Effect of Exchange Rate Changes on Export Performance in Turkey

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements of the degree of

Master of Science
in
Economics

Eastern Mediterranean University
September 2009
Gazimagosa, North Cyprus

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ABSTRACT

In this study we examined the relationship between exchange rate changes and export performance in Turkey. The study uses time series data from mid 1980s, the years Turkey started to use flexible exchange rate and export-based growth, and ends at 2009, the year Turkish export reach a significant place in the world's exports.

In empirical analysis, the study uses bound testing and autoregressive distributed lag (ARDL) approach to model the dynamic relationship between the exports and its determinants. The short-run and long-run causality among the variables in the model is determined based on the estimated ARDL models. The empirical results show that the real effective exchange rate coefficient is insignificant. Therefore depreciation of real exchange rate in Turkey does not cause a substantial increase in export volume in long-run. We find that the recent export boom in Turkey is determined by wages, productivity and world demand, rather than exchange rate changes.

Keywords: Exchange rate changes, export performance, bound test, ARDL.

ÖZET

Bu çalışmada Türkiye'deki döviz kuru değişmeleri ile ihracat arasındaki ilişki araştırılmıştır. Çalışmanın örnek periyodunu Türkiye'nin esnek kur sistemini ve ihracata dayalı büyüme modelini uygulamaya başladığı 1980li yıllar ile Türk ihracatının dünya ihracatında önemli bir yer edindiği 2009 yılı arasındaki dönem oluşturmaktadır.

Ampirik analizlerde ihracat ve belirleyicileri arasındaki dinamik ilişkileri modellemek için bound test ve ARDL yöntemi kullanılmıştır. Modelin değişkenleri arasındaki kısa dönem ve uzun dönem nedenselliği ARDL modeliyle belirlenmiştir. Test sonuçlarına göre reel efektif döviz kuru katsayısı tahmini anlamsız çıkmıştır. Bu nedenle uzun dönemde Türkiye'de kurun yükselmesi ihracat hacminde önemli bir artışa neden olmamaktadır. Çalışmada elde edilen bulgular Türkiye'de son zamanlarda ortaya çıkan önemli ihracat artışının döviz kuru değişmlerinden daha çok ücretler, verimlilik ve dış talep tarafından belirlendiği göstermektir.

Anahtar kelimeler : Döviz kuru değişmeleri, ihracat, bound test, ARDL.

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CHAPTER 1

INTRODUCTION

For the past half century the world economy has experienced an unprecedented globalization which has been facilitated by numerous bilateral and multilateral trade agreements, lowered tariffs and non-tariff barriers as well as much-improved communication and transportation technologies.

Developed countries have opened up their economies to international competition much earlier but mostly traded among themselves. Most developing countries have liberalized their economies and started to compete for international markets in the 1980s after the success stories of East Asian Tigers (Taiwan, South Korea, Singapore and Hong Kong) which have all demonstrated substantial industrialization and economic growth spurred by export-growths.

Indeed, in the 1980s, there was a striking difference among the economic performances of import-substituting Latin America, and export-led and growing East Asia. However, initial four Asian Tigers were soon joined by other developing countries in opening up their economies to international competition. Some of these countries included China, India, Brazil Argentina, Chile, Mexico, Indonesia, Malaysia, Thailand, Egypt and Turkey.

Since the early 1990s, most of the developing world - including most of Latin America, Eastern Europe, South Asia and others - has already adopted export-led growth strategies, making export performance as one of the main focal point for economic development. To this end, while import substitution and protectionism of 1980s have faded away, trade barriers have been lowered across borders continually in favor of freer trade. This is so because it is now widely accepted that free trade and specially growing export sector leads to faster economic growth.

Increasing trade in the developing world has also brought about liberalization on the financial side. Many developing countries have reduced their control on capital flows and liberalized their foreign currency markets switching from pegged systems to managed or freely floating exchange systems.

While research continues to investigate the exact role of export sectors on economic growth for both developed and developing countries, there is now a growing research interest on the link between the exchange rates and exports. Some of the questions to be answered are whether the floating exchange rate systems is better than the fixed ones for economic growth and export performance and whether undervalued currencies improve exports and growth. The second question has particularly come up on the discussions over the Chinese trade surpluses and its undervalued currency.

This study also intends to conduct a research on a similar topic. More specifically, we aim to investigate how overvaluations of Turkish Lira affect the Turkish export performance.

It is long debated in Turkey that the Turkish lira is overvalued since 2003 and this is detrimental to exports. Most research on export performance in Turkey concentrated the exchange rate response. However, the theories of export supply and demand emphasizes other factors, such as the unit labor cost (or wages), productivity, capacity, and income (measured by gross domestic product, GDP) are significant determinants of exports.

The evidence obtained in this study indicates the opposite. The real exchange rate does not seem to have any significant impact on exports in recent years. Most significant determinant of export is the overall competitiveness (low unit labor cost) of the Turkish economy. This factor emerges to be the key factor at the background of the successful export growth performance of Turkey. In addition the world economic conditions seem to be the second most important factor behind the recent export growth.

The remaining part of the thesis is organized as follows. Chapter 2 gives the literature review. Chapter 3 presents the history of exchange rate regime and development of export in Turkey. Chapter 4 gives the theoretical and empirical framework. Chapter 5 gives empirical result. Chapter 6 concludes.

CHAPTER 2

LITERATURE REVIEW

Export performance is affected by many factors. Relative price levels in the two countries, level of foreign income, and level of the exchange rate are the variables that would expect to affect both demand for imports and foreign demand for domestic exports. [Froyen (1999)]. Here the most important one is the level of the exchange rate. Since 1980, Turkey has changed exchange rate system as stable and floating in some periods.

In the periods of 1980-2001 and later 2001, it is thought that exchange rates would affect the foreign trade positively and adopted export-based growth policy. The US also has changed its exchange rate system in some periods and faced with incompatible situations. In 1980-1985, the US experienced similar developments which Turkey has been facing recently. The US dollar rose 40% over against its trade partners. Therefore, the US's import cheapened, export became expensive. In this period, the trade deficit in US increased, but after 1987 US reduced its trade deficit through depreciation of the dollar and through other countries that had good economic conditions. Therefore, it can be understood from this case that, exchange rate greatly affects a country's import and export. Even though Turkey's export was increasing in price, it was not expected to show an increase in export value. Turkey imports in Turkey increased much faster than exports due to the overvaluation of the Turkish lira which fostered production through

cheaper raw-materials. Despite some groups had the idea that import would affect local industries negatively, in Turkey cheap import was seen as cheap raw-material and by selling the produced materials to foreign countries, Turkey was able to increase its exports as well.

Moreover, one issue that international agreements especially focused on is import. Just selling the products and limiting the import are against these agreements. According to this view that is limiting the import, decreasing the import and increasing the export will make the country stronger and richer. According to merchantilism, export enriches, import impoverishes. It should be accepted that exporters are broader, more productive and compensate higher wages than domestic firms.

On the other hand according to Froyen (1999), importing more is not harmful for country's economy. A country can import more expeditiously produced goods and trade steps-ups the efficiency of the resources. Therefore as a result of increase in imports demand and domestic inflation rate below trade partners, real exchange rate gets overvalued. Rise in the value of domestic currency makes that country's goods expensive to other countries. This causes a decrease in demand for domestic exports and increase in demand for imports. For instance, in the case of US Dollar and German Mark, the rise in the US Dollar forces German to pay more Marks to buy US goods that causes decrease in demand for US goods. Whether there are effects on exchange rate operations of profitability ratios in foreign trade or not is important for the country's exchange rate policy. For this reason, it is necessary to make coherent and comprehensive analyses.

Export performance of Turkey has been studied widely in recent years. There is a considerable amount of research examining the Turkish export performance. Significant part of them concentrated on the relationship between export growth and economic growth. Arslan and Van Winjnbergen (1993) examine the driving forces of export expansion of Turkey from the period 1980 to 1987. They focus on the effects of export subsidies and depreciation of Turkish currency on export growth of Turkey. Their results indicate that policies that allowed real depreciation of the exchange rate caused export expansion in Turkey.

Bahmani-Oskooee and Domac (1995) investigated the export-led growth hypothesis for Turkey by using co-integration Analysis. They confirmed the validity of the export-led growth hypothesis for Turkey in the long-run. However Yiğidim and Köse (1997) rejected this hypothesis. They used GDP growth as explained variable and import and export as explanatory variables. They concluded that import is statistically significant and export is not statistically significant on the economic growth. Özmen and Furtun (1998) also rejected the validity of the export-led growth hypothesis for Turkey.

Export performance is also affected by the level of the exchange rate. Bahmani-Oskooee and Ltaifa (1992) estimated a real export equation to analyze the effects of the exchange rate on export. They used devaluation rate of each country's exchange rate against Dollar, exchange rate variability of country, population and real income as explanatory variables. They found that exchange rate has a negative effect on export. Using monetary aggregates affecting real income, exchange rate and aggregate demand in their

study, Baldemir and Keskiner (2004) examined export performance of Italy, England, Holland, the US and Germany with panel data model. They focused on the Gross Domestic Products (GDP) of these countries. They found that the increase in GDP has negative effect on the foreign trade balances.

Zengin (2000), Sivri and Usta (2001) and Gürbüz and Çekerol (2003) used Vector Auto-Regression (VAR) and co-integration to test the long term relationships between export-import prices and exchange rates. By using VAR technique, Zengin (2000) tested the interactions between exchange rates and import-export price indexes for late 1990s. As a result, he realized that there is a mutual causality relationship between exchange rates and import-export price indexes. They further found that exchange rate operations have important relationships to import and export and exchange rate volatility weakens foreign trade. Moreover, in his study, Zengin draws attention to the fact that there is a long-term co-integration between export price indexes, import price indexes and real exchange rate variables. He also added that exchange rates have a direct impact on the import price index, but not on the export price index. Exchange rate impact of the export price index also affects import price index through a causal relationship.

There are some different findings as well. Sivri and Usta (2001) and Karagöz and Doğan (2005) found that there is no causal relationship from real exchange rates to neither export nor to import. Sivri and Usta (2001) analyzed the relationship between export-import and real exchange rate. They used a VAR model and found that real exchange rate can not be used to explain the changes of export. Gurbuz and Cekerol's (2003) econometric results showed that (by using VAR and cointegration analysis) there is no

causality relationship between export and import prices, on sectoral basis, and real exchange rates. According to results of VAR analyses, any long-term does not exists, either. Therefore, exchange rate and foreign trade relationship is not maintained in the long-run.

Karagöz and Doğan (2005) used econometric time series methodology and analyzed the relationship of export and import with the exchange rate both in the long- and short-run. In the long-run there is no causal relationship between real exchange rate and trade variables. Nevertheless, in short-run exchange rate impact on import and export has been found significant. They conclude that there is no economic relation between export and import with exchange rate. However impact of devaluation in 2001 has been found significant. According to Cushman (1983), in short-run exchange rate uncertainty reduces trade quantity and expectations of increase in exchange rate increases trade quantity in long-run.

On the other hand in his study Özatay (2000) used total export as a function of real exchange rate and concluded that real exchange rate is statistically significant. Grier and Smallwood (2005) also made a study about the relationship between exchange rate and export performance in 2005. Developing and industrial 18 countries in total were analyzed in order to investigate the relationship between fluctuations in exchange rates and export performances. Using a VAR model, in their study, they found that results vary and uncertain. For 9 rich countries there were 2 countries with negative effects, 3 with positive effects and 4 with insignificant effects. For other 9 poor countries, there were 3 with negative effects, 1 with positive effect and 5 with insignificant effects.

According to Baldemir and Keskiner (2004) in order to examine this kind of relation, import values also should be taken in to consideration. Increases in imports stemming from overvalued Turkish Lira will change the prices of imported products, thus exchange rates and will balance the foreign trade in a course of time. Because of the major part of Turkey's export is related to import incomes, in some years the changes in exchange rates have not been enough to explain the changes in exports.

According to Frey (2005), in theory the risk arising from exchange rate movements is the link between trade volume and exchange rate fluctuations. This risk has a big effect on firm's decisions in trade. Firms can not predict the fluctuations and it makes difficulties in payments. Besides in his study Frey (2005) emphasized that exchange rate volatility blocks trade. He argues that if the trade relations are highly focused to one county there is a significant effect. To find the relationship between trade (export and import) and exchange rate, economists should use properly specified models.

Abuşoğlu (1990) examined the impact of exchange rate policies on export for the 1980-88 periods and reached the conclusion that a meaningful relationship does not exists between them. He found that depreciation of Turkish Lira against foreign currencies affects export very little. Barlow and Şenses (1995) examined export expansion of Turkey during 1980s. According to their study this expansion was due to economic policies or external conditions, such as foreign income growth, crisis or wars. Their findings indicate that this expansion was mostly the result of trade policies, but external conditions have also had some impact. Ulusoy and Zengin (1995) found that appreciation of Turkish Lira makes negatively affects Turkey's exports and strengthen

the extend to which domestic market remains dependent to imports. Therefore, appreciation or depreciation of Turkish Lira does not have significant impact on exports.

One of the studies investigating the trade effects of European Customs Union membership of Turkey in the period 1988-2002 is the study of Nowak-Lehmann et al. (2005). They focused on the EU protection, price competition and cost of transport. In this study they used Gravity Model and concluded that transport costs have a negative effect on Turkish export and real exchange rate depreciation has a positive effect on Turkish export. Uygur (1997) in his study emphasized on the foreign trade policies used in Turkey between the period 1970s to mid-1990s. He evaluated the effects of domestic demand policies, exchange rate policies and different export policies both in short- and long-run. He concludes that domestic demand policies have significant effect on export. Real exchange rate policies have significant effect on export both in the short- and long-run. Different export policies have a positive effect in the short term but have a negative effect in the long term.

Şahinbeyoğlu and Ulaşan (1999) used the Error Correction Model for Turkey in order to investigate export supply and export demand functions for the period 1987-1998. They show that both price elasticities and income elasticities of export demand functions and supply functions are inelastic. Another study by Lall (2000) made an investigation in Turkish manufacturing export. This study focused on the technological structure of Turkish manufacturing export position. He concluded that export is composed of low technology products. While Turkey has a high wage economy, it is better to make competition with low wage countries. Özçelik and Taymaz (2002) conducted an

extensive study for the determinants of export performance by using firm-level innovation survey data for 4000 firms in the period 1995-1997. They found that Turkish manufacturing firms have to give priority to avoid imitating and choosing innovation and Research & Development activities to compete in international platform. It is not very important to transfer technology or membership of a business group for international competitiveness. The important thing is to constitute comprehensive technological development policies to have a stable and qualified increase in competition. Albeni, Demir and Demirgil (2004) estimated the effects of real effective exchange rate and the real wages in Turkish manufacturing industry on export during the period from 1997 to mid-2004. They concluded that, as other studies found, there is a weak link between exchange rate and export in general. They also found that except 5 sectors exchange rate changes have some effect on of manufacturing industry.

One of the recent studies investigating the factors that determine the decision to participate in export in the period 1990-1996 is the study of Özler, Taymaz and Yılmaz (2007). They used plant level data from Turkish manufacturing industry. They concluded that export decision is affected by plant size, shares of managerial employees and female employees in total employment, technology and equipment stock. Moreover, Yükseler and Türkan (2006) emphasized the transformation of the Turkish manufacturing industry from 1996 to 2005. They argue that importization, internationalization and Asialization characterize the transformation of Turkish manufacturing industry. According to their results export volume increased with a huge amount by these three styles. However this increase has not contributed to the economy importantly.

Another study by Keyder, Sağlam and Öztürk (2004) makes a comprehensive evaluation of Turkish manufacturing sector and its fifteen trading partners covering the period 1994-2003. They used various unit labor cost indexes to evaluate the export performance. As a conclusion, they state that, overvaluation of Turkish Lira leads to decrease in unit labor costs. Yaşar and Nelson (2004) also emphasize the export and productivity relation of Turkish industries. They used Error Correction specification for plant level panel data for Turkish clothing and motor vehicles and motor parts industries. The results showed that the relationship between export and productivity is as usual bidirectional. However, the effect of exporting on productivity is much weaker than the effect of productivity on exporting.

CHAPTER 3

EXCHANGE RATE REGIME AND EXPORT DEVELOPMENT IN TURKEY

3.1 Exchange Rate Regime and Rate Changes

3.1.1 1980-1994 Era

Turkey which could not have stabilization and could not make progress with due to isolations, protectionist foreign trade policies, and available fixed exchange rate system in the period before 1980, aimed to fix the economic conditions by making changes on exchange rate regime and become more competitive in international area with the economic stability verdict made on 24th January 2004.

In 1973, because of the collapse of the Bretton Woods System, many countries moved to flexible exchange system also Turkey has moved to this realistic flexible exchange system on 1st May 1981 by quitting fixed exchange system. Between the years 1980 and 1981, devaluations occurred in small rates on TL. At this period, 1 USD was equal to 70 lira and during this period currency exchanges were done very often. With the flexible exchange rate system policies, which were in practice until 1st May 1981, TL fluctuated around 1.1%-5.5% over against foreign currency on a daily basis. The exchange rate

regime that was in practice until then became a kind of improved version of fixed exchange system (Çiçek, 2006:116).

Turkey made some important changes in the FX regime in 1983-84 by issuing two new laws. These laws allowed commercial banks to have freedom to deviate from the exchange rates announced by the Central Bank. Foreign exchange and effective buying and selling rates were determined under the condition of not exceeding 6% for foreign exchanges and 8% for effectives announced by Central Bank. Furthermore, banks were independent about foreign exchange allowance and transfer operations, it was an opportunity to open a foreign exchange account for individuals and also it provided exporters to keep the 20% of their profit which they earned from the export trading with the foreign countries, to their own usage. (Çiçek, 2006:116).

The decisions made, were in practice till 1986 and in 1986 by making small changes on buying and selling rates, the practices were continuing. In August 1988, in order to determine foreign exchange rates under the conditions of market freely, under the constitution of Central Bank, foreign exchange cash markets were opened.

After this period, the most important decision newspaper in terms of present exchange rate regime which was published in the 11th of August 1989 official, was the law number 32 about the protection of value of Turkish currency. With this decision, Turkish Lira gained the feature of being convertible and gained mainly liberty on FX operations. In Turkey, permission was given to resident individuals to buy certain amount of foreign exchanges from banks and authorized establishments and to use these abroad. TL, that

earned the feature of being convertible with 32 numbered law in 1989, was officially announced as convertible by IMF in 1990. In this period, crisis occurred all around the world (1991 Gulf Crises) caused TL to lose value over against foreign currency however; has not continued in fixed term (Arat, 2003: 40).

Turkey although all the economical decisions taken, experiencing micro-economic imbalances with hugely current and public deficit in 1994 could not stay in balance and had big crisis. .In early 1994, foreign exchange rate was 19000TL/$ but in April 1994 it rose to 38000TL/$. In 5th April 1994, in order to make balances Central Bank Notice was published in Official Newspaper and with this new applications were set for determining foreign exchange rates. Decreasing Central Bank reserves because of trend to foreign exchange rates, threw existent government in a high devaluation. With a one year stand-by agreement signed with IMF in 1994, it was tried to prevent TL from loosing value over against USD and German Mark. The effects of devaluation were tried to be decreased by using forward exchange selling system which became extensive in that time. However, Central Bank did not use this application in long term (Arat,2003:40).

3.1.2 1995-2001 Era

Coming to 1995, Central Bank formed Fixed Term Transaction Market in 27th November in order to prevent damages that could be caused by the increase or decrease in the value of foreign currency.

South East Asian crisis in 1997 and right after that Russian crisis which created negative effects on world economy, pushed Turkish economy in stagnation like other economies. Nevermore, Turkey came over this crisis with much less effects than it was expected to have and it experienced stationary period. (Çiçek, 2006:125).

When it was 1999, Turkey signed the 17th stand-by agreement with IMF and displayed a three-year application. The aim was the studies of struggling with inflation and improving the state's financial condition. Rates of increase were started to be applied inflation-oriented. The application proved useful and in the beginning of 2000 it was observed that there was a huge decrease in inflation. Another important issue in 1999 was in 1st of January, in order to achieve political unity; EU started using Euro by making an economic arrangement. In this period when USD gained value over against Euro, the imports done from EU countries increased and export done to these countries decreased (Çiçek, 2006:131).

Beside this, because the increase in exchange rates continued to be lower than the expectations about inflation, Turkish Lira gained value, hence export decreased and import increased. After these negative issues, in November 2000 there was big crisis in Turkey. The preliminary reason of this crisis was the problem of TL liquidity that emerged in market. The possibility of devaluation in the country caused demands to lessen and made production deteriorate. Additionally, some negative actions such as disagreements with EU increase in petrol costs, Armenian problem, played an important role in emerge of the crisis. In these crisis conditions, when everyone who had bond and share stocks in their hands started selling them and forthcoming to foreign currency, the

problem of TL liquidity came out, bond costs decreased and interests increased. In order to reduce the effects of the crisis, 7.5 billion USD donation was taken from IMF in the name of Additional Reserve Convenience. Thus, Turkish Republic Central Bank provided liquidity in market. Interests of money market decreased but this did not enclose the financial fragility in the markets completely. When the liquidity problems in the market increased, some troubles occurred in payment systems (Çiçek, 2006:135).

Besides this, in the period of February 2001, in the coalition government composed of DSP-MHP-ANAP, some arguments between prime minister and president caused political crisis, disbelief emerged in the country which increased demands to buy foreign currency; government omitted the improved version of fixed exchange system, left Turkish Lira fluctuating and moved to free float rate regime. In the process of economic transformation after these huge crises, by the help of IMF Passing to Powerful Economy Program was established. The aim of the program was, by destroying distrustful atmosphere resulted from the changes of rate systems in the country, call off the public debt crises, abolish this negative environment in the economy, increase the power of competitiveness by getting into world markets and so by covering the debts providing a stable increase in economy. Under this program many new arrangements were done and new laws were made. Some issues such as restructuring financial sector in laws, strengthening public financing over against the problems resulted from public debts and increasing competitiveness in economy were taken into consideration. Again during the year of 2001, with the aim of making new rate system work properly and destroying uncertain atmosphere, ISE opened forward market in August (Arat, 2003:47).

3.1.3 2002-2007 Era

When it was 2002, it was observed that the condition of country improved. The changes on political issues, the programs which aimed to set a stable environment and measure packages were decreasing the effects of crisis and stabilization started to in the country. Floating rate system that was being used in 2001 continued to be used this year again. The decisions which were taken in the frame of stand-by agreement signed with IMF in 28th May 2001 carried on in 2002, too. In this period, new arrangements were done in order to change economic structure based on exchange rate. Hence, between period of 2002-2005, Turkey caught stabilization on exchange rates compared to previous years. Turkish Lira began gaining value over against USD since 2003 (in 2005 the value of USD increased at the rate of 0.4 over against New Turkish Lira) (Ciğerlioğlu, 2007:41).

In these years, Turkish Republic Central Bank aimed to use floating rate system, so that exchange rates should not be used as a tool of currency policy. It followed exchange market closely and announced that if there happened a huge increase or decrease more than expected, it would interfere to market. After crisis, when flexible exchange system was applied, stabilization effected rates and changes which were not at extreme ratios. In 2006, the increase in petrol costs damaged the balances in Turkey and caused troubles in economy again. However, the stabilization caught in domestic policy prevented the conditions of country to become worse (Çiçek, 2006:141).

Until 2007, Turkey made overall 20 stand-by agreements with IMF. Although fund had an important role for providing stabilization in Turkey's economy, disciplined economic programs were applied in Turkey. When the circumstances of Turkey in last years are evaluated, decreasing ratio of inflation up to single division ratios was the biggest success. For 2008-2009 periods, the aimed inflation ratio was 4%. Because of the stabilization on inflation, floating exchange rate regime continued in 2007. New Turkish Lira caught the highest value increase in last quarter century in 2007. Turkish Republic Central Bank in the frame of its previous decisions, continued to arrange and announce the programs of annual foreign exchange purchase in 2007.

Table 1: Foreign Trades and Exchange Rates

	FOREIGN TRADE (Million Dollar)			EXCHANGE RATE	
Year	Export	Import	Volume	$ rate	Euro rate
2001	31.334	41.399	-10.065	1.231.322	1.093.683
2002	36.059	51.554	-15.495	1.513.102	1.433.214
2003	47.253	69.340	-22.087	1.500.269	1.689.365
2004	63.075	97.362	-34.419	1.429.202	1.771.948
2005	73.476	116.774	-43.297	1.347.300	1.674.000
2006	85.535	139.576	-54.041	1.434.560	1.804.340
2007(*)	67.123	107.589	-40.466	1.311.000	1.786.000

**End of August (source: http://kisi.deu.edu.tr/yasar.uysal)*

As it is seen from the table, after 2002 parallel to the decrease on USD rate, there was a huge increase in import. Except in 2005, Euro showed a continuous increase. Because of

this improvement on rates, it became more profitable to do import with dollar and do export with euro. While decrease of export was waiting in a term that TL gained value, its increase happened in this sense.

3.2 Development of Export

3.2.1 1980-1994 Era

The year of 1980 was very important in terms of exporting. With 24th of January in 1980 dated decisions Turkey that moved to a new exchange rate system, at the same time started applying an industrialization strategy based on export by changing import-based industrialization strategy. The goal was having an industry which had a power to compete against world markets and providing economical balances. Therefore, in order to revive export, financial support was given with export bank loans competitive real exchange rate policy were applied TL devalued in the ratio of 32.7%.Export was induced to be done by big-scaled capital corporations. Some studies were done regarding to vary agricultural and industrial products which had limited export facilities 3-year stand-by agreement made with IMF in 1980 was also effective to perform these strategies (DTM, 2009:4).

In 1985, previous strategies continued to be applied with Fifth Five-Year Development Plan made applicable by State Planning Organization. In these years, increase on import besides export captivated many manufacturers, leaned onto import and this caused industry production to decrease. However, there was no big difference in the ratio of export and import (Çiçek, 2006:118).

In 1987, supporting strategies, regarding country's export, developing the applications that are bank loan and insurance helps supported export and therefore in order to become competitive in world markets Turkish Exim bank was established.

In the beginning of 1990s, negative progresses (Gulf Crisis) all around the world also affected Turkey negatively such other countries which foresee export-based increase. Besides this, after leaving competitive real exchange rate policy, gaining excessive value of TL, increase of world competitiveness and stagnancy in the economies of developed countries, massive increase in import and early general elections caused 1990s to be distressing. When demands for foreign exchange increased, Turkish Republic Central Bank reserves decreased and in 1994 Turkey had a big economic crisis with largely current and public shortage. Because of all these, in Sixth Five-Year Development Plan covering 1990-1994 term, also could not be reached the aimed values in terms of export. In plan, there were some issues such as for encouraging and supporting export providing all types of technical help through bank loan and insurance, standardization of export commodities, paying importance to improve its package and quality, continuing increase of product's export about industry, having product variety, informing exporters to make them survive in overseas market and while inducing export giving way to indirect inducement rather than direct inducement (Çiçek, 2006:125-127).

Table 2: Export-Import Numbers between the years of 1980-1994

YEARS	EXPORT (MILLION DOLAR)	IMPORT (MILLION DOLAR)
1980	2.910	7.909
1981	4.703	8.933
1982	5.746	9.235
1983	5.728	9.235
1984	7.134	10.757
1985	7.958	11.343
1986	7.457	11.105
1987	10.190	14.158
1988	11.662	14.335
1989	11.625	15.792
1990	12.959	22.302
1991	13.594	21.047
1992	14.715	22.871
1993	15.345	29.428
1994	18.106	23.270

Source: Under secretariat of the Prime Ministry for Foreign Trade
www.dtm.gov.tr/dtmadmin/upload/IHR/genel.doc

As it is seen from the table which displays foreign trade data between the years of 1980-1994, export increased two times as a result of export-based increase strategy applied after 1980. In following years, increase on export was observed despite to the decreases on small scale resulted from negativities happening all around the world.

3.2.2 1995-2001 Era

With the effects of 1994 crisis, although gaining excessive value of TL over against dollar, it did not correspond to the expected increase on export thoroughly in following years, owing to applied programs and given decisions after the crisis, domestic demand became tapered and export's compensation rate for import began decreasing. The most important progress in terms of export of 1995 was the membership of World Trade Organization (WTO). With the membership, new decisions were given and put into practice. Granting a tariff reduction in industrial products, making arrangements in agricultural and textile sectors and taking investment measures connected to trade, formed some of them (DTM, 2009:5).

The most important event of the year of 1996 was European Customs Union inured in 1st January. Previously taken decisions regarding export, provided support and now providing Customs Union elicited more responsible, more consistent and more developing foreign trade environment in terms of Turkey. However, Asian Crisis emerged in 1997 and Russian crisis in 1998 effected Turkey's and many other countries' economies all around the world negatively as well as their own economies. During these periods, Turkey had not practiced the expected export increase. Before coming through the effects of this crisis that happened all around the world, Turkey underwent a very depressive period with 17th August 1999 Marmara Earthquake. The earthquake affected the economy of country largely and so this affected export of the country as well. The area where the earthquake happened was made up of forthcoming industrial and trade

area of the country. Therefore, both import and export practices decreased (Çiçek 2006:149).

On the other hand, after the beginning to use Euro among EU countries in 1st January 1999, by gaining value of USD over against Euro, decrease occurred in import that was made with EU countries. At the same time, because of the measures that Turkey took for struggling with inflation and the applied programs, it made changes on exchange rate policy and this caused TL become valuable. But with gaining value of TL an expected increase did not happen in export. Both economic and political problems emerged in the country, made two crises period occur in November 2000 and February 2001. After these crises TL left to fluctuate, a runaway devaluation happened in the country and a reduction on domestic demand occurred. A relative rate advantage appeared as a result of these made export increase about in the rate of 12% in 2001 (DTM, 2009:5-6).

After 1994 crisis, a desired increase could not be provided in export. Our export which was 26.974 million dollar in 1998 could not provide expected export increase ratio and had a huge decrease with the effects of crises ongoing in the world and the effects of Marmara Earthquake. Our import showing a continuous increase since 1989 became 26.558 million dollar at the end of 1999 by presenting decrease in the rate of 1.4%. As it is seen from the table, the year of 2000 was again a rough year in terms of our imports. Because of whether the things happened between the exchange rates of Euro/Dollar or a great increase in the cost of crude oil or the taken decisions in the frame of economical packages, the effects of inflation changes in Turkish Lira discomfited the exporters and the planned increase could not be carried out in export.

Table 3: Export-Import Numbers between the years of 1995-2001

YEARS	EXPORT (MILLION DOLAR)	IMPORT (MILLION DOLAR)
1995	21.637	35.709
1996	23.224	43.627
1997	26.261	48.559
1998	26.974	45.921
1999	26.588	40.671
2000	27.774	54.503
2001	31.334	41.399

Source: Under secretariat of the Prime Ministry for Foreign Trade
www.dtm.gov.tr/dtmadmin/upload/IHR/genel.doc

3.2.3 2002-2007 Era

Even though the negative progresses occurred in Turkey and worldwide, this made Turkish economy instable. Taken measures, applied programs helped Turkey to experience a stable term during and after 2001.

After crises, atmosphere of disbelief surrounded the country and it caused domestic demand to reduce and this made them to lean on export. Besides this, by having a runaway increase in a labor force productivity and decrease in its costs, appropriate conditions were provided and caused export to increase.

In this era, it was expected that with the reason of TL became valuable, the export would decrease and as a result of low costs of production both export and import would increased.

In 2003 as a result of increased productivity, rising world export costs, reduced labor force costs, by keeping the rate of interest low and experiencing financial facilities, Turkey was placed at 24th in the world's export volume ranking with its increasing export.

With the Export Strategic Plan covering the years of 2004-2006 Turkey developed through the economical support that export provided to our country, it was integrated with the world and caught a sustainable growth in export. In these years, by varying the countries which did export, the number of countries that were exported was raised and this gave benefits to export. In this context, the number of countries that we did export 1 billion dollars and above was 9 in 2003, 14 in 2004, 15 in 2005, 19 in 2006 and it became 24 in the year of 2007 (DTM, 2009:11).

Also, in the years of 2004 and 2005 in export performance evaluation despite of the market awoke in the world, Turkey had progression. According to the explanation that the Confederation of Turkish Employer's Unions made, in the data of Global Benchmark Report in 2006 Turkey had the first place among OECD countries in the period of 2000-2004 with the highest export growth (TISK, 2006).

In 2007, Turkey increased its export with 107.2 million dollars which was three times more of the export in the year of 2002 that was only 36 million dollars. In these years that the global competitiveness was dense, it was interpreted as a great success in terms of Turkey that it raised to 22nd place in world export (Boğa 2008)

According to Minister of State, Kürşat Tüzmen, "when the problems are evaluated with a current view, it is observed that our exporters affected a series of factors negatively such as getting of raw material and semi-finished goods in the axis of investment-production-export, input costs, exchange rates and marketing problems." (Tüzmen 2006). In order to overcome these problems, many strategies like Strategy of Surrounding Countries were applied and since 2000 our exporters become permanent in the new markets they entered.

Table 4: Export-Import Numbers between the years of 2002-2007

YEARS	EXPORT (MILLION DOLAR)	IMPORT (MILLION DOLAR)
2002	36.059	51.554
2003	47.253	69.340
2004	63.167	97.540
2005	73.476	116.773
2006	85.534	139.576
2007	107.212	170.057

Source: Under secretariat of the Prime Ministry for Foreign Trade

The positive results of export connections made in 2001 raised our 2001 export from 31.334 million dollars to 36.059 million dollars. In addition to export numbers, getting

intermediate goods like cheap raw material increased import. Since 2001, our import numbers showed a continuous growth. Neighbor and Surrounding Countries Strategy started to be applied in 2000 and Export Strategic Plan made up for providing a sustainable export growth in 2004 which was taken in hand comprehensively every year and put into practice. Consequently our import numbers increased more and more each year and in 2007 by catching a good raise in the rate of 25.3% it became 107.212 million dollars. In import besides consumer goods, importing of capital and cheap raw material gave advantage to production, productivity raised and thus with the year of 2007 our import numbers became 170.057 million dollars (DTM, 2009).

CHAPTER 4

THEORETICAL AND EMPIRICAL FRAMEWORK: DETERMINANTS OF EXPORT PERFORMANCE

4.1 Determinants of Export Performance

In an increasingly integrated world, manufacturing exports become an important component of Turkish economic policy. For the policy makers, it is important to understand how exports respond to price and exchange rate changes. Knowledge of the magnitudes of the response (or elasticity) of export quantity to changes in its determinates helps to identify potentially successful policies. For instance, if exports are unresponsive (or inelastic) to exchange rate changes (price changes), then policies which target exchange rates (prices) in an attempt to encourage exports will fail to achieve their goal. It is long debated in Turkey that the Turkish lira is overvalued since 2003 and this is detrimental to exports.

Most research on export performance in Turkey concentrated the exchange rate response. However, the theories of export supply and demand emphasizes other factors, such as the unit labor cost (or wages), productivity, capacity, and income (measured by gross domestic product, GDP) are significant determinants of exports.

Export performance can be defined as the ability of domestic firms to compete in international markets. The export performance characterized by competitive ability depends on various factors. These factors include essentially productivity, wage, technological innovation, and exchange rate. In this study, the role of exchange rate is particularly investigated, since it impact on the cost competition is long debated and maybe ambiguous. However, the role of other factors is also recognized and thoroughly examined. As argued by Turner and Golub (1997), the most important non-tradable input is labor, and the unit labor cost (ULC) is one of the most crucial elements determining the international competitiveness of an industry. ULC is a composite variable that captures the effect of relative prices (price in foreign country relative to domestic prices), exchange rate, wages in home country, and productivity (output per hour) in home country. In this study, instead of including a composite measure (which is obtained by several homogeneity restrictions) we incorporate components of ULC separately to our model.

Although cost is a supply side factor our model is characterized by both export supply and export demand functions. Export demand function brings in additional factors such as the foreign income. The exchange rate is also a factor arising from the export demand function. Domestic and foreign prices appear in both export demand and export supply functions. In the export supply function we include additional factors such as the output capacity and productivity.

In this chapter, we set up a theoretical model that forms the underpinnings of the empirical specification. Our theoretical model is based on imperfect substitutes model, which leads to a reduced form derived from export demand and export supply functions.

4.2 Theoretical Model

Our model is a variant of the imperfect substitution model sketched in Goldstein and Kahn (1985) and further extended in Edwards and Wilcox (2003). The key assumption in this model is that neither exports nor imports are perfect substitutes for domestic. In this is formed by a system of equations for export supply (X_s) and export demand (X_d), which simultaneously determine the export price and the export quantity. Assuming that the producer maximizes profits subject to a cost constraint, the model determines an export supply equation. Following the previous studies, we specify an export supply function which in the long-run depends on the relative prices, input prices, and other determinants such as productivity and productive capacity. The export supply function is specified as follows:

$$X_s = f(P_x, P, C, Z) \tag{1}$$

where

X_S = quantity of exports supplied

P_x = domestic price of exports

P = domestic price level

C = nominal variable cost

P^* = foreign price

Z = vector of other variables that influence the supply of exports, such as a productivity, exchange rate volatility, and output capacity

Utility maximizing under standard assumptions leads to following export demand function:

$$X_d = f(P_x, P^*, e, Y^*) \quad (2)$$

where

X_d = quantity of exports demanded

e = exchange rate defined as domestic currency per unit of foreign currency

Y^* = foreign real income

Equation (1) characterizes the supply side of exports. Decisions of firms to export depend on their relative returns between domestic sales and exports given production capacity, cost (input prices), and productivity. The return in domestic sales should be measured by the price of close substitutes in the domestic market that is "exportables." An increase in the price of exportables is expected to lower the supply of exports, other things being equal, since the profits in the local market are. Conversely, a rise in export prices and production capacity would increase the supply of exports. The cost, which is

measured by wage since it is the only nontradable factor, is expected to have a negative impact on the supply of exports. Conversely, productivity (or technology) should have a positive impact on export supply, since an increase in productivity will lower the cost of production. Other supply side variables such as tariff rates, import penetration, infrastructure costs, capacity utilization and trend income may be included in *Z*.

All other things being equal, an increase in the price of exports lowers the demand for exports while a rise in the price of the competing foreign goods would increase demand for exports. Therefore, in Equation (2) export demand assumed to be positively affected by foreign income (Y^*) and the price of competing foreign goods (P^*), but is negatively affected by the foreign price of domestic exports (P_x/e). Thus, P_x has a negative while e has a positive impact on export demand.

One of the underlying assumptions of this model is that the exchange rate fluctuations and/or volatility do not significantly influence the individual and collective trade flows. Otherwise, a country would be better off by eliminating the incidental foreign exchange transactions costs through a fixed exchange rate arrangements among themselves. Against this common assumption, Fontaigne and Freudenberg (1999) found that exchange rate volatility has a negative impact on intra-industry trade. This finding is supported by Doroodian (1999), Chou (2000), and Siregar and Rajan (2002), which showed that for less developed countries exchange rate volatility has negative effects on multilateral, bilateral and sectoral exports. The evidence in these papers support to hypothesis that an increase in exchange rate volatility appears to depress exports in less developed countries. Based on this evidence, we add a measure of exchange rate

volatility to resulting export supply equation, assuming that for a developing country, like Turkey, transactions costs due to volatility will only affect the exporters.

Following Fallon and Pereira da Silva (1994), Tsikata (1999), Behar and Edwards (2003) and Edwards and Golub (2004), capacity utilization is included to test the "vent-for-surplus" hypothesis. A negative coefficient is expected on the capacity utilization. Further, tariff liberalizations reduce the anti-export bias of production and thus positively affect export supply. Trend income is included as a proxy for non-price improvements in competitiveness (infrastructure, total factor productivity, export supply networks, learning by doing, and capacity) arising from increased economic activity. Infrastructure constraints are expected to negatively affect export supply. Trend income, as measured by Hodrick-Prescott filtered[1] real GDP, captures the impacts of various factors above and therefore its sign is ambiguous.

Based on the discussion above we specify a system export demand and export supply equations in log-linear form as follows:

$$X_s = \alpha_0 + \alpha_1 P_x - \alpha_2 P - \alpha_3 C + \psi Z, \quad \alpha_i > 0 \tag{3}$$

$$X_d = \delta_0 - \delta_1 P_x + \delta_2 e + \delta_3 P^* + \delta_4 Y^*, \quad \delta_i > 0 \tag{4}$$

Ideally, we should estimate equations (3) and (4) simultaneously using system estimation methods. However, such an approach tends to be constrained by data

[1] The Hodrick-Prescott filter or H-P filter is an algorithm for choosing smoothed (trend) values for a time series.

availability and data problems such as nonstationarity when time series data is used. Furthermore, long-run specification in equations (3) and (4) ignores dynamic interactions between export volume and its determinants, which may result in seriously biased estimates. Therefore, a number of empirical researchers (e.g., Goldstein and Khan 1985, Bushe et al. 1986, Arndt and Huemer 2004, Athukorala 2004, Chinn 2003 and 2005) estimated a relationship between export and its determinants using a single-equation approach where both demand and supply equations are solved together to yield an expression for the equilibrium volume of exports. The reduced form solution for export demand in equilibrium, i.e., $X = X_s = X_d$ is given by

$$P_x = \frac{\delta_0}{\delta_1} - \frac{1}{\delta_1} X_d + \frac{\delta_2}{\delta_1} e + \frac{\delta_3}{\delta_1} P^* + \frac{\delta_4}{\delta_1} Y^* \qquad (5)$$

For a small open price taking economy, the coefficient on X_d and Y^* tend towards zero, because the export price elasticity of demand (δ_1) tends towards negative infinity. Therefore, for a small price taking economy equation (5) represents the standard PPP, in which export prices in domestic currency equal foreign prices multiplied by the exchange rate. Furthermore, if price homogeneity holds, the coefficients on the exchange rate and foreign prices equal one, that is $\delta_2/ \delta_1 = \delta_3/ \delta_1 = 1$.

Substituting equation (5) into the export supply function in (4), imposing the assumption of price homogeneity (i.e. $\delta_1 = \delta_2 = \delta_3 = \delta$ and $\alpha_1 = \alpha_2 = \alpha$), and expressing the export demand and supply, we obtain following reduced form export volume relationship:

$$X = \frac{1}{1+\lambda_1}\left[\lambda_0 + \lambda_2(e + P^* - P) + \lambda_3 Y^* - \lambda_4 C + \lambda_5 Z\right] \quad (6)$$

where

$$\lambda_0 = \alpha_0 + \frac{\alpha_0\delta_0}{\delta_1}, \quad \lambda_1 = \frac{\alpha_1}{\delta_1}, \quad \lambda_2 = \alpha_1, \quad \lambda_3 = \frac{\alpha_1\delta_4}{\delta_1}, \quad \lambda_4 = \alpha_3, \quad \lambda_5 = \psi$$

Note that $e + P^* - P$ is the real effective exchange rate (REER) that measures the price of foreign products relative to Turkish products, valued in a common currency. Normally, a real depreciation ($e + P^* - P$ rises) positively affects exports. Note that in a small price-taking open economy, the reduced form equation for export volume given in (6) effectively becomes the export supply equation (1).

Although we normally expect a positive sign on REER, the impact of REER on exports is more complicated than it looks in equation (6). The Intra-industry trade in parts and components has increasingly become a major feature of many world economies. However, there is no clear consensus about the implications for the determinants of exports, especially the role of real exchange rate. Economic Theory indicates that export performance depends on real exchange rates as well as unit labor costs, unit production costs, productivities, trade partners' economic performance, the sectors of specialization, stability of the economy, stability in exchange rates, trade agreements, tariffs and many other factors. While a positive relationship between depreciated currencies and export seems to be a basic one, there are a number of factors which may complicate findings and empirical evidence in favor of this statement.

The effect of deprecation of domestic currency on exports may be ambiguous due to imported input contents. Some studies, such as Jones and Kierzkowski (2001) and Arndt and Huemer (2004), have argued that rapidly changing intermediate goods trade may weaken the immediate impact of real exchange rates on export performance since intermediate exports involve a high proportion of imported parts and components. The depreciation (or appreciation) of a currency lowers (raises) the foreign currency price of exports but at the same time increases (reduces) the home-currency prices of imported inputs. To the extent that imported input costs rise (decline), this may offset any expansion in demand induced by depreciation (appreciation).

Furthermore, it may be difficult recover effect of effect of depreciation on exports due to lagged impact. J-curve phenomenon is one of these factors. Findings indicate that it may take time for the trade balance and export performance to improve when the domestic currency is depreciated. The J-curve effect, however, can be modeled with a dynamic model specification where lagged values of exchange rate enters into the model within a specification such as the autoregressive distributed lag (ARDL), which is the preferred specification in this study. Another and maybe much complicated issue is the causation effect. While depreciated currency may improve export performance, an increasing export is also highly likely to lead to currency appreciation. This dual causation makes it more complicated to spot the relationship between the exchange rates and the export performance.

4.3 Econometric Specification

We note that because of dynamic interactions and lagged effects, due to features such as the J-curve effect discussed above, the use of static model in (6) is inadequate since it only captures the long-term relationship between exports and its determinants (Pindyck and Rubinfeld, 1991). The static modeling would not be useful when the short- to medium term relationship between the volume of exports and it determinants is significant and interest, particularly when exports react an respond with lags to changes in the real exchange rate and other factors. In this case dynamic modeling approach is required. There are several ways to transform the static relationship in (6) into a dynamic model, such as the vector autoregression (VAR) and autoregressive distributed lag (ARDL) models. We prefer ARDL approach in this study due to several advantages it offers in our case. These advantages are discussed below.

The ARDL approach embodies the relationship being investigated within a sufficiently rich dynamic specification by including lagged dependent and independent variables. The number of lags can be varied across variables so that a parsimonious specification of the model can be uncovered. The export volume equation in (6) can be transformed into a dynamic ARDL model by allowing for dependent variable (export supply or export volume) to depend on its own lags and contemporaneous as well lagged values of independent variables.

In order specify the ARDL model with a compact notation let the vector V_t be defined as

$$V_t = [R_t, Y_t, C_t, Z_t']', \qquad t = 1, 2, \ldots, T \tag{6}$$

where *t* is the time index, R_t is the real exchange rate defined as $R_t = e_t + P_t^* - P_t$, Z_t is a vector of variables such as the productivity, output capacity and exchange rate volatility; and other variables are defined blow equations (1) and (2). The long-run empirical model specification relates the export volume to its and is given by

$$X_t = \beta_0 + \beta_1 R_t + \beta_2 Y_t^* + \beta_3 C_t + \beta_4 K_t + \beta_5 G_t + \beta_6 H_t + \varepsilon_t, \qquad t = 1, 2, \ldots, T \tag{7}$$

where, K_t is a variable representing trend level of output, G_t is a measure of productivity, H_t is a measure of exchange rate volatility, and ε_t is the random error term, and *t* is time or trend variable. Equation (7) is a long-run level relationship and provides the basis for the models estimated in this study. The major empirical question in this study is the existence of the levels relationship in equation (7). Following the specification in equation (6), β_2 and β_5 are expected to be positive while β_3 and β_6 are expected to have negative signs. Normally, the expected sign of β_1 is positive, however due to effect on imported inputs the effect of real exchange rate on export supply may even be negative. If the imported input contents offsets the positive effect on export supple an insignificant estimate for β_1 is also possible. The expected sign of β_4 is also ambiguous, since the trend output variable indeed captures the effects of capacity limitation and non-price improvements in competitiveness (infrastructure, total factor productivity, export supply networks, learning by doing, and capacity) arising from increased economic activity.

Our study uses quarterly time series data on Turkey for the period 1988:1-2009:1 and the relationship in equation (7) should be estimated using cointegration or long-run levels relationship estimation methods due to the nonstationarity of the data. In order test the existence of the levels relationship in equation (7) we use the bounds test proposed by Pesaran et al. (2001)[2]. The bounds testing procedure involves two stages. The first stage is to establish the existence of a long-run relationship. Once a long-run relationship has been established, a two-step procedure is used in estimating the long-run relationship bases on the autoregressive distributed lag (ARDL) approach of Pesaran and Shin (1999).

Suppose the theory predicts that there is a long-run relationship among the variables in equation (7). Without having any prior information about the direction of the long-run relationship among the variables, the bounds testing approach estimates an unrestricted conditional error-correction model (UECM) taking each of the variables in turn as dependent variable. For instance, UECM when X is dependent variable takes the following form:

$$\Delta X_t = c_0 + c_1 t + \lambda_1 X_{t-1} + \sum_{i=1}^{6} \phi_i V_{it-1} + \sum_{j=1}^{p} \gamma_j \Delta X_{t-j} + \sum_{i=1}^{6} \sum_{j=0}^{p} \omega_{ij} \Delta V_{it-j} + \psi' D_t + \varepsilon_t \qquad (8)$$

where V_t is a vector of variables defined as $V_t = (R_t, Y_t, C_t, K_t, G_t, H_t)'$,and D_t is a vector of exogenous variables such as the structural change dummies.[3] The first stage in bounds

[2] There are several alternatives one can use to test for long-run relationship among a set of time series, including two step Engle and Granger (1987) and Johansen (1988) full information methods. Compared to other tests, bounds testing approach has better small sample properties and can be applied irrespective of whether the underlying regressors are purely I(0), purely I(1), fractionally integrated, or mutually co-integrated.

[3] The lag length p in the UECM model should be specified prior to estimation. We use Akaike information criterion to select the lag order parameter p.

testing approach is to estimate equation (1) by ordinary least squares (OLS). The null hypothesis of no cointegration against the alternative of a long-run levels relationship is performed as a Wald restriction test. The null and alternative hypotheses are specified as follows:

$$H_0: \lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$$

$$H_1: \lambda_1 \neq \phi_1 \neq \phi_2 \neq \cdots \neq \phi_6 \neq 0$$

The asymptotic distributions of the *F*-statistics are non-standard under the null hypothesis of levels relationship among the variables in the UECM in equation (2), irrespective of whether variables are purely I (0), I (1), fractionally integrated, or mutually cointegrated.[4] Two sets of asymptotic critical values are provided by Pesaran et al. (2001). The first set assumes that all variables are I (0) while the second set assumes that all variables are I (1). We reject the null hypothesis of no levels relationship and conclude that there exists a long-run equilibrium among the variables, if the computed *F*-statistics is greater than the upper bound critical value. On the other had, we cannot reject the null hypothesis of no levels relationship, if the computed *F*-statistics is less than the lower bound critical value. The bounds test is inconclusive, if the computed *F*-statistics falls within the lower and upper bound critical values.

If a long-run relationship has been established in the first stage, a two-step procedure is used in estimating the long-run relationship in the autoregressive distributed lag (ARDL)

[4] According to Pesaran et al. (2001), the dependent variable X in equation (2) must be an I(1) variable, but the regressors V_t can be either I(0) or I(1). However, the critical values given in Pesaran et al. (2001) corresponds to cases where all regressors are I(1), the upper bound, and all regressors are I(0), the lower bound.

approach. In the first step, a conditional ARDL $(p_1,\ q_i), i = 1, 2, \ldots, 6$ long-run model for *X* can be estimated as:

$$X_t = c_0 + \sum_{j=1}^{p_1} \eta_j X_{t-j} + \sum_{i=1}^{6} \sum_{j=0}^{q_i} \theta_{ij} V_{it-j} + \psi' D_t + u_t \qquad (9)$$

where all variables are as defined above and the lag lengths $p_1,\ q_i, i = 1, 2, \ldots, 6$ relating to four variables in the model are selected using the Akaike (AIC) or Schwarz Bayesian (SBC) Information Criterion. The second step of the second stage of bounds testing ARDL approach involves estimating a conditional ECM model. The conditional ECM model is specified as follows:

$$\Delta X_t = \mu + \sum_{j=1}^{p} \gamma_j \Delta X_{t-j} + \sum_{i=1}^{6} \sum_{j=0}^{p} \omega_{ij} \Delta V_{it-j} + \vartheta ECM_{t-1} + \psi' D_t + \varepsilon_t \qquad (10)$$

where γ_j, and ω_{ij}, are short-run parameters, ϑ is the speed of adjustment, which determines model's convergence to equilibrium, and the error-correction term ECM_t is defined as

$$ECM_t = X_t - \hat{\beta}_0 - \hat{\beta}_1 R_t - \hat{\beta}_2 Y_t^* - \hat{\beta}_3 C_t - \hat{\beta}_4 K_t - \hat{\beta}_5 G_t - \hat{\beta}_6 H_t \qquad (11)$$

The long-run parameters $\hat{\beta}_0, \hat{\beta}_1, \ldots, \hat{\beta}_6$ in equation (11) are obtained from the OLS estimates of the conditional ARDL model in equation (9) as follows:

$$\hat{\beta}_0 = \hat{c}_0 \Big/ \left(1 - \sum_{k=1}^{p_1} \hat{\eta}_k\right), \qquad \hat{\beta}_i = \left(\sum_{j=0}^{q_i} \hat{\theta}_{ij}\right) \Big/ \left(1 - \sum_{k=1}^{p_1} \hat{\eta}_k\right) \qquad i=1,2,\ldots,6 \qquad (12)$$

We compute the standard errors of $\hat{\beta}_0, \hat{\beta}_1, \ldots, \hat{\beta}_6$ using the Delta-method.

It is also interest to investigate the causal relationships among the export volume and its determinants in the short- and long-run. Engle and Granger (1987) showed that if two I (1) series maintain a long-run levels relationship then there would be a causal relationship at least in one direction. However, the direction of causality can be detected from the conditional error-correction model. In our case, tests for Granger causality can be made through the following equations:

$$\Delta X_t = \pi_{10} + \sum_{j=1}^{p} \pi_{11,j} \Delta X_{t-j} + \sum_{i=1}^{6} \sum_{j=0}^{p} \pi_{1i,j} \Delta V_{it-j} + \varphi_0 ECM_{t-1} + u_{1t} \quad (13a)$$

$$\Delta V_{it} = \pi_{i0} + \sum_{j=0}^{p} \pi_{i1,j} \Delta X_{t-j} + \sum_{j=1}^{p} \pi_{ii,j} \Delta V_{t-j}^{i} + \sum_{k=1}^{6} \sum_{j=0}^{p} \pi_{ki,j} \Delta V_{t-j}^{k} + \varphi_0 ECM_{t-1} + u_{it} \quad (13b)$$

where, V_t^i is the *i*th element of $V_t, i = 1, 2, \ldots, 6$ V_t^k is vector that obtained by omitting the *k*th element of V_t, π are parameters to be estimated, u_{1t}, and u_{it} are serially uncorrelated error terms, and ECM_t is the error correction term estimated from equation (11). The *F*-statistics on the lagged explanatory variables in these *ECM*s indicates the significance of the short-run causal effects. The *t*-statistics on the coefficients $\phi_i, i = 0, 1, \ldots, 6$ of the lagged *ECM* indicates the significance of the long-run causal effect.

CHAPTER 5

EMPIRICAL RESULTS

In this chapter, the export volume equation corresponding to export supply in small price taking economy is estimated using total export volume for Turkey. First, we describe the data set used in our study. Second, the properties of the time series data are presented. Third and last, estimation results as outlined in Chapter 4 are presented.

5.1 Data

We use quarterly data for the period from 1988:1 to 2009:1. The choice of this period is based on data limitations as well as the trade policy in Turkey. Turkey extensively liberalized foreign trade regime starting early 1980s. Most importantly capital account restrictions are removed in 1987. We therefore limit our estimation to data after 1987 in order to avoid mixing data from two radically different trade regime periods.

The real effective exchange rate (REER) data is obtained from the database of Central Bank of Republic of Turkey (CBRT). In the estimation we use the Consumer Price Index (CPI) based REER. The REER is based on weighted average of exchange rates for the largest 13 trade partners and calculated using the IMF methodology by the CBRT. The total export volume index is obtained from the International Financial Statistics published by IMF. The real gross domestic product (GDP) of US is used as a proxy for foreign (world) income, which is obtained from IFS. All remaining data, which includes

wage index, CPI, productivity, and real GDP are obtained from TURKSTAT database of Turkish Statistical Institute. Export volume, wage index, CPI, real GDP, and productivity were characterized by significant seasonal variation and therefore seasonally adjusted using X-12 method. In some studies wage and productivity variables are combined into a single variable by imposing a homogeneity restriction that coefficient of real wages is apposite of the coefficient of productivity. This variable is called unit labor cost (ULC) and calculated as the ratio of real wages to productivity.

There can be a few alternative measurements for export performance. These may include export volume in dollars, export's share in GDP, export's share in GDP relative to the trade partner's export's share in their GDPs or domestic share in world's total export volume. In this study we use export volume as the variable measuring the export performance.

The trend GDP which used to capture the effects of capacity limitation and non-price improvements in competitiveness (infrastructure, total factor productivity, export supply networks, learning by doing, and capacity) arising from increased economic activity is proxied by the trend of real GDP obtained using the Hodrick-Prescott filter method. Other methods, such as exponential smoothing and the Kalman filter, also provide virtually identical results but the Hodrick-Prescott filter.

5.2 Properties of the Data

Over the past three decades real Turkish exports has grow almost continuously. At the end of 2008 real total exports was more than double its value a decade ago and reached

132 billion US dollars. Although nominal value of exports is a measure of export performance, in this study export volume is used as the measure of export performance. Figure 1 displays the time path of the export volume index over the 1980-2009 periods. The figure depicts three episodes of export developments: 1980-1995, 1996-2000 and 2001-2009. After the crisis in 2001, domestic demand was very weak and the government decided to abandon the crawling peg regime. Turkish Lira allowed to fully floating in 2001, which caused the Turkish currency to depreciate more than 30 percent. Probably due to depreciation exports significantly accelerated after 2001. The export volume index was 70 in the fourth quarter of 2002 and reached 140 in the in the first quarter of 2008, that is export volume doubled in 5 years. This acceleration in export growth was largely attributed to deprecation of the domestic currency.

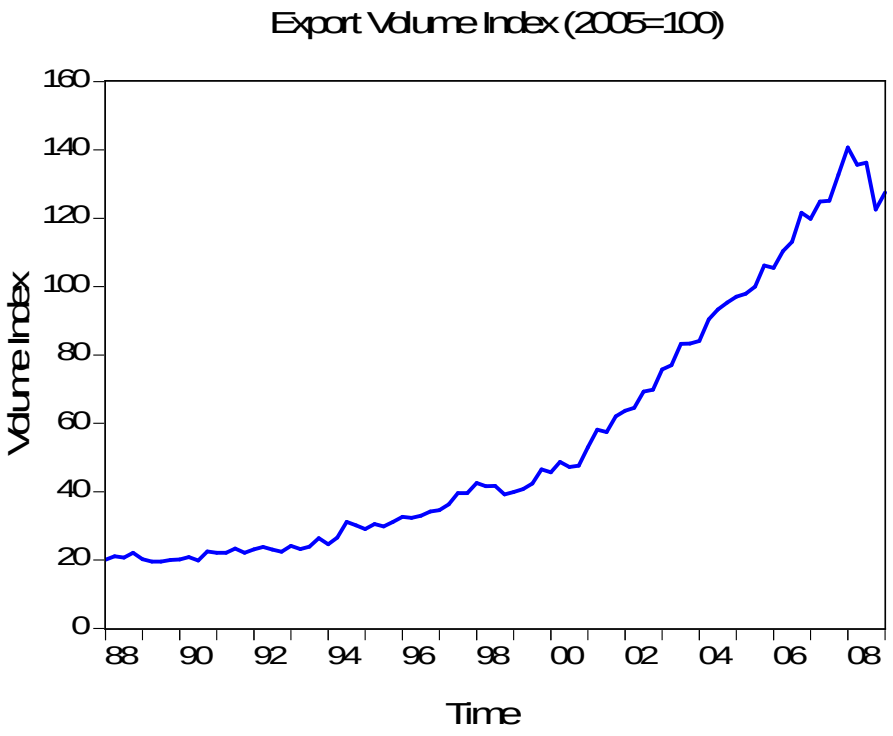

Figure 1: Volume of Turkish Exports

However complaints echoed since 2004 that the Turkish lira was overvalued due to high interest rate in Turkey relative to the developed countries and the overvalued currency was damaging the exports. As seen from Figure 1, export volume growth did not actually decline until second quarter of 2008. The sharp decrease in export volume in 2008:2 coincides with the start of global recession. An interesting question than remains is then the factors behind the high export volume growth since 1995. Whether the depreciation of the domestic currency was a significant factor leading to acceleration of export growth is one of the questions this study attempts to explain.

Figure 2 plots both CPI and Producer Price Index (PPI) based real effective exchange rate series for the period 1980-2009. From the plots of CPI and PPI based REER we see that these two measures do indeed move almost by the same amount and rarely deviate. The deviation of CPI and PPI based REER from each other do not materialize enough to prefer one over the other. For consistency and comparability to previous studies we will base our analysis on the CPI bases REER. Figure 2 reveals seven episodes of REER developments in the last three decades.

The first episode corresponds to the period 1980-1988 where REER was rising (Lira was deprecating in real terms) continuously. In early 1986 REER started decrease at fast phase, where the second episode started and lasted until the first quarter of 1994. During this second episode REER has appreciated significantly. After the 1994 crisis the REER depreciated sharply, however it depreciation process is reversed in the second quarter of 1995, where Turkish Lira started to appreciate again. The appreciation of the REER continued until 2000, when the economy was hit by a major banking crisis.

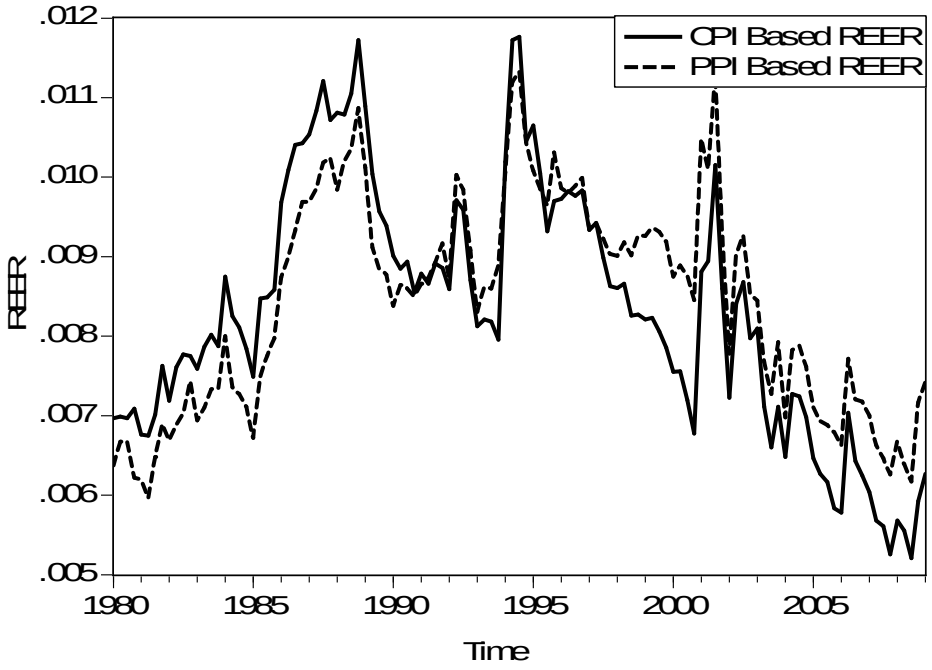

Figure 2: Real Effective Exchange Rate

Following the sharp depreciation of the REER from 2000 to 2001, another phase of appreciated started by 2002. REER continued to decline since 2002. The period of continues appreciation of Turkish Lira from 2002 to 2008 witnessed also the period of fastest export volume growth of the last three decades. Today, most economists argue that the appreciation of Turkish currency is negatively affecting the exports. If Turkish Lira was overvalued in recent years, then Turkey has had record high levels of export growth despite the overvalued currency. This observation indicates that the argument that the overvalued domestic currency impacting the exports on negatively is overly naïve and simplistic. Observed trends in REER and export volume point to the need for investigating other and more complex determinants of export growth in Turkey.

A final variable we have to construct is the exchange rate volatility. As we have discussed in Chapter 4, several studies found that exchange rate volatility adversely affects the export performance commonly in developing countries. In order test the validity of this claim and estimate its effect if it is supported by data we have to construct a variable that measures the exchange rate volatility. A natural candidate is moving standard deviation. However, what is important is the unpredicted volatility and standard deviation measured variability not volatility. Variability and volatility will deviate from each other if variability or a part of it is can be predicted. Indeed a true definition of volatility is unpredicted variability.

The autoregressive conditional heteroscedasticity (ARCH) model of Engle (1982) and its generalization (GARCH) by Bollerslev (1986) can be used to estimate volatility of a time series. The most widely used specification is the GARCH (1, 1) model introduced by Bollerslev (1986) as a generalization of Engle (1982). The (1,1) in parentheses is indicates the orders of the GARCH model where the first number refers to how many autoregressive lags appear in the equation, while the second number refers to how many lags are included in the moving average component of a variable. Before fitting a GARCH model to the exchange rate, the linear dependence in mean series should be removed. Using SBC following AR (1) model is selected for the first differenced exchange rate:

$$\Delta e_t = \mu + \alpha \Delta e_{t-1} + u_t, \qquad u_t \sim t(0, \sigma_t^2) \tag{14}$$

The GARCH (1, 1) can be represented as follows:

$$u_t = \sqrt{h_t}\,\varepsilon_t, \qquad \varepsilon_t \sim iid(0,1)$$
$$h_t = \omega + \alpha h_{t-1} u_{t-1}^2 + \beta h_{t-1} \tag{15}$$

This model forecasts the variance of date *t* exchange rate as a weighted average of a constant, yesterday's forecast, and yesterday's squared error.

Estimate of the model specified in equations (14) and (15) are given in Table 1. We have assumed that the innovations to the exchange rate equation in model (14) is fat tailed, which is a well documented fact for foreign exchange rates. The fat tailed distribution is model by assuming that u_t follows a t distribution, which has fat tails for small degrees of freedom.

Table 5: GARCH(1,1) Model Estimates for Exchange Rate

	Coefficient	Std. Error	z-Statistic	Prob.
μ	0.092900	0.031044	2.992565	0.0028
Δe_{t-1}	0.716428	0.153439	4.669139	0.0000
Variance Equation				
ω	0.002365	0.001516	1.560256	0.1187
r_{t-1}^2	0.623795	0.310674	2.007877	0.0447
h_{t-1}	0.249277	0.148336	1.680488	0.0929
T-DIST. DOF	7.495352	5.995299	1.250205	0.2112
R-squared	0.078467	Mean dependent var		0.087544
Adjusted R-squared	0.020142	S.D. dependent var		0.105463
S.E. of regression	0.104396	Akaike info criterion		-2.157415
Sum squared resid	0.860976	Schwarz criterion		-1.984992
Log likelihood	97.69012	Hannan-Quinn criter.		-2.088062
F-statistic	1.345345	Durbin-Watson stat		2.603908
Prob(F-statistic)	0.254091			
Inverted AR Roots	.72			

The estimates in Table 5 are all significant at 10 percent level. The degrees of freedom of the *t* distribution is estimated to be 7.50 which points to the heavy fat tailed distribution. The conditional variance forecasts for exchange rate are given in Figure 3. These estimates are consistent with the known history of the exchange rate fluctuations in Turkey, which we have discussed above. In the empirical section of the study conditional variance estimates obtained by estimating the GARCH(1,1) model that are given in Figure 3 are used as the measure of exchange rate volatility.

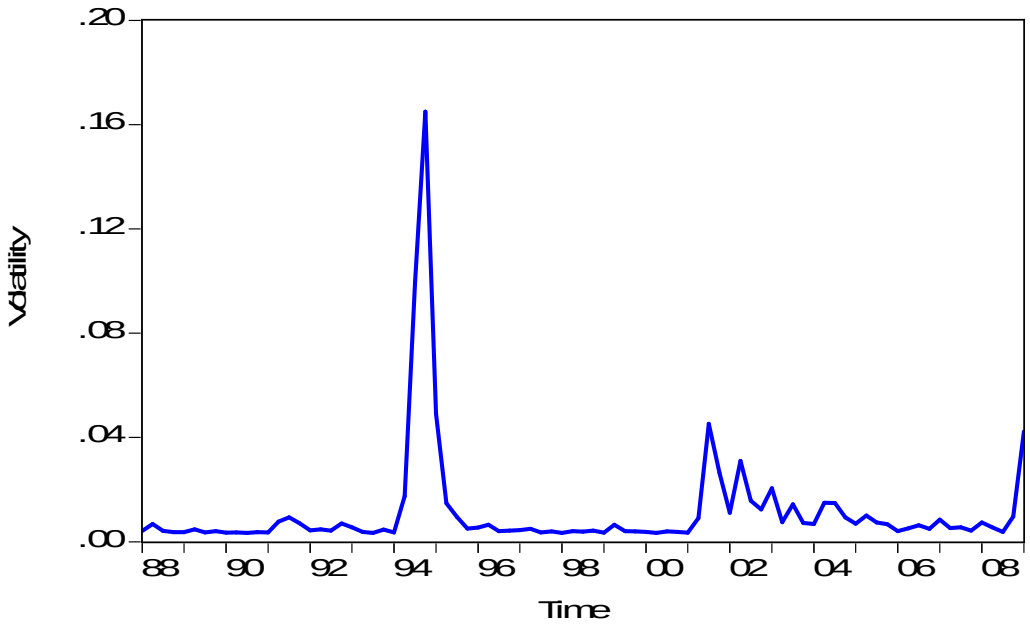

Figure 3: Estimates of Exchange Rate Volatility

5.3 Estimation Results

The data set used in this study includes quarterly time series data for Turkey from 1988:1 to 2007:1. Since we use time series data and time series properties of the data must be taken into account for proper analysis. Particular concern is the nonstationarity of the data. Descriptive statistics of the data set used is given in Table 5. In the following sections we use the following notation:

LEXPORT = logarithm of export volume index (X)

LREER = logarithm of real effective exchange rate ($e+ P^*-P$)

LRWAGE = logarithm of real wage index (C)

LPRODUCTIVITY = logarithm of output produced per hour (G)

LRGDPUS = logarithm of real Gross Domestic Product of US (Y^*)

LRULC = logarithm of real unit labor cost (ULC) defined as

LRWAGE-LPRODUCTIVITY

LTRENDGDP = logarithm of Hodrick-Prescott filter estimate of the trend real GDP

Observing from Table 6, we see that there are 85 observations for each time series data. Although it is not a major concern EXPORT, WAGE, and ULC variables are not normally distributes in levels as indicated by Jarqua-Bea test of normality. The

logarithms of these series are however normally distributed, so these variables are log-normal.

Table 6: Descriptive Statistics

	EXPORT	REER	WAGE	PRODUCTIVITY	GDPUS	ULC
Mean	56.03	125.54	605.36	109.92	9141.02	4.11
Median	40.72	117.00	195.10	102.64	8789.52	1.96
Maximum	140.70	192.00	2123.09	180.57	14412.80	11.76
Minimum	19.50	85.00	0.30	50.88	4951.95	0.01
Std. Dev.	37.29	26.69	705.69	37.91	2839.14	4.31
Skewness	0.87	0.72	0.77	0.30	0.33	0.47
Kurtosis	2.38	2.64	2.05	2.01	1.91	1.53
Jarque-Bera	12.14	7.81	11.51	4.70	5.79	10.75
Probability	0.00	0.02	0.00	0.10	0.06	0.00
Observations	85	85	85	85	85	85

The correlation coefficient estimates for the variables used in the study are given in Table 7.

Table 7: Correlation Coefficient Estimates

	LEXPORT	LREER	LRWAGE	LRGDPUS	LPROD.	LTREND.	ERVOL
LEXPORT	1.00						
LREER	-0.85	1.00					
LRWAGE	-0.13	-0.07	1.00				
LRGDPUS	0.99	-0.84	-0.08	1.00			
LPROD.	0.96	-0.84	0.11	0.97	1.00		
LTREN.	0.97	-0.83	-0.01	0.99	0.98	1.00	
ERVOL	0.00	0.22	-0.00	-0.02	0.01	-0.02	1.00

The Pearson correlation coefficient estimates given in Table 7 are static measures of linear association and would be misleading when there are dynamic interactions among

the variables. The estimates in Table 7 show that the static relationship of export volume is very high and positive with, foreign income, productivity, and trend GDP. The correlation with the REER is also very high and negative as it would be the case normally. We see that the correlation with real wage is low and exchange rate volatility is almost zero.

5.3.1 Unit Root Tests

In line with standard practice in time-series econometrics, the time series property of data was tested using the Augmented Dickey-Fuller test (Dickey and Fuller, 1979, 1981). If a time series has a one unit root it is nonstationary and called integrated of order *d*, denoted *I* (*d*). In order to test for unit roots using augmented Dickey-Fuller test (ADF) we estimate following regressions for a time series of interest:

$$\Delta y_t = \mu + \delta t + \gamma y_{t-1} + \sum_{j=1}^{k} \alpha_j \Delta y_{t-j} + e_t \qquad (16)$$

$$\Delta^2 y_t = \mu + \gamma \Delta y_{t-1} + \sum_{j=1}^{k} \alpha_j \Delta^2 y_{t-j} + e_t \qquad (17)$$

If the time series has a unit root the hypothesis that γ=0 is not rejected. The unit root test is has nonstandard distribution and the critical values are taken from Dickey and Fuller (1981). We first use equation (16) to test for nonstationarity of the series in levels. If it is nonstationary then equation (17) is used to test for stationarity of the first differenced data. For instance the test result for EXPORT is tested for levels using equation (16) is denoted by LEXPORT and that using equation (17) is denoted by D (LEXPORT). We

use Schwarz Bayesian Information Criterion (SBC) to select the lag length p in equations (16) and (17). The lag lengths selected by SBC are also reported in Appendix A.

Unit root test results are given in Appendix A. In Appendix A for each series we first report the test result for equation (14) and then for equation (15). The test results in Appendix A revels that all variables are nonstationary in levels and stationary in first differences. Therefore, one cannot proceed with usual estimation procedures. Since our time series data uniformly has a unit root we first need to establish that a long-run relationship exists among these variables.

5.3.2 Bounds Test Results

According to the unit root test results in Appendix A, the variables under consideration do not have the same order of integration for each variable. In this case, we can indeed proceed with the fashionable cointegration econometric procedures, such as the two-step residual-based procedure adopted by Engle-Granger (1987), and the system-based reduced rank regression approach due to Johansen (1988 and 1991), which are appropriate for the variables in the system, being of equal order of integration. The econometric analysis in this study is based on the bounds testing and ARDL approach due to Pesaran et al. (2001) and Pesaran and Shin (1999) because of several advantages it offers in our case. The bounds test procedure is applicable when the set of variables includes series that are nonstationary, or a mixture of nonstationary and stationary variables. Even though its applicability to mixture of I(0)/I(1) variables is not a

requirement of our data set we prefer bounds test ARDL approach due to other advantages explained below.

This bounds testing ARDL procedure has several advantages over alternatives such as the Engle and Granger (1987) two-step residual-based procedure for testing the null of no cointegration and the system-based reduced rank regression approach pioneered by Johansen (1988,1991). In the case of a finite sample and nonstationary data series, this procedure tends to provide more precise estimates than the Johansen procedure. This advantage is one reason we prefer this approach since we have a relatively small sample size. In particular, the Johansen maximum likelihood procedure, which is based on the full vector autoregressive representation and hence has more parameters to estimate, tends to deteriorate significantly in small samples, generating estimates with fat tails (frequent outliers) and sometimes substantial mean bias. The second main advantage of the bounds test approach is that it can be applied regardless of the stationary properties of the variables in the sample and allows for inferences on long run estimates, which is not possible under alternative cointegration procedures. Third, the unrestricted error correction model (UECM) estimated in the bounds testing approach is likely to have better statistical properties than the two-step Engle-Granger and full VAR Johansen methods because, unlike these methods UECM does not push the shot-run dynamics into the residual term (Banerjee et al., 1993, 1998). Therefore, ARDL procedure is chosen for estimating the behavioral equations in this chapter.

The first step in ARDL bounds testing approach is to estimate equation (8) by ordinary least squares (OLS) in order to test for the existence of a long-run relationship among

the variables. Normally, we will estimate the conditional ECM in equation (8) by taking each of one of the variables as the dependent variable. However, we only estimate equation (8) by taking LEXPORT as the dependent variable since our model theoretically specifies it and also finding a levels relationship when LEXPORT is dependent variable makes estimating the other equations unnecessary. The linear trend term in the ECM model may be a misspecification when the data is not indeed trending. In order to be robust against the misspecification of the linear trend we further estimate each model with or without a linear deterministic trend.

Before estimating the conditional ECMs we need to specify the lag length p for each model to be estimated. In order to determine p we use Akaike (AIC) and Schwarz Bayesian (BIC) Information Criterion. For each lag length, we also test the first and fourth order residual autocorrelations using the Breusch-Pagan Lagrange Multiplier (LM) statistics, which are distributed as $\chi^2(1)$ and $\chi^2(4)$, respectively. We estimate AIC, SBC, and LM tests for each model.

Tables 8 and 9 report optimal length lengths and corresponding AIC, SBC values as well as the LM tests with their p-values for the model without and with deterministic trend, respectively. The lag lengths chosen by AIC and BIC is the same for the models with or without deterministic trend. The optimal lag lengths are uniformly determined to be 7 by both AIC and SBC for both cases. At the optimal lag length chosen LM test indicates no first order autocorrelation. Although the LM test shows that there is some mild fourth order autocorrelation, we do not increase the lag length further since it will we have small number of observations and doing so would greatly reduce the degrees of freedom.

Table 8: Lag Selection Criteria for Bounds Test without Deterministic Trend

p	AIC	SBC	$\chi^2(1)$	p-val $\chi^2(1)$	$\chi^2(4)$	p-val $\chi^2$41)
0	-3.5133	-2.9346	21.1334	0.0000	37.8641	0.0000
1	-3.5383	-2.7515	49.6710	0.0000	65.2504	0.0000
2	-3.5683	-2.5704	44.3047	0.0000	70.8752	0.0000
3	-3.8517	-2.6397	1.2095	0.2714	3.8933	0.4206
4	-3.8798	-2.4506	5.8862	0.0153	11.6601	0.0201
5	-4.2131	-2.5635	0.4365	0.5088	15.0687	0.0046
6	-4.6459	-2.7726	0.6215	0.4305	17.2124	0.0018
7	-5.8529*	-3.7526*	1.0273	0.3108	14.8215	0.0051

Notes: *p* is the lag order chosen according to Akaike (AIC) and Shwarz Bayesian (SBC) Information Criterion. $\chi^2(1)$ and $\chi^2(4)$ are LM statistics for testing no residual serial correlation against order 1 and 4, respectively. *p*-value of χ^2 statistics are given in brackets.

* Lag length selected by AIC: 7

* Lag length selected by SBC: 7

Table 9: Lag Selection Criteria for Bounds Test with Deterministic Trend

p	AIC	SBC	$\chi^2(1)$	p-val $\chi^2(1)$	$\chi^2(4)$	p-val $\chi^2$41)
0	-3.5242	-2.9165	11.1458	0.0008	26.5407	0.0000
1	-3.5223	-2.7063	19.1314	0.0000	49.4936	0.0000
2	-3.5772	-2.5499	49.1192	0.0000	65.4413	0.0000
3	-4.0868	-2.8452	46.8956	0.0000	74.7067	0.0000
4	-4.1960	-2.7370	0.0123	0.9118	17.7777	0.0014
5	-4.4220	-2.7424	0.0062	0.9370	14.7853	0.0052
6	-4.6320	-2.7286	0.6431	0.4226	13.6837	0.0084
7	-5.9123*	-3.7816*	6.9792	0.0082	13.4694	0.0092

Notes: See notes to Table 5.

* Lag length selected by AIC: 7

* Lag length selected by SBC: 7

We use three variants of the bounds test in Pesaran et al. (2001) when a linear deterministic trend is present. These are (1) *F*-iv, which is the *F*-statistics for testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ and $c_1 = 0$ in equation (8), (2) *F*-v, which is the *F*-statistics for

testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ in equation (8), and (3) *t*-v, which is the *t*-statistics for testing $\lambda_1 = 0$ in equation (2). When the linear trend is excluded form equation (2) there are two additional tests we report. These are (1) *F*-iii, which is the *F*-statistics for testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ in equation (8) with c_1 set equal to 0, and (2) *t*-iii, which is the *t*-statistics for testing $\lambda_1 = 0$ in equation (8) with c_1 set equal to 0.

The bounds test results are given in Tables 10 reports the bound tests when the LECPORT is taken as dependent variable. We report test statistics for lag lengths chosen by both AIC and SBC, which is 7, as well as the test statistics at lag lengths 1, 3, and 5. The null hypothesis of no levels relationship is rejected at 5 percent level by *F-iii*, *F-iv*, and *F-v* at the optimal lag length 7. The *t-iii* and *t-v* statistics do not find a levels relationship between export volume and its possible determinants at the optimal lag length, although they do so at lag length 1 and inconclusive at lag lengths 3 and 5. The *t-iii* and *t-v* tests corresponds to an earlier test proposed by Banerjee, Dolado and Mestre (1998) and valid only when there is only a one equation in the system and no levels relationship exists under the null. Since we have more than 2 variables in our model assumption of one levels equation will most likely not hold. Therefore the results of *t-iii* and *t-v* should not be taken seriously unless all other tests are performed where each of the variables enter as dependent variable.

Table 10: Bounds F- and t-statistics for the Existence of a Levels Relationship

Without Determintic Trends

p	*F-iii*	*p-val F-iii**	*t-iii*	*p-val t-iii**
7	8.5699[c]	0.0035	-0.3527[a]	0.7334
5	2.8291[b]	0.0268	-2.4919[b]	0.0200
3	3.3157[b]	0.0071	-3.9215[b]	0.0003
1	3.4129[b]	0.0042	-4.4037[c]	0.0000

With Determintic Trends

p	*F-iv*	*p-val F-iv**	*F-v*	*p-val F-v**	*t-v*	*p-val t-v**
7	7.2239[c]	0.0086	6.1230[c]	0.0145	-0.5690[a]	0.5872
5	3.7570[c]	0.0060	3.6947[b]	0.0081	-3.4385[b]	0.0022
3	5.1143[c]	0.0002	5.7365[c]	0.0001	-5.4158[c]	0.0000

1	3.0130[c]	0.0071	3.4322[b]	0.0041	-3.4967[c]	0.0009

Notes: *p-values are invalid. Test statistics should be compared with critical values in Pesaran, Shin, Smith (2001)

F-iv is the *F*-statistics for testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ and $c_1 = 0$ in equation (8). *F*-v is the *F*-statistics for testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ in equation (8). *F*-iii is the *F*-statistics for testing $\lambda_1 = \phi_1 = \phi_2 = \cdots = \phi_6 = 0$ in equation (8) with c_1 set equal to 0. *t*-v and *t*-iii are the *t*-ratios for testing $\lambda_1 = 0$ in equation (8) with and without a linear deterministic trend, respectively.

[a] indicates that the statistic lies below the 5% lower bound.

[b] indicates that the statistic falls within the 5% bounds.

[c] indicates that the statistic lies above the 5% upper bound.

For k =6, 5% critical value bounds of *F*-iv are [2.63 3.62].

For k =6, 5% critical value bounds of *F*-v are [[2.87 4.00].

For k =6, 5% critical value bounds of *t*-v are [-3.41 -4.69].

For k =6, 5% critical value bounds of *F*-iii are [2.45 3.61].

For k =6, 5% critical value bounds of *t*-iii are [-2.86 -4.38].

Thus, there find supporting evidence that export volume maintains a long-run levels relationship with 6 variables, that is real effective exchange rate (LREER), real wages (LRWAGE), productivity (LPRODUCTIVITY), foreign income (LGDPUS), trend GDP (LTRENDGDP), and exchange rate volatility (ERVOL). The conditional ECM equation (8) estimated for the case where there is no deterministic linear trend is given in Table 11 and for the case where a deterministic linear trend is included in Table 12. The bounds tests given in Table 14 are based on these estimates (given in Appendicies).

We conclude this section by stressing that the evidence from bounds testing approach given in Table 10 is sufficiently convincing on the existence of a levels relationship among export volume and its potential determinants. Bases on this evidence we estimate the levels relationship that gives the long-run elasticites in the next section.

5.3.3 Estimates of Long-run Levels Relationship

In Table 13, we report the estimates of the long-run levels equation (7) with parameters obtained using the ARDL approach. We first estimate equation (9) by selecting the lag length according to AIC, and then the long-run parameters are obtained form equation

(12). The standard errors of these long-run parameter estimates are computed using the Delta-method.

Table 11: Estimates of Long-run Levels Relationship

	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	-11.128	1.621	-6.863	0.000
LREER	0.013	0.055	0.236	0.814
LRWAGE	-0.992	0.068	-14.666	0.000
LRGDPUS	0.951	0.306	3.110	0.003
LPRODUCTIVITY	1.186	0.102	11.598	0.000
LTRENDGDP	0.731	0.189	3.856	0.000
ERVOL	-0.010	0.007	-1.450	0.151

According to the estimation results in Table 13, all variables have the expected signs and only the variables LREER and ERVOL have insignificant coefficient estimate. It is interesting that the estimate of coefficient of real effective exchange rate is the extremely insignificant with a p-value of 0.81. Clearly, acclaimed exchange rate appreciation and its negative impact on exports may not be as significant as commonly pronounced in recent years. The second insignificant parameter estimate relates to the exchange rate volatility. Although the coefficient of ERVOL is estimated to be negative, implying that exchange rate volatility is damaging to exports, it is insignificant and has a quite small elasticity. Thus, we did obtain any evidence to support the hypothesis that exchange rate volatility significantly affects the exports.

Although the Turkish Lira to foreign exchange rates was highly volatile particularly after 2001 this might not have significant impact on Turkish exports. We find that the export volume intensity is negatively related to real wages, indicating that a high real wages have been detrimental Turkey's export performance. The second most significant

estimate with the highest elasticity relates to the productivity. The estimated elasticity of export volume to productivity is 1.17, being the highest elasticity. This indicates that the recent boom in Turkish exports is most significantly supported by productivity growth. The elasticity estimates for real wages and productivity have opposite signs but are very close in magnitude, supporting the homogeneity assumption. Thus, one can include unit labor cost rather than separately including the real wages and productivity in the model.

The positive and significant coefficient estimate of the US GDP implies that an expansion in the world GDP affects Turkey's export significantly. The coefficient estimate of the trend GDP is positive and significant, implying that rather than capacity constraint, non-price improvements in competitiveness (infrastructure, total factor productivity, export supply networks, learning by doing, and capacity) arising from increased economic activity positively and significantly affects the Turkey's exports.

To conclude, the evidence obtained from the long run levels relationship implies that real exchange rate depreciation in Turkey rate does not induce a significant increase in export volume. The unit labor cost is the most important determinant of exports followed by world income. Thus, in order to obtain a sustainable and stabilized export growth, public and private policy measures should be directed towards improving productivity and reducing labor costs.

5.3.4 Granger Causality Tests

Finally, we report the conditional Granger causality test results in Table 10. The short-run causality tests show some sensitivity to which variable enters as dependent variable.

The test results indicate no short-run Granger causality from LREER, LRGDPUS, LRWAGE, LRTRENDGDP, and ERVOL. Only significant short-run Granger causality for exports is from productivity. The long-run causality hypothesis in the LEXPORT equation is rejected at 5 percent level. The long-run causality test is not performed in other equations since only one level equation in which LEXPORT is dependent variable is estimated.

5.4 Summary of Findings

The factors behind the recent boom in Turkish export have constituted a matter of debate. The appreciation domestic currency is associated with the highest growth rates in exports since 1994. It has been argued that in the public that overvalued domestic currency was harmful to exports. The evidence obtained in this study indicates the opposite. The real exchange rate does not seem to have any significant impact on exports in recent years. Most significant determinant of export is the overall competitiveness (low unit labor cost) of the Turkish economy. This factor emerges to be the key factor at the background of the successful export growth performance of Turkey. In addition the world economic conditions seem to be the second most important factor behind the recent export growth.

There is no consensus on the factors behind the recent rapid growth of Turkish exports. Some argued that the repression of wages after the 2001 crisis was a driving forces. Others have focused on the productivity changes. Our study shows that they both are significant factors behind the export boom in Turkey after 1994. Our evidence is at

macro level and since each sector would be affected differently from the factors such as the unit labor cost and world income, an analysis of export.

Various implications arise from these results. Firstly, export growth in Turkey predominantly depends on the economic prosperity of Turkey's trading partners or on their ability to compete in the export market on the basis of price. Secondly, the export volume is most importantly determined by the profitability of export supply and it is basically determined by the unit labor cost. Therefore, factors that raise the output price received by exporter and reduce their cost of production will enhance export performance in Turkey. Thirdly, exchange rate depreciations although positively affect export performance by raising the profitability of export supply; this is not a significant factor. Our evidence also suggests that preferential reductions in foreign tariffs and market access will improve export performance if they successfully raise the price received by exporters.

CHAPTER 6

CONCLUSION

In this study, we examined the relationship between exchange rate changes and export performance in Turkey. The study uses time series data from mid 1980s, the years Turkey started to use flexible exchange rate and export-based growth, and ends at 2009, the year Turkish export reach a significant place in the world's exports.

There are several ways to analyze the dynamic relationship between exports and its determinants, such as the vector autoregression (VAR) and autoregressive distributed lag (ARDL) models. We prefer ARDL approach in this study due to several advantages it offers in our case.

Export performance can be defined as the ability of domestic firms to compete in international markets. The export performance characterized by competitive ability depends on various factors. These factors include essentially productivity, wage, technological innovation, and exchange rate. In this study, the role of exchange rate is particularly investigated, since it impact on the cost competition is long debated and maybe ambiguous. However, the role of other factors is also recognized and thoroughly examined.

The empirical analysis in the study used bound testing and autoregressive distributed lag (ARDL) approach to model the dynamic relationship between the exports and its determinants. The short-run and long-run causality among the variables in the model is determined based on the estimated ARDL models. According to the test results, the estimate of coefficient of real effective exchange rate is insignificant. That is the depreciation or appreciation of the domestic currency does not have insignificant impact in Turkey. On the other hand productivity has been found to have the highest impact on exports, which means that the recent boom in export is mostly supported by growth in productivity.

Exchange rate is an important tool that affect the economy in many respects especially the foreign trade. According to some economists overvaluation of domestic currency has a negative effect on exports. However our findings show that appreciation of Turkish Lira did not have significant effects on exports in recent years. The long-run relationship shows that real exchange rate depreciation rate in Turkey does not cause a substantial increase in export volume. The unit labor cost is the most important determinant of exports followed by world income. The test results also shows that unit labor cost, productivity changes and world income are important indicators of export boom in Turkey after 1994. Although many economists consider the exchange rate changes are the most important factor of export performance of a country, our test results indicates that exchange rate changes is not the most important factor for the Turkish export performance. Turkey is geographically close to the European Union market and Middle Eastern countries.

To conclude it can be added that, reducing the cost of production, reducing the foreign tariffs and market access will help to improve export performance and will obtain a sustainable and stabilized growth in export.

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APPENDICIES

APPENDIX A: Unit Root Tests

Null Hypothesis: LEXPORT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.005566	0.1352
Test critical values:	1% level	-4.039075	
	5% level	-3.449020	
	10% level	-3.149720	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LEXPORT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.80600	0.0000
Test critical values:	1% level	-3.488063	
	5% level	-2.886732	
	10% level	-2.580281	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-2.556076	0.3012
Test critical values:	1% level	-4.039075	
	5% level	-3.449020	
	10% level	-3.149720	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LREER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.06450	0.0000
Test critical values:	1% level	-3.488063	
	5% level	-2.886732	
	10% level	-2.580281	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LRWAGE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.511845	0.3219
Test critical values:	1% level	-4.071006	
	5% level	-3.464198	
	10% level	-3.158586	

Null Hypothesis: D(LRWAGE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.69798	0.0001
Test critical values:	1% level	-3.511262	
	5% level	-2.896779	
	10% level	-2.585626	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LRULC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.974321	0.1456
Test critical values:	1% level	-4.071006	
	5% level	-3.464198	
	10% level	-3.158586	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LRULC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.75376	0.0001
Test critical values:	1% level	-3.511262	
	5% level	-2.896779	
	10% level	-2.585626	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LPRODUCTIVITY has a unit root

Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.282698	0.4384
Test critical values:	1% level	-4.071006	
	5% level	-3.464198	
	10% level	-3.158586	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LPRODUCTIVITY) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.614733	0.0000
Test critical values:	1% level	-3.511262	
	5% level	-2.896779	
	10% level	-2.585626	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LRGDPUS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.080148	0.5510
Test critical values:	1% level	-4.039797	
	5% level	-3.449365	
	10% level	-3.149922	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LRGDPUS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.102201	0.0000
Test critical values:	1% level	-3.488063	
	5% level	-2.886732	
	10% level	-2.580281	

APPENDIX B: Bounds Test Equation without Deterministic Trends

Table 12: Bounds Test Equation without Deterministic Trends

	Coefficient	Std. Error	t-Statistic	Prob.
LEXPORT(-1)	0.217419	0.616411	0.352717	0.7334
LREER(-1)	0.593101	0.809705	0.732491	0.4848
LRWAGE(-1)	1.781645	1.173933	1.517672	0.1676
LRGDPUS(-1)	7.921148	5.309354	1.491923	0.1741
LPRODUCTIVITY(-1)	-12.14013	3.616648	-3.356736	0.0100
LTRENDGDP(-1)	6.488015	2.122326	3.057030	0.0157
ERVOL(-1)	-2.874998	2.381848	-1.207045	0.2619
DLEXPORT(-1)	-1.830940	0.638377	-2.868119	0.0209
DLEXPORT(-2)	-1.278824	0.591047	-2.163659	0.0624
DLEXPORT(-3)	-0.733914	0.561019	-1.308181	0.2271
DLEXPORT(-4)	0.197264	0.539495	0.365645	0.7241
DLEXPORT(-5)	0.198741	0.380815	0.521883	0.6159
DLEXPORT(-6)	0.287582	0.320189	0.898164	0.3953
DLEXPORT(-7)	0.459028	0.241479	1.900898	0.0938
DLREER	0.157310	0.241978	0.650101	0.5338
DLREER(-1)	0.091068	0.583830	0.155983	0.8799
DLREER(-2)	-0.005061	0.453582	-0.011158	0.9914
DLREER(-3)	0.390417	0.416597	0.937156	0.3761
DLREER(-4)	0.271070	0.338147	0.801636	0.4459
DLREER(-5)	0.355624	0.242347	1.467418	0.1804
DLREER(-6)	0.223844	0.187210	1.195685	0.2661
DLREER(-7)	0.035150	0.131391	0.267525	0.7958
DLRWAGE	0.020619	0.314356	0.065590	0.9493
DLRWAGE(-1)	-2.016879	0.761039	-2.650165	0.0292
DLRWAGE(-2)	-1.312686	0.584503	-2.245816	0.0549
DLRWAGE(-3)	-1.050009	0.489522	-2.144968	0.0643
DLRWAGE(-4)	0.065951	0.374581	0.176065	0.8646
DLRWAGE(-5)	0.731848	0.268816	2.722485	0.0261
DLRWAGE(-6)	0.465059	0.230444	2.018098	0.0783
DLRWAGE(-7)	0.048817	0.128355	0.380326	0.7136
DLRGDPUS	1.338182	1.167187	1.146501	0.2847
DLRGDPUS(-1)	-6.582463	3.822301	-1.722121	0.1233
DLRGDPUS(-2)	-3.886722	2.276543	-1.707292	0.1262
DLRGDPUS(-3)	-2.621557	2.043688	-1.282758	0.2355

DLRGDPUS(-4)	0.174351	2.020720	0.086282	0.9334
DLRGDPUS(-5)	5.036477	1.892842	2.660802	0.0288
DLRGDPUS(-6)	2.650249	2.137889	1.239657	0.2502
DLRGDPUS(-7)	6.416560	1.466336	4.375914	0.0024
DLPRODUCTIVITY	-0.569299	0.578208	-0.984593	0.3537
DLPRODUCTIVITY(-1)	11.19466	3.068928	3.647743	0.0065
DLPRODUCTIVITY(-2)	10.23064	2.466762	4.147397	0.0032
DLPRODUCTIVITY(-3)	8.196962	1.816218	4.513204	0.0020
DLPRODUCTIVITY(-4)	4.552950	1.181595	3.853225	0.0049
DLPRODUCTIVITY(-5)	2.287557	0.751224	3.045105	0.0159
DLPRODUCTIVITY(-6)	0.240131	0.616688	0.389388	0.7071
DLPRODUCTIVITY(-7)	-0.067688	0.472060	-0.143390	0.8895
DLTRENDGDP	-448.4718	292.9049	-1.531118	0.1643
DLTRENDGDP(-1)	886.9955	661.5084	1.340868	0.2168
DLTRENDGDP(-2)	-1062.158	652.8049	-1.627068	0.1424
DLTRENDGDP(-3)	1625.668	663.2498	2.451065	0.0399
DLTRENDGDP(-4)	-1345.669	665.4894	-2.022075	0.0778
DLTRENDGDP(-5)	553.0275	512.7240	1.078607	0.3122
DLTRENDGDP(-6)	-355.6674	337.1886	-1.054803	0.3223
DLTRENDGDP(-7)	104.6438	137.4663	0.761232	0.4684
DERVOL	1.120075	0.524312	2.136274	0.0652
DERVOL(-1)	3.104311	1.934489	1.604719	0.1472
DERVOL(-2)	1.017079	1.936056	0.525336	0.6136
DERVOL(-3)	-0.651380	1.675121	-0.388856	0.7075
DERVOL(-4)	-1.906634	1.390129	-1.371552	0.2074
DERVOL(-5)	-1.968635	1.257223	-1.565860	0.1560
DERVOL(-6)	-1.573127	0.871042	-1.806029	0.1085
DERVOL(-7)	-0.331445	0.434524	-0.762776	0.4675
C	-69.55202	42.47196	-1.637599	0.1401

R-squared	0.987587	Mean dependent var	0.024074
Adjusted R-squared	0.882076	S.D. dependent var	0.047812
S.E. of regression	0.016419	Akaike info criterion	-5.852934
Sum squared resid	0.002157	Schwarz criterion	-3.752641
Log likelihood	294.3380	Hannan-Quinn criter.	-5.012835
F-statistic	9.360009	Durbin-Watson stat	3.100984
Prob(F-statistic)	0.001131		

APPENDIX C: Bounds Test Equation with Deterministic Trends

Table 13: Bounds Test Equation with Deterministic Trends

	Coefficient	Std. Error	t-Statistic	Prob.
LEXPORT(-1)	-0.846447	1.487719	-0.568956	0.5872
LREER(-1)	0.575901	0.829732	0.694081	0.5100
LRWAGE(-1)	0.941904	1.605211	0.586779	0.5758
LRGDPUS(-1)	1.920173	9.344345	0.205490	0.8430
LPRODUCTIVITY(-1)	-9.591804	4.912969	-1.952344	0.0918
LTRENDGDP(-1)	-3.693528	13.07391	-0.282511	0.7857
ERVOL(-1)	-3.529041	2.576633	-1.369633	0.2131
DLEXPORT(-1)	-0.777117	1.485978	-0.522967	0.6171
DLEXPORT(-2)	-0.357359	1.314498	-0.271860	0.7936
DLEXPORT(-3)	-0.119218	0.967508	-0.123222	0.9054
DLEXPORT(-4)	0.558591	0.717452	0.778575	0.4617
DLEXPORT(-5)	0.453850	0.506477	0.896092	0.4000
DLEXPORT(-6)	0.494123	0.419494	1.177904	0.2773
DLEXPORT(-7)	0.534992	0.265409	2.015725	0.0837
DLREER	0.083889	0.264738	0.316876	0.7606
DLREER(-1)	-0.019220	0.614151	-0.031295	0.9759
DLREER(-2)	-0.147631	0.498477	-0.296164	0.7757
DLREER(-3)	0.301207	0.441451	0.682311	0.5170
DLREER(-4)	0.168411	0.369977	0.455193	0.6628
DLREER(-5)	0.290104	0.261750	1.108323	0.3043
DLREER(-6)	0.187564	0.197199	0.951141	0.3732
DLREER(-7)	0.059742	0.138149	0.432448	0.6784
DLRWAGE	-0.057641	0.336922	-0.171082	0.8690
DLRWAGE(-1)	-1.443138	1.065611	-1.354283	0.2177
DLRWAGE(-2)	-0.875082	0.815798	-1.072670	0.3190
DLRWAGE(-3)	-0.767884	0.615687	-1.247198	0.2524
DLRWAGE(-4)	0.155644	0.400168	0.388946	0.7089
DLRWAGE(-5)	0.656263	0.291527	2.251120	0.0591
DLRWAGE(-6)	0.395840	0.251808	1.571995	0.1599
DLRWAGE(-7)	0.042485	0.131728	0.322517	0.7565
DLRGDPUS	0.693532	1.447701	0.479057	0.6465
DLRGDPUS(-1)	-1.823667	7.186014	-0.253780	0.8070
DLRGDPUS(-2)	-0.234659	5.179004	-0.045310	0.9651
DLRGDPUS(-3)	0.378016	4.336828	0.087164	0.9330
DLRGDPUS(-4)	1.855829	2.969488	0.624966	0.5518
DLRGDPUS(-5)	5.736137	2.131788	2.690763	0.0311

DLRGDPUS(-6)	2.882530	2.209673	1.304505	0.2333
DLRGDPUS(-7)	6.617874	1.523561	4.343688	0.0034
DLPRODUCTIVITY	-0.301373	0.682579	-0.441522	0.6722
DLPRODUCTIVITY(-1)	9.068173	4.139209	2.190799	0.0646
DLPRODUCTIVITY(-2)	8.439477	3.395428	2.485541	0.0419
DLPRODUCTIVITY(-3)	6.913558	2.470270	2.798706	0.0266
DLPRODUCTIVITY(-4)	3.936363	1.440348	2.732925	0.0292
DLPRODUCTIVITY(-5)	2.175127	0.782596	2.779373	0.0273
DLPRODUCTIVITY(-6)	0.439863	0.680465	0.646416	0.5386
DLPRODUCTIVITY(-7)	0.096540	0.526384	0.183401	0.8597
DLTRENDGDP	-529.1088	316.9426	-1.669416	0.1390
DLTRENDGDP(-1)	1027.519	700.6072	1.466612	0.1859
DLTRENDGDP(-2)	-1138.564	675.6827	-1.685057	0.1358
DLTRENDGDP(-3)	1551.981	685.7968	2.263034	0.0581
DLTRENDGDP(-4)	-1313.707	682.9147	-1.923676	0.0958
DLTRENDGDP(-5)	609.0198	529.9879	1.149120	0.2883
DLTRENDGDP(-6)	-389.5179	348.0586	-1.119116	0.3000
DLTRENDGDP(-7)	176.5147	167.6640	1.052788	0.3274
DERVOL	0.835694	0.646631	1.292382	0.2372
DERVOL(-1)	3.492893	2.041822	1.710675	0.1309
DERVOL(-2)	1.642253	2.135401	0.769061	0.4670
DERVOL(-3)	0.188280	2.018631	0.093271	0.9283
DERVOL(-4)	-1.077840	1.768931	-0.609317	0.5616
DERVOL(-5)	-1.272090	1.560924	-0.814960	0.4419
DERVOL(-6)	-1.145971	1.043406	-1.098298	0.3084
DERVOL(-7)	-0.178866	0.485237	-0.368615	0.7233
C	43.11553	149.1465	0.289082	0.7809
TREND	0.146604	0.185631	0.789764	0.4556

R-squared	0.988602	Mean dependent var	0.024074
Adjusted R-squared	0.876255	S.D. dependent var	0.047812
S.E. of regression	0.016819	Akaike info criterion	-5.912315
Sum squared resid	0.001980	Schwarz criterion	-3.781583
Log likelihood	297.6241	Hannan-Quinn criter.	-5.060041
F-statistic	8.799537	Durbin-Watson stat	3.070829
Prob(F-statistic)	0.002758		

APPENDIX D: Granger Causality Tests

Table 14: Granger Causality Tests

Dependent variable: D(LEXPORT)

Excluded	Chi-sq/t	Prob.
D(LREER)	0.655	0.884
D(LRWAGE)	5.336	0.149
D(LRGDPUS)	2.520	0.472
D(LPRODUCTIVITY)	10.980	0.012
D(LTRENDGDP)	2.701	0.440
D(ERVOL)	2.055	0.561
ECM_{t-1}	-1.162	-2.490
All	27.933	0.063

Dependent variable: D(LREER)

Excluded	Chi-sq	Prob.
D(LEXPORT)	1.215	0.750
D(LRWAGE)	2.299	0.513
D(LRGDPUS)	2.077	0.557
D(LPRODUCTIVITY)	10.945	0.012
D(LTRENDGDP)	6.495	0.090
D(ERVOL)	0.977	0.807
All	22.736	0.201

Dependent variable: D(LRWAGE)

Excluded	Chi-sq	Prob.
D(LEXPORT)	7.869	0.049
D(LREER)	7.996	0.046
D(LRGDPUS)	2.210	0.530
D(LPRODUCTIVITY)	3.194	0.363
D(LTRENDGDP)	3.074	0.380
D(ERVOL)	3.999	0.262
All	22.967	0.192

Dependent variable: D(LRGDPUS)

Excluded	Chi-sq	Prob.
D(LEXPORT)	1.170	0.760
D(LREER)	4.276	0.233
D(LRWAGE)	1.042	0.791
D(LPRODUCTIVITY)	2.065	0.559
D(LTRENDGDP)	3.147	0.370
D(ERVOL)	0.940	0.816
All	15.862	0.602

Dependent variable: D(LPRODUCTIVITY)

Excluded	Chi-sq	Prob.
D(LEXPORT)	6.737	0.081
D(LREER)	8.599	0.035
D(LRWAGE)	1.384	0.709
D(LRGDPUS)	12.519	0.006
D(LTRENDGDP)	15.259	0.002
D(ERVOL)	1.130	0.770
All	39.086	0.003

Dependent variable: D(LTRENDGDP)

Excluded	Chi-sq	Prob.
D(LEXPORT)	2.840	0.417
D(LREER)	6.228	0.101
D(LRWAGE)	10.429	0.015
D(LRGDPUS)	5.036	0.169
D(LPRODUCTIVITY)	8.821	0.032
D(ERVOL)	4.743	0.192
All	60.226	0.000

Dependent variable: D(ERVOL)

Excluded	Chi-sq	Prob.
D(LEXPORT)	10.678	0.014

D(LREER)	1.508	0.680
D(LRWAGE)	6.220	0.101
D(LRGDPUS)	2.635	0.451
D(LPRODUCTIVITY)	4.747	0.191
D(LTRENDGDP)	4.182	0.242
All	22.164	0.225

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