkish lira against the currencies of the trading partners improves the trade balance in the long run in the trade with Germany, Japan and the UK. In addition, using impulse response functions, they conclude that there is no evidence of J curve in the trade with any of the countries; nevertheless, the reverse J curve is detected for Germany and the US while the trade with France is the only situation where the trade balance deteriorates after a real devaluation.

2.4.1. Brief Discussion on the Studies Examining the Turkish Case

The studies examining the existence of Turkish J curve generally conclude that a depreciation of the Turkish lira causes the trade balance to improve in the long run, validating the ML condition[29]; while in the short run the exchange rate is found to be significantly effective as well, not having a common pattern. The exact J curve effect is found by only two of these studies (Bahmani-Oskooee and Alse (1994), Halicioglu (2008b)); while evidences of delayed and inverse J curves, along with inverse N curve are also detected by some of the studies.

Moreover, only four of the above reviewed studies are conducted in bilateral level[30], while there are just two studies (Yazici and Klasra (2010), Keskin (2008)) that attempt to disaggregate Turkish trade data at industry level, but remained limited as solely two or three sectors are examined. This study therefore aims at contributing to this deficiency of the literature by conducting a relatively more detailed J curve analysis on the Turkish trade balance which is disaggregated at both country and industry levels.

[29] The exception to this is that Halicioglu (2008b) and Bahmani-Oskooee and Kutan (2009) both found that the ML condition does not hold for Turkey, but the short run effects are significant.

[30] Halicioglu (2007, 2008a), Keskin (2008), Celik and Kaya (2010).

CHAPTER 3

THE MODEL AND THE DATA

As given in the previous section, the response of the Turkish trade balance to the exchange rate changes has been investigated in bilateral level in several studies, but has been examined in a very limited sense for commodity or industry dimensions. This study aims to take a step in the way of filling this gap by analyzing whether the J curve phenomenon exists in the Turkish trade balance disaggregated both in country and in more detailed industry levels.

In this chapter, firstly the scope of the abovementioned analysis regarding the selection of partner country and the industry group to be studied is presented. Secondly, the trade balance model adopted is introduced. Afterwards, information about the characteristics of the data employed, such as the data sources, an overview of the series and their statistical properties are given.

3.1. Scope of the Analysis

3.1.1. Country Selection

For analysis of the bilateral Turkish J curve at the industry level, the leading trading partner of Turkey, namely Germany, is chosen as the country of interest.

Germany has been traditionally the number-one trading partner of Turkey throughout the history of the Republic of Turkey. Beginning from the foundation of the Republic in 1923, Germany ranked the first in total trade of Turkey for 56 times in 88 years till 2010. In the early years of the Republic, between 1923 and 1929, Germany was mostly the second trading partner having on the average 12.1% share annually in total Turkish trade. From 1932 to the beginning of World War 2 (1939), Germany ranked first constantly but lost pace and fell fifth in 1940 while becoming the second in 1941. In 1942, trade with Germany gained strength again and took over the leadership back for three years until 1944. However, the trade relations between two countries weakened the most in the end of the

War (1945) and could not recover for the subsequent years. In 1948, the commercial ties with Germany began to revive and in 1949 Germany ranked the third in total Turkish trade. From then on, the trade between two parties never fell back to number three and Germany continued to be mostly the first (for 45 years in 1950-2010: 74% of the period) or from time to time the second trading partner of Turkey over the last half of twentieth century and over the first decade of 2000's. (See Appendix A: Top Five Trading Partners of Turkey by Years)

Table 3.1: Average annual percentage shares of Germany in total Turkish exports, imports and total trade volume[31]

	Exports	**Imports**	**Total Trade**
1923-1929	12.0%	12.1%	12.1%
1930-1939	30.2%	34.7%	32.4%
1940-1949	12.2%	12.5%	12.2%
1950-1959	19.1%	19.2%	19.2%
1960-1969	16.5%	17.4%	17.0%
1970-1979	20.7%	18.2%	18.9%
1980-1989	17.5%	12.6%	14.4%
1990-1999	22.6%	15.9%	18.4%
2000-2010	13.3%	11.6%	12.3%

Especially for the last two decades (1990-2010), as Figure 3.1 shows clearly, Germany has been continually the foremost trading partner of Turkey, having more than approximately 10% share per se each year in total Turkish trade volume (except for 2008 when Russia takes the first place and Germany ranks second). While Germany had on the average 18.4% annual share in the total trade of Turkey in 1990's, this share has decreased down to 12.3% in 2000's on the average. Despite this decline, Germany never had an annual share below 10% (except for 2008: 9.5%) which signifies the importance of the role of Germany in Turkish foreign trade as her major trading partner.

[31] Author's own calculations based on the data which is taken for the period 1923-1968 from resources of former Ministry of Trade compiled by Foreign Trade Expert Husamettin Nebioglu. The data for the period 1969-2010 are gathered from TURKSTAT.

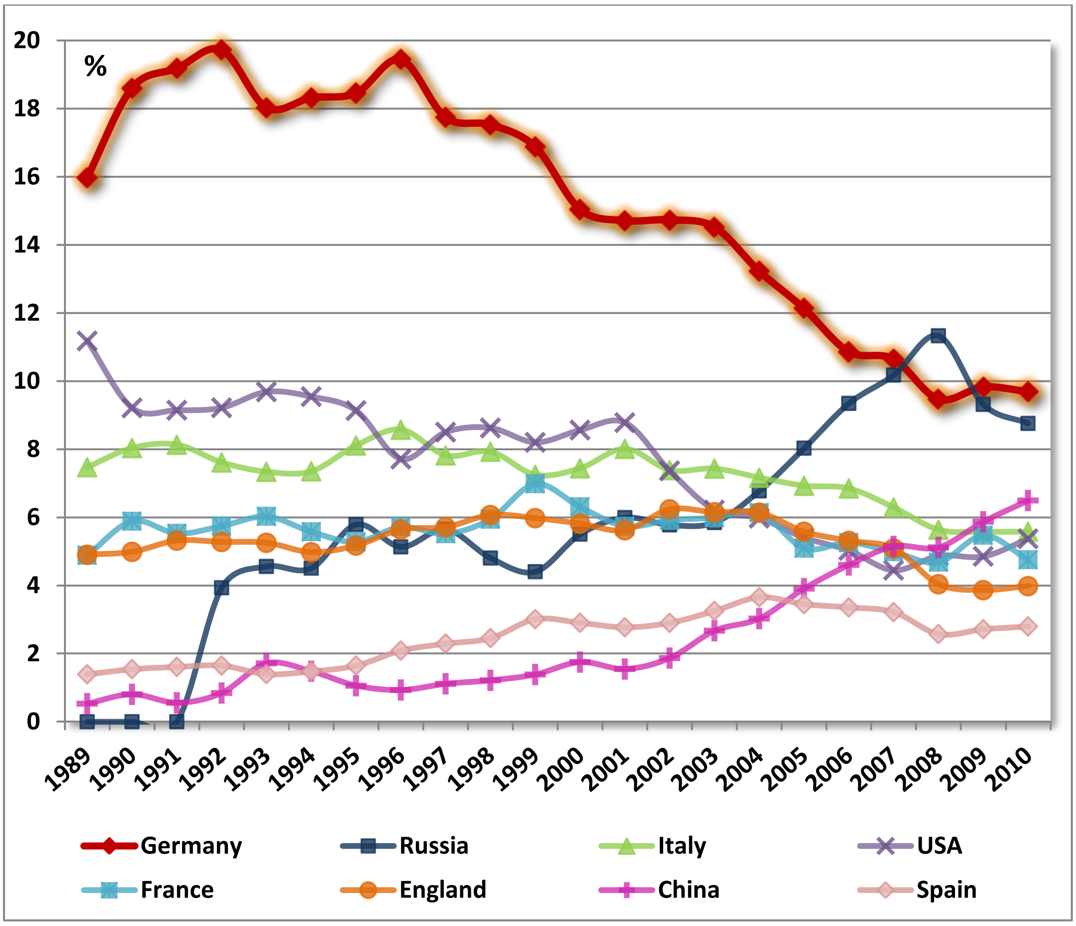

Figure 3.1: Leading trading partners' percent shares in total trade volume of Turkey (Top 8 countries in total Turkish trade in the period 2000-2010)

When examined separately, it is seen that Germany ranks the first incessantly in Turkish exports for the last two decades having on average 18% annual share in total exports of Turkey between 1990 and 2010. In the first half of this period, between 1990 and 1999, the average share was 22.6%, however, in the second half, between 2000 and 2010, the share decreases to 13.3%. As Figure 3.2 illustrates, the declining pattern observed in the share of Germany in total Turkish exports is also inherent in Germany's shares in imports and consequently in total trade as well. This fact can be interpreted as during the 2000's; the country composition of Turkey in trade has diversified, reducing the roles of individual countries and increasing the number of prominent trading partners. Similarly, the recent increases in the shares of some of the remaining partners such as Russia and China may have also been responsible for this situation (as can be seen from Figure 3.1). As a result, the relative importance of Germany has decreased in time, especially since the beginning of 2000's. Nevertheless, Germany has retained to have the highest shares in Turkey's exports and in total trade as well. Furthermore, Table 3.1 demonstrates that the role of Germany in Turkish total trade has fluctuated over the past 88 years but never decreased below 12.1% average annual share level.

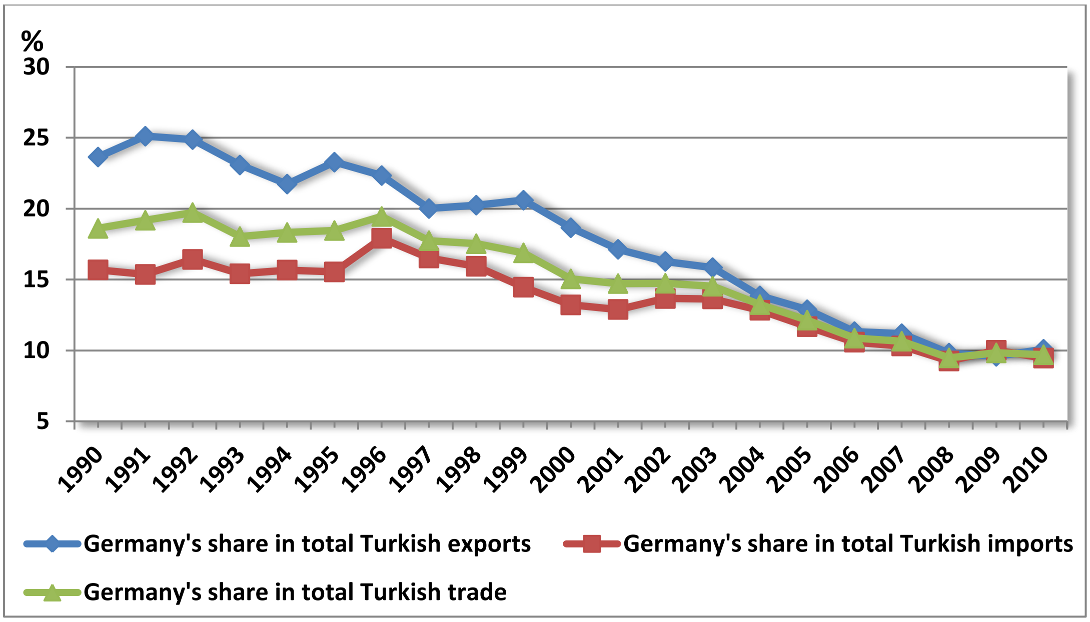

Figure 3.2: Germany's shares in exports, imports and total trade of Turkey between 1990 and 2000

On the imports side, Germany has on the average 13.6% annual share in total imports of Turkey between 1990 and 2010. Throughout this period, Germany was constantly the leading import market of Turkey but has recently conveyed its leadership to Russia and ranked second for five years: between 2006 and 2010 which results from Turkey's excessive natural gas imports from Russia in the mentioned period.

The aforementioned descriptive analysis shows that having at least around 10% annual shares each year in both Turkish imports and exports, Germany is the leading and the most influential trading partner of Turkey. Therefore, trade with Germany can be taken as a representation of Turkey's trade pattern and can be analyzed to see the responses of Turkish trade balance to changes in the exchange rate.

The representative power of the trade with Germany is also explicit when we examine the trade balance between the two countries. As can be seen from Figure 3.3, the trade balance that Turkey has with Germany follows the exact path that Turkish total trade balance exhibits. Except for the period between 1995 and 1997 where the trade balance with Germany experienced a relatively higher deterioration compared to the total trade balance, over the last two decades, trade with Germany possessed similar characteristics with total Turkish foreign trade. As the figure illustrates distinctly, when the overall trade deficit widened, e.g. as is the case from 2001 till 2008, trade balance of Turkey with Germany worsened in the same manner. Similarly, when the total Turkish trade balance started to improve, e.g. as observed in 1994, 1998-99, 2001, 2009, trade with Germany exhibits the same positive movement as well.

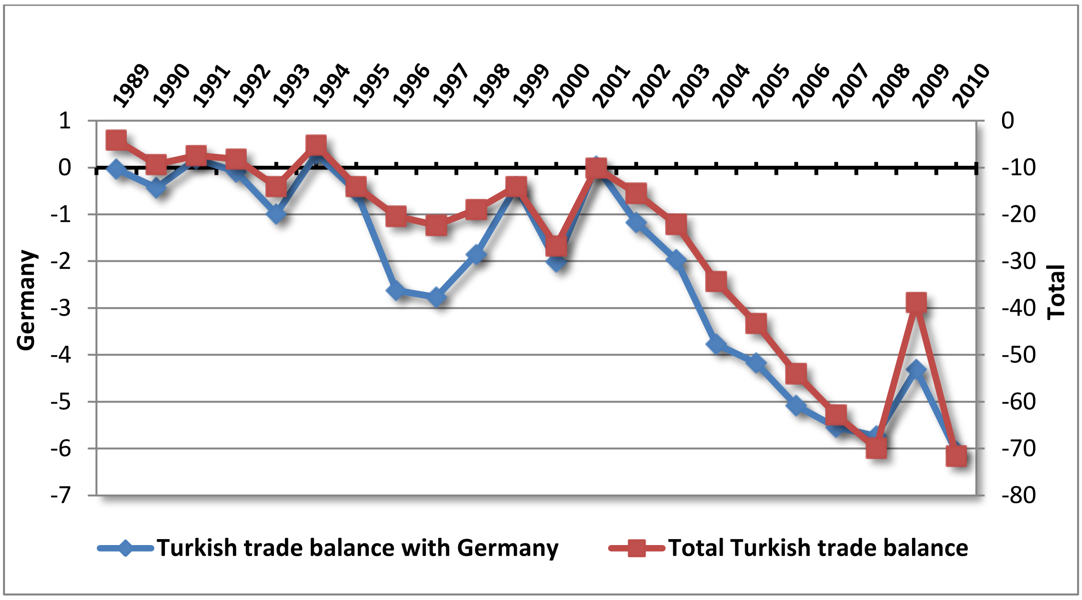

Figure 3.3: Turkish total trade balance and trade balance with Germany in billions of dollars

Our analysis show that Germany is the outstanding trading partner of Turkey that is substantially effective on the trade path of Turkey, which in turn highlights the high representative ability of bilateral trade with Germany to reflect the dynamics of total Turkish trade properly. For this reason, Germany is chosen as the country to be studied, in order to search for the existence of industry-level J curve phenomenon in Turkey at the bilateral level.

3.1.2. Industry Selection

In the analysis of the bilateral J curve, the industry level is incorporated through the use of the commodity breakdown of the total trade with Germany according to the Harmonized System. Harmonized System (HS, The Harmonized Commodity Description and Coding System) is defined to be a multipurpose international product nomenclature which is developed by the World Customs Organization (WCO). WCO states that the HS is employed by more than 200 countries for the registration of the international trade statistics, and consequently over 98% of the merchandise trade in the world is said to be classified in terms of the HS (World Customs Organization, 2011).

In order to search for the bilateral J curve phenomenon in industry level, the commodity groups that are traded the most between Germany and Turkey between 2000 and 2010 is examined. The period beginning with 2000 and extending to 2010 is chosen in order to figure out the up-to-date set of the most traded industries between the two parties. Further examination of the commodities traded has shown that the set of the prominent goods sold to and bought from Germany in 1990's is different from that in 2000's. For this reason, in order to investigate whether the J curve exists in the trade of the most excessively traded products contemporarily between two countries, the total trade volume of Turkey with Germany in 2000's is examined according to HS chapters. The top twenty chapters that have at least 1% share in total trade volume of Turkey with Germany is chosen to be analyzed, which altogether comprises 86% of the total trade realized between Turkey and Germany in the period 2000-2010. The rest of trade, which corresponds to 14% of the total volume in the same period, was carried out in 77 of the 97 HS chapters which each have less than 1% share on the average. Moreover, the group of industries selected also composes a considerable portion of the goods that Turkey in general trades mostly currently. As Table 3.2 illustrates, approximately 62% of Turkey's total trade since 2000 is carried out in the set of industries to be analyzed.

Table 3.2: Shares of twenty leading industries in bilateral trade with Germany in the period 2000-2010 and the industries' shares in total trade of Turkey[32]

HS Code	**HS Chapter**	**Shares of goods in trade with Germany**	**Shares of goods in total trade of Turkey**
		2000-2010	
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	18.11%	10.82%
87	Vehicles other than railway or tramway rolling-stock, and parts and acc. thereof	16.36%	9.45%
61	Articles of apparel and clothing acc., knitted or crocheted	8.93%	3.45%
85	Electrical machinery and equip. and parts, telecommunications equip., sound recorders, TV recorders	8.75%	7.64%
39	Plastics and articles thereof	4.74%	3.95%
62	Articles of apparel and clothing acc., not knitted or crocheted	4.46%	2.53%
72	Iron and steel	2.65%	8.30%
30	Pharmaceutical products	2.43%	1.61%
73	Articles of iron or steel	2.24%	2.21%
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and acc.	2.18%	1.28%
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags	2.01%	0.92%
29	Organic chemicals	1.66%	1.80%
40	Rubber and articles thereof	1.65%	1.24%
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	1.54%	1.25%
08	Edible fruit and nuts; peel of citrus fruit or melons	1.50%	1.22%
20	Preparations of vegetables, fruit, nuts or other parts of plants	1.35%	0.55%
76	Aluminium and articles thereof	1.33%	1.25%
38	Miscellaneous chemical products	1.28%	0.69%
32	Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks	1.20%	0.71%
89	Ships, boats and floating structures	1.19%	0.92%
	Sum of the industries	**85.58%**	**61.77%**

[32]Author's own calculations using the data taken from the Database of Ministry of Economy that is based on TURKSTAT data.

Of these 20 principal industries in which majority of the trade between Turkey and Germany is realized, there are some that Turkey has been a net exporter of permanently, and in the same way, there are some that Turkey imports more than it exports. For instance, Turkey has always been a net exporter of apparel articles and clothing accessories to Germany, irrespective of whether knitted/crocheted or not (Chapters 61 and 62). Likewise, worn clothing and other textile articles, rags (Chapter 63) are another group of goods that Turkey has been constantly exporting to Germany remarkably more than it imports from the same direction.

In addition, edible fruit and nuts, citrus fruit or melon peels (Chapter 08) as well as vegetables, fruit or nut preparations (Chapter 20) are the other groups of commodities that Turkey has been persistently recording a trade surplus with Germany. On the other hand, in trade of some goods with Germany, such as rubber and rubber articles (Chapter 40, since 1998) and articles of iron and steel (Chapter 73, since 2004), Turkey has recently started to experience favorable balance of trade, while having trade deficits formerly. Although there had been occasional trade surpluses earlier in the trade of aluminium and aluminium articles (Chapter 76), Turkey has started to export this group of products to Germany considerably more than it imports since 2005.

On the other hand, the rest of the chapters other than the abovementioned ones, are the group of goods that Turkey imports heavily from Germany and exports in comparatively smaller amounts. For example, Turkey imported tanning or dyeing extracts (tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks, Chapter 32) from Germany on average 150 times more than the value of its exports to Germany each year between 2000 and 2010. The greatest trade deficit totaled in the period 2000-2010 with Germany was experienced in the product group of nuclear reactors, boilers, machinery and mechanical appliances (Chapter 84) with an annual average deficit of 2.1 billion dollars. Similarly, Turkey registered a trade deficit in the vehicles other than railway or tramway rolling-stock (Chapter 87) amounting up to over 14 billion dollars between 2000 and 2010. Plastics and plastics articles (Chapter 39) as well as electrical machinery and equipments (Chapter 85) are the other two industries that Turkey ran considerable amounts of deficit with Germany. The trade of these goods posted annual deficits of respectively 771 and 506 million dollars on average over the period 2000-2010. In all of the abovementioned industries, Turkey has been conventionally running trade deficits with Germany over the last two decades.

In a descending manner, iron and steel (Chapter 72), pharmaceuticals (Chapter 30), optical, photographic, cinematographic medical or surgical instruments (Chapter 90), organic chemicals (Chapter 29), paper, paperboard and articles made of them (Chapter 48), miscellaneous chemicals (Chapter 38), tanning or dyeing extracts (Chapter 32), ships, boats and floating structures (Chapter 89) are the other basic industries that Turkey trades substantially. At the same time these are the groups of goods that Turkey has recurrent and sizeable trade deficits with Germany. As a result, in these twenty industries that Turkey makes nearly 85% of its trade with Germany each year during 2000's, the majority (12 out of 20) are the goods of which Turkey is a net importer from Germany.

3.2. The Trade Balance Model

In analysis of the industry-level bilateral J curve, the model of Rose and Yellen (1989) is used. A remarkable number of the empirical studies reviewed in Chapter 2 (such as Rose (1990), Brada et al. (1997), Bahmani-Oskooee and Brooks (1999), Doroodian et al. (1999), Wilson and Tat (2001), Wilson (2001), Arora et al. (2003), Akbostanci (2004), Bahmani-Oskooee and Ratha (2004b), Bahmani-Oskooee et al. (2005), Bahmani-Oskooee et al. (2006), Bahmani-Oskooee and Wang (2006), Baek (2006), Bahmani-Oskooee and Ratha (2007), Halicioglu (2007), Bahmani-Oskooee et al. (2008), Halicioglu (2008a, 2008b), Bahmani-Oskooee and Kutan (2009), Celik and Kaya (2010)) have adopted the partial reduced form model introduced in the work of Rose and Yellen (1989) where the trade balance is modeled as a function of real exchange rate, real foreign income and real domestic income. The model in question is as follows:

$$LogTB\_i_t = \beta_0 + \beta_1 LogRER_t + \beta_2 LogYG_t + \beta_3 LogYT_t + u_t \qquad (1)$$

In this model, the trade balance is denoted as LogTB_i where the subscript *i* symbolizes the top twenty industries chosen to be analyzed. The trade balances of each of the 20 industries are regressed on the real bilateral exchange rate between the currencies of Turkey and Germany (denoted as LogRER), the domestic real income of Turkey (denoted as LogYT) and the real income of Germany (denoted as LogYG) following Rose and Yellen (1989). In order to transfer the variables on a similar scale numerically, the logarithms of the variables are calculated and included in the model, which is represented by the prefix *Log*. The logarithmic use of the variables also enables the interpretation of the coefficients as elasticities.

Following Rose and Yellen (1989) all the variables employed are chosen to be in real terms. Rose (1990), Rose (1991), Bahmani-Oskooee and Malixi (1992), Bahmani-Oskooee and Brooks (1999), Wilson and Tat (2001), Wilson (2001), Kale (2001), Bahmani-Oskooee and Goswami (2003), Onafowora (2003), Arora et al. (2003), Akbostanci (2004), Bahmani-Oskooee and Wang (2006), Baek (2006), Bahmani-Oskooee and Ratha (2007), Bahmani-Oskooee and Ardalani (2007), Bahmani-Oskooee and Wang (2007a, 2007b), Halicioglu (2007), Bahmani-Oskooee et al. (2008), Bahmani-Oskooee and Mitra (2008), Bahmani-Oskooee and Hegerty (2008), Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee and Wang (2008), Bahmani-Oskooee and Kovyryalova (2008), Bahmani-Oskooee and Mitra (2009), Bahmani-Oskooee and Satawatananon (2010) constitute examples of other studies that have used real variables.

The trade balance variable is defined as a ratio of exports of Turkey to Germany in an industry over imports of Turkey from Germany in the same industry (X_i/M_i), following Bahmani-Oskooee and Alse (1994). They state that defining the trade balance as exports over imports or vice versa removes the sensitivity of the conclusions to the measurement units; as such ratios become unit free. They further praised the use of such ratios for the trade balance variable as they can be interpreted in real as well as in nominal terms since the ratio will not differ whether price indices are employed to transform the nominal values into real or not. Moreover, Onafowora (2003), having one of the studies which defined the trade balance as exports to imports ratio, mentions that the logarithmic use of such a ratio conveys the exact Marshall-Lerner condition rather than an approximation. Bahmani-Oskooee and Malixi (1992), Marwah and Klein (1996), Brada et al. (1997), Kale (2001), Bahmani-Oskooee and Goswami (2003), Arora et al. (2003), Bahmani-Oskooee and Wang (2007), Bahmani-Oskooee and Mitra (2009), Celik and Kaya (2010) all are examples of studies which have defined the trade balance as the ratio of exports to imports.

In order to construct the real bilateral exchange rate, the bilateral nominal exchange rate between Turkish Lira and the German currency Euro which is defined as units of Liras per unit of Euros, is adjusted by the Consumer Price Indices (CPI) of both countries in the following way:

$$RER_t = NER_t * {}^{CPI\_Germany}/_{CPI\_Turkey}$$

Since the bilateral real exchange rate variable is defined as the units of domestic currency (Lira) per units of foreign currency (Euro), a depreciation of Lira against Euro, or in other words an appreciation of Euro against Lira, is demonstrated by an increase in LogRER. Among the studies reviewed in Chapter 2, Bahmani-Oskooee and Alse (1994), Zhang (1996), Brada et al. (1997), Bahmani-Oskooee and Niroomand (1998), Gupta-Kapoor and Ramakrishnan (1999), Wilson (2001), Bahmani-Oskooee and Goswami (2003), Arora et al. (2003), Bahmani-Oskooee and Ratha (2004b, 2007, 2008), Bahmani-Oskooee et al. (2005), Bahmani-Oskooee et al. (2006), Bahmani-Oskooee and Hegerty (2008), Bahmani-Oskooee and Harvey (2006), Bahmani-Oskooee and Wang (2006, 2007a, 2007b, 2008), Halicioglu (2007, 2008a), Bahmani-Oskooee et al. (2008), Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee and Mitra (2008, 2009), Bahmani-Oskooee and Kutan (2009), Bahmani-Oskooee and Satawatananon (2010), Wilson and Tat (2001), Bahmani-Oskooee and Mitra (2010), Celik and Kaya (2010), and Yazici and Klasra (2010) are the ones that deflated the nominal exchange rates using CPIs.

When it comes to the expectations regarding the coefficients in equation (1), as long as the Marshall-Lerner condition holds, the bilateral real exchange rate (β_1) is anticipated to have a positive coefficient in the long run. However, the J curve phenomenon is consistent with having negative β_1's followed by positive ones in the short run, as real depreciation is expected to deteriorate the trade balance in the short run but to ameliorate thereafter in time. On the other hand, an increase in the domestic real income is expected to boost the domestic demand for imports, as put forward by Felmingham (1988), therefore one should expect a negative coefficient for the LogYT variable. Similarly, since increases in the foreign real income is associated with enhanced foreign demand for domestic goods, which in turn raises exports of a country, an increase in the real income of Germany (LogYG) is expected to improve the trade balance of Turkey. Therefore, the coefficient of LogYG should be expected to be positive with the same logic. However, Brada et al. (1997) state that real domestic income proxies the availability of exportables, and of import substitutes with increasing domestic production. In a similar manner, Bahmani-Oskooee and Brooks (1999) mention that if the increases observed in the domestic income are originated from an increase in the production of import-substitute goods, then imports may decline resulting in an improvement of the trade balance. By the same token, if Germany's real income is increasing due to the production of the goods similar to the ones imported from Turkey, then this may result in a deterioration of the Turkish trade balance. Therefore, there are no a-priori expectations in this study regarding β_2 and β_3, as they can be either negative or positive depending on whether demand side factors dominate the supply side factors or vice versa in trade between Germany and Turkey, as stated by Halicioglu (2007).

3.3. The Data

In this section, while information about the data sources and the corresponding adjustments are presented, a preliminary investigation about the statistical properties of the data is introduced.

3.3.1. The Data Sources

The data of the exports and imports of Turkey with Germany in the abovementioned 20 chapters are taken from the Database of Ministry of Economy that is based on TURKSTAT data. The trade data in the commodity level is available quarterly for the period 1989:1-2011:3 in the Database of Ministry of Economy. For this reason the analysis period is chosen to be 1989:1-2011:3[33].

Since Democratic Republic of Germany (East Germany) was united with the Federal Republic of Germany (West Germany) in 1990, the trade data after 1991 represents the unified Germany. Prior to 1991, the trade of Turkey with East Germany corresponds to merely 1% of the trade with West Germany in the same years and therefore accepted to be negligible. For this reason, the trade data for 1989 and 1990 represents only West Germany.

The nominal bilateral exchange rate series between Turkish Lira and Euro is obtained from the Electronic Data Delivery System of the Central Bank of Republic of Turkey (CBRT). Since the Euro is adopted in January 1st, 1999, the Euro-Turkish Lira exchange rates are available beginning from 1999:1 in the database of CBRT. For this reason, the German Mark (DEM) - Turkish Lira bilateral exchange rates prior to 1999 retrieved from CBRT are converted to the Euro-Turkish Lira exchange rate using the Euro fixed rates (the irrevocably fixed conversion rates of old national currencies into Euro) adopted by the European Commission's Council Regulation (EC) No 2866/98 of 31

[33] In order not to lose information on the data, some imputations were done to tackle the unduly missing data resulting solely from the definition of the trade balance as exports to imports ratio. For example, for the quarters when no imports are made, the ratio cannot be calculated and when no exports are made the ratio equals zero, and becomes undefined when taken the logarithm. For these cases, one dollar worth of imports or exports is assumed to be made rather than zero dollars.

December 1998 on the conversion rates between the Euro and the currencies of the Member States adopting the Euro (Statistical Office of European Union (EUROSTAT), 2009).

The Consumer Price Indices (CPI) for Turkey and Germany used in construction of the bilateral real exchange rates, are taken from the statistical database of Organization for Economic Cooperation and Development (OECD) where the year 2005 is the base year.

For the domestic and foreign real income variables, GDP volume estimates (in millions of US dollars, fixed PPPs) are taken from the Database of OECD, and they are transformed into indices where the base year is chosen to be 2005 in order to be compatible with CPIs.

3.3.2. A Brief Visual Inspection of the Series

In this section, with the purpose of acquiring a preliminary understanding of the variable movements, the data are depicted in graphs in order to facilitate basic visual examinations.

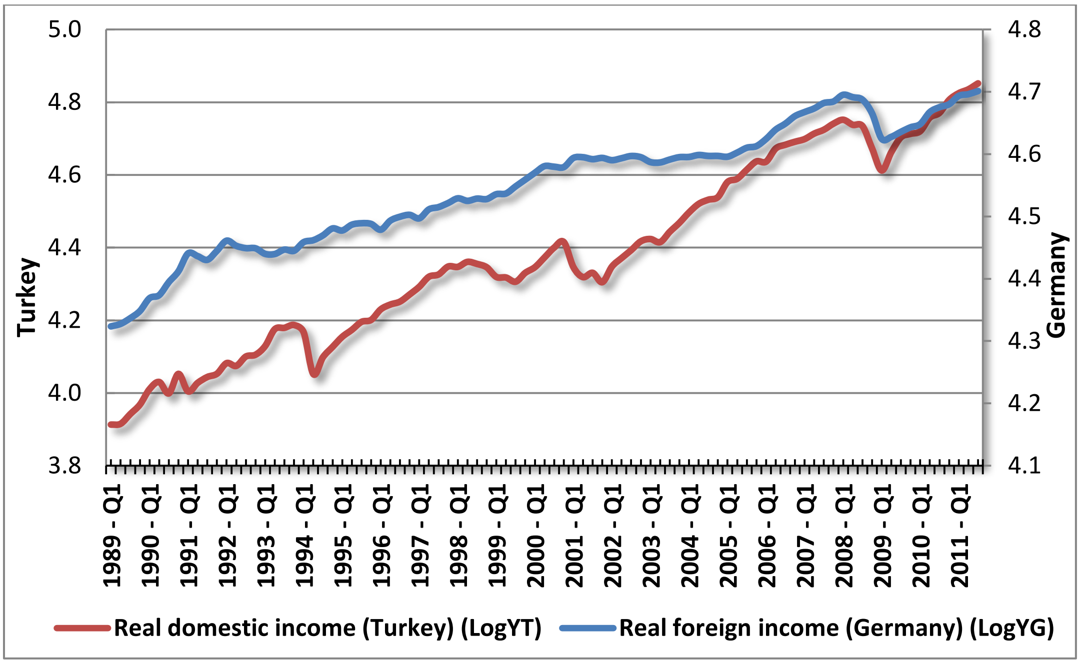

Figure 3.4: The real domestic income (of Turkey) and the real foreign income (of Germany)

Figure 3.4 portrays the behavior of the real income of Turkey (LogYT) over the study period, along with the simultaneous movements in the real income of Germany (LogYG). Figure 3.4 shows that, Germany experienced a constant rise in its real income with small fluctuations for most of the period, however recorded a remarkable downturn in the global financial crisis of 2009 whose effects were noticeable beginning from the last quarter of 2008.

When compared, Turkey experienced severe contractions several times prior to 2009, while Germany followed a relatively stable path up to the same point. Over the period 1989:1-2011:3, the first sharp decrease in Turkish real income is observed in the first and the second quarter of 1994, corresponding to the economic crisis of that year. Nevertheless, Turkish economy starts to recover by the third quarter of 1994 and grows steadily for approximately four years. However, with the economic slowdown of 1998, Turkish real income started to worsen once again in the second half of the year, although not as sharply as experienced by the contraction of 1994. The deterioration in the Turkish economy continued in the following year, 1999, and deepened further in the third quarter of the year by the disruptive earthquake of August 17th, 1999 that hit a very important industrial district of the country. Fortunately, amelioration of the Turkish economy started in the last quarter of 1999 and continued to improve until the second big shock of 2001. This new crisis resulted in a steep drop in the output of the economy which endured throughout the whole year. With the beginning of the subsequent year 2002, the economy gathers its strength back and the real domestic income sustains improvement continually over approximately more than six years with slight deviations until the global financial crisis occurred in the middle of 2008 while the most detrimental effects became apparent in the first quarter of 2009. It is worth to note that the only similar movement in the real incomes of Turkey and Germany is observed from 2008 up to the end of the study period 2011:3, in response to the crisis that influenced most of the major economies in the world. As the contraction after the crisis took place having the same dynamics for both of the countries, similarly the recovery from the recession also followed the parallel paths in both Turkey and Germany.

Figure 3.5 plots the bilateral real exchange rate between Turkish Lira and German currency Euro (LogRER) along the research span. At first glance, three periods of time with distinctive characteristics draw attention. More precisely, the first one of these periods is the duration of real depreciation of the exchange rate between 1993:4 and 1994:2 which results from the economic crisis of 1994. This period is followed by a time span where the Turkish lira is appreciated against Euro almost constantly ongoing from 1994:3 till 2000:Q4. The third featured period consists of the first three quarters of 2001 where continuous real depreciation takes place, which was a feature of the crisis arose that year. The movements of the real bilateral exchange rate excluding these periods do not seem to pursue any specific pattern, but mostly fluctuate. However, the fluctuations seem to become more volatile after the last quarter of 2001 till the end of the study coverage when compared to the period prior to the crisis of 1994.

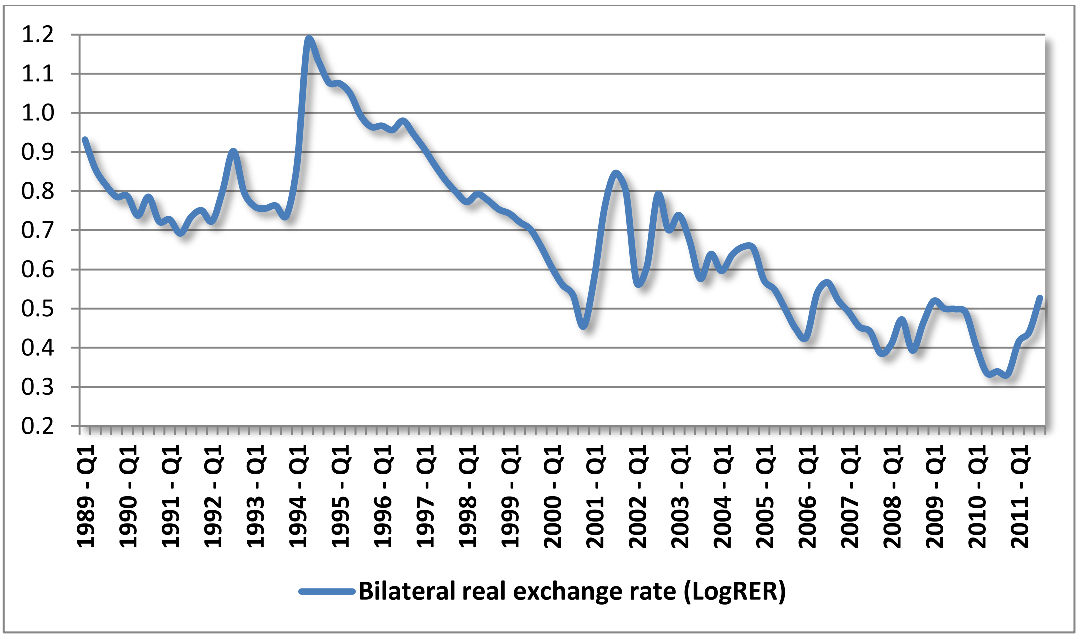

Figure 3.5: The bilateral real exchange rate (LogRER) between Turkish Lira and Euro

Figures 3.6 to 3.12 show the movements in the trade balances of the twenty chapters under study over the research period, in groups of three[34]. The bilateral real exchange rate (LogRER) variable is also attached to the graphs in order to develop a basic understanding of the relationship between the trade balances and the exchange rate[35]. The first four figures present the series of twelve chapters of which Turkey is a net importer

[34] Except for Figure 3.12 where the group consists of the two remaining chapters which possess more fluctuations compared to the rest of the chapters of which Turkey is a net exporter.

[35] The bilateral real exchange rate (LogRER) is depicted in the secondary vertical axis in the right of the graphs.

from Germany in majority, while the following three figures portray the eight chapters of which Turkey is a net exporter to Germany, as given in the discussion of Chapter 3.1.2 Industry Selection.

To begin with, from Figure 3.6, it is seen that Chapters 84, 87, and 39 seem to be responsive somehow to the steep movements experienced in real exchange rate in 1994, 2001 and in between these two years. For example, the trade balance in Chapter 87 seems to move in the opposite direction to that of the real exchange rate with some lags. In other words, following the real depreciation in 1994 and 2001, the trade deficit widens in the subsequent quarters and improves with some delay when the currency is being appreciated, as is the case between 1994 and 2001. Similarly, there exist initial upswings in the trade balance of Chapter 84 in the following quarters of 1994 and 2001 depreciations, while a decrease is observed in the beginning of the appreciation period, which gives the sign of a positive relationship between trade balance and the exchange rate for Chapter 84. Similarly, the trade deficit in Chapter 39 seems to narrow primarily when the currency is depreciated, and to widen when appreciated. This signals the existence of a parallel movement of the trade balance in Chapter 39 that occurs in the early quarters following the changes in the exchange rate.

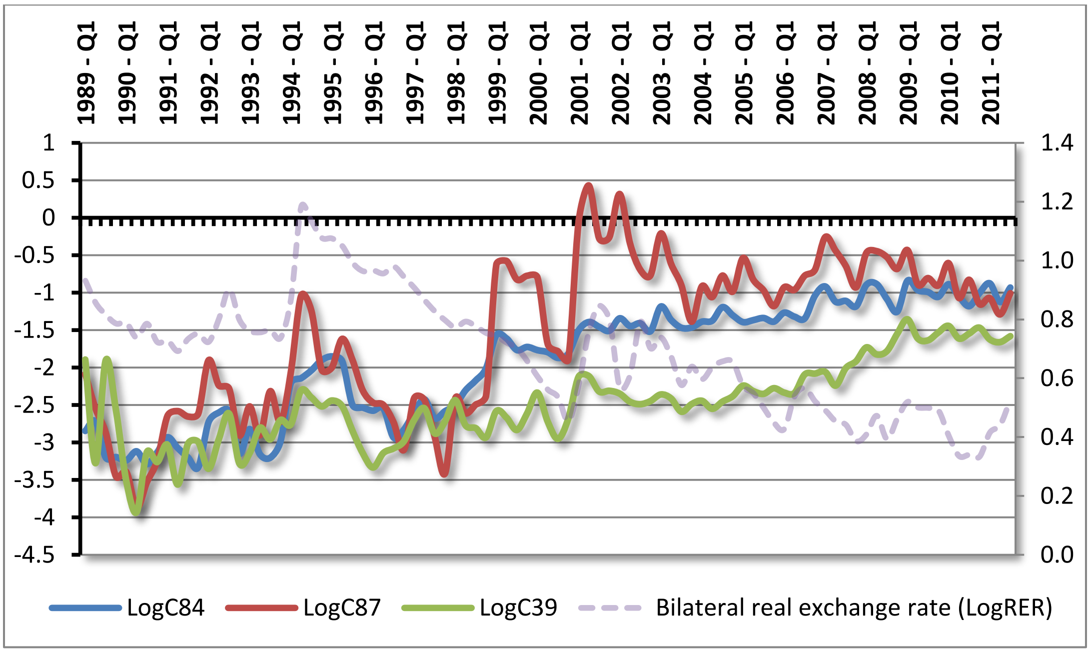

Figure 3.6: The trade balances in Chapters 84, 87, and 39

Among the remaining chapters that Turkey imports from Germany more than it exports, as revealed from the inspection of Figures 3.7, 3.8 and 3.9, the trade balances in Chapters 30, 72, 85, 29, 48, and 89 seem to adjust their path to major changes in the real exchange rate with some lags. For instance, Figure 3.7 shows that, the trade deficit in Chapter 72 experiences a remarkable change following the depreciation in 1994, while a similar alteration occurs in the trade deficit of Chapter 30 corresponding to the depreciation in 2001. Moreover, although Chapter 85 seems relatively unresponsive, still slight co-movements with the depreciations can be detected. In the same way, Figure 3.8 gives hints of a possible relationship between the real exchange rate and the trade balance of Chapters 29 and 48, apparent from the changed directions of these series coinciding with the two prominent depreciations in the study period. However, Chapter 90 does not look like to respond in a particular way to exchange rate changes. Figure 3.9 also shows that the trade deficit in Chapter 89 deteriorates strikingly after approximately one year following the depreciations of 1994 and 2001, suggesting a negative relationship with the exchange rate movements. Nevertheless, Chapters 32 and 38 seem to remain unaffected by the changes in the real exchange rate.

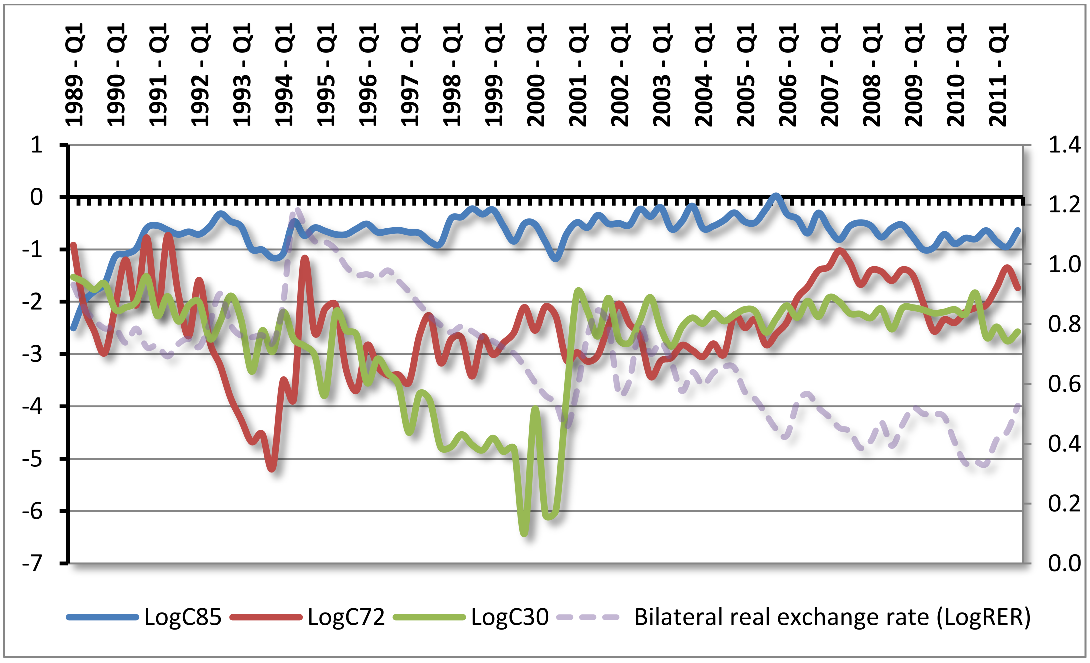

Figure 3.7: The trade balances in Chapters 85, 72, and 30

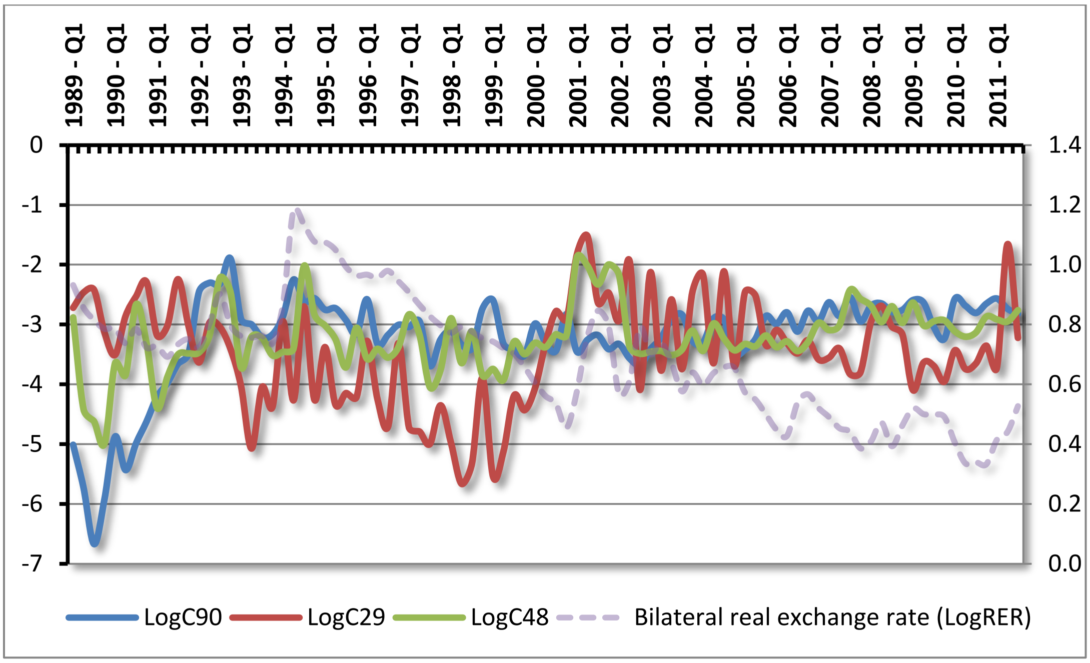

Figure 3.8: The trade balances in Chapters 90, 29, and 48

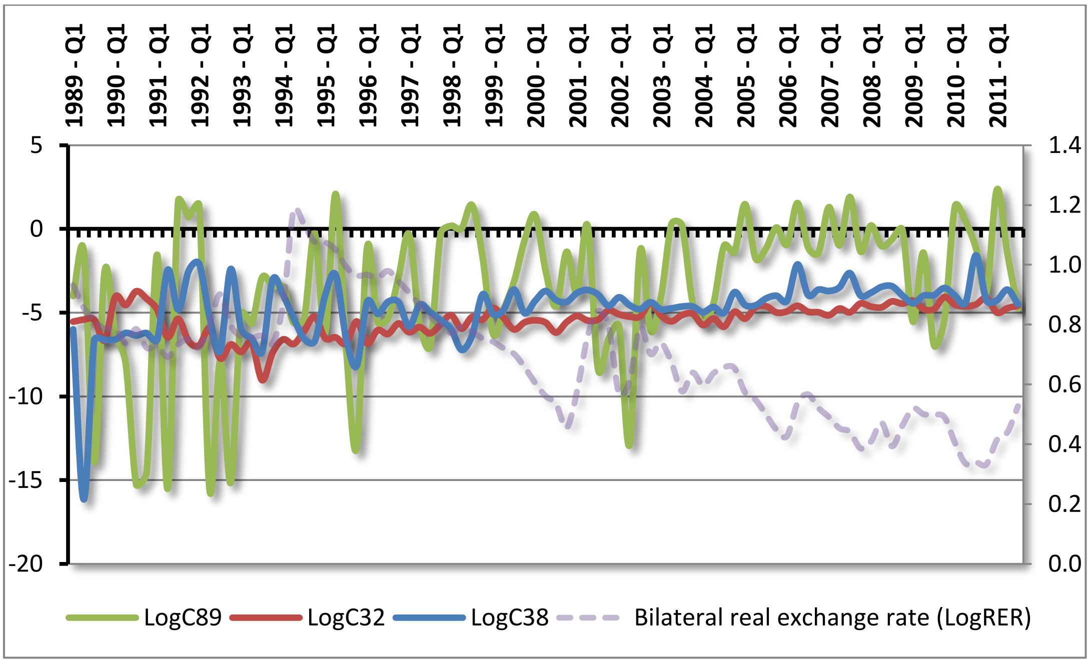

Figure 3.9: The trade balances in Chapters 38, 32, and 89

The chapters in which Turkey is a net exporter to Germany are given in Figures 3.10, 3.11 and 3.12. In Figure 3.10, it can be seen that the trade balances in the Chapters 73, 40 and 76 rise following the real depreciation of the Turkish Lira in 1994 and worsen with the subsequent appreciation; while they start to move in opposite directions after 2001. Therefore, it is suspected that trade balance of these Chapters in which Turkey has recently started to record trade surpluses can be significantly related to the exchange rate fluctuations. Likewise, Figure 3.11 also points out that there exists an eye-catching parallel movement between the absolute trade surpluses in the Chapters 61, 62, and 63 and the real exchange rate. The depreciation of 1994 seem to increase the trade surpluses of Chapters 62 and 63 sooner than it increases that of Chapter 61 slightly, while the deterioration happens almost simultaneously with the appreciation afterwards for all of the chapters. Similarly, depreciation of 2001 also seems to cause the trade surpluses of these chapters to grow further. Finally, inspection of Figure 3.12 reveals that the trade surplus of Chapter 08 seems to pursue a similar path to that of the real exchange rate, which is inferred especially from the period around the 1994 depreciation and from the following appreciation span. Moreover, trade balance in Chapter 20 appears to respond in an opposite way, while tracing a relatively stable course through time.

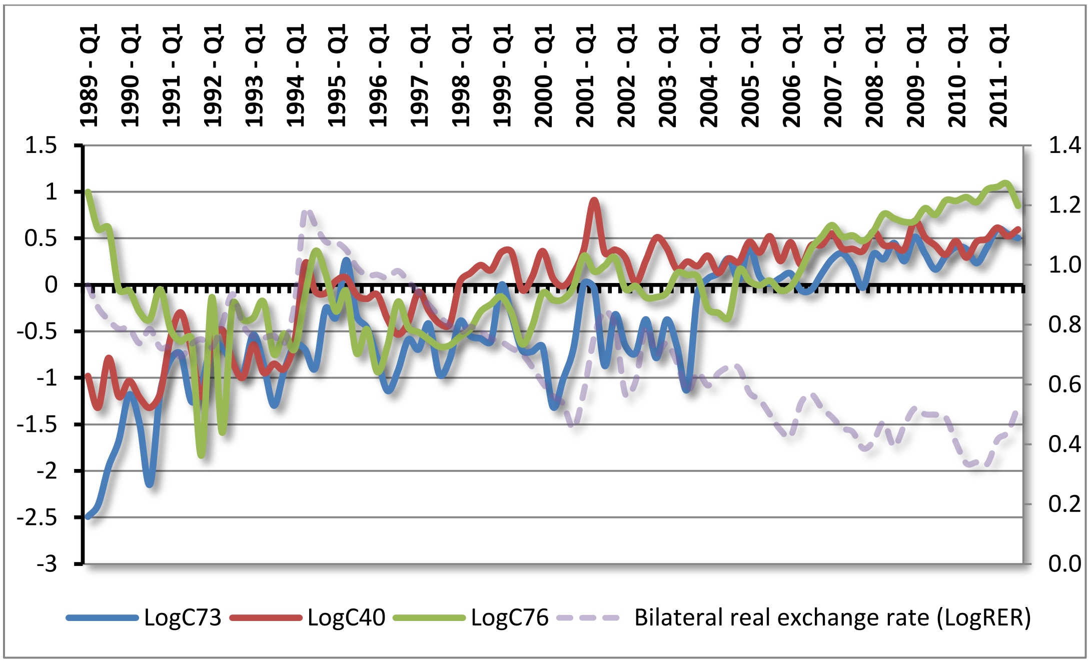

Figure 3.10: The trade balances in Chapters 73, 40, and 76

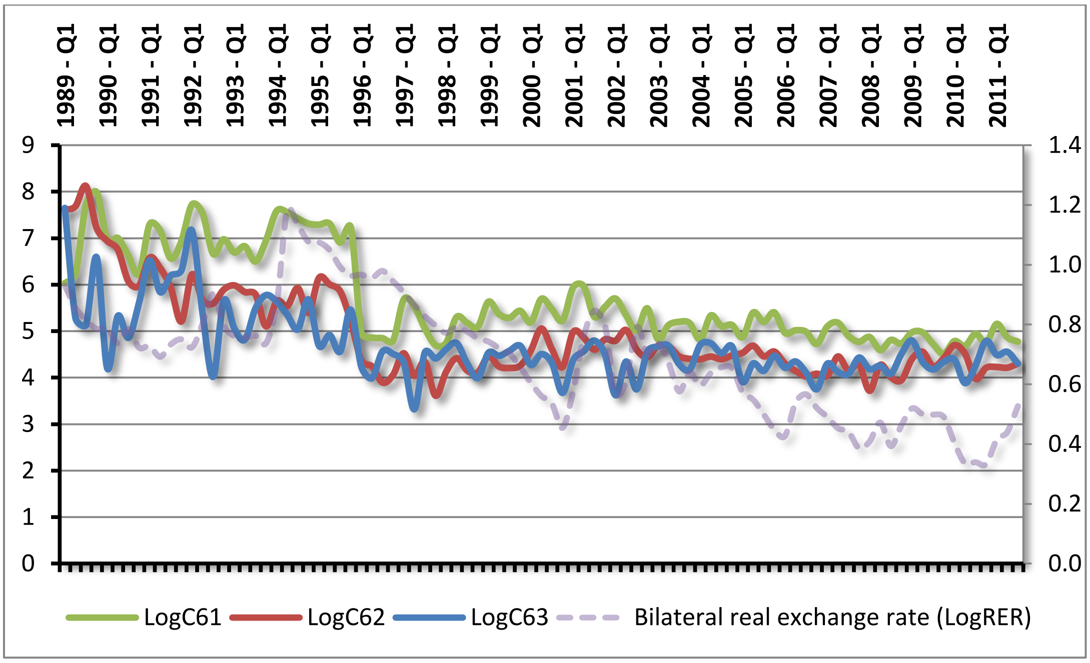

Figure 3.11: The trade balances in Chapters 61, 62, and 63

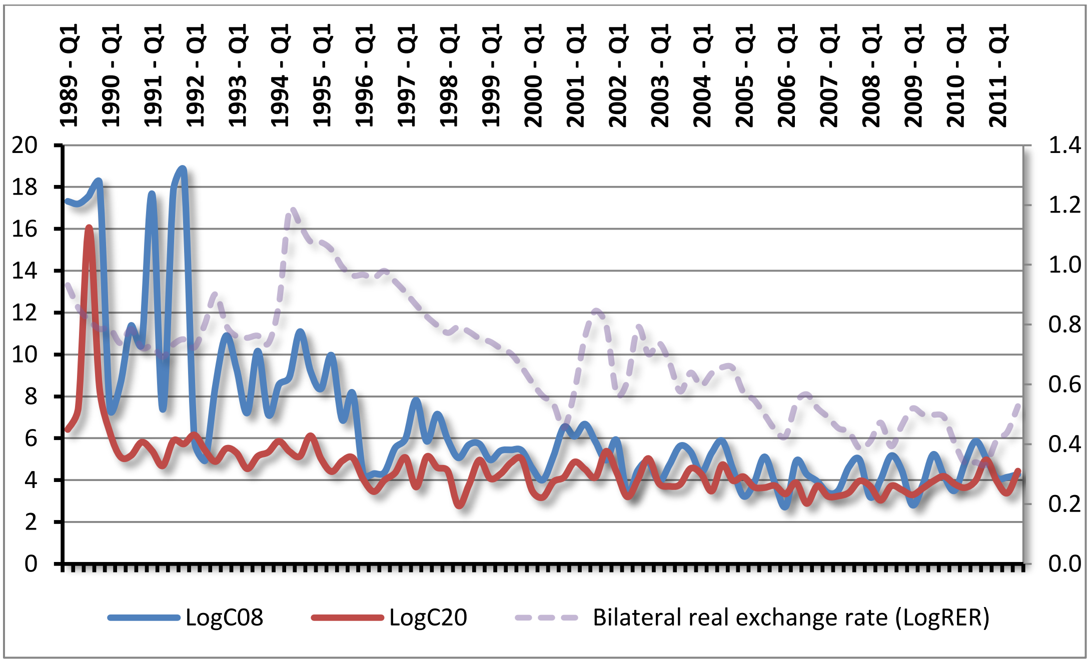

Figure 3.12: The trade balances in Chapters 08 and 20

3.3.3. Unit Root Tests

Many of the econometric estimation techniques take into account the stationarity of the time series involved. Methods adopted vary significantly according to whether the variables are stationary or not. For this reason, Augmented Dickey Fuller (ADF) unit root tests for the levels as well as for the first differences of the variables are presented below[36]. The prefix *D* indicates the first difference of the variable under study, while the 20 industries are shown with letter *C* (Chapter) followed by the corresponding chapter code.

Table 3.3 shows that while real bilateral exchange rate variable (LogRER) shows a weak sign of trend-stationarity as the null hypothesis of having a unit root is rejected when trend is included, still Table 3.4 shows that LogRER should be regarded as integrated of order 1 (I (1)), as first differencing makes the series stationary. On the other hand, the real income of Germany (LogYG) exhibits strong evidence of trend stationary, as inclusion of the trend rejects the hypothesis of unit root at 99% confidence level. However, the real income of Turkey (LogYT) is nonstationary as seen from Table 3.3, but becomes stationary after differencing as proved by Table 3.4.

Among the industry series, Chapter 48 (Paper and paperboard and articles made of them) and Chapter 85 (Electrical machinery and equip.; telecommunication equip.) are found to be stationary, at 99% level. Similarly, Chapter 72 (Iron and steel), Chapter 62 (Not Knitted/crocheted articles of apparel and clothing), and Chapter 90 (Optical, photographic, cinematographic medical or surgical inst.) are stationary at 95% confidence levels.

According to Table 3.3, Chapter 08 (Edible fruits, nuts, citrus fruit or melon peels), Chapter 38 (Miscellaneous chemical products), Chapter 61 (Knitted/crocheted articles of apparel and clothing acc.), and Chapter 89 (Ships, boats and floating structures) are all trend stationary series, as when trend is included into the test equation the null of nonstationarity is rejected at the 99% confidence level. Similarly, Chapter 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks) and Chapter 76 (Aluminium and aluminium articles) are also found to be trend stationary at the 95% confidence level as seen from the Table 3.3.

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[36] The upper bound to the lag length to be used in the unit root testing is chosen to be 11 as this is the maximum lag length appropriate for the sample size of the data employed.

Table 3.3: ADF test results for the levels of the variables

	With intercept only		With trend and intercept	
Variables	**Lags**	**Calculated ADF**	**Lags**	**Calculated ADF**
LogRER	2	-1.55013	1	-3.30131 *
LogYG	1	-1.87058	3	-4.25072 ***
LogYT	1	-0.53891	1	-2.98490
LogC08	7	-2.53574	2	-4.55003 ***
LogC20	8	-2.82269 *	8	-2.70192
LogC29	1	-2.72398 *	1	-2.78553
LogC30	1	-2.35342	1	-2.41521
LogC32	4	-2.15602	4	-3.57539 **
LogC38	10	-2.16781	10	-4.24520 ***
LogC39	11	-0.29232	11	-1.98071
LogC40	10	-1.90662	10	-1.39735
LogC48	0	-5.01729 ***	0	-5.67832 ***
LogC61	1	-1.89428	0	-4.21636 ***
LogC62	1	-3.07598 **	1	-3.04061
LogC63	6	-1.52388	6	-1.82496
LogC72	3	-3.07602 **	3	-3.36793 *
LogC73	10	-1.28284	10	-2.46502
LogC76	5	-0.40161	4	-3.52286 **
LogC84	10	-1.25032	11	-2.46966
LogC85	0	-5.71303 ***	0	-5.44850 ***
LogC87	8	-1.95115	8	-2.25401
LogC89	6	-2.24584	0	-8.99533 ***
LogC90	0	-2.94275 **	0	-2.99269

The critical values for the model having only the intercept are -3.51, -2.89, -2.58 for confidence levels of 99%, 95% and 90% respectively. The critical values for the model including intercept and trend are -4.06, -3.46, and -3.16 for confidence levels of 99%, 95% and 90% respectively. Rejection of null hypothesis is indicated by * for 90%, by ** for 95% and by *** for 99% confidence levels. Lags are chosen based on AIC, with maximum lag length of 11.

The rest of the industries [Chapter 20 (Vegetables, fruit or nut preparations), Chapter 29 (Organic chemicals), Chapter 30 (Pharmaceuticals), Chapter 39 (Plastics and its articles), Chapter 40 (Rubber and its articles), Chapter 63 (Worn Clothing and other textile articles, rags), Chapter 73 (Articles of iron and steel), Chapter 84 (Nuclear reactors, boilers, machinery and mechanical app.), Chapter 87 (Vehicles other than railway or tramway rolling-stock)] all fail to reject the null hypothesis of having a unit root in their levels as illustrated by Table 3.3, but achieve to reject the null of nonstationarity when their first differences are taken as shown by Table 3.4. Therefore, Chapters 20, 29, 30, 39, 40, 63, 73, 84, and 87 are concluded to be I (1). To sum up the results drawn from Table 3.3 and 3.4, it is concluded that the variables included in the J curve analysis are either I (0) - stationary or I (1) – becoming stationary after differencing.

Table 3.4: ADF test results for the first differences of the variables

	With intercept only			Without intercept and trend		
Variables	**Lags**	**Calculated ADF**		**Lags**	**Calculated ADF**	
DLogRER	3	-5.99901	***	3	-5.98589	***
DLogYG	0	-6.76832	***	0	-5.92698	***
DLogYT	0	-8.69939	***	0	-7.70366	***
DLogC08	5	-7.40388	***	5	-7.24364	***
DLogC20	8	-5.51519	***	8	-5.82679	***
DLogC29	0	-18.98215	***	0	-19.09288	***
DLogC30	1	-9.08404	***	1	-9.13087	***
DLogC32	2	-7.32415	***	2	-7.34753	***
DLogC38	8	-4.47593	***	8	-4.52086	***
DLogC39	10	-3.72224	***	10	-3.04654	***
DLogC40	9	-5.23699	***	9	-4.54847	***
DLogC48	6	-5.24161	***	6	-5.25374	***
DLogC61	0	-11.05493	***	0	-11.10307	***
DLogC62	0	-12.40633	***	0	-12.30430	***
DLogC63	5	-6.46924	***	5	-6.46581	***
DLogC72	4	-5.20513	***	4	-5.24016	***
DLogC73	9	-4.86138	***	9	-4.24491	***
DLogC76	11	-3.52430	***	11	-3.20268	***
DLogC84	9	-4.70781	***	5	-5.30126	***
DLogC85	5	-5.21945	***	5	-5.23988	***
DLogC87	7	-3.43397	**	7	-3.35099	***
DLogC89	5	-8.38479	***	5	-8.36682	***
DLogC90	1	-9.42841	***	1	-9.25757	***

The critical values for the model having only the intercept are -3.51, -2.89, -2.58 for confidence levels of 99%, 95% and 90% respectively. The critical values for the model without an intercept and trend are -2.59, -1.94, and -1.61 for confidence levels of 99%, 95% and 90% respectively. Rejection of null hypothesis is indicated by * for 90%, by ** for 95% and by *** for 99% confidence levels. Lags are chosen based on AIC, with maximum lag length of 11.

3.3.4. Basic Descriptive Statistics

The fundamental descriptive statistics of the variables are presented in Table 3.5, in order to provide insight about the statistical properties of the series. For this purpose, measures of central location such as mean and median; measures of dispersion such as maximum (Max.) and minimum (Min.) values, and standard deviations (Std. Dev.) as well as measures of distribution shape like skewness and kurtosis are presented in order to present an overall initial description of the data set.

Table 3.5: Basic descriptive statistics of the variables

	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
LogRER	0.69	0.72	1.18	0.33	0.20	0.24	2.47
LogYG	4.55	4.58	4.70	4.32	0.10	-0.36	2.29
LogYT	4.38	4.35	4.85	3.91	0.26	0.10	1.91
LogC08	6.69	5.40	18.74	2.73	3.78	1.93	6.16
LogC20	4.59	4.30	16.06	2.78	1.57	4.51	32.56
LogC29	-3.45	-3.40	-1.52	-5.66	0.89	-0.23	2.76
LogC30	-2.79	-2.37	-1.52	-6.43	1.06	-1.56	4.84
LogC32	-5.45	-5.32	-3.72	-9.03	0.93	-0.95	4.28
LogC38	-4.75	-4.42	-1.57	-16.15	1.77	-2.99	20.04
LogC39	-2.47	-2.46	-1.36	-3.93	0.55	0.03	2.62
LogC40	-0.03	0.17	0.91	-1.32	0.55	-0.86	2.62
LogC48	-3.21	-3.23	-1.87	-4.99	0.54	-0.13	4.27
LogC61	5.70	5.31	7.99	4.51	0.98	0.82	2.25
LogC62	4.92	4.53	8.12	3.61	0.96	1.32	4.19
LogC63	4.70	4.51	7.65	3.32	0.75	1.53	5.88
LogC72	-2.49	-2.55	-0.73	-5.18	0.86	-0.36	3.38
LogC73	-0.45	-0.46	0.60	-2.49	0.67	-0.68	3.39
LogC76	0.00	-0.06	1.08	-1.83	0.57	-0.17	3.38
LogC84	-1.91	-1.73	-0.84	-3.33	0.78	-0.39	1.73
LogC85	-0.68	-0.60	0.02	-2.50	0.38	-2.10	9.89
LogC87	-1.54	-1.15	0.43	-3.87	1.02	-0.33	1.99
LogC89	-3.51	-2.47	2.35	-15.63	4.39	-1.20	4.09
LogC90	-3.22	-3.01	-1.90	-6.67	0.80	-2.10	8.03

CHAPTER 4

THE EMPIRICAL ANALYSIS

In this chapter, econometric analysis of trade balance dynamics is presented. Results of the empirical analysis are used to examine the existence of J curve phenomenon at the industrial level.

Since the examination of the J-curve effect necessitates the investigation of both the short and the long run responses of the trade balance to the exchange rate changes, the short run dynamics should be incorporated into the long run model of Equation (1). In doing this, firstly it should be found out whether there exists cointegration among the variables of the model. Secondly, if evidence of cointegration among variables is detected, then it should be investigated whether there exists a significant long run relationship between the trade balances of the chosen chapters and the real exchange rate. The following step requires the existence of any significant relationship between these two variables in the short run. The final examination on the link between the trade balance and the real exchange rate should be the identification of the direction of the relationship. In order to infer the existence of the J-curve effect, negative short run responses of the trade balances in the chapters should be succeeded by positive short run responses to real depreciation, or following the 'new definition of J-curve' of Rose and Yellen's (1989), negative short run effects of real depreciation on the trade balances should be combined with positive long run effects.

In order to carry out the abovementioned analysis, an econometric model that combines the short run dynamics with the long run relationship is needed to be adopted. For this reason, the Autoregressive Distributed Lag (ARDL) approach to cointegration and error correction modeling developed by Pesaran et al. (2001) which is called the ARDL bounds-testing approach is employed. The ARDL bounds testing approach of Pesaran et al. (2001) is preferred because of its certain econometric aspects that are compatible with the nature of the data and the purpose of this study. First and foremost, the ARDL bounds testing approach does not require the variables to be integrated of the same order and can be applied regardless of whether the variables under study are stationary (I(0)), integrated of order one (I(1)) or mutually cointegrated (a combination of I(0) and I(1) variables). As the variables examined in this study are either I(0) or I(1) as demonstrated in Chapter 3, this aspect of the ARDL bounds testing approach is suitable for our analysis. Second, a simple linear transformation on the ARDL model generates an error correction model which puts forward the short run dynamics while restricting the long run equilibrium (Baek, 2006). By means of this specification, the short run and the long run behavior of the variables included in the model can be estimated simultaneously. Thus, conveying both the short run and the long run dynamics together, ARDL bounds testing approach is deemed to be an appropriate method for analysis of J-curve in the literature. Among the studies reviewed in Chapter 2, J-curve articles at bilateral level such as Bahmani-Oskooee and Ratha (2004b, 2008), Bahmani-Oskooee et al. (2005, 2008), Bahmani-Oskooee and Wang (2006); industry level studies like Baek (2006), Bahmani-Oskooee and Wang (2007a, 2007b, 2008), Bahmani-Oskooee and Mitra (2008, 2009), Bahmani-Oskooee and Hegerty (2008), Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee and Kovyryalova (2008), Bahmani-Oskooee and Satawatananon (2010); and the articles that examines the Turkish J-curve such as Bahmani-Oskooee and Kutan (2009) and Halicioglu (2008a, 2008b) all follow the ARDL bounds testing approach of Pesaran et al. (2001).

Moreover, Baek (2006) highlights another econometric advantage of ARDL bounds testing approach by stating that the ARDL model has adequate lag numbers in order to represent the response of the variables in a dynamic structure of a general-to-specific modeling. Additionally, Pesaran and Shin (1999) shows that the ARDL model is more robust and performs superior for small sample sizes compared to the other cointegration methods.

The ARDL based bounds testing approach of Pesaran et al. (2001) expresses the long run specification of Equation 1 in an error correction form in the following way:

$$\Delta LogCi_t = \alpha + \sum_{k=1}^{p} \beta_k \Delta LogCi_{t-k} + \sum_{k=0}^{p} \gamma_k \Delta LogRER_{t-k} + \sum_{k=0}^{p} \delta_k \Delta LogYG_{t-k} + \sum_{k=0}^{p} \theta_k \Delta LogYT_{t-k} + \lambda_1 LogCi_{t-1} + \lambda_2 LogRER_{t-1} + \lambda_3 LogYG_{t-1} + \lambda_4 LogYT_{t-1} + u_t \quad (2)$$

where LogCi represents the trade balance of Chapter i, Δ is the first difference operator, p is the order of lag, and u_t is the error term which is assumed to be serially uncorrelated.

The specification of Equation 2 is regarded as a conventional Autoregressive Distributed Lag model where a linear combination of one period lagged level regressors is included in order to be used as a tool to test for the null hypothesis of no cointegration. Pesaran et al. (2001) draw conclusions about whether there exists cointegration among variables or not by testing for the inclusion of the lagged level variables in Equation 2. In other words, test of no cointegration among variables becomes a joint significance test of the lagged level variables: a null hypothesis of $H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$ representing the absence of cointegration against the alternative hypothesis of $H_1: \lambda_1 \neq 0,\ \lambda_2 \neq 0,\ \lambda_3 \neq 0,$ $\lambda_4 \neq 0$ representing the existence of cointegration. The logic behind this test, as explained by Bahmani-Oskooee and Hegert (2008), is that in an equilibrium state, the short run regressors represented by the first differenced variables become zero while merely the lagged level variables that symbolize the long run behavior remain. Hence, if these lagged level terms are all different than zero in equilibrium, then it can be concluded that there exists an interconnection between the variables in the long run. However, if at least one of the lagged level terms is zero, then it is concluded that there is no long run relationship among the variables.

In order to test the above mentioned null hypothesis of no cointegration, Pesaran et al. (2001) propose carrying out an ordinary F test which requires the use of non-standard critical values since the variables included in Equation 2 can be stationary, integrated of order one or a combination of both. Pesaran et al. (2001) construct specific pairs of critical values for each confidence levels comprising of two bounds. The lower bound critical value is produced assuming that all the underlying variables are integrated of order zero (I(0)), while the upper bound critical value is produced assuming that all of the included variables are integrated of order one (I(1)). Thus, they generate a set in between these two extreme cases encompassing all the possible combinations of variables being I(0), I(1) or even partially cointegrated. If the calculated F statistics is greater than the upper bound of the critical values, then the lagged level variables (having the coefficients: $\lambda_1,\ \lambda_2,\ \lambda_3,\ \lambda_4$) are concluded to have joint significance implying cointegration. However, if the calculated F statistics is smaller than the lower critical bound, then it is concluded that there exists no cointegration among the variables. Finally, if the calculated F statistics fall in between the two critical value bounds, the results are considered to be inconclusive.

If the results of the bounds test indicate cointegration, or at least the test conveys inconclusiveness, then by estimating coefficients in Equation 2, conclusions can be drawn concerning the short run and long run relationship between variables. The short run coefficients γ_k's will be observed in order to search for the existence of the J curve effect, where the negative lower lags pursued by positive lags will depict a J curve shape. On the other hand, the long run impacts of a real depreciation on the trade balances of the chosen chapters are reflected by the estimates of λ_2 which are normalized on λ_1 (Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee et al. (2005)).

Since the specification of Equation 2 does not provide any evidence on the direction of the adjustment towards equilibrium, Pesaran et al. (2001) suggests estimating the long run relationship (represented by Equation 1) and using the produced estimates of λ_1, λ_2, λ_3, λ_4 in order to construct a one period lagged error correction term (ECT_{t-1}). Pesaran et al. (2001) proposes using this error correction term (ECT_{t-1}) in place of the lagged level variables in Equation 2 and estimating the model once more with the same chosen lags. Evidence of adjustment towards equilibrium and convergence is underpinned if a significantly negative coefficient is estimated for the ECT_{t-1} while this finding is also considered to be an additional way of establishing cointegration between the studied variables (Bahmani-Oskooee et al. (2005), Bahmani-Oskooee and Ardalani (2006), Baek (2006), etc.).

The first step in the above-outlined analysis, as put forward by Pesaran et al. (2001), is to choose the lag order p of Equation 2 appropriately as this error correction model is grounded on the assumption that the disturbances represented by u_t are serially uncorrelated. Pesaran et al. (2001) accentuates that there exists a sensitive balance between selecting the lag order p sufficiently large to overcome the residual serial correlation problem as much as possible and simultaneously, sufficiently small in order to prevent Equation 2 from being improperly over-parameterized, especially when taking into account the limited time series data in hand. Moreover, the choice of the lag order p is also critical in the sense that the outcome of the bounds tests depends highly on this selection and thus varies significantly across different lag levels. In view of this discussion, following Pesaran et al. (2001), Table 4.1 gives Akaike and Schwarz Bayesian Information Criteria denoted by AIC and SC, along with Lagrange Multiplier (LM) statistics for testing the hypothesis of there exists no residual serial correlation against orders 1 and 4 represented by $\chi^2_{SC}(1)$ and $\chi^2_{SC}(4)$ respectively. Table 4.1 also conveys the results of the bounds tests denoted by 'F stat' for each of the corresponding lag levels. The maximum lag order is chosen to be 11, as this was the maximum lag length appropriate for the sample size of the data employed also in the unit root test presented in Chapter 3. The information criteria AIC and SC, the LM statistics and the corresponding bounds test results are calculated for each of the lags up to 11^{th} lag, such as p=0,1,2,3,…,11, which sum up to 12 quarters in total representing a span equal to three years.

Table 4.1 displays clearly how strongly the outcomes of the bounds test differ when calculated for different lag orders p. For instance, the first panel of Table 4.1 shows that for Chapter 08, lags up to order 4, the null hypothesis of the bounds test that states trade balance of Chapter 08, the real exchange rate, foreign and domestic incomes are not cointegrated is rejected at 99% confidence level. Similarly, when p is equal to 5 or 11, the null of no cointegration is rejected at 95% confidence level. Moreover, while the lag orders of 6 and 10 lead to inconclusive region of the bounds test, the remaining lags imply that the underlying variables are not cointegrated. Similarly, the following panels of Table 4.1 allocated for each of the 20 chapters set examples of the fact that bounds test depends highly on the selection of the lag order.

Conventionally, in order to decide on the order of lag, the information criteria such as AIC and SC are utilized. Table 4.1 shows that AIC and SC usually indicate the use of different lag orders, however AIC mostly suggests greater number of lags than SC does. Following Pesaran et al. (2001) and many examples in the literature, since it is essential to allow for a lag structure as extensive as possible in order to be able to search for the J curve effect, the lag suggestions of AIC are regarded to be the starting point. However, since it is of great importance to satisfy the assumption of absence of serial correlation among residuals of Equation 2 for the validity of the bounds test, for each of the 20 chapters under study, the lag structure proposed by the AIC (having the lowest value for AIC) guaranteeing serially uncorrelated errors is chosen. In other words, the lag order p that has the lowest AIC among the ones for which the LM statistics, $\chi^2_{SC}(1)$ and $\chi^2_{SC}(4)$, indicate failure to reject the null of no residual serial correlation against orders 1 and 4 is selected[37]. By this way, the assumption vital for the validity of the corresponding F tests, is met for each of the 20 chapters.

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[37] Although the statistics calculated to select the appropriate lag order are all reported for p from 0 to 11, lag orders are chosen to be greater than 0, with the purpose of avoiding the existence of solely the current values of the first differenced variables and allowing for at least one lag in Equation 2, in line with the specification of Pesaran et al. (2001).

To illustrate, for Chapter 08 (Edible fruit and nuts; peel of citrus fruit or melons), AIC suggests a lag order of 11, while SC signals the use of lag order 1. However, when the proposition of AIC, p=11, is taken into account, it is seen that the specification of Equation 2 has serially correlated errors which make the result of the F test implying cointegration invalid. For this reason, among the lags for which the LM statistics are insignificant showing that errors are serially uncorrelated, the one having the lowest AIC (p=7) is chosen to be the lag order suitable for Chapter 08.

Table 4.1 is investigated adopting this logic and consequently, the lag order associated with the adaptation of Equation 2 to Chapter 20 (Vegetables, fruit or nut preparations) is chosen to be p=11. In the same way, for Chapter 29 (Organic chemicals) p=2, for Chapter 30 (Pharmaceuticals) the chosen lag order is p=9, for Chapter 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks) p=7, for Chapter 38 (Miscellaneous chemical products) p=1, for Chapter 39 (Plastics and its articles) p=10, for Chapter 40 (Rubber and its articles) p=4, for Chapter 48 (Paper and paperboard and articles made of them) p=8, for Chapter 61 (Knitted/crocheted articles of apparel and clothing acc.) p=6, for Chapter 62 (Not Knitted/crocheted articles of apparel and clothing) p=11, for Chapter 63 (Worn Clothing and other textile articles, rags) p=8, for Chapter 72 (Iron and steel) p=5, for Chapter 73 (Articles of iron and steel) p=6, for Chapter 76 (Aluminium and aluminium articles) p=7, for Chapter 84 (Nuclear reactors, boilers, machinery and mechanical app.) p=4, for Chapter 85 (Electrical machinery and equip.; telecommunication equip.) p=1, for Chapter 87 (Vehicles other than railway or tramway rolling-stock) p=9, for Chapter 89 (Ships, boats and floating structures) p=9, and finally for Chapter 90 (Optical, photographic, cinematographic medical or surgical inst.) p=2.

The results of this investigation for the appropriate lag level satisfying uncorrelated errors coincide with the lag order suggested by AIC for Chapters 20, 30, 32, 48, 73, 87 and 89. Here, only for Chapter 87, the hypotheses of no serially correlated errors are rejected up to order four for all lags, while for most of the lags including the chosen lag p=9, the residuals are found to be serially uncorrelated up to order one. Since Chapter 87 is an outstanding industry among the studied chapters, having the second greatest share in trade between Turkey and Germany as shown in Table 3.2, this chapter is kept in the analysis despite the LM test is rejected against order four.

Table 4.1: Statistics for selecting the lag order of Equation 2 and corresponding F-statistics

LOGC08- Edible fruit and nuts; peel of citrus fruit or melons

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	4.57	4.57	4.50	4.47	4.28	4.23	4.22	4.20	4.14	4.16	3.79	3.53*
SC	4.79*	4.90	4.95	5.03	4.97	5.04	5.15	5.25	5.31	5.46	5.22	5.09
$\chi^2_{SC}(1)$	0.02	0.39	6.86*	0.09	0.41	0.09	4.30*	1.04	4.57*	17.70*	7.61*	12.55*
$\chi^2_{SC}(4)$	3.94	12.28*	13.61*	8.32	3.52	2.30	10.66*	1.45	23.50*	34.63*	15.74*	21.70*
F stat	12.62***	7.51***	6.79***	9.08***	6.88***	5.34**	3.48 *i*	2.43	2.62	1.25	3.06 *i*	4.56**

LOGC20-Preparations of vegetables, fruit, nuts or other parts of plants

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	3.26	3.34	1.83	1.91	1.97	1.98	1.81	1.59	1.50	1.40	1.28	1.04*
SC	3.48	3.67	2.28*	2.48	2.65	2.79	2.74	2.64	2.67	2.71	2.71	2.60
$\chi^2_{SC}(1)$	1.35	10.34*	0.83	2.06	0.06	6.37*	3.66	2.34	1.84	2.72	15.98*	0.72
$\chi^2_{SC}(4)$	1.90	29.65*	5.20	3.76	1.37	18.66*	10.67*	6.97	7.05	5.77	17.06*	6.00
F stat	11.96***	9.07***	34.51***	11.98***	9.97***	5.57**	4.37**	2.82 *i*	4.38**	0.59	0.99	1.64

LOGC29-Organic chemicals

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	2.36	2.17	2.19	2.20	2.29	2.30	2.33	2.35	2.41	2.39	2.38	2.15*
SC	2.58	2.50*	2.64	2.76	2.98	3.10	3.26	3.40	3.58	3.69	3.81	3.71
$\chi^2_{SC}(1)$	20.75*	3.71	2.78	0.00	0.35	0.05	0.16	0.55	6.51*	1.33	21.12*	7.49*
$\chi^2_{SC}(4)$	22.21*	11.24*	5.74	6.89	5.33	5.77	4.22	5.28	11.44*	23.15*	34.58*	17.48*
F stat	9.92***	4.54**	4.16*	4.46**	3.16 *i*	2.11	2.94 *i*	3.04 *i*	2.22	1.37	1.81	3.85*

Table 4.1 Cont'd

LOGC30-Pharmaceutical products

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	1.97	1.89	1.91	1.89	1.96	2.00	2.03	2.05	2.00	1.84*	1.91	1.92
SC	2.19*	2.23	2.36	2.46	2.65	2.81	2.95	3.10	3.18	3.14	3.34	3.48
$\chi^2_{SC}(1)$	7.95*	6.21*	6.04*	0.90	0.77	2.55	0.80	2.22	0.00	0.68	5.65*	0.09
$\chi^2_{SC}(4)$	13.27*	6.83	10.76*	2.52	4.97	7.09	8.31	12.02*	8.06	6.57	9.83*	12.32*
F stat	2.78 *i*	2.41	2.78 *i*	3.60 *i*	2.23	2.75 *i*	2.83 *i*	2.73 *i*	1.35	2.47	1.53	1.51

LOGC32-Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	2.08	2.06	2.06	2.05	1.89	1.92	1.79	1.55*	1.56	1.68	1.62	1.67
SC	2.30*	2.40	2.51	2.61	2.58	2.72	2.71	2.60	2.73	2.98	3.05	3.23
$\chi^2_{SC}(1)$	8.74*	2.28	4.01*	6.48*	5.13*	4.52*	15.61*	1.59	0.00	0.01	3.01	0.52
$\chi^2_{SC}(4)$	11.40*	6.05	5.31	15.25*	23.21*	20.57*	17.44*	5.92	6.27	7.34	9.09	17.16*
F stat	7.44***	2.84 *i*	2.87 *i*	1.37	2.23	2.97 *i*	3.96*	8.90***	3.62 *i*	2.01	2.52	2.67

LOGC38-Miscellaneous chemical products

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	3.74	3.21	3.25	3.27	3.23	3.30	3.30	3.33	3.17*	3.23	3.22	3.19
SC	3.97	3.55*	3.70	3.83	3.91	4.10	4.22	4.38	4.34	4.53	4.65	4.75
$\chi^2_{SC}(1)$	11.20*	0.36	1.85	5.44*	0.11	3.05	0.00	9.71*	0.14	0.68	0.01	3.03
$\chi^2_{SC}(4)$	14.09*	5.90	4.95	7.71	3.75	11.54*	2.96	11.38*	9.57*	15.12*	6.72	21.69*
F stat	21.95***	20.56***	8.66***	6.22***	5.40**	2.98 *i*	3.25 *i*	3.81*	6.02***	3.18 *i*	3.46 *i*	2.30

Table 4.1 Cont'd

LOGC39-Plastics and articles thereof

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	0.34	0.25	-0.26	-0.36	-0.38	-0.45	-0.35	-0.41	-0.44	-0.53	-0.60	-0.66*
SC	0.56	0.58	0.19*	0.20	0.31	0.35	0.57	0.63	0.74	0.77	0.83	0.90
$\chi^2_{SC}(1)$	0.43	8.11*	0.63	1.21	8.67*	0.33	0.04	1.43	3.79	6.76*	0.55	11.93*
$\chi^2_{SC}(4)$	10.61*	44.46*	1.47	4.89	17.54*	6.88	8.10	17.26*	10.39*	7.83	2.28	28.00*
F stat	10.10***	3.91*	8.51***	6.14***	4.43**	5.43**	4.15*	3.37 *i*	3.20 *i*	2.58	2.31	2.61

LOGC40-Rubber and articles thereof

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	-0.26	-0.27	-0.29	-0.29	-0.25	-0.19	-0.15	-0.13	-0.20	-0.47	-0.42	-0.49*
SC	-0.03*	0.06	0.16	0.28	0.43	0.62	0.78	0.92	0.97	0.83	1.01	1.07
$\chi^2_{SC}(1)$	0.00	0.86	0.13	4.49*	0.47	0.11	0.18	0.05	3.50	4.67*	4.91*	6.83*
$\chi^2_{SC}(4)$	5.35	13.05*	13.37*	5.99	3.37	6.87	14.84*	4.45	11.65*	20.37*	37.55*	34.84*
F stat	9.57***	5.68***	4.42**	2.08	2.60	1.77	1.02	0.99	1.68	1.67	1.74	1.25

LOGC48-Paper and paperboard; articles of paper pulp, of paper or of paperboard

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	1.22	1.12	1.12	1.13	1.17	1.18	1.13	1.19	1.02*	1.06	1.14	1.22
SC	1.44*	1.46	1.57	1.69	1.86	1.99	2.06	2.24	2.19	2.36	2.57	2.78
$\chi^2_{SC}(1)$	1.46	0.05	1.61	1.22	1.53	0.72	0.10	0.10	0.28	2.20	0.10	9.81*
$\chi^2_{SC}(4)$	2.77	0.86	3.29	2.20	3.70	4.52	15.58*	11.70*	2.29	3.69	3.99	10.54*
F stat	11.30***	8.88***	6.79***	5.92***	4.49**	3.96*	3.18 *i*	2.38	2.21	1.36	1.23	1.29

Table 4.1 Cont'd

LOGC61-Articles of apparel and clothing acc., knitted or crocheted

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	1.17	1.26	1.23	1.26	1.17	1.22	1.08	1.09	1.04	1.04	0.84	0.68*
SC	1.39*	1.59	1.68	1.82	1.86	2.02	2.00	2.14	2.22	2.34	2.26	2.24
$\chi^2_{SC}(1)$	0.22	2.83	4.56*	1.34	1.42	7.57*	2.54	0.82	1.10	10.79*	3.90*	0.25
$\chi^2_{SC}(4)$	2.19	5.31	11.80*	7.58	8.84	10.98*	5.70	2.93	10.96*	19.87*	6.31	12.01*
F stat	3.59 *i*	3.13 *i*	2.03	2.37	2.42	2.96 *i*	5.93***	5.35**	4.66**	3.61 *i*	6.54***	6.70***

LOGC62-Articles of apparel and clothing acc., not knitted or crocheted

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	0.86	0.88	0.85	0.87	0.75	0.76	0.71	0.77	0.49*	0.51	0.56	0.57
SC	1.08*	1.21	1.30	1.44	1.44	1.56	1.64	1.82	1.66	1.81	1.98	2.13
$\chi^2_{SC}(1)$	5.59*	3.26	1.39	9.16*	6.34*	3.79	0.20	0.82	0.09	0.28	2.89	2.89
$\chi^2_{SC}(4)$	9.35	5.09	2.75	18.09*	17.45*	9.50*	6.40	8.04	15.93*	13.61*	9.97*	4.26
F stat	3.40 *i*	2.41	3.90*	3.66 *i*	5.88***	6.69***	6.71***	4.47**	7.44***	2.94 *i*	2.27	1.80

LOGC63-Other made up textile articles; sets; worn clothing and worn textile articles; rags

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	1.62	1.60	1.55	1.58	1.38	1.45	1.25	1.30	1.25	1.27	1.29	0.87*
SC	1.84*	1.93	2.00	2.14	2.07	2.25	2.18	2.35	2.42	2.57	2.72	2.43
$\chi^2_{SC}(1)$	0.34	1.11	4.31*	17.56*	0.00	4.10*	1.05	9.53*	0.03	0.00	0.60	25.13*
$\chi^2_{SC}(4)$	3.85	1.96	8.85	21.49*	10.01*	10.15*	5.13	11.66*	5.73	13.88*	4.33	28.99*
F stat	15.63***	6.39***	4.32*	2.60	2.48	1.92	2.73 *i*	2.31	3.15 *i*	2.10	2.21	1.51

Table 4.1 Cont'd

LOGC72-Iron and steel

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	1.93	1.60	1.66	1.61	1.58	1.43	1.49	1.52	1.56	1.46	1.15	1.06*
SC	2.15	1.94*	2.11	2.18	2.26	2.24	2.42	2.57	2.73	2.76	2.58	2.62
$\chi^2_{SC}(1)$	2.95	1.90	6.37*	0.42	2.72	0.22	0.84	1.40	0.40	6.69*	8.22*	0.20
$\chi^2_{SC}(4)$	9.85*	6.27	10.26*	5.85	11.42*	1.96	7.42	9.31	17.91*	18.44*	24.57*	20.22*
F stat	5.66***	4.70**	4.01*	5.83***	6.25***	6.23***	3.37 *i*	3.14 *i*	1.83	1.81	3.81*	4.91**

LOGC73-Articles of iron or steel

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	0.54	0.60	0.67	0.72	0.76	0.67	0.39*	0.49	0.49	0.50	0.49	0.41
SC	0.76*	0.94	1.12	1.28	1.45	1.47	1.32	1.54	1.67	1.80	1.92	1.97
$\chi^2_{SC}(1)$	0.02	0.03	2.27	0.56	2.93	7.95*	0.15	2.15	0.36	4.40*	0.08	1.04
$\chi^2_{SC}(4)$	4.91	1.29	10.95*	8.62	9.29	11.35*	6.63	4.54	1.53	8.87	1.17	3.59
F stat	8.44***	7.00***	4.46**	4.02*	2.36	3.88*	8.27***	3.86*	3.20 *i*	2.10	2.21	2.41

LOGC76-Aluminium and articles thereof

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	0.78	0.39	0.38	0.24	0.12	0.14	0.19	0.10	0.13	-0.16	-0.23	-0.66*
SC	1.00	0.73*	0.83	0.81	0.81	0.94	1.12	1.14	1.31	1.14	1.20	0.90
$\chi^2_{SC}(1)$	26.40*	1.96	0.15	6.91*	0.84	0.25	1.31	0.02	12.26*	4.27*	4.66*	0.21
$\chi^2_{SC}(4)$	36.22*	26.28*	17.10*	17.64*	5.54	9.02	7.29	7.08	17.94*	9.59*	8.27	15.50*
F stat	7.38***	5.46**	7.07***	5.44**	5.39**	4.77**	4.52**	4.34*	3.24 *i*	7.34***	5.19**	5.14**

Table 4.1 Cont'd

LOGC84-Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	-0.29	-0.29	-0.28	-0.38	-0.54	-0.49	-0.41	-0.39	-0.33	-0.50	-0.55	-0.62*
SC	-0.07*	0.04	0.18	0.19	0.14	0.32	0.52	0.66	0.84	0.81	0.87	0.94
$\chi^2_{SC}(1)$	0.91	2.37	1.92	3.69	2.11	0.17	0.03	0.02	0.40	9.04*	0.11	1.42
$\chi^2_{SC}(4)$	13.82*	15.36*	11.00*	7.27	3.57	7.41	11.59*	7.46	14.02*	15.09*	10.61*	13.67*
F stat	3.73 *i*	4.22*	1.99	2.16	3.59 *i*	2.19	1.84	2.09	2.01	2.44	2.58	3.40 *i*

LOGC85-Electrical machinery and equip. and parts, telecommunications equip., sound recorders, TV recorders

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	-0.37*	-0.30	-0.27	-0.21	-0.21	-0.14	-0.08	-0.14	-0.08	-0.06	0.03	-0.10
SC	-0.15*	0.04	0.18	0.36	0.48	0.66	0.84	0.91	1.09	1.24	1.46	1.46
$\chi^2_{SC}(1)$	0.23	0.22	0.81	0.46	2.24	1.07	3.97*	0.25	0.07	0.01	0.27	6.67*
$\chi^2_{SC}(4)$	5.80	7.13	3.78	4.05	9.33	10.89*	8.54	1.62	4.48	14.07*	24.14*	26.85*
F stat	8.28***	5.66***	4.97**	4.05*	3.04 *i*	3.17 *i*	2.29	1.21	1.18	1.72	1.38	1.91

LOGC87-Vehicles other than railway or tramway rolling-stock, and parts and acc. thereof

Lags	0	1	2	3	4	5	6	7	8	9	10	11
AIC	1.01	1.03	1.05	1.02	0.75	0.69	0.72	0.83	0.83	0.54*	0.60	0.63
SC	1.23*	1.37	1.50	1.59	1.43	1.50	1.65	1.88	2.00	1.84	2.02	2.19
$\chi^2_{SC}(1)$	1.81	0.03	6.20*	11.13*	9.19*	0.62	0.32	3.75	0.05	0.04	0.84	6.82*
$\chi^2_{SC}(4)$	17.71*	16.97*	22.08*	24.25*	12.01*	12.94*	10.45*	13.13*	14.70*	14.38*	15.78*	16.05*
F stat	5.79***	4.76**	3.56 *i*	2.28	4.64**	2.13	1.31	1.22	1.94	1.77	0.87	0.96

Table 4.1 Cont'd

LOGC89-Ships, boats and floating structures

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	5.71	5.75	5.76	5.75	5.79	5.88	5.82	5.68	5.69	5.42*	5.52	5.42
SC	5.93*	6.09	6.21	6.32	6.48	6.69	6.74	6.73	6.87	6.72	6.95	6.98
$\chi^2_{SC}(1)$	0.06	4.44*	0.65	1.33	0.19	0.26	10.39*	1.11	0.26	1.17	0.64	15.91*
$\chi^2_{SC}(4)$	7.50	9.33	10.30*	1.86	3.46	6.67	13.05*	11.68*	17.67*	5.51	7.94	29.15*
F stat	21.66***	8.34***	7.29***	7.97***	7.24***	5.10**	2.69	3.06 *i*	2.92 *i*	5.86***	3.22 *i*	2.49

LOGC90-Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and acc.

Lags	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AIC	1.01	1.00	0.81	0.82	0.88	0.87	0.91	0.72	0.68	0.67	0.63	0.30*
SC	1.23*	1.33	1.26	1.39	1.56	1.68	1.83	1.77	1.86	1.97	2.06	1.86
$\chi^2_{SC}(1)$	1.01	18.52*	3.69	2.34	1.71	0.38	0.02	0.51	0.85	3.03	4.68*	5.47*
$\chi^2_{SC}(4)$	4.14	19.45*	8.05	7.08	5.05	11.81*	8.76	25.70*	31.08*	34.28*	18.58*	6.00
F stat	2.71	2.78 *i*	4.57**	4.94**	2.32	3.60 *i*	3.21 *i*	5.56**	5.59**	5.16**	5.40**	8.98***

AIC stands for Akaike Information Criterion, while SC stands for Schwarz Information Criterion. * indicates the lag suggested by the corresponding information criteria. $\chi^2_{SC}(1)$ and $\chi^2_{SC}(4)$ are the Lagrange Multiplier (LM) statistics for testing no residual serial correlation against orders 1 and 4, where rejection of the null hypothesis at 95% confidence level are indicated by *. F stat is the result of the test statistic for the null hypothesis of no cointegration, where the critical value bounds are (2.72, 3.77) for 90%, (3.23, 4.35) for 95%, (4.29, 5.61) for 99% confidence levels obtained from Table CI(iii) Case III (p.300) in Pesaran et al. (2001). Rejection of the null hypothesis is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels while *i* indicates inconclusiveness at 90% level. Lags refer to the lag order *p* in Equation 2.

The selected lag orders are reported as a summary in the first panel of Table 4.2 with the associated F statistics produced by the bounds test. Inspection of Table 4.2 reveals that, the hypothesis of no cointegration among the trade balances of Chapters 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 38 (Miscellaneous chemical products), 61 (Knitted/crocheted articles of apparel and clothing acc.), 72 (Iron and steel), 73 (Articles of iron and steel), 85 (Electrical machinery and equip.; telecommunication equip.), 89 (Ships, boats and floating structures) and the real exchange rate, foreign and domestic incomes are rejected at 99% confidence level. Moreover, for Chapter 90 (Optical, photographic, cinematographic medical or surgical inst.), cointegration among variables is supported at 95% confidence level while for Chapters 29 (Organic chemicals) and 76 (Aluminium and aluminium articles) the hypothesis of no cointegration is rejected at 90% confidence level. In addition, the results of the bounds test are inconclusive for Chapter 63 (Worn Clothing and other textile articles, rags) and Chapter 84 (Nuclear reactors, boilers, machinery and mechanical app.) at the chosen lags. Therefore, in 10 out of 20 industries, the trade balances of the chapters and the other variables are found to be cointegrated and 2 additional industries signal the possibility of finding cointegration in the following steps, while for the remaining 8 chapters the null of no cointegration cannot be rejected.

However, these findings related to the bounds testing are regarded to be preliminary in the sense that they constitute the starting point for the subsequent parts of the estimation process. Pesaran et al. (2001) state that while testing the null hypothesis of no (lagged) level effects in Equation 2, it is important to let the coefficients of the lagged differenced variables remain unrestricted, in order to avoid a possible pre-testing problem. However, Pesaran et al. (2001) advice using a more parsimonious specification for the following estimation of (lagged) level effects and the short run dynamics associated with them. For this reason, Pesaran et al. (2001) adopt the ARDL approach to the estimation of the level relations proposed by Pesaran and Shin (1999). Thus, they suggest first to select the orders of an ARDL model specified as ARDL (q, r, s, t) representing the lags belonging to four variables (C*i*, RER, YG, YT) by searching across $(p+1)^k = (p+1)^4$ ARDL estimations where k is the number of variables included in Equation 2, p is the lag order chosen in the previous stage and reported in the first panel of Table 4.2, spanning by p=0, 1, …, 11 (maximum 12^4 = 20,736 regressions to be estimated).

Table 4.2: Optimal lags based on AIC with corresponding F statistics

Trade Balance	Chosen Lag	F-statistic	Optimal Lag ARDL(C*i*, RER, YG, YT)	F-statistic
LogC08	7	2.43	ARDL(7,6,5,0)	4.20*
LogC20	11	1.64	ARDL(11,6,8,11)	6.10***
LogC29	2	4.16*	ARDL(2,1,0,0)	4.66**
LogC30	9	2.47	ARDL(7,9,4,4)	5.12**
LogC32	7	8.90***	ARDL(4,0,7,2)	12.55***
LogC38	1	20.56***	ARDL(1,0,0,0)	21.17***
LogC39	10	2.31	ARDL(10,5,0,4)	3.73 *i*
LogC40	4	2.60	ARDL(4,0,2,1)	3.44 *i*
LogC48	8	2.21	ARDL(0,5,8,7)	6.24***
LogC61	6	5.93***	ARDL(0,6,4,3)	9.43***
LogC62	11	1.80	ARDL(8,9,1,3)	6.22***
LogC63	8	3.15 *i*	ARDL(2,8,8,8)	4.94**
LogC72	5	6.23***	ARDL(3,5,3,1)	8.58***
LogC73	6	8.27***	ARDL(5,6,0,4)	11.02***
LogC76	7	4.34*	ARDL(6,2,7,6)	5.91***
LogC84	4	3.59 *i*	ARDL(4,2,3,1)	3.48 *i*
LogC85	1	5.66***	ARDL(0,0,0,0)	8.28***
LogC87	9	1.77	ARDL(8,8,9,9)	3.19 *i*
LogC89	9	5.86***	ARDL(4,2,3,9)	13.87***
LogC90	2	4.57**	ARDL(2,1,0,0)	5.53**

C*i* symbolizes the trade balance of the relevant chapter *i*. F statistic is the result of the test statistic for the null hypothesis of no cointegration, where the critical value bounds are (2.72, 3.77) for 90%, (3.23, 4.35) for 95%, (4.29, 5.61) for 99% confidence levels obtained from Table CI(iii) Case III (p.300) in Pesaran et al. (2001). Rejection of the null hypothesis is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels while *i* indicates inconclusiveness at 90% level. ARDL (C*i*, RER, YG, YT) shows the lags to be imposed on DLogC*i*, DLogRER, DLogYG, and DLOGYT respectively in Equation 2 for each of the relevant chapters.

The lag orders of C*i*, RER, YG and YT denoted by q, r, s, and t, were searched over a set of values beginning from 0 and extending to the chosen lag order p, such that q, r, s, t = 0, 1, … , p. The AIC associated with each of the $(p+1)^4$ ARDL estimations are sorted descendingly and the specification ARDL (q, r, s, t) with minimum AIC is entitled to be the optimal lag structure for the relevant chapter.[38] The optimal lags ARDL (q, r, s, t) designated for each of the 20 chapters are presented in the first column of the second panel of Table 4.2.

Since the most favorable specification of the lag orders imposed on each variable is determined for the chapters, the results of the bounds test produced under these lag structures are accepted to be conclusive for the existence of cointegration and consequently for proceeding to the estimation of the long and the short run coefficients of Equation 2. In other words, the F statistics calculated adopting the optimal lags are taken as basis, instead of relying on the F statistics produced by the initially chosen lag p appointed to each variable. This practice of focusing on the optimal lag combinations for bounds testing is followed by many of the recent articles reviewed in Chapter 2, such as, Bahmani-Oskooee et al. (2005, 2008), Bahmani-Oskooee and Wang (2006, 2007a, 2007b, 2008), Bahmani-Oskooee and Ratha (2007), Bahmani-Oskooee and Bolhasani (2008), Bahmani-Oskooee and Kovyryalova (2008), Halicioglu (2008a), Bahmani-Oskooee and Mitra (2008, 2009), Bahmani-Oskooee and Kutan (2009), and Bahmani-Oskooee and Satawatananon (2010).

Thus, considering the results of the bounds test which are presented in the second panel of Table 4.2, decision on whether there exists cointegration among the variables are taken for each of the chapters which leads the way to the estimation process of the ARDL models. According to Table 4.2, for 11 out of 20 industries, the hypothesis that there exists no cointegration between the trade balances and the explanatory variables (RER, YG and YT) is rejected at 99% confidence level. Namely, for Chapters 20 (Vegetables, fruit or nut preparations), 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 38 (Miscellaneous chemical products), 48 (Paper and paperboard and articles made of them), 61 (Knitted/crocheted articles of apparel and clothing acc.), 62 (Not Knitted/crocheted articles of apparel and clothing), 72 (Iron and steel), 73 (Articles of iron and steel), 76 (Aluminium and aluminium articles), 85 (Electrical machinery and equip.; telecommunication equip.), and 89 (Ships, boats and floating structures), there exists a 'level trade balance equation' at 99% level, regardless of whether the regressors are purely I(1), I(0) or mutually cointegrated (Pesaran et al., 2001). Moreover, for Chapters 29 (Organic chemicals), 30 (Pharmaceuticals), 63 (Worn Clothing and other textile articles,

[38] This grid search is accomplished through the utilization of a program written specifically for this purpose in the econometric software used (E-views Version 7.1) and run for each of the chapters. (See Appendix B: E-Views Programs Written For The Analysis)

rags) and 90 (Optical, photographic, cinematographic medical or surgical inst.), the hypothesis of no cointegration among variables is rejected at the 95% confidence level. Additionally, evidence of cointegration for the trade balance in Chapter 08 (Edible fruits, nuts, citrus fruit or melon peels) and the explanatory variables (RER, YG and YT) is found at the 90% confidence level. Therefore, in 80% of the industries, the hypothesis of no cointegration among C*i*, RER, YG and YT is conclusively rejected.

The resultant F statistics of the bounds test for Chapters 39 (Plastics and its articles), 40 (Rubber and its articles), 84 (Nuclear reactors, boilers, machinery and mechanical app.) and 87[39] (Vehicles other than railway or tramway rolling-stock) fall into the inconclusiveness region at 90% confidence level. Consequently, some evidence of cointegration among the trade balances in all of the 20 industries (100%) with RER, YG and YT is detected when the bounds test is carried out at the optimum lags, while this is the case in only 60% of the industries when the same lag p is imposed on all of the variables. Thus, the four variables included in Equation 2 cointegrate for each of the industries studied, constituting a long-run relationship and making it meaningful to estimate the short and the long run coefficients under investigation.

Before moving to the estimation of Equation 2, there is one more 'pre-test' that needs to be conducted. Pesaran et al. (2001) remarks that the bounds testing method adopted in this analysis is based on a single-equation approach. As a consequence, they emphasize that applying bounds test is not appropriate in the cases when there may exist more than one level relationship involving the trade balance variable (LogC*i*). Pesaran and Shin (1999) highlights that in such a case, inefficient estimates of short and long run coefficients may be produced. In order to test whether there are any other cointegration relationships among the four variables other than specified by Equation 1, the bounds test is run three more times for each of the chapters with the lag levels determined in the first stage (p), where the dependent variable of Equation 2 is replaced by RER, YG and YT each time and regressed on the remaining explanatory variables. The results of the F tests carried out for different dependent variables for each of the chapters are reported in Table 4.3.

[39] Although the F test cannot be rejected at the optimal lags, since Chapter 87 is an important industry among the studied chapters, in order to keep it in the analysis, the lag combination with minimum AIC which possesses an indication of cointegration (at least inconclusiveness) is chosen to be the optimal lag set.

Table 4.3: The F-statistics of the bounds test for different dependent variables

Trade Balance	**LogC08**	**LogC20**	**LogC29**	**LogC30**
Chosen Lag	**7**	**11**	**2**	**9**
F(LogRER|LogC*i*, LogYG, LogYT)	2.07	1.83	0.94	3.05 *i*
F(LogYG|LogC*i*, LogRER, LogYT)	2.36	1.32	3.77 *i*	3.38 *i*
F(LogYT|LogC*i*, LogRER, LogYG)	0.73	0.96	0.51	1.98

Trade Balance	**LogC32**	**LogC38**	**LogC39**	**LogC40**
Chosen Lag	**7**	**1**	**10**	**4**
F(LogRER|LogC*i*, LogYG, LogYT)	1.21	2.02	4.35*	1.03
F(LogYG|LogC*i*, LogRER, LogYT)	2.30	2.90 *i*	2.40	5.76***
F(LogYT|LogC*i*, LogRER, LogYG)	1.40	0.12	1.38	0.27

Trade Balance	**LogC48**	**LogC61**	**LogC62**	**LogC63**
Chosen Lag	**8**	**6**	**11**	**8**
F(LogRER|LogC*i*, LogYG, LogYT)	2.61	2.40	4.33*	2.26
F(LogYG|LogC*i*, LogRER, LogYT)	0.59	2.13	1.95	2.45
F(LogYT|LogC*i*, LogRER, LogYG)	0.98	0.42	1.51	1.54

Trade Balance	**LogC72**	**LogC73**	**LogC76**	**LogC84**
Chosen Lag	**5**	**6**	**7**	**4**
F(LogRER|LogC*i*, LogYG, LogYT)	2.03	2.06	2.30	0.91
F(LogYG|LogC*i*, LogRER, LogYT)	3.01 *i*	2.12	1.79	3.59 *i*
F(LogYT|LogC*i*, LogRER, LogYG)	0.21	0.42	0.61	0.18

Trade Balance	**LogC85**	**LogC87**	**LogC89**	**LogC90**
Chosen Lag	**1**	**9**	**9**	**2**
F(LogRER|LogC*i*, LogYG, LogYT)	1.82	2.92 *i*	2.83 *i*	1.97
F(LogYG|LogC*i*, LogRER, LogYT)	2.55	1.06	2.86 *i*	2.87 *i*
F(LogYT|LogC*i*, LogRER, LogYG)	0.25	1.05	2.91 *i*	0.26

C*i* symbolizes the trade balance of the relevant chapter *i*. F statistic is the result of the test statistic for the null hypothesis of no cointegration, where the critical value bounds are (2.72, 3.77) for 90%, (3.23, 4.35) for 95%, (4.29, 5.61) for 99% confidence levels obtained from Table CI(iii) Case III (p.300) in Pesaran et al. (2001). Rejection of the null hypothesis is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels while *i* indicates inconclusiveness at 90% level.

Here, the expression F(LogRER|LogC*i*, LogYG, LogYT) refers to the outcome of testing the existence of cointegration in a model where RER is the dependent variable and explained by the right hand side variables C*i*, YG, and YT. The results show that the one and only direction of cointegration between the four variables is the one specified by Equation 1, i.e. the mere endogenous variable is the trade balance (C*i*) and is explained by the exogenous variables real exchange rate (RER), real foreign income (YG) and real domestic income (YT) for all of the chapters[40], as the null of no cointegration could not be rejected. Therefore, since the only reasonable form of long run relationship between the variables is the one employed in the equation of bounds test, then this single equation technique is accepted to be appropriate for this analysis.

As the above mentioned initial findings of the bounds testing procedure which is proved to be suitable for the data in hand, indicate that there exists cointegration among the variables for all chapters; hence, the consecutive step of the procedure comprises of estimating the short and the long run coefficients of Equation 2. Before proceeding to the estimation of short run coefficients, following Pesaran et al. (2001), 'the levels relationship' associated with the short run dynamics should be estimated. The long run relationship between the variables as outlined in Equation 1 is estimated and presented in Table 4.4 for each of the chapters. The residuals produced from the estimation of Equation 1 for each chapter constitute 'the equilibrium error correction term' (Pesaran et al., 2001).

The results show that in the long run, the changes in the real exchange rate (RER) are significantly effective on trade balances of 12 chapters (60% of the cases). For the remaining 8 chapters, the trade balance does not seem to respond to real exchange rate changes in the long run. However among these 12 chapters, only in 4 industries, namely Chapter 40 (Rubber and its articles), Chapter 73 (Articles of iron and steel), Chapter 85 (Electrical machinery and equip.; telecommunication equip.) and Chapter 90 (Optical, photographic, cinematographic medical or surgical inst.), the exchange rate is positively related to the trade balance. In other words, a deprecation of Turkish Lira against Euro is expected to ameliorate the trade balance in these four industries in the long run, in accordance with the expectations. However, for the remaining 8 industries, currency depreciation results in a deterioration in the bilateral trade balances in the long run, in contrast to the theory.

[40] Table 4.2 shows that there is just one F statistics which is significant at least at the 95% confidence level indicating an additional possible long run relationship for Chapter 40 where the dependent variable becomes the foreign income (YG). However, since this is the case for just one chapter, it is not regarded as a threat for the use of the underlying single equation method.

Table 4.4: Long-run coefficient estimates of the levels relationship in trade balance models

	Constant		LogRER		LogYG		LogYT	
TB	**Coef.**	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
LogC08	156.92	0.000***	-5.73	0.010***	-28.77	0.003***	-3.53	0.374
LogC20	69.48	0.000***	-1.80	0.096*	-14.57	0.002***	0.60	0.758
LogC29	-16.44	0.093*	-2.75	0.000***	7.41	0.024**	-4.30	0.002***
LogC30	18.79	0.128	-1.61	0.091*	-5.83	0.157	1.38	0.422
LogC32	-9.21	0.310	-1.85	0.009***	0.51	0.866	0.62	0.625
LogC38	-74.58	0.000***	-1.35	0.315	20.36	0.001***	-4.99	0.043**
LogC39	-10.23	0.019**	0.17	0.614	0.06	0.966	1.68	0.006***
LogC40	-32.58	0.000***	0.82	0.000***	7.52	0.000***	-0.50	0.179
LogC48	-31.97	0.000***	0.55	0.188	8.04	0.000***	-1.87	0.015**
LogC61	22.92	0.001***	-0.47	0.385	-0.82	0.723	-3.00	0.003***
LogC62	47.31	0.000***	-1.82	0.000***	-8.02	0.000***	-1.06	0.218
LogC63	26.24	0.000***	-1.18	0.024**	-3.28	0.146	-1.32	0.160
LogC72	-2.86	0.764	-1.84	0.014**	0.76	0.812	-0.41	0.755
LogC73	-22.15	0.000***	0.92	0.004***	3.09	0.025**	1.60	0.006***
LogC76	3.69	0.483	-0.47	0.245	-2.69	0.127	2.03	0.007***
LogC84	-37.53	0.000***	0.31	0.267	7.77	0.000***	0.02	0.973
LogC85	-24.28	0.000***	0.58	0.031**	6.56	0.000***	-1.52	0.002***
LogC87	-69.51	0.000***	-0.21	0.677	19.31	0.000***	-4.51	0.000***
LogC89	-34.46	0.462	2.45	0.496	-3.47	0.824	10.29	0.117
LogC90	-43.46	0.000***	2.27	0.000***	8.73	0.000***	-0.23	0.813

TB symbolizes the trade balance of the relevant chapters. ‘Coef.’ stands for coefficient while ‘Prob.’ stands for the corresponding p-value of the coefficient. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.4 shows that the changes in real foreign income (YG), i.e. changes in the real income of Germany, are significantly determinative on the bilateral trade balances of 12 industries in the long run. An increase in the real income of Germany causes a worsening in the trade balances of 3 out of these 12 chapters (Chapters 08 (Edible fruits, nuts, citrus fruit or melon peels), 20 (Vegetables, fruit or nut preparations) and 62 (Not Knitted/crocheted articles of apparel and clothing)) in the long run. A possible theoretical explanation to this supply side domination is that, an increase in real foreign income may cause Germany to improve the domestic production of the products belonging to these 3 chapters and thus import less from Turkey which deteriorates the bilateral trade balance.

However, when the sectors in question are taken into account, a more plausible explanation in this case is that these goods can be regarded as inferior goods in Germany such that as real income rises their consumption decrease.

On the other hand, the trade balances of the remaining 9 industries are positively affected by the increases in YG. The increase in German real income causes the demand for imports of Chapters 29 (Organic chemicals), 38 (Miscellaneous chemical products), 40 (Rubber and its articles), 48 (Paper and paperboard and articles made of them), 73 (Articles of iron and steel), 84 (Nuclear reactors, boilers, machinery and mechanical app.), 85 (Electrical machinery and equip.; telecommunication equip.), 87 (Vehicles other than railway or tramway rolling-stock) and 90 (Optical, photographic, cinematographic medical or surgical inst.) from Turkey to rise and this increase outweighs the improvement in the supply side, consequently enhancing the trade balance from the Turkish side. Therefore, it is seen that, the theoretical expectation of positive impact of YG on trade balance is fulfilled for most of the industries.

When it comes to the long run effects of Turkish real income movements, Table 4.4 shows that trade balances of 9 industries are significantly influenced by the changes in domestic income. Increases in domestic real income generate betterments in the trade balances of Chapters 39 (Plastics and its articles), 73 (Articles of iron and steel) and 76 (Aluminium and aluminium articles). This might be resulting from an improvement in the domestic supply of the substitutes of these goods along with lessening the demand for foreign counterparts caused by increased domestic income. On the contrary, the increase in Turkish real income causes deterioration in the trade balances of 6 chapters, namely: Chapters 29 (Organic chemicals), 38 (Miscellaneous chemical products), 48 (Paper and paperboard and articles made of them), 61 (Knitted/crocheted articles of apparel and clothing acc.), 85 (Electrical machinery and equip.; telecommunication equip.), and 87 (Vehicles other than railway or tramway rolling-stock). In other words, when real domestic income rises, the enhanced demand towards the foreign versions of these goods becomes prevalent compared to the will against improving the local production of them. Thus, in majority of the cases where the advancement of domestic economy significantly affects the trade balances, the impact in question occurs to be detrimental, in line with the theoretical expectations.

Once the long run relationships are portrayed, then the conditional error correction model regressions corresponding to the above reported level relationships are estimated in order to demonstrate the short run dynamics. Thus, the error correction model specified in Equation 3 is estimated for each of the chapters under the determined optimal lag structure ARDL (q, r, s, t).

$$\Delta LogCi_t = \alpha + \sum_{k=1}^{q} \beta_k \Delta LogCi_{t-k} + \sum_{k=0}^{r} \gamma_k \Delta LogRER_{t-k}$$

$$+ \sum_{k=0}^{s} \delta_k \Delta LogYG_{t-k} + \sum_{k=0}^{t} \theta_k \Delta LogYT_{t-k} + ECT_{t-1} \qquad (3)$$

Here, the error correction term (ECT) which represents the inclusion of lagged level variables is the one period lagged residuals obtained from the long run regressions. A significant and negative ECT_{t-1} is interpreted as an evidence of adjustment towards equilibrium and convergence, while is also regarded to be another way of establishing cointegration among variables, as mentioned before. The results of the estimated short run coefficients are presented in Tables 4.5 to 4.11.

The results show that, the 'equilibrium correction coefficient' or the error correction term (ECT_{t-1}) is highly significant and negative for all of the chapters, except for Chapters 20 and 39[41], comprising 90% of the studied chapters. In other words, for 90% of the chapters, the cointegration inference based on the bounds test results of Table 4.2 is supported by the significantly negative error correction term. Moreover, these findings indicate that for majority of the industries, deviations from the long run equilibrium are adjusted back to the steady state and convergence is established.

In the short run, there are 15 industries for which there exists at least one lagged coefficient of the real exchange rate (DLogRER) that is significant at the 90% confidence level, signifying that the real depreciation of Turkish Lira against Euro has remarkable short run effects on the trade balances of 15 out of 20 chapters, comprising 75% of the cases. Among these 15 industries, there are some chapters for which the significant short run effects of exchange rate movements are found to be solely improving on the trade balances, while for some of the chapters the impacts are merely deteriorating. Moreover,

[41] Although statistically insignificant, the ECT_{t-1} terms for Chapters 20 and 39 are negative as well.

for some of these chapters, a devaluation of the real exchange rate results in a set of positive and negative short run fluctuations on the trade balance. Overall, for three fourths of the cases, the real exchange rate is a significant determinant of the short run dynamics inherent in the trade balances.

When examined in more detail, it is seen that for 9 of the Chapters [Chapter 08 (Edible fruit and nuts, citrus fruit or melon peels), 39 (Plastics and its articles), 48 (Paper, paperboard and articles made of them), 61 (Knitted/crocheted articles of apparel and clothing acc.), 63 (Worn Clothing and other textile articles, rags), 73 (Articles of iron and steel), 76 (Aluminium and aluminium articles), 84 (Nuclear reactors, boilers, machinery and mechanical app.), and 85 (Electrical machinery and equip.; telecommunication equip.)], the short run effects of exchange rate depreciation on the trade balances are found to be positive. Of these chapters, for 5 industries, only one lag of the differenced exchange rate variable (DLogRER) is affirmatively effective on the trade balance. To illustrate, while an increase in 4 periods lagged DLogRER causes the trade balance in Chapter 08 to improve, it is the 3rd lag for Chapter 39, the 5th lag for Chapter 48, the 6th lag for Chapter 63 and the current value of the variable DLogRER for Chapter 85, which is significantly influential on the trade balance. On the other hand, a combination of several lagged values of DLogRER has positive impacts on the trade balances of Chapters 61, 73, 76 and 84. The 2nd, 4th and 6th lags of DLogRER have positive effects on the trade balance of Chapter 61, while the current, the 3rd and the 5th period lagged values of DLogRER is positively effective on the trade balance of Chapter 73. Similarly, a pair of lagged values of DLogRER has positive coefficients for the trade balances in Chapter 76 (1st and 2nd lags) and in Chapter 84 (current value and 2nd lag). Ultimately, for majority of the chapters for which short run currency changes possesses a significant impact (60% of the 15 industries), depreciation of Turkish Lira against Euro will improve the bilateral trade balance in these industries latest in the subsequent 6th quarter.

However, the short run favorable effect of currency depreciation becomes ineffective in the long run on the trade balances of Chapters 39, 48, 61, 76 and 84. While the positive short run impact of real depreciation of Turkish Lira against Euro endures for longer periods of time on the trade balance of Chapters 73 and 85, it is reversed in the long run by turning into a negative impact for Chapters 08 and 63.

Table 4.5: Short-run coefficient estimates of the trade balance models of Chapters 08, 20 and 29 in the specified ARDL (q,r,s,t) form

	DLogC08		**DLogC20**		**DLogC29**	
	ARDL(7,6,5,0)		**ARDL(11,6,8,11)**		**ARDL(2,1,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
C	-0.431	0.102	0.276	0.006***	-0.034	0.679
DLogC*i*(t-1)	-0.085	0.700	-0.473	0.103	-0.494	0.000***
DLogC*i*(t-2)	-0.236	0.210	-0.173	0.537	-0.121	0.277
DLogC*i*(t-3)	-0.044	0.807	-0.071	0.789		
DLogC*i*(t-4)	-0.258	0.075*	-0.044	0.859		
DLogC*i*(t-5)	-0.052	0.680	-0.235	0.288		
DLogC*i*(t-6)	-0.332	0.002***	-0.553	0.005***		
DLogC*i*(t-7)	-0.186	0.052*	-0.250	0.131		
DLogC*i*(t-8)			-0.053	0.688		
DLogC*i*(t-9)			-0.063	0.466		
DLogC*i*(t-10)			-0.126	0.099*		
DLogC*i*(t-11)			-0.058	0.382		
DLogRER	5.096	0.153	-2.146	0.078*	0.184	0.878
DLogRER(t-1)	4.194	0.199	0.347	0.796	1.717	0.109
DLogRER(t-2)	4.273	0.216	2.166	0.119		
DLogRER(t-3)	1.293	0.692	-0.217	0.851		
DLogRER(t-4)	5.916	0.082*	-0.353	0.754		
DLogRER(t-5)	-0.198	0.950	-1.346	0.180		
DLogRER(t-6)	2.739	0.382	3.753	0.000***		
DLogYG	40.292	0.104	18.847	0.055*	6.688	0.406
DLogYG(t-1)	-60.979	0.019**	-5.399	0.531		
DLogYG(t-2)	57.921	0.031**	-30.856	0.001***		
DLogYG(t-3)	12.528	0.643	13.892	0.130		
DLogYG(t-4)	68.144	0.009***	2.067	0.813		
DLogYG(t-5)	-55.331	0.032**	8.113	0.361		
DLogYG(t-6)			13.331	0.121		
DLogYG(t-7)			-22.148	0.004***		
DLogYG(t-8)			-20.455	0.010***		
DLogYT	-0.051	0.996	-11.282	0.001***	-0.443	0.889
DLogYT(t-1)			-3.957	0.224		
DLogYT(t-2)			4.900	0.097*		
DLogYT(t-3)			-2.499	0.348		
DLogYT(t-4)			-4.404	0.144		
DLogYT(t-5)			-0.613	0.836		
DLogYT(t-6)			0.806	0.755		
DLogYT(t-7)			-7.307	0.004***		

Table 4.5 Cont'd	**DLogC08**		**DLogC20**		**DLogC29**	
	ARDL(7,6,5,0)		**ARDL(11,6,8,11)**		**ARDL(2,1,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
DLogYT(t-8)			1.371	0.533		
DLogYT(t-9)			6.876	0.005***		
DLogYT(t-10)			-2.966	0.225		
DLogYT(t-11)			-9.903	0.000***		
ECT(t-1)	-0.591	0.015**	-0.309	0.259	-0.417	0.000***
Adj. R^2	0.599		0.702		0.456	
LM(1)	0.077	0.781	8.424	0.004***	0.216	0.642
LM(4)	9.643	0.047**	14.081	0.007***	6.348	0.175
JB	0.317	0.853	2.982	0.225	0.142	0.931
Heterosc.	8.326	0.004***	1.336	0.248	0.086	0.769
CUSUM	S		U		S	
CUSUMSQ	S		S		S	
RESET	7.711	0.006***	2.488	0.115	1.163	0.281

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.6: Short-run coefficient estimates of the trade balance models of Chapters 30, 32 and 38 in the specified ARDL (q,r,s,t) form

	DLogC30		**DLogC32**		**DLogC38**	
	ARDL(7,9,4,4)		**ARDL(4,0,7,2)**		**ARDL(1,0,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
C	-0.127	0.194	0.118	0.183	0.022	0.875
DLogC*i*(t-1)	-0.320	0.032**	-0.276	0.050*	0.098	0.237
DLogC*i*(t-2)	-0.012	0.932	-0.068	0.624		
DLogC*i*(t-3)	0.257	0.074*	0.052	0.692		
DLogC*i*(t-4)	0.329	0.029**	0.198	0.067*		
DLogC*i*(t-5)	0.135	0.359				
DLogC*i*(t-6)	-0.123	0.362				
DLogC*i*(t-7)	0.027	0.833				

Table 4.6 Cont'd	**DLogC30**		**DLogC32**		**DLogC38**	
	ARDL(7,9,4,4)		**ARDL(4,0,7,2)**		**ARDL(1,0,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
DLogRER	1.571	0.217	-1.431	0.156	-0.862	0.668
DLogRER(t-1)	2.193	0.114				
DLogRER(t-2)	1.461	0.275				
DLogRER(t-3)	0.782	0.581				
DLogRER(t-4)	1.101	0.433				
DLogRER(t-5)	1.977	0.093*				
DLogRER(t-6)	0.706	0.535				
DLogRER(t-7)	-0.195	0.862				
DLogRER(t-8)	-1.941	0.076*				
DLogRER(t-9)	-0.836	0.452				
DLogYG	17.774	0.053*	2.460	0.731	28.172	0.037**
DLogYG(t-1)	-20.038	0.037**	-4.660	0.525		
DLogYG(t-2)	-9.180	0.306	14.726	0.038**		
DLogYG(t-3)	-12.476	0.165	-16.387	0.024**		
DLogYG(t-4)	17.886	0.022**	-5.827	0.425		
DLogYG(t-5)			7.690	0.290		
DLogYG(t-6)			-14.551	0.051*		
DLogYG(t-7)			-1.079	0.882		
DLogYT	-8.135	0.023**	-4.415	0.104	-2.110	0.694
DLogYT(t-1)	5.891	0.113	-1.719	0.468		
DLogYT(t-2)	5.688	0.105	-5.150	0.030**		
DLogYT(t-3)	10.117	0.007***				
DLogYT(t-4)	0.842	0.816				
ECT(t-1)	-0.248	0.016**	-0.455	0.000***	-1.061	0.000***
Adj. R^2	0.355		0.474		0.608	
LM(1)	5.003	0.025**	3.621	0.057*	0.726	0.394
LM(4)	14.137	0.007***	7.243	0.124	3.595	0.464
JB	13.079	0.001***	30.909	0.000***	20.397	0.000***
Heterosc.	16.003	0.000***	0.008	0.929	4.444	0.035**
CUSUM	S		S		U	
CUSUMSQ	S		U		U	
RESET	0.223	0.637	4.522	0.034**	1.531	0.216

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by ***

Table 4.6 Cont'd	DLogC30		DLogC32		DLogC38	
	ARDL(7,9,4,4)		**ARDL(4,0,7,2)**		**ARDL(1,0,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
for 99% confidence levels.						

Table 4.7: Short-run coefficient estimates of the trade balance models of Chapters 39, 40 and 48 in the specified ARDL (q,r,s,t) form

	DLogC39		**DLogC40**		**DLogC48**	
	ARDL(10,5,0,4)		**ARDL(4,0,2,1)**		**ARDL(0,5,8,7)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
C	0.097	0.004***	0.043	0.096*	-0.017	0.797
DLogC*i*(t-1)	-0.155	0.300	0.001	0.993		
DLogC*i*(t-2)	-0.355	0.010***	-0.112	0.297		
DLogC*i*(t-3)	-0.044	0.764	-0.144	0.144		
DLogC*i*(t-4)	-0.127	0.347	0.171	0.061*		
DLogC*i*(t-5)	-0.226	0.093*				
DLogC*i*(t-6)	-0.159	0.161				
DLogC*i*(t-7)	-0.187	0.067*				
DLogC*i*(t-8)	0.007	0.940				
DLogC*i*(t-9)	-0.238	0.011**				
DLogC*i*(t-10)	-0.182	0.034**				
DLogRER	0.405	0.263	0.194	0.571	0.211	0.778
DLogRER(t-1)	-0.114	0.742			0.687	0.346
DLogRER(t-2)	-0.081	0.814			0.293	0.699
DLogRER(t-3)	0.789	0.031**			1.314	0.101
DLogRER(t-4)	-0.427	0.205			-0.711	0.326
DLogRER(t-5)	0.346	0.267			1.286	0.076*
DLogYG	2.398	0.332	0.791	0.742	13.632	0.018**
DLogYG(t-1)			7.429	0.004***	-10.186	0.054*
DLogYG(t-2)			-4.161	0.091*	12.190	0.025**
DLogYG(t-3)					0.593	0.905
DLogYG(t-4)					-5.678	0.249
DLogYG(t-5)					-2.514	0.606
DLogYG(t-6)					8.032	0.115
DLogYG(t-7)					8.778	0.078*
DLogYG(t-8)					-5.576	0.247
DLogYT	-2.488	0.018**	-2.682	0.003***	-2.519	0.192

Table 4.7 Cont'd	**DLogC39**		**DLogC40**		**DLogC48**	
	ARDL(10,5,0,4)		**ARDL(4,0,2,1)**		**ARDL(0,5,8,7)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
DLogYT(t-1)	-1.361	0.167	-1.451	0.082*	-1.549	0.398
DLogYT(t-2)	-0.783	0.396			0.255	0.888
DLogYT(t-3)	0.804	0.361			-0.003	0.999
DLogYT(t-4)	-1.405	0.119			-0.499	0.788
DLogYT(t-5)					5.673	0.003***
DLogYT(t-6)					-1.639	0.315
DLogYT(t-7)					-1.857	0.270
ECT(t-1)	-0.136	0.244	-0.479	0.001***	-0.484	0.000***
Adj. R^2	0.455		0.482		0.436	
LM(1)	3.141	0.076*	0.078	0.780	0.075	0.785
LM(4)	4.783	0.310	0.140	0.998	3.612	0.461
JB	1.510	0.470	2.179	0.289	5.463	0.065*
Heterosc.	0.114	0.736	4.048	0.044**	0.083	0.773
CUSUM	S		U		S	
CUSUMSQ	S		S		S	
RESET	0.759	0.384	4.436	0.035**	0.960	0.327

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.8: Short-run coefficient estimates of the trade balance models of Chapters 61, 62 and 63 in the specified ARDL (q,r,s,t) form

	DLogC61		**DLogC62**		**DLogC63**	
	ARDL(0,6,4,3)		**ARDL(8,9,1,3)**		**ARDL(2,8,8,8)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
C	-0.044	0.464	-0.042	0.334	0.016	0.840
DLogC*i*(t-1)			-0.216	0.106	-0.106	0.470
DLogC*i*(t-2)			-0.055	0.684	-0.285	0.030**
DLogC*i*(t-3)			0.064	0.631		
DLogC*i*(t-4)			0.172	0.165		

Table 4.8 Cont'd	**DLogC61**		**DLogC62**		**DLogC63**	
	ARDL(0,6,4,3)		**ARDL(8,9,1,3)**		**ARDL(2,8,8,8)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
DLogC*i*(t-5)			0.231	0.051*		
DLogC*i*(t-6)			0.104	0.367		
DLogC*i*(t-7)			0.071	0.499		
DLogC*i*(t-8)			0.350	0.001***		
DLogRER	0.091	0.912	-0.016	0.980	-0.590	0.524
DLogRER(t-1)	0.607	0.438	1.689	0.019**	-0.055	0.955
DLogRER(t-2)	1.904	0.028**	1.641	0.019**	0.862	0.381
DLogRER(t-3)	1.338	0.123	1.213	0.096*	-1.617	0.105
DLogRER(t-4)	1.604	0.039**	2.044	0.001***	0.322	0.744
DLogRER(t-5)	0.656	0.358	-0.066	0.911	-0.691	0.462
DLogRER(t-6)	1.621	0.025**	0.470	0.416	2.679	0.006***
DLogRER(t-7)			-1.687	0.006***	0.858	0.377
DLogRER(t-8)			0.125	0.826	1.159	0.242
DLogRER(t-9)			-1.716	0.003***		
DLogYG	13.627	0.015**	-1.483	0.748	-6.081	0.370
DLogYG(t-1)	1.940	0.727	3.084	0.494	10.116	0.130
DLogYG(t-2)	-1.802	0.740			-9.468	0.150
DLogYG(t-3)	-0.343	0.948			5.078	0.429
DLogYG(t-4)	8.057	0.098*			3.144	0.617
DLogYG(t-5)					5.831	0.329
DLogYG(t-6)					-4.935	0.411
DLogYG(t-7)					-4.395	0.469
DLogYG(t-8)					-7.278	0.209
DLogYT	-6.140	0.002***	-2.125	0.223	-5.683	0.020**
DLogYT(t-1)	-0.726	0.714	0.855	0.631	1.406	0.565
DLogYT(t-2)	2.416	0.227	3.347	0.050*	-5.050	0.051*
DLogYT(t-3)	2.719	0.173	1.687	0.317	2.805	0.234
DLogYT(t-4)					-4.174	0.073*
DLogYT(t-5)					3.023	0.186
DLogYT(t-6)					0.415	0.854
DLogYT(t-7)					3.328	0.182
DLogYT(t-8)					4.476	0.065*
ECT(t-1)	-0.399	0.000***	-0.349	0.005***	-0.407	0.012**
Adj. R^2	0.253		0.437		0.488	
LM(1)	0.026	0.871	0.240	0.624	0.382	0.537
LM(4)	3.779	0.437	4.623	0.328	2.540	0.638
JB	7.170	0.028**	0.756	0.685	0.295	0.863
Heterosc.	0.095	0.758	2.015	0.156	0.560	0.454
CUSUM	S		S		S	

Table 4.8 Cont'd	**DLogC61**		**DLogC62**		**DLogC63**	
	ARDL(0,6,4,3)		**ARDL(8,9,1,3)**		**ARDL(2,8,8,8)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
CUSUMSQ	U		S		S	
RESET	4.575	0.032**	0.089	0.765	0.247	0.619

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.9: Short-run coefficient estimates of the trade balance models of Chapters 72, 73 and 76 in the specified ARDL (q,r,s,t) form

	DLogC72		**DLogC73**		**DLogC76**	
	ARDL(3,5,3,1)		**ARDL(5,6,0,4)**		**ARDL(6,2,7,6)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
C	-0.074	0.266	0.027	0.538	0.105	0.020**
DLogC*i*(t-1)	-0.211	0.050*	0.147	0.359	-0.273	0.060*
DLogC*i*(t-2)	0.151	0.181	0.099	0.512	0.294	0.036**
DLogC*i*(t-3)	0.250	0.010***	0.179	0.192	0.103	0.415
DLogC*i*(t-4)			0.222	0.082*	-0.316	0.013**
DLogC*i*(t-5)			0.207	0.077*	-0.128	0.287
DLogC*i*(t-6)					-0.023	0.819
DLogRER	0.036	0.966	1.071	0.084*	0.296	0.549
DLogRER(t-1)	-0.322	0.711	-0.036	0.955	0.921	0.058*
DLogRER(t-2)	1.003	0.214	0.142	0.816	1.151	0.020**
DLogRER(t-3)	0.328	0.702	1.574	0.013**		
DLogRER(t-4)	1.272	0.124	-0.623	0.327		
DLogRER(t-5)	-1.851	0.025**	0.958	0.059*		
DLogRER(t-6)			0.559	0.283		
DLogYG	6.291	0.327	6.926	0.076*	3.726	0.271
DLogYG(t-1)	16.966	0.008***			1.765	0.610
DLogYG(t-2)	0.051	0.994			-7.374	0.034**
DLogYG(t-3)	7.469	0.209			-1.530	0.655
DLogYG(t-4)					5.151	0.130

Table 4.9 Cont'd	DLogC72		DLogC73		DLogC76	
	ARDL(3,5,3,1)		ARDL(5,6,0,4)		ARDL(6,2,7,6)	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
DLogYG(t-5)					-2.223	0.512
DLogYG(t-6)					1.406	0.681
DLogYG(t-7)					-10.042	0.003***
DLogYT	3.025	0.195	-1.401	0.351	-1.761	0.165
DLogYT(t-1)	-10.351	0.000***	-1.072	0.479	-1.847	0.152
DLogYT(t-2)			1.099	0.445	0.183	0.885
DLogYT(t-3)			2.304	0.104	2.630	0.020**
DLogYT(t-4)			-2.148	0.143	-4.165	0.001***
DLogYT(t-5)					0.636	0.631
DLogYT(t-6)					-2.260	0.088*
ECT(t-1)	-0.386	0.000***	-0.705	0.000***	-0.358	0.002***
Adj. R^2	0.544		0.361		0.666	
LM(1)	0.006	0.937	9.426	0.002***	0.079	0.779
LM(4)	3.472	0.482	14.514	0.006***	10.393	0.034**
JB	0.557	0.757	1.626	0.444	7.510	0.023**
Heterosc.	2.311	0.129	1.176	0.278	0.355	0.551
CUSUM	U		S		U	
CUSUMSQ	S		S		S	
RESET	5.776	0.016**	1.877	0.171	0.000	0.998

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.10: Short-run coefficient estimates of the trade balance models of Chapters 84, 85 and 87 in the specified ARDL (q,r,s,t) form

	DLogC84		DLogC85		DLogC87	
	ARDL(4,2,3,1)		ARDL(0,0,0,0)		ARDL(8,8,9,9)	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
C	0.047	0.061*	0.011	0.648	0.082	0.254
DLogC***i***(t-1)	0.003	0.982			0.076	0.648
DLogC***i***(t-2)	-0.100	0.359			-0.074	0.655

Table 4.10 Cont'd	**DLogC84**		**DLogC85**		**DLogC87**	
	ARDL(4,2,3,1)		**ARDL(0,0,0,0)**		**ARDL(8,8,9,9)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
DLogC*i*(t-3)	-0.149	0.133			-0.093	0.575
DLogC*i*(t-4)	0.388	0.000***			0.283	0.059*
DLogC*i*(t-5)					-0.253	0.081*
DLogC*i*(t-6)					-0.020	0.892
DLogC*i*(t-7)					-0.055	0.683
DLogC*i*(t-8)					0.237	0.090*
DLogRER	0.753	0.020**	0.584	0.086*	0.691	0.319
DLogRER(t-1)	-0.214	0.496			-0.477	0.515
DLogRER(t-2)	0.765	0.009***			0.407	0.582
DLogRER(t-3)					0.270	0.743
DLogRER(t-4)					0.687	0.365
DLogRER(t-5)					-1.248	0.092*
DLogRER(t-6)					0.621	0.392
DLogRER(t-7)					-0.456	0.532
DLogRER(t-8)					0.515	0.483
DLogYG	5.295	0.019**	4.685	0.042**	13.263	0.021**
DLogYG(t-1)	-0.483	0.824			4.975	0.432
DLogYG(t-2)	2.821	0.189			-17.623	0.004***
DLogYG(t-3)	-6.142	0.004***			5.988	0.321
DLogYG(t-4)					-7.941	0.160
DLogYG(t-5)					3.035	0.583
DLogYG(t-6)					3.029	0.572
DLogYG(t-7)					1.499	0.766
DLogYG(t-8)					-8.024	0.113
DLogYG(t-9)					-5.209	0.270
DLogYT	-1.141	0.168	-0.618	0.499	-7.357	0.001***
DLogYT(t-1)	-1.716	0.047**			-2.318	0.307
DLogYT(t-2)					1.294	0.568
DLogYT(t-3)					0.880	0.696
DLogYT(t-4)					-1.161	0.573
DLogYT(t-5)					0.373	0.852
DLogYT(t-6)					-0.993	0.630
DLogYT(t-7)					-0.368	0.869
DLogYT(t-8)					1.952	0.346
DLogYT(t-9)					4.794	0.005***
ECT(t-1)	-0.292	0.001***	-0.378	0.000***	-0.259	0.055*
Adj. R^2	0.398		0.276		0.623	
LM(1)	0.279	0.597	0.011	0.915	2.147	0.143
LM(4)	3.429	0.489	6.481	0.166	6.330	0.176

Table 4.10 Cont'd	DLogC84		DLogC85		DLogC87	
	ARDL(4,2,3,1)		ARDL(0,0,0,0)		ARDL(8,8,9,9)	
	Coef.	**Prob.**	**Coef.**	**Prob.**	**Coef.**	**Prob.**
JB	0.845	0.655	0.710	0.701	3.201	0.202
Heterosc.	0.133	0.716	1.080	0.299	1.005	0.316
CUSUM	S		S		S	
CUSUMSQ	S		S		S	
RESET	0.943	0.332	2.275	0.131	11.092	0.001***

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

Table 4.11: Short-run coefficient estimates of the trade balance models of Chapters 89 and 90 in the specified ARDL (q,r,s,t) form

	DLogC89		DLogC90	
	ARDL(4,2,3,9)		ARDL(2,1,0,0)	
	Coef.	**Prob.**	**Coef.**	**Prob.**
C	-0.690	0.222	0.058	0.178
DLogC***i***(t-1)	0.717	0.001***	-0.156	0.134
DLogC***i***(t-2)	0.711	0.000***	-0.123	0.214
DLogC***i***(t-3)	0.397	0.004***		
DLogC***i***(t-4)	0.143	0.154		
DLogRER	-7.416	0.269	0.186	0.766
DLogRER(t-1)	-3.800	0.566	0.460	0.388
DLogRER(t-2)	-14.321	0.030**		
DLogYG	93.033	0.057*	4.946	0.236
DLogYG(t-1)	70.306	0.182		
DLogYG(t-2)	-54.827	0.257		
DLogYG(t-3)	204.189	0.000***		
DLogYT	-7.986	0.639	-1.749	0.291
DLogYT(t-1)	-50.490	0.006***		
DLogYT(t-2)	-14.982	0.372		
DLogYT(t-3)	7.271	0.602		

Table 4.11 Cont'd	**DLogC89**		**DLogC90**	
	ARDL(4,2,3,9)		**ARDL(2,1,0,0)**	
	Coef.	**Prob.**	**Coef.**	**Prob.**
DLogYT(t-4)	-26.777	0.070*		
DLogYT(t-5)	16.870	0.226		
DLogYT(t-6)	20.852	0.123		
DLogYT(t-7)	18.442	0.178		
DLogYT(t-8)	-12.605	0.368		
DLogYT(t-9)	27.365	0.051*		
ECT(t-1)	-1.835	0.000***	-0.226	0.003***
Adj. R^2	0.652		0.167	
LM(1)	0.276	0.599	0.029	0.865
LM(4)	4.246	0.374	7.635	0.106
JB	2.777	0.249	2.761	0.252
Heterosc.	1.341	0.247	1.561	0.212
CUSUM	S		U	
CUSUMSQ	S		U	
RESET	0.299	0.585	0.270	0.603

C*i* symbolizes the trade balance of the relevant chapter *i*. D represents first differencing. 'Coef.' stands for coefficient while 'Prob.' stands for the corresponding p-value of the coefficient. Adj. R^2 is the adjusted R-squared. LM(1) and LM(4) are Lagrange Multiplier (LM)statistics for testing no residual serial correlation up to order 1 and 4 respectively, distributed as $\chi^2(1)$ and $\chi^2(4)$. JB is the Jarque-Bera statistics testing for residual normality. 'Heterosc.' is the LM test for no autoregressive conditional heteroskedasticity (ARCH) in the residuals, distributed as $\chi^2(1)$. CUSUM (CUSUMQ) is the cumulative sum of the (squared) recursive residuals for parameter stability, where S refers to stable, U refers to unstable parameters. RESET is the Regression Specification Error Test for functional form misspecification. Significance is denoted by * for 90%, by ** for 95%, and by *** for 99% confidence levels.

On the other hand, the short run effect of an increase in the value of real exchange rate is unfavorable on the trade balances of Chapters 72 (Iron and steel), 87 (Vehicles other than railway or tramway rolling-stock) and 89 (Ships, boats and floating structures). A currency depreciation leads to deterioration in the trade balances of Chapter 72 and 87 with a lag of 5 periods, while the same impact occurs for Chapter 89 at the following 2nd quarter. Although the initial worsening of the trade balance in response to currency depreciation in the short run is consistent with the first part of a possible J curve, this negative primer effect detected in these industries does not reverse either in short or in the long run. While the short run negative impacts of devaluation does not last into long run in any shape for

Chapters 87 and 89, it continues to deteriorate the trade balance for Chapter 72 in the long run as well.

Second panel of Table 4.5 shows that real depreciation of Turkish Lira against Euro immediately deteriorates the trade balance in Chapter 20 (Vegetables, fruit or nut preparations) but starts to improve back again at the 6th consecutive lag with a highly significant coefficient[42]. This finding suggests that the exact J curve response is detected for the trade balance in Chapter 20.

Inspection of the first panel of Table 4.6 reveals that the first significant effect of the currency depreciation on the trade balance of Chapter 30 (Pharmaceuticals) is observed at the following 5th lag and occurs positively, while the second impact is found to worsen the trade balance at the 8th lag. The favorable initial effect pursued by a secondary detrimental effect on the trade balance is consistent with the so called ‘inverse J curve’.

In the same manner, as seen from the second panel of Table 4.8, movements in the value of DLogRER variable results in significant changes in the trade balance of Chapter 62 (Not Knitted/crocheted articles of apparel and clothing) in many of the subsequent lags. In the first four quarters following a real depreciation of Turkish Lira, the trade balance in Chapter 62 improves successively. However, this effect reverses and begins to negatively affect the trade balance in the 7th and 9th consequent lags. As a result, short run response of trade balance in Chapter 62 forms an inverse J curve similar to Chapter 30, as the positive primer impacts are combined with negative sequent ones observed in longer lags. In addition, Table 4.4 shows that the secondary adverse effect prevails in the long run for both of the Chapters which possess the characteristics of an inverse J curve response. Thus, for Chapters 30 and 62, it can be concluded that, real depreciation of Turkish Lira against Euro firstly causes the trade balance to improve, but worsens in the trailing shorter term and sustain this detrimental influence in the distant future, depicting a complete inverse J curve.

Tables 4.5 – 4.11 also show that movements in the real bilateral exchange rate between Turkey and Germany does not exhibit any alternating power in the short run on the trade balances of Chapters 29 (Organic chemicals), 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 38 (Miscellaneous chemical products), 40

[42] Although the coefficients of DLogRER fluctuate in between these two significant lags, these intermediary lags and their effects are regarded to be completely negligible, as they do not have statistically significant coefficients. Therefore, throughout the study, only the statistically significant lags are interpreted and conclusions are drawn upon them accordingly.

(Rubber and its articles) and 90 (Optical, photographic, cinematographic medical or surgical inst.). For Chapter 38, this ineffectiveness of the exchange rate continues in the long run as well. However, although in the short run the trade balances of the remaining four chapters do not depend on the real exchange rate; in the long run trade balance of Chapters 40 and 90 improves, while those of Chapters 29 and 32 worsens in response to a real depreciation.

When these findings are evaluated altogether once more for the existence of J curve, it is seen that only Chapter 20 presents evidence of J curve phenomenon according to the classical definition of Magee (1973). However, since in the long run the J shape does not persist and the response of trade balance in Chapter 20 to depreciation of Turkish Lira ends up negative, inference of J curve in Chapter 20 is assessed to be incomplete. Moreover, even if the 'new definition' put forward by Rose and Yellen (1989) is adopted, which denominates J curve as short run negative effects combined with positive long run ones as explained in Literature Review Chapter, still no further indication of J curve in any of the other chapters could be detected. Among the chapters that could fit to this definition i.e. the chapters having short run negative coefficients for exchange rate variable (Chapters 72, 87, and 89), none of them has positive coefficients in the long run. Therefore, it is not possible to draw conclusions on the existence of any 'complete' J curve effect that takes place in any of the chapters studied.

Similar to the situation with the exchange rate, Tables 4.5 – 4.11 show that foreign real income (YG) is an important short run element of the trade balances of 15 industries having at least one significant lag coefficient at 90% confidence level. Among these 15 industries, changes in the real income of Germany have mixed effects (both negative and positive) over the trade balances of 8 chapters. To be more precise, in Chapters 08 (Edible fruits, nuts, citrus fruit or melon peels), 20 (Vegetables, fruit or nut preparations), 30 (Pharmaceuticals), 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 40 (Rubber and its articles), 48 (Paper and paperboard and articles made of them), 84 (Nuclear reactors, boilers, machinery and mechanical app.) and 87 (Vehicles other than railway or tramway rolling-stock), responses of the trade balance to an increase in YG is significant at many lags, but does not possess a specific pattern and generally fluctuate between positive and negative coefficients. Moreover, while these mixed results turn into negative effects in the long run for Chapters 08 and 20, the trade balances of

Chapters 40, 48, 84 and 87 respond positively to increases in YG in the long run. Thus, in majority, the short run fluctuations end up favoring Turkish trade balance.

On the other hand, of these 15 chapters for which YG matters in the short run, trade balances of 6 industries react positively to an increase in real foreign income. A rise in the real foreign income results in an immediate improvement in the trade balances of Chapters 38 (Miscellaneous chemical products), 61 (Knitted/crocheted articles of apparel and clothing acc.), 73 (Articles of iron and steel), 85 (Electrical machinery and equip.; telecommunication equip.) and 89 (Ships, boats and floating structures) while the same favorable effect recurs once more respectively at 4^{th} and 3^{rd} lags in Chapters 61 and 89. Similarly, the same effect is observed at lag level of 1 for Chapter 72 (Iron and steel). This fact can be attributed to the explanation of the straightforward theory favoring demand side domination. In other words, as real income of trading partner rises, demand towards Turkish imports of the goods included in these 6 chapters increases in the short run. Moreover, lag levels of the significant coefficients indicate that this increase in demand occurs so fast that supply of domestic counterparts cannot meet this enlargement simultaneously, thus Turkish exportation of these chapters increase which in turn benefits the trade balances in the short run. In addition in this group, the short run positive effects that are created with an increase in YG are transferred into the long run for Chapters 38, 73 and 85, while for the other half of the industries YG becomes irrelevant in the long run.

Furthermore, only in Chapter 76 (Aluminium and aluminium articles), the influential coefficients of DLogYG variable have a negative value which occurs at 2^{nd} and 7^{th} lags. This implies that in the short run, in contrast to the situation in most of the chapters, the response observed in Chapter 76 induces the supply side factors to dominate and causes the trade balance to deteriorate when YG increases. To express in more detail, when the economy grows, Germany prefers to increase the in-country production of aluminum and its articles rather than augmenting imports from Turkey and consequently Turkish trade balance in Chapter 76 worsens in the short run. However as Table 4.4 shows, this negative reaction fades out in the long run.

When it comes to the short run effects of real domestic income (YT), Tables 4.5-4.11 bring out that trade balances of 14 industries gets affected significantly by changes in DLogYT at least in one lag at minimum 90% confidence level. An increase in Turkish real income gives rise to a mixture of positive and negative changes in trade balances of 6 chapters consisting of Chapter 20 (Vegetables, fruit or nut preparations), Chapter 30

(Pharmaceuticals), Chapter 63 (Worn Clothing and other textile articles, rags), Chapter 76 (Aluminium and aluminium articles), Chapter 87 (Vehicles other than railway or tramway rolling-stock) and Chapter 89 (Ships, boats and floating structures). A closer look at these combined effects reveals that, lags with negative coefficients are in majority compared to positive lags in most of the chapters. However, among these 6 industries, the short run mixed effects last into the long run only in 2 chapters; the trade balance of Chapter 87 experiences a deterioration in the long run in response to an increase in YT, while that of Chapter 76 improves on the contrary.

Of these 14 industries for which YT is a significant short run factor, trade balances of 6 chapters respond adversely to an increase in the real domestic income. A growth of Turkish economy brings about an instantaneous deterioration in the trade balances of Chapters 39 (Plastics and its articles), 61 (Knitted/crocheted articles of apparel and clothing acc.) and 40 (Rubber and its articles), while this deterioration continues at the 1st lag for Chapter 40. A similar reaction occurs in the trade balances of Chapters 72 (Iron and steel) and 84 (Nuclear reactors, boilers, machinery and mechanical app.) in the upcoming 1st period after an increase in YT. Moreover, it takes two periods for Chapter 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks) to worsen following a rise in domestic real income. Supposedly, when Turkey experiences economic growth, the demand for foreign goods that fall into these 6 chapters increases and Turkey imports more of these goods from Germany. This demand oriented drive may surpass the likely increased incentive to locally produce these goods, which in the end worsens the trade balance in relevant chapters. In the long run, the detrimental effect of an increase in YT continues to prevail in Chapter 61; reverses and becomes favorable in Chapter 39, while becomes ineffective for the rest of the chapters.

On the other hand, in response to an increase in real domestic income, supply side factors dominate in the short run in the trade balances of Chapters 48 (Paper and paperboard and articles made of them) and 62 (Not Knitted/crocheted articles of apparel and clothing). As a result, growth in domestic income causes the trade balance in Chapter 48 to increase in the following 5th period, while the trade balance in Chapter 62 improves at the 2nd lag. However, this short run positive impact continues in the long run having a negative coefficient for Chapter 48, while for Chapter 62, the effect of YT disappears in the long run.

The discrepancies observed in the short and the long run responses to foreign or domestic income changes may be resulting from supply elasticities that differ through time. To illustrate, an excess demand for goods created by an increase in income may not be offset immediately by altering domestic production in the short run, thus, the adaptation to the new situation may take place in the long run. Therefore, an increase in Turkish real income may lead to an initial increase in imports which deteriorates the trade balance in relevant chapters in the short run. However, as time goes by, the domestic suppliers try to adjust to the unbalanced demand and enhance the facilities in order to boost the local production of the goods in those chapters. The augmented in-country production of goods may satisfy the domestic demand and thus relaxing imports, or by outweighing it, exportation of these goods may rise as well. As a result, increase in domestic income initially damages the trade balance but eventually benefits in the distant future (e.g. Chapter 39). A similar sequence of events may occur in Germany as a result of its economic growth which firstly favors Turkish trade balance but harms in the long run.

Moreover, an increase in Turkish real income may initially trigger the domestic supply dynamics of some goods in some Chapters (e.g. Chapter 48) before the demand side gets into action, which may promote the trade balance in the short run. However, as time passes, the local production may be discovered to be unprofitable and may be abandoned which in the end may lead the consumers towards German counterparts of those goods, deteriorating the trade balance in the long run. Consequently, foreign or domestic real income increases may bring out opposite short run and long run reactions.

The lags of the trade balance itself also play an effective role in the short run determination of the trade balances in 75% of the chapters. Trade balances of 5 chapters which are Chapters 40 (Rubber and its articles), 62 (Not Knitted/crocheted articles of apparel and clothing), 73 (Articles of iron and steel), 84 (Nuclear reactors, boilers, machinery and mechanical app.), and 89 (Ships, boats and floating structures), are positively related to their previous values belonging to prior periods. In other words, the increases in the trade balances of these chapters cause the future trade balance values in the upcoming quarters to increase as well. An increase in the trade balance in the present period causes the trade balance in Chapter 89 to increase in the following three quarters, while the same effect is observed after approximately one year on Chapters 40, 73 and 84. Similarly, it takes 5 to 8 quarters to witness an improvement in the trade balance of Chapter 62 resulting from a current betterment.

Conversely, the trade balances of Chapters 08 (Edible fruits, nuts, citrus fruit or melon peels), 20 (Vegetables, fruit or nut preparations), 29 (Organic chemicals), 39 (Plastics and its articles) and 63 (Worn Clothing and other textile articles, rags) depend negatively on their lagged values. To state in another way, an improved trade balance in the ongoing period surprisingly causes the values of the forthcoming periods to decrease, which implies that current betterment triggers deterioration in the future for these chapters. Additionally, the lags of trade balance variables does not follow a specific pattern when significantly affecting the current value for Chapters 30 (Pharmaceuticals), 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 72 (Iron and steel), 76 (Aluminium and aluminium articles), and 87 (Vehicles other than railway or tramway rolling-stock).

Following Pesaran et al. (2001) and many of the studies adopted bounds testing method for analysis, a few post-estimation tests for model accuracy and residual diagnostic checks carried out for each of the chapters are presented in the last section of each panel in Tables 4.5-4.11. In order to present a measure associated with goodness of fit of the regressions, adjusted R squared statistics are included. Similarly, in order to test for functional form misspecification, Regression Specification Error Test (RESET) is presented. Additionally, residual diagnostic tests such as Jarque-Bera (JB) statistic for examining whether the residuals of each regression are distributed normally and an LM statistic testing for absence of heteroskedasticity in the residuals are presented. Moreover, another LM statistics which tests for residual serial autocorrelation against the specified order is also presented, although the model adopted is already designated specifically to overcome this problem. At this point, Pesaran et al. (2001) mention that these statistics should not be given extra credit. Moreover, since the existence of cointegration does not imply that the short and the long run coefficients are stable along the studied period as stated by Bahmani-Oskooee and Brooks (1999), cumulative sum of the (squared) recursive residuals tests shown as CUSUM (CUSUMQ) are employed for parameter stability. The inspection of the plots where the resultant statistics are depicted versus the study period, are summarized with letters *S* and *U* representing that the coefficients derived from the bounds testing approach in Tables 4.5-4.11 are stable or unstable.

Tables 4.5-4.11 show that for many of the chapters, the size of the adjusted R squared statistics is reasonable, pointing out that the goodness of fit is sufficient for most of the cases. For 6 industries, at least 60% of the variation in the dependent variable can be explained by the explanatory variables; while for 12 chapters the variation can be explained by the underlying model by at least 45%. Similarly, the RESET statistics also indicate that the null hypothesis of no incorrect functional form is rejected for only 6 of the 20 chapters. Therefore, functional form of the estimated regressions is properly and accurately specified for 70% of the chapters under study.

The LM statistics for testing no autocorrelation among residuals up to order 1 is rejected for only 3 of the chapters at 95% confidence level, while the number of cases increases to 5 when the statistic is tested up to order 4. In total, for 5 of the chapters, the residuals are found to be serially correlated with 95% confidence. Therefore, it can be concluded that the crucial assumption of the bounds testing approach could be supported to be satisfied for at least 75% and at most 85% of the chapters by the selected optimum lag specifications. However, as mentioned above, these results should be disregarded to the extent that the regressions were constructed such that the serial autocorrelation problem was solved for each of the chapters. Moreover, it is worth mentioning at this point that, although for Chapter 87, ARDL specification at any lag was found to have serially autocorrelated residuals (up to order 4) as seen from Table 4.1, the last panel of Table 4.10 shows that the estimated model of the Chapter is freed from this drawback at the selected optimum lag specification.

The LM statistic for testing the null hypothesis of there is no heteroskedasticity among residuals is rejected for only 4 chapters, signifying that the residuals of the estimated models are homoskedastic, having the same finite variance for 80% of the cases. In addition, the Jarque-Bera test statistic which has a null hypothesis stating that the residuals follow the normal distribution, could be rejected for 5 of the chapters at 95% confidence level. Therefore, the residuals generated from the estimated models are normally distributed in 75% of the cases.

The recursive estimation of the equations and the corresponding cumulative sum of the resultant residuals (CUSUM) plots portray that for 70% of the chapters, the presented coefficients are stable over the study period. Similarly, inspection of the cumulative sum of the squared residuals (CUSUMQ) plots indicates parameter stability for 80% of the cases. Overall, the short and the long run coefficients reported in Tables 4.2 and 4.5-4.11 as a result of the bounds testing procedure are found to be stable in the trade balance models of 90% of the chapters, as indicated by at least one of the two statistics.

On the whole, the residual diagnostics checks and the model accuracy tests all reveal that, the specification of the equations and the associated outcomes (the coefficients and the residuals) satisfy the general assumptions reasonably well. This constitutes another evidence for the validity of the bounds testing procedure and the obtained results.

To sum up the findings of this chapter presented above, in none of the chapters, the bilateral trade balance response to the real depreciation of Turkish Lira against Euro reveals the investigated ‘complete’ J curve effect. Although in Chapter 20 (Vegetables, fruit or nut preparations), the short run effect of currency depreciation on the trade balance is totally consistent with the J curve phenomenon, since the positive portion of the J-shaped response is not pursued in the long run, this J curve inference is presumed to be incomplete. Although it is not possible to observe a common short run dynamics originating from real depreciation among the studied chapters, nevertheless it can be concluded that the trade balances of Chapters 30 (Pharmaceuticals) and 62 (Not Knitted/crocheted articles of apparel and clothing) follow a complete inverse J curve in reaction to a real depreciation of the bilateral exchange rate. Overall, the exchange rate variations as well as the movements of foreign and domestic real income are highly effective on the determination of bilateral trade balance between Turkey and Germany in the majority of the chapters both in the short and in the long run.

CHAPTER 5

CONCLUSION

In this thesis, the relationship between the bilateral real exchange rate and the trade balances of 20 industries which constitute the majority of the trade between Turkey and Germany is examined both for the short and long run, seeking the existence of any J-curve effect. Using quarterly data over the period 1989:1-2011:3, the relationship is modeled through the commonly adopted partial reduced form model of Rose and Yellen (1989), and the trade balance of each of the 20 HS chapters (defined as exports over imports) are explained by real bilateral exchange rate (defined as units of Turkish Lira per unit of Euro), domestic as well as foreign real incomes. As long as the ML condition holds, a depreciation of Turkish Lira against Euro is expected to improve the bilateral trade balance in the long run. However, detecting the J curve phenomenon necessitates observing initially a negative relationship between these two key variables which tends to improve later in the short run, while this improvement is anticipated to continue in the long run as well. Furthermore, although straightforwardly negative and positive links are expected respectively for the domestic and foreign real income variables, still no a-priori expectations are assigned as their coefficients can have either sign according to the dominance of demand or supply side factors in trade between Germany and Turkey.

The above constructed relationship is estimated for each of the 20 chapters in search of the J curve through the ARDL bounds-testing approach to cointegration and error correction modeling developed by Pesaran, Shin and Smith (2001). Bounds testing is suitable primarily as the series employed in the analysis are all found to be either stationary or integrated of order one. More importantly, it is particularly an appropriate method to apply when testing for the J curve effect, as it conveys the short run dynamics of the variables simultaneously along with the long run framework.

The results of the bounds test indicate that when the same lag structure (p) is imposed on each variable, sign of cointegration among all the variables included in the trade balance model is detected for 60% of the 20 chapters. However, when the optimal lag set (q, r, s, t) is sought over all possible combinations through extensive grid searches for each of the chapters in order to allow the lag lengths to differ for each variable, then the bounds test carried out at these optimum lags reveal sign of cointegration for all of the 20 chapters. Verifying the existence of a long-run relationship among the four variables (TB, RER, YG, YT) for each of the industries studied, paves the way for estimating the short and the long run responses of the trade balance for the industries.

Besides, existence of any additional cointegration relations other than specified above is tested. It is found that for all of the chapters[43] the one and only direction of cointegration between the four variables is the one where the mere endogenous variable trade balance is explained by the exogenous variables: real exchange rate, real foreign income, and real domestic income.

As the findings indicate that the single equation method employed in the analysis is suitable in every respect, first the levels relationship and afterwards the relevant short run dynamics are estimated for the chapters. It is found that, in the long run, many of the chapters (60%: 12 chapters) are responsive to changes in the bilateral real exchange rate, foreign real income (60%: 12 chapters) and domestic real income (45%: 9 chapters). However, the responses of chapters vary significantly to movements in these variables, justifying the expectation that disaggregation reveals the distinct and unique reactions.

Depreciation of the Turkish Lira against Euro improves the bilateral trade balance in the long run in only 4 of the chapters (Chapters 40, 73, 85 and 90), in line with the expectations. However, in contrast to the theory, trade balances of majority of the chapters (8 chapters) worsen. Therefore, the ML condition is found to hold for only a small group of the chapters under study, while depreciation is detrimental for a larger part of the cases. Additionally, in contrast to the studies such as Halicioglu (2007) and Celik and Kaya (2010) stating that ML condition holds in the total bilateral trade with Germany, the industry group for which a similar conclusion is made by this study corresponds to a small portion of total trade with Germany. More precisely, the 4 chapters for which depreciation improves the trade balance make up approximately 15% of the total trade between Turkey and Germany in the period 2000-2010, while the 8 chapters for which depreciation is found to be harmful constitute 17%. This may lead to infer that depreciation of the bilateral exchange rate causes both positive and negative effects on the trade balance of industries which have close shares in total trade between two countries.

[43] Except only for Chapter 40 which is regarded to be negligible.

An increase in the German real income improves the trade balance of 9 industries, while worsening that of 3 chapters. Likewise, an increase in the domestic real income causes deterioration in the trade balance of 6 chapters, while generating betterment for 3 cases. Thus, the straightforward expectations foreseeing positive foreign income and negative domestic income long run impacts on the trade balance is validated for most of the industries.

The short run dynamics revealed by the estimated level relations also show extensive variations in different industries' reactions to the explanatory variable changes, similar to the case in the long run. Moreover, compared to the long run, a greater number of chapters are responsive to the movements of the exogenous determinants in the short run. To illustrate, while for 75% of the chapters (15 chapters) the exchange rate fluctuations has significant short run effects on the trade balance, the foreign real income matters for the trade balance of 75% of the industries (15 chapters), and 70% of the chapters (14 chapters) gets affected by changes in domestic real income in the short run.

The short run effect of a depreciation of Turkish Lira against Euro is solely positive on the trade balances of 9 chapters, while it is negative for 3 chapters. Among these chapters, it draws attention that for the trade balance in Chapter 73 (Articles of iron and steel) and in Chapter 85 (Electrical machinery and equip.; telecommunication equip.), the short run constructive effects of depreciation prevails in the long run, which makes the depreciation beneficial at all times for the Turkish bilateral trade with Germany in these industries. Similarly, depreciation is found to be continuously detrimental on the trade balance in Chapter 72 (Iron and steel) both in the short and the long run.

The investigated J curve effect is detected solely in the trade balance of Chapter 20 (Vegetables, fruit or nut preparations). Although this short run dynamics entirely corresponds to the classical definition of J curve by Magee (1973), since the J letter shape does not endure in the long run and the response of trade balance in Chapter 20 to depreciation of Turkish Lira reverses eventually, inference of J curve in Chapter 20 is assessed to be incomplete. On the other hand, this type of response which begins with an initial worsening followed by improvement for a while but concludes with deterioration in the end has also been detected for the aggregate Turkish trade data by Bahmani-Oskooee and Malixi (1992) and named as the inverse N curve.

Moreover, the so called ‘inverse J curve’ is consistent with the short run dynamics created in Chapters 30 (Pharmaceuticals) and 62 (Not Knitted/crocheted articles of apparel and clothing) where the positive early responses to a currency depreciation are combined with negative ensuing ones observed in longer lags. Furthermore, since the secondary negative effect proceeds also in the long run for both of the industries, the ‘inverse J curve’ inference for Chapters 30 and 62 is regarded to be complete. This type of short run response to depreciation has also been recorded in the literature by Celik and Kaya (2010) for Turkish bilateral trade with Germany at the aggregate level.

In view of the search for the existence of J curve, it is not possible to detect a complete J curve effect in any of the chapters, adopting the classical definition which necessitates the initial worsening to be followed by improvement in the short run that is further expected to continue in the longer term. Moreover, even if the ‘new definition’ put forward by Rose and Yellen (1989) is adopted, which defines J curve as short run negative effects combined with positive long run ones, still no additional evidence of J curve in any of the other chapters could be supported. At this point it is worth mentioning that, this new definition is conventionally searched in the recent industry level literature by combining any short run pattern (including the insignificant ones) with significantly positive long run effects, which increases the number of cases possessing the J curve. However, this study merely concentrates on the statistically significant coefficients with the belief that only they can create a meaningful noteworthy change on the trade balance while the insignificant coefficients are considered to be totally impotent. Thus, sticking even to the new definition, none of the chapters having short run negative coefficients for exchange rate variable takes on positive long run coefficients. Therefore, the bilateral trade balance response to the real depreciation of Turkish Lira against Euro does not exhibit the investigated ‘complete’ J curve effect in any of the chapters studied, irrespective of the definition adopted.

Similar to the exchange rate, changes in real foreign and domestic incomes are also important short run components of the trade balance dynamics for many of the industries. While for most of the chapters the short run effect of an increase in foreign real income is found to be mixed, it is positive for 6 chapters and negative for 1 chapter. It stands out that an increase in German real income starts to ameliorate the trade balance in Chapters 38 (Miscellaneous chemical products), 73 (Articles of iron and steel), and 85 (Electrical machinery and equip.; telecommunication equip.) in the short run and these favorable effects transfer into the long run as well. Besides, an increase in the Turkish real income gives rise to a blend of positive and negative changes in trade balances of 6 chapters, causes deterioration in 6 chapters while originates improvements for 2 chapters. In particular, the initial adverse effect on the trade balance in Chapter 61 (Knitted/crocheted articles of apparel and clothing acc.) becomes continuous for a longer period of time after the Turkish real income increases.

An overview of the results of the analysis reveals that the bilateral trade in a considerable amount of chapters is based on a single essential long run determinant. For instance, the one and only effective factor on the long run dynamics of trade balance in Chapters 30 (Pharmaceuticals), 32 (Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, and inks), 63 (Worn Clothing and other textile articles, rags) and 72 (Iron and steel) is found to be the real exchange rate. In other words, the real exchange rate of the Turkish Lira against Euro is the key element that shapes the bilateral trade in these industries. Similarly, the trade balance of Chapters 39 (Plastics and its articles), 61 (Knitted/crocheted articles of apparel and clothing acc.) and 76 (Aluminium and aluminium articles) depend solely on the real domestic income in the long run, while that of Chapter 84 (Nuclear reactors, boilers, machinery and mechanical app.) gets affected only by movements in the real foreign income.

Moreover, this overall evaluation also shows that the trade balance of Chapter 90 (Optical, photographic, cinematographic medical or surgical inst.) does not respond to changes in any of the explanatory variables in the short run, while eventually begins to be influenced by exchange rate and foreign income movements in the long run. Likewise, although each of the exogenous determinants is significantly effective on the short run formation of the trade balance in Chapter 89 (Ships, boats and floating structures), in the long run they all become irrelevant in explaining the dependent variable.

Furthermore, any specific pattern could not be observed within the two industry groups of which Turkey is a net exporter or net importer to/from Germany in terms of the trade balance responses to explanatory variables. Thus, due to diverse individual sector dynamics, it is not possible to draw common conclusions with respect to the role of Turkey as net exporter or net importer in her bilateral trade with Germany.

In terms of the empirical analysis, the residual diagnostics checks and the model accuracy tests all indicate that, the specification of the equations and the associated outcomes (the coefficients and the residuals) satisfy the general assumptions to a considerably reasonable extent.

The findings of this thesis conclude that, although the short run pattern created by a depreciation does not follow a specific path such as J curve for most of the chapters, still the exchange rate is an effective determinant of the trade balance for the majority of the cases both in the short and in the long run. Furthermore, along with exchange rate variations, the movements of foreign and domestic real incomes are also immensely effective on the determination of bilateral trade balance between Turkey and Germany in the majority of the chapters both in the short and in the long run. Finally, this thesis justifies the intuition behind disaggregation attempt and provides sound support for the assertion that the responses of the trade balance to exchange rate fluctuations vary significantly across different industries.

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APPENDICES

APPENDIX A: TOP FIVE TRADING PARTNERS OF TURKEY BY YEARS

Table A.1: The Rankings of the Top Five Trading Partners in Turkish Exports by Years

Top 5 Export Markets of Turkey					
	1	**2**	**3**	**4**	**5**
1923	UK	Italy	France	**Germany**	USA
1924	Italy	UK	**Germany**	France	USA
1925	Italy	**Germany**	USA	France	UK
1926	Italy	USA	**Germany**	France	UK
1927	Italy	USA	France	UK	**Germany**
1928	Italy	USA	**Germany**	France	UK
1929	Italy	**Germany**	France	USA	UK
1930	Italy	**Germany**	France	USA	UK
1931	Italy	**Germany**	USA	France	UK
1932	Italy	**Germany**	USA	UK	France
1933	**Germany**	Italy	USA	UK	France
1934	**Germany**	Italy	USA	UK	USSR
1935	**Germany**	USA	Italy	UK	USSR
1936	**Germany**	USA	UK	Italy	Czechoslovakia
1937	**Germany**	USA	UK	Italy	Bel.-Lux.
1938	**Germany**	USA	Italy	USSR	Czechoslovakia
1939	**Germany**	USA	Italy	UK	Czechoslovakia
1940	Italy	USA	Romania	UK	**Germany**
1941	**Germany**	UK	USA	Switzerland	Romania
1942	**Germany**	USA	UK	Sweden	Hungary
1943	**Germany**	USA	UK	Egypt	Switzerland
1944	USA	**Germany**	UK	Egypt	Switzerland
1945	USA	UK	Egypt	Switzerland	Palestine
1946	USA	UK	Palestine	Greece	Egypt
1947	USA	UK	Italy	Palestine	Czechoslovakia
1948	USA	UK	Czechoslovakia	Italy	Egypt
1949	**Germany**	USA	UK	Czechoslovakia	Greece
1950	**Germany**	USA	UK	Italy	France
1951	**Germany**	USA	UK	France	Italy
1952	**Germany**	USA	France	Italy	UK
1953	USA	**Germany**	Italy	UK	Yugoslavia
1954	**Germany**	USA	UK	Italy	Yugoslavia
1955	**Germany**	USA	Italy	UK	France
1956	USA	**Germany**	Italy	UK	Czechoslovakia
1957	USA	**Germany**	UK	Italy	France

Table A.1 Cont'd

Top 5 Export Markets of Turkey

	1	**2**	**3**	**4**	**5**
1958	USA	**Germany**	France	GDR	UK
1959	**Germany**	USA	UK	Italy	France
1960	USA	**Germany**	UK	Italy	France
1961	USA	**Germany**	Italy	UK	Lebanon
1962	USA	**Germany**	Italy	UK	Lebanon
1963	**Germany**	USA	UK	Italy	Switzerland
1964	USA	**Germany**	UK	Italy	France
1965	USA	**Germany**	UK	Italy	Bel.-Lux.
1966	USA	**Germany**	UK	Italy	Bel.-Lux.
1967	USA	**Germany**	Italy	UK	France
1968	**Germany**	USA	UK	USSR	Switzerland
1969	**Germany**	USA	Italy	UK	USSR
1970	**Germany**	USA	Switzerland	France	Italy
1971	**Germany**	USA	Switzerland	France	Lebanon
1972	**Germany**	USA	Switzerland	Italy	France
1973	**Germany**	USA	Switzerland	Italy	Lebanon
1974	**Germany**	USA	Lebanon	Switzerland	Italy
1975	**Germany**	USA	Switzerland	Italy	USSR
1976	**Germany**	USA	Switzerland	Italy	UK
1977	**Germany**	Italy	USA	Switzerland	UK
1978	**Germany**	Italy	USA	France	UK
1979	**Germany**	Italy	France	USSR	Switzerland
1980	**Germany**	Italy	USSR	France	Iraq
1981	**Germany**	Iraq	Libya	USA	Switzerland
1982	Iran	**Germany**	Iraq	Saudi Arabia	Italy
1983	Iran	**Germany**	Italy	Saudi Arabia	Iraq
1984	**Germany**	Iraq	Iran	Italy	Saudi Arabia
1985	**Germany**	Iran	Iraq	UK	USA
1986	**Germany**	Italy	Iran	Iraq	USA
1987	**Germany**	Iraq	Italy	USA	UK
1988	**Germany**	Iraq	Italy	USA	UK
1989	**Germany**	Italy	USA	USSR	UK
1990	**Germany**	Italy	USA	UK	France
1991	**Germany**	Italy	USA	France	UK
1992	**Germany**	Italy	USA	France	UK
1993	**Germany**	USA	UK	France	Italy
1994	**Germany**	USA	Italy	UK	France
1995	**Germany**	USA	Italy	Russian Fed.	UK
1996	**Germany**	USA	Russian Fed.	Italy	UK
1997	**Germany**	Russian Fed.	USA	UK	Italy
1998	**Germany**	USA	UK	Italy	Russian Fed.
1999	**Germany**	USA	UK	Italy	France
2000	**Germany**	USA	UK	Italy	France
2001	**Germany**	USA	Italy	UK	France
2002	**Germany**	USA	UK	Italy	France

Table A.1 Cont'd	**Top 5 Export Markets of Turkey**				
	1	**2**	**3**	**4**	**5**
2003	**Germany**	USA	UK	Italy	France
2004	**Germany**	UK	USA	Italy	France
2005	**Germany**	UK	Italy	USA	France
2006	**Germany**	UK	Italy	USA	France
2007	**Germany**	UK	Italy	France	Russian Fed.
2008	**Germany**	UK	UAE	Italy	France
2009	**Germany**	France	UK	Italy	Iraq
2010	**Germany**	UK	Italy	France	Iraq

The data for the period 1923-1968 are gathered from the resources of the former Ministry of Trade which were compiled by Foreign Trade Expert Husamettin Nebioglu. The data for the period 1969-2010 are gathered from TURKSTAT. Rankings are constructed by the author.

Table A.2: The Rankings of the Top Five Trading Partners in Turkish Imports by Years

Top 5 Import Suppliers of Turkey

	1	**2**	**3**	**4**	**5**
1923	Italy	UK	France	USA	**Germany**
1924	Italy	UK	**Germany**	France	USA
1925	Italy	UK	**Germany**	France	USA
1926	Italy	UK	**Germany**	France	Czechoslovakia
1927	**Germany**	France	UK	Italy	Czechoslovakia
1928	**Germany**	France	UK	Italy	Czechoslovakia
1929	**Germany**	Italy	UK	France	USA
1930	**Germany**	Italy	UK	France	USSR
1931	**Germany**	Italy	UK	France	Bel.-Lux.
1932	**Germany**	Italy	UK	France	Bel.-Lux.
1933	**Germany**	UK	Italy	Bel.-Lux.	France
1934	**Germany**	UK	Italy	France	Czechoslovakia
1935	**Germany**	UK	USA	Italy	USSR
1936	**Germany**	USA	UK	USSR	Czechoslovakia
1937	**Germany**	USA	UK	USSR	Italy
1938	**Germany**	UK	USA	Italy	USSR
1939	**Germany**	USA	Italy	UK	USSR
1940	Italy	Romania	UK	**Germany**	USA
1941	UK	**Germany**	Romania	USA	Hungary
1942	**Germany**	UK	India	Hungary	USA
1943	**Germany**	UK	India	Hungary	Switzerland
1944	**Germany**	UK	India	Hungary	Switzerland
1945	UK	USA	Sweden	Switzerland	India

Table A.2 Cont'd

Top 5 Import Suppliers of Turkey

	1	**2**	**3**	**4**	**5**
1946	USA	UK	Switzerland	Sweden	Italy
1947	USA	Italy	UK	Czechoslovakia	Japan
1948	UK	USA	Italy	Czechoslovakia	France
1949	USA	UK	Czechoslovakia	France	Canada
1950	USA	**Germany**	UK	France	Italy
1951	**Germany**	UK	USA	Italy	France
1952	**Germany**	UK	USA	Italy	Bel.-Lux.
1953	**Germany**	UK	USA	Italy	France
1954	**Germany**	USA	UK	France	Yugoslavia
1955	USA	**Germany**	UK	France	Czechoslovakia
1956	**Germany**	USA	UK	Italy	Czechoslovakia
1957	USA	**Germany**	Italy	UK	Czechoslovakia
1958	USA	**Germany**	Italy	UK	GDR
1959	USA	**Germany**	UK	Italy	France
1960	USA	**Germany**	UK	Italy	France
1961	USA	**Germany**	UK	Italy	France
1962	USA	**Germany**	UK	Italy	France
1963	USA	**Germany**	UK	Italy	France
1964	USA	**Germany**	UK	Italy	France
1965	USA	**Germany**	UK	Italy	France
1966	USA	**Germany**	UK	Italy	France
1967	**Germany**	USA	UK	Italy	USSR
1968	**Germany**	USA	UK	Italy	USSR
1969	USA	**Germany**	UK	Italy	Switzerland
1970	USA	**Germany**	UK	Italy	Switzerland
1971	**Germany**	USA	Italy	UK	France
1972	**Germany**	USA	UK	Italy	USSR
1973	**Germany**	UK	USA	Italy	France
1974	**Germany**	USA	Iraq	Italy	UK
1975	**Germany**	Iraq	USA	Italy	UK
1976	**Germany**	Iraq	USA	UK	Italy
1977	**Germany**	Iraq	USA	Italy	UK
1978	**Germany**	Iran	France	Italy	USA
1979	**Germany**	Iraq	Italy	USA	France
1980	Iraq	**Germany**	Iran	Libya	USA
1981	Iraq	**Germany**	Libya	USA	Switzerland
1982	Iraq	**Germany**	Libya	USA	Iran
1983	Iran	**Germany**	Iraq	Libya	USA
1984	Iran	**Germany**	USA	Iraq	Libya
1985	**Germany**	Iran	USA	Iraq	Italy
1986	**Germany**	USA	Italy	Iraq	Japan
1987	**Germany**	USA	Iraq	Italy	Iran
1988	**Germany**	USA	Iraq	Italy	France
1989	**Germany**	USA	Iraq	Italy	France
1990	**Germany**	USA	Italy	France	USSR

Table A.2 Cont'd	**Top 5 Import Suppliers of Turkey**				
	1	**2**	**3**	**4**	**5**
1991	**Germany**	USA	Italy	Saudi Arabia	France
1992	**Germany**	USA	Italy	Saudi Arabia	France
1993	**Germany**	USA	Italy	France	Japan
1994	**Germany**	USA	Italy	France	Saudi Arabia
1995	**Germany**	USA	Italy	Russian Fed.	France
1996	**Germany**	Italy	USA	France	UK
1997	**Germany**	Italy	USA	France	UK
1998	**Germany**	Italy	USA	France	UK
1999	**Germany**	Italy	France	USA	Russian Fed.
2000	**Germany**	Italy	USA	Russian Fed.	France
2001	**Germany**	Italy	Russian Fed.	USA	France
2002	**Germany**	Italy	Russian Fed.	USA	France
2003	**Germany**	Italy	Russian Fed.	France	UK
2004	**Germany**	Russian Fed.	Italy	France	USA
2005	**Germany**	Russian Fed.	Italy	China	France
2006	Russian Fed.	**Germany**	China	Italy	France
2007	Russian Fed.	**Germany**	China	Italy	USA
2008	Russian Fed.	**Germany**	China	USA	Italy
2009	Russian Fed.	**Germany**	China	USA	Italy
2010	Russian Fed.	**Germany**	China	USA	Italy

The data for the period 1923-1968 are gathered from the resources of the former Ministry of Trade which were compiled by Foreign Trade Expert Husamettin Nebioglu. The data for the period 1969-2010 are gathered from TURKSTAT. Rankings are constructed by the author.

Table A.3: The Rankings of the Top Five Trading Partners in Turkish Total Trade Volume by Years

Top 5 Trading Partners in Total Turkish Trade Volume

	1	**2**	**3**	**4**	**5**
1923	Italy	UK	France	USA	**Germany**
1924	Italy	UK	**Germany**	France	USA
1925	Italy	**Germany**	UK	France	USA
1926	Italy	**Germany**	France	UK	USA
1927	Italy	France	UK	**Germany**	USA
1928	Italy	**Germany**	France	UK	USA
1929	Italy	**Germany**	France	UK	USA
1930	Italy	**Germany**	France	UK	USA
1931	Italy	**Germany**	UK	France	USA
1932	**Germany**	Italy	UK	France	USA

Table A.3 Cont'd

Top 5 Trading Partners in Total Turkish Trade Volume

	1	2	3	4	5
1933	**Germany**	Italy	UK	USA	France
1934	**Germany**	Italy	UK	USA	France
1935	**Germany**	USA	Italy	UK	USSR
1936	**Germany**	USA	UK	USSR	Czechoslovakia
1937	**Germany**	USA	UK	USSR	Italy
1938	**Germany**	USA	UK	Italy	USSR
1939	**Germany**	USA	Italy	UK	France
1940	Italy	USA	Romania	UK	**Germany**
1941	UK	**Germany**	USA	Romania	Switzerland
1942	**Germany**	UK	USA	Hungary	Sweden
1943	**Germany**	UK	USA	Egypt	Hungary
1944	**Germany**	UK	USA	Egypt	Switzerland
1945	USA	UK	Switzerland	Egypt	Sweden
1946	USA	UK	Switzerland	Palestine	Sweden
1947	USA	UK	Italy	Czechoslovakia	Palestine
1948	USA	UK	Italy	Czechoslovakia	France
1949	USA	UK	**Germany**	Czechoslovakia	France
1950	USA	**Germany**	UK	Italy	France
1951	**Germany**	USA	UK	France	Italy
1952	**Germany**	UK	USA	France	Italy
1953	**Germany**	USA	UK	Italy	France
1954	**Germany**	USA	UK	Yugoslavia	Italy
1955	USA	**Germany**	UK	France	Czechoslovakia
1956	**Germany**	USA	Italy	UK	Czechoslovakia
1957	USA	**Germany**	Italy	UK	Czechoslovakia
1958	USA	**Germany**	Italy	UK	GDR
1959	USA	**Germany**	UK	Italy	France
1960	USA	**Germany**	UK	Italy	France
1961	USA	**Germany**	UK	Italy	France
1962	USA	**Germany**	UK	Italy	France
1963	USA	**Germany**	UK	Italy	France
1964	USA	**Germany**	UK	Italy	France
1965	USA	**Germany**	UK	Italy	France
1966	USA	**Germany**	UK	Italy	France
1967	**Germany**	USA	UK	Italy	France
1968	**Germany**	USA	UK	Italy	USSR
1969	**Germany**	USA	UK	Italy	Switzerland
1970	**Germany**	USA	UK	Italy	Switzerland
1971	**Germany**	USA	Italy	UK	France
1972	**Germany**	USA	Italy	UK	USSR
1973	**Germany**	UK	USA	Italy	Switzerland
1974	**Germany**	USA	Italy	Iraq	UK
1975	**Germany**	USA	Iraq	Italy	UK
1976	**Germany**	Iraq	USA	Italy	UK
1977	**Germany**	Iraq	USA	Italy	UK

Table A.3 Cont'd	**Top 5 Trading Partners in Total Turkish Trade Volume**				
	1	**2**	**3**	**4**	**5**
1978	**Germany**	Iran	France	Italy	USA
1979	**Germany**	Iraq	Italy	USA	France
1980	**Germany**	Iraq	Iran	Libya	USA
1981	Iraq	**Germany**	Libya	USA	Switzerland
1982	Iraq	**Germany**	Iran	Libya	USA
1983	Iran	**Germany**	Iraq	Libya	Italy
1984	**Germany**	Iran	Iraq	USA	Italy
1985	**Germany**	Iran	Iraq	USA	Italy
1986	**Germany**	USA	Italy	Iraq	UK
1987	**Germany**	Iraq	USA	Italy	Iran
1988	**Germany**	Iraq	USA	Italy	France
1989	**Germany**	USA	Iraq	Italy	UK
1990	**Germany**	USA	Italy	France	USSR
1991	**Germany**	USA	Italy	Saudi Arabia	France
1992	**Germany**	USA	Italy	France	Saudi Arabia
1993	**Germany**	USA	Italy	France	UK
1994	**Germany**	USA	Italy	France	UK
1995	**Germany**	USA	Italy	Russian Fed.	France
1996	**Germany**	Italy	USA	France	UK
1997	**Germany**	USA	Italy	UK	Russian Fed.
1998	**Germany**	USA	Italy	UK	France
1999	**Germany**	USA	Italy	France	UK
2000	**Germany**	USA	Italy	France	UK
2001	**Germany**	USA	Italy	Russian Fed.	France
2002	**Germany**	Italy	USA	UK	France
2003	**Germany**	Italy	USA	UK	France
2004	**Germany**	Italy	Russian Fed.	France	UK
2005	**Germany**	Russian Fed.	Italy	UK	USA
2006	**Germany**	Russian Fed.	Italy	UK	France
2007	**Germany**	Russian Fed.	Italy	China	UK
2008	Russian Fed.	**Germany**	Italy	China	USA
2009	**Germany**	Russian Fed.	China	Italy	France
2010	**Germany**	Russian Fed.	China	Italy	USA

The data for the period 1923-1968 are gathered from the resources of the former Ministry of Trade which were compiled by Foreign Trade Expert Husamettin Nebioglu. The data for the period 1969-2010 are gathered from TURKSTAT. Rankings are constructed by the author.

APPENDIX B: E-VIEWS PROGRAMS WRITTEN FOR THE ANALYSIS

Table B.1: The Program Codes Written for Selecting Lag Length p (Program for Table 4.1)

```
series dlogrer= d(logrer)
series dlogyg= d(logyg)
series dlogyt= d(logyt)

%s=‘logc08’
series y = {%s}
series dy=d(y)

scalar p=11
scalar r=p+1
matrix (6,r) results

'Creating ‘lags’ row:
for !j=1 to r
rowvector(r) lags
lags (!j) = !j-1
next

rowplace(results,lags,1)

'!i=0 (The cases where DLogYG has no lags):

!i = 0
'AIC and SC for each lag:
equation rssur.ls dy c dlogrer(0 to -!i) dlogyg(0 to -!i) dlogyt(0 to -!i) y(-1) logrer(-1)
logyg(-1) logyt(-1)
 !pointer = !i+1
results(2,!pointer) = rssur.@aic
results(3,!pointer) = rssur.@sc

'LM test stat Chi(1):
freeze(table_!i) rssur.auto(1)
results(4,!pointer) = table_!i (4,2)
'LM test stat Chi(4):
freeze(table_2!i) rssur.auto(4)
results(5,!pointer) = table_2!i (4,2)

'F statistic for each lag:
equation rssr.ls dy c dlogrer(0 to -!i) dlogyg(0 to -!i) dlogyt(0 to -!i)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
```

Table B.1 Cont'd

```
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))
results(6,!pointer) = F

'The cases where !i starts from 1:
for !i = 1 to p
'AIC and SC for each lag:
equation rssur.ls dy c dy(-1 to -!i) dlogrer(0 to -!i) dlogyg(0 to -!i) dlogyt(0 to -!i) y(-1)
logrer(-1) logyg(-1) logyt(-1)
 !pointer = !i+1
results(2,!pointer) = rssur.@aic
results(3,!pointer) = rssur.@sc

'LM test stat Chi(1):
freeze(table_!i) rssur.auto(1)
results(4,!pointer) = table_!i (4,2)
'LM test stat Chi(4):
freeze(table_2!i) rssur.auto(4)
results(5,!pointer) = table_2!i (4,2)

'F statistic for each lag:
equation rssr.ls dy c dy(-1 to -!i) dlogrer(0 to -!i) dlogyg(0 to -!i) dlogyt(0 to -!i)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))
results(6,!pointer) = F

next

freeze({%s}resultstable) results
{%s}resultstable.label {%s} AIC SC LM RESULTS
{%s}resultstable.displayname {%s}
{%s}resultstable (4,1) = 'Lags'
{%s}resultstable (5,1) = 'AIC'
{%s}resultstable (6,1) = 'SC'
{%s}resultstable (7,1) = 'LM-CHI(1)'
{%s}resultstable (8,1) = 'LM-CHI(4)'
{%s}resultstable (9,1) = 'F statistic'
```

Table B.2: The Program Codes Written for Selecting Optimal Lag Structure ARDL (q,r,s,t) (Program for Table 4.2)

```
series dlogrer= d(logrer)
series dlogyg= d(logyg)
series dlogyt= d(logyt)

%s='logc08'
series y = {%s}
series dy=d(y)

scalar p=7

scalar matrixsize= (p+1)^4
table (matrixsize,3) optresults
!pointer=1

'!p1=0 (The cases where DLogYG has no lags):
!p1= 0
   for !p2= 0 to p
      for !p3= 0 to p
         for !p4= 0 to p

equation rssur.ls dy c dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4) y(-1) logrer(-1)
logyg(-1) logyt(-1)

%ardl = 'ARDL(' +@str(!p1) +',' +@str(!p2) +','+ @str(!p3)+','+@str(!p4)+')'
optresults(!pointer,1) = %ardl

optresults(!pointer,2) = rssur.@aic

'f stat
equation rssr.ls dy c dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))
optresults(!pointer,3) = F

!pointer= !pointer+1
         next
      next
   next

'!p1>=1:
for !p1= 1 to p
   for !p2= 0 to p
      for !p3= 0 to p
```

Table B.2 Cont'd

```
            for !p4= 0 to p

equation rssur.ls dy c dy(-1 to -!p1) dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4)
y(-1) logrer(-1) logyg(-1) logyt(-1)

%ardl = ‘ARDL(‘ +@str(!p1) +’,’ +@str(!p2) +’,’+ @str(!p3)+’,’+@str(!p4)+’)’
optresults(!pointer,1) = %ardl

optresults(!pointer,2) = rssur.@aic

'F stat
equation rssr.ls dy c dy(-1 to -!p1) dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))
optresults(!pointer,3) = F


!pointer= !pointer+1
         next
      next
   next
next
```

Table B.3: The Program Codes Written for Bounds Testing Applied For Different Dependent Variables (Program for Table 4.3)

```
series dlogrer= d(logrer)
series dlogyg= d(logyg)
series dlogyt= d(logyt)

%s='LOGC08'
series y = {%s}
series dy=d(y)

table (4,2) diffYresults
diffYresults (1,1) = 'Dependent vr.'
diffYresults (1,2)= 'F stat'

scalar p=7

!p1= p
!p2= p
!p3= p
!p4= p

'1  F(LOGRER| LOGCX, LOGYG, LOGYT)
equation rssur.ls dlogrer c dy(0 to -!p1) dlogrer(-1 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -
!p4) y(-1) logrer(-1) logyg(-1) logyt(-1)

'F stat
equation rssr.ls dlogrer c dy(0 to -!p1) dlogrer(-1 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -
!p4)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))

%Ftitle= 'F(LOGRER|'+%s+', LOGYG, LOGYT)'
diffYresults (2,1) = %Ftitle
diffYresults (2,2) = F

'2 F(LOGYG| LOGCX, LOGRER, LOGYT)
equation rssur.ls dlogyg c dy(0 to -!p1) dlogrer(0 to -!p2) dlogyg(-1 to -!p3) dlogyt(0 to -
!p4) y(-1) logrer(-1) logyg(-1) logyt(-1)

'F stat
equation rssr.ls dlogyg c dy(0 to -!p1) dlogrer(0 to -!p2) dlogyg(-1 to -!p3) dlogyt(0 to -!p4)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))
```

Table B.3 Cont’d

```
%Ftitle= ‘F(LOGYG|’+%s+’, LOGRER, LOGYT)’

diffYresults (3,1) = %Ftitle
diffYresults (3,2) = F

'3 F(LOGYT| LOGCX, LOGRER, LOGYG)
equation rssur.ls dlogyt c dy(0 to -!p1) dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(-1 to -
!p4) y(-1) logrer(-1) logyg(-1) logyt(-1)

'F stat
equation rssr.ls dlogyt c dy(0 to -!p1) dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(-1 to -!p4)
scalar T= rssur.@regobs
scalar K=rssur.@ncoef
scalar g= rssur.@ncoef-rssr.@ncoef
scalar F = ((rssr.@ssr-rssur.@ssr)/g)/(rssur.@ssr/(t-k))

%Ftitle= ‘F(LOGYT|’+%s+’, LOGRER, LOGYG)’
diffYresults (4,1) = %Ftitle
diffYresults (4,2) = F
```

Table B.4: The Program Codes Written for Estimation of Long Run and Short Run Coefficients of the Trade Balance Models (Program for Tables 4.4 – 4.11)

```
series dlogrer= d(logrer)
series dlogyg= d(logyg)
series dlogyt= d(logyt)

%s='logc08'
series y = {%s}
series dy=d(y)

!p1= 7
!p2= 6
!p3= 5
!p4= 0

equation longrun_{%s}.ls y c logrer logyg logyt
longrun_{%s}.makeresids ECT

if !p1=0 then

equation shortrun_{%s}.ls dy c dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4) ect(-1)
endif

if !p1>0 then

equation shortrun_{%s}.ls dy c dy(-1 to -!p1) dlogrer(0 to -!p2) dlogyg(0 to -!p3) dlogyt(0 to -!p4) ect(-1)
endif
```

APPENDIX C: ABBREVIATIONS USED THROUGHOUT THE THESIS

Acc.	Accessories
App.	Appliances
Bel.-Lux.	Belgium-Luxembourg
Equip.	Equipment/s
EUROSTAT	Statistical Office of European Union
GDR	German Democratic Republic (East Germany)
HS	Harmonized System
Russian Fed.	Russian Federation
TURKSTAT	Turkish Statistical Institute
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America
USSR	Union of Soviet Socialist Republics
WCO	World Customs Organization

APPENDIX D: TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	
Sosyal Bilimler Enstitüsü	X
Uygulamalı Matematik Enstitüsü	
Enformatik Enstitüsü	
Deniz Bilimleri Enstitüsü	

YAZARIN

Soyadı : Gümüştekin
Adı : Başak
Bölümü : İktisat

TEZİN ADI (İngilizce): The J Curve At The Industry Level: An Examination Of Bilateral Trade Between Turkey And Germany

TEZİN TÜRÜ: Yüksek Lisans [X] Doktora [ ]

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. [X]
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullanıcılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) [ ]
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.). [ ]

Yazarın imzası .... Tarih ....