AN ANALYSIS ON COMPOSITIONAL EFFECT DURING THE GREAT TRADE COLLAPSE

A Master's Thesis

by
ONURSAL BAĞIRGAN

Department of
Economics
İhsan Doğramacı Bilkent University Ankara
September 2014

To my family

and the people I see as family

AN ANALYSIS ON COMPOSITIONAL EFFECT DURING THE GREAT TRADE COLLAPSE

Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

ONURSAL BAĞIRGAN

In Partial Fulfilment of the Requirements for the Degree of
MASTER OF ARTS

in

THE DEPARTMENT OF
ECONOMICS
İHSAN DOĞRAMACI BİLKENT UNIVERSITY
ANKARA

September 2014

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

Assoc. Prof. Fatma Taşkın
Supervisor

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

Asst. Prof. Ayşe Özgür Pehlivan
Examining Committee Member

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

Asst. Prof. Tanseli Savaşer
Examining Committee Member

Approval of the Graduate School of Economics and Social Sciences

----
Prof. Erdal Erel
Director

ABSTRACT

AN ANALYSIS ON COMPOSITIONAL EFFECT DURING THE GREAT TRADE COLLAPSE

ONURSAL BAĞIRGAN
M.A. in Economics
Supervisor: Assoc. Prof. Dr. Fatma Taşkın
September, 2014

This thesis focuses on one of the famous hypotheses on The Great Trade Collapse which is compositional effect hypothesis. It includes three different parts. The first part examines the method of Levchenko, Lewis, Tesar (2010) for testing compositional effect, attempts to reproduce the results and conducts some robustness analysis of their results. The second part suggests some modifications on the existing model and applies the newly modified model to the US data. The findings suggest that compositional effect is an important factor of the US trade collapse during the The Great Recession. In the last part, the new model is applied to Turkey and the findings show that the compositional effect is not a significant factor of the trade reduction in Turkey. This result could be an indicator which shows that trade of the emerging countries are not governed by the same factors that drive developed country trade falls during the recent economic crisis.

Keywords: The Great Trade Collapse, The Great Recession.

ÖZET

BÜYÜK TİCARET DÜŞÜŞÜ SIRASINDA KOMPOZİSYON ETKİSİ ÜZERİNE BİR ANALİZ

ONURSAL BAĞIRGAN
İktisat Bölümü, Yüksek Lisans
Tez Yöneticisi: Assoc. Prof. Dr. Fatma Taşkın
Eylül, 2014

Her ne kadar kompozisyon etkisi bir çok çalışma tarafından ticaret düşüşünün çok önemli bir sebebi olarak gösterilse de üzerine bir takım yeni analizler yapılması gerekmektedir. Bu tez kompozisyon etkisi üç farklı ana başlık altında bir analiz gerçekleştirmektedir. İlk kısım Levchenko, Lewis, Tesar (2010) tarafından kurulan modeli eleştirisel bir şekilde analiz etmektedir. İkinci kısım mevcut modele getirilebilecek bazı geliştirmeler önermekte ve bu önerilerle geliştirilen yeni metodu Amerika Birleşik Devletleri (A.B.D.) verisi üzerinde uygulamaktadır. Sonuçlar kompozisyon etkisinin son küresel ekonomik kriz sırasında A.B.D. ticaretinin düşmesinin önemli sebeplerinden birisi olduğunu ortaya koymuştur. Bu özelliği ile bu alanda yapılan bir çok çalışma ile benzerlik göstermektedir. Üçüncü ve son kısım ise yeni geliştirilmiş metodu Türkiye verisi üzerine uygulamaktadır. Bu kısmın bulguları kompozisyon etkisinin Türkiye ticaret düşüşünde önemli bir etken olmadığını ortaya koymuştur. Şimdiye kadar gelişmekte olan ülkeler üzerine bu literatürde pek fazla çalışma yapılmadığı göz önünde bulundurulursa, bu kısmın sonuçları Türkiye gibi gelişmekte olan ülkeler üzerine daha fazla çalışma yapılması gerektiğinin göstergesi olarak kabul edilebilir.

Anahtar sözcükler: Küresel Ekonomik Kriz, Uluslararası Ticaret.

ACKNOWLEDGEMENTS

I would like to thank Professor Fatma Taşkın for her great expert advice and constant support throughout the thesis writing process. She has been my mentor since the beginning of finding a research idea until the end of transforming it to an academic thesis. I also want to thank Professor Ayşe Özgür Pehlivan and Professor Tanseli Savaşer for their help and useful feedbacks as examining committee member. I also thank Nusret Doru and Burak Alparslan Eroğlu for their beneficial comments and supports as a colleague.

I would like to express my gratitude to Hale Nur Kazaçeşme for her effort during the thesis writing process. Although she is in the process of writing her own thesis and has lots of other own important works, she gave her full effort to help me in many ways. Since I was not physically in Turkey during the submission process, she was the one who has done my responsibilities instead of me. She also helped by proofreading and in so many other ways that it is impossible to list all of them here. Therefore, I have to acknowledge my indebtedness to her support.

Sincerest thanks are also due to the people who believe in me throughout this process. They are the people who kept my motivation and self confidence high. Their emotional support were priceless. Hence, my special thanks are for these people: Murat İplikçi, Hüseyin Gürkan, Oğuz Çetin, Ali Yılmaz, Serkan Pekçetin.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

As a consequence of the recent global economic crisis, namely The Great Recession, the world trade has experienced a decrease in the period of 2008-2009, which is the steepest fall in the recorded history and the deepest fall of the post-war period. Although a drop in world trade is expected when the world output is decreased, this time trade falls much more than GDP compared to past experiences. For example, during the crisis, the US GDP fell 3.9 percent while the US imports fell 18.6 percent and exports fell 15.2 percent (Baldwin and Evenett 2009). This sudden and synchronized fall is labeled as The Great Trade Collapse and there is a vast literature on the causes of this collapse.

Understanding the characteristics of this collapse is crucial, because it is unique in many ways. The most important characteristic of this recent trade fall is that it is the deepest fall of the post war period. Figure 1.1 shows the quarter-to-quarter percentage change in world trade based on data from OECD Statistics Database.[1]

Another important characteristic of this collapse is that it is highly synchronized

[1]The world trade is a statistical concept which is calculated as an arithmetic average of the volume of world imports and exports.

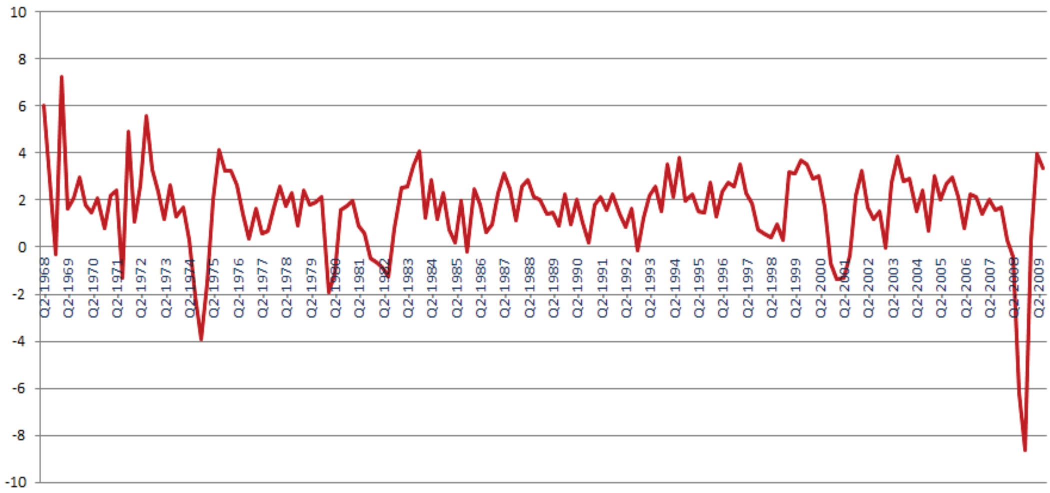

Figure 1.1: *Percentage Change of Real World Trade*

Data Source: OECD Statistics Database

throughout the world. Almost in every country, trade collapsed suddenly during the recession period and it was followed by a sudden recovery. Figure 1.2 shows the trade collapse in various countries.[2]

The third important feature of this recent trade collapse is that trade has fallen much more than GDP during the recession. It is an unusual situation compared to the previous crises. Figure 1.3 shows the time series plot of world imports to world GDP ratio which is taken from Baldwin(2009). As it is seen from the graph, this ratio has increased during the last decade significantly, but during the recent economic crisis the ratio has fallen suddenly. A sudden and deep fall at this magnitude has not been experienced before.

Lastly, to see the percentage change in imports of US and Turkey is important, because these two countries are the focus of our econometric analysis throughout this

[2]Note that the analysis of this paper mostly focuses on US trade collapse and uses US data. Table B.1 shows the percentage change of only US trade.

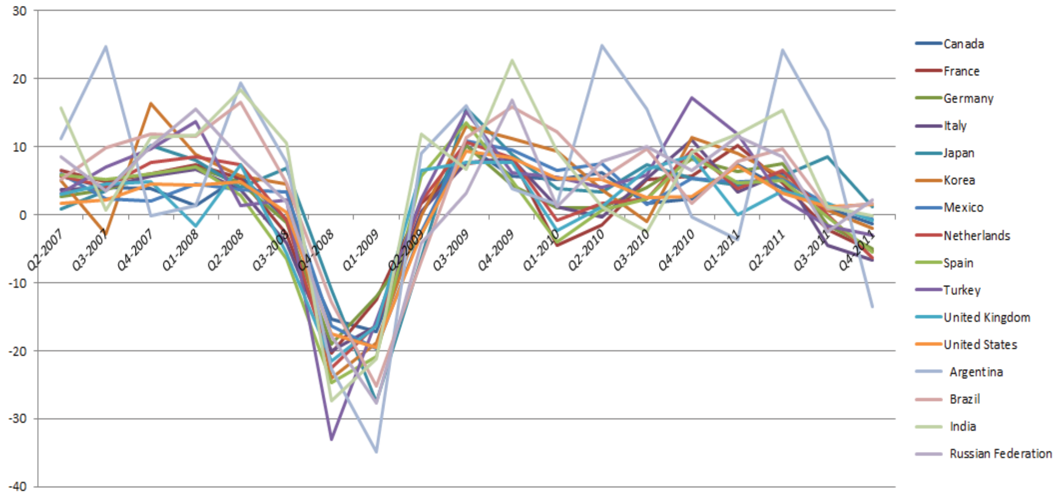

Figure 1.2: *Percentage Change in Trade of Various Countries*

Data Source: OECD Statistics Database

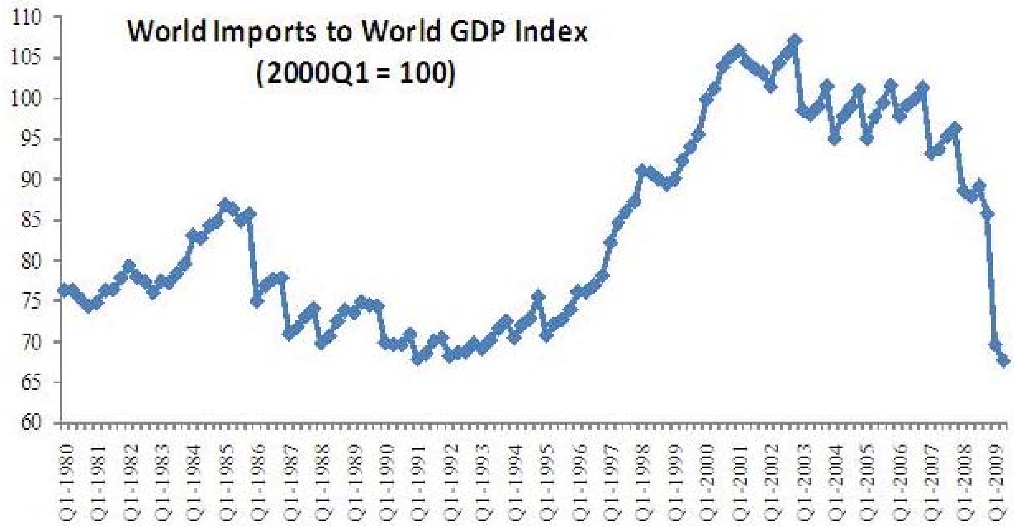

Figure 1.3: *World Imports to World GDP Index*

Source: Baldwin(2009)

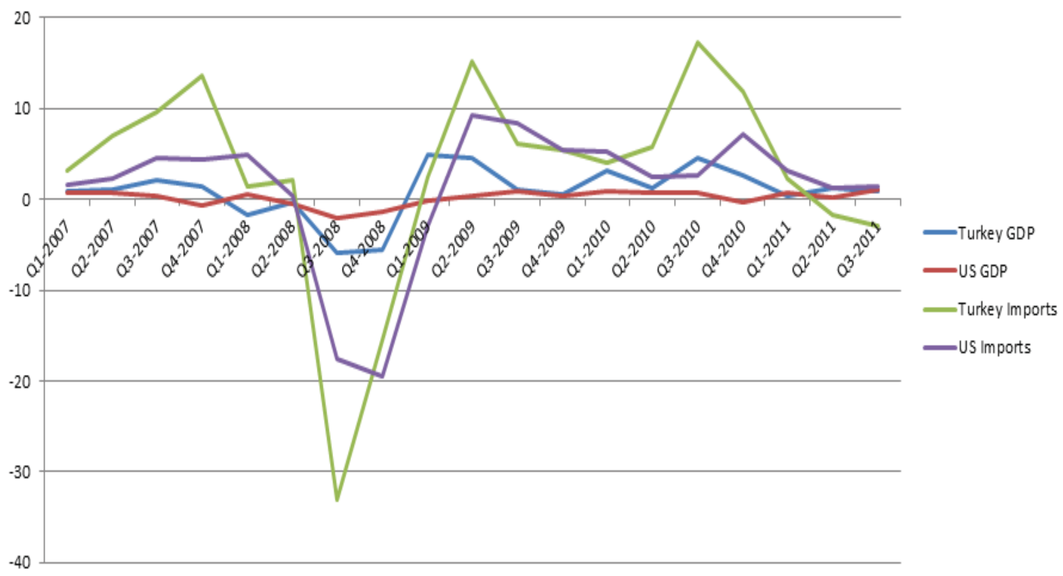

Figure 1.4: *Percentage Change in Imports of US and Turkey*

Data Source: OECD Statistics Database

thesis. Table 1.4 shows the percentage change in imports of US and Turkey. The most important feature of this graph is difference between the magnitudes of the fall of imports and the fall of GDP values. Fall of imports is a lot higher than fall of GDP for both countries. It means that the fall of trade of both countries has the most unique characteristic of The Great Trade Collapse.

There are hypotheses that tries to explain The Great Trade Collapse. The most popular hypotheses are vertical linkages hypothesis, trade credit hypothesis and compositional effect hypothesis. In this thesis, we only focus on compositional effect hypothesis and make a detailed analysis on it. We firstly analyze the compositional effect estimation of Levchenko, Lewis, Tesar (2010) paper and do robustness checks for their analysis. We reached the conclusion that their results are sensitive to certain small changes such as changing the time period, durable definition etc. Note that since all data which they use are not available publicly, we could not use the same data frequency and disaggregation. To strengthen our results, an analysis has to be made with exactly the same data with Levchenko, Lewis, Tesar (2010) paper. Secondly, we modify Levchenko, Lewis, Tesar (2010) model. We transform it to a panel data model and propose two different additional control variables. By this way, we put a time perspective to compositional effect analysis and find that the compositional effect hypothesis hold for the US import reduction during the period 2007 to 2010. Lastly, we apply the panel data estimation to Turkey. The results show that compositional effect is not an important factor for the reduction of imports. The next chapter will give details about compositional effect hypothesis and the existing literature on The Great Trade Collapse.

CHAPTER 2

LITERATURE REVIEW

There are several hypotheses about why the trade falls much more than GDP. One of the candidates is the vertical production linkages. Hypothesis on vertical production linkages fundamentally states that there are huge and increasing supply chain networks among countries. In other words, different raw materials and semi-products have to be transported from one country to another so as to produce one final good. Therefore, if the demand for the final good is decreased, then it affects the trade of several goods negatively. Similarly, if there is a negative supply shock on one of the raw materials, then it has a negative impact on the manufacturing process of final good and causes the trades of other raw materials to drop too. This hypothesis is generally associated with Yi(2003) which explains the growth of international trade during the last decades with a similar logic. Di Giovanni and Levchenko (2010) shows that the vertical linkages have an impact on the transmission of shocks through countries and Levchenko, Lewis and Tesar (2010) found support for this hypothesis by using US data.

Second explanation is the trade credit effect. It simply argues that the decrease in trade credits during the crisis may cause a sudden decrease in trade. Auboin (2009) found some evidence that trade credit falls have a significant effect on trade fall during the recent crisis. Iacovone and Zavacka (2009) showed that during the banking crisis exports fell more in two financially dependent industries. On the other hand, Mora and Powers (2009) showed that a decrease in trade credit may have some impact on trade but it is not a major factor because the magnitude of this impact is not sufficient to explain this large and sudden fall in trade by itself.

Third explanation, and the one this work will focus on, is the compositional effect hypothesis. The idea is that the demand for certain goods such as durable goods or investment goods decrease proportionally more than others. If the share of these goods on trade is much more than the share of them in GDP, then the trade should decrease much more than GDP. Boileau (1999) and Erceg, Guerrieri and Gust (2008) showed that direct trade in capital goods are affecting the volatility of exports and imports. In their research on the last trade collapse, Levchenko, Lewis and Tesar (2010) stated that the compositional effect has a great impact on the collapse. They suggested that the share of durable goods in trade is much more than their share in GDP and they showed with an econometric model that this compositional difference is significant for the recent trade fall.

There are other works which support the results of Levchenko, Lewis and Tesar (2010) about the compositional effect. Francois and Woerz (2009) has reached the same conclusion about this effect by using the data which focus on the trade between US and China. Other works which support this result are Eaton et al. (2011) and Bems, Johnson, Yi (2013). The first one founds that compositional effect is a significant factor for multiple countries, the second one suggests that the composition effect is the most important factor of the recent trade collapse. All these works built their analyses on a theoretical international trade model. One more important aspect of Eaton et al. (2011)

article is that it is the first article which examines this effect for a group of countries. They use the data from OECD and work on 15 different countries.

Theoretical literature on the compositional effect hypothesis is well-established. Boileau (1999) shows with an International Real Business Cycle (IRBC) model structure that compositional effect of investment goods is important for the volatility of exports. Moreover, Engel and Wang (2011) show that compositional effect of durable goods is an important factor for the magnitude of trade falls.

Although there are ample studies which suggest that compositional effect is a significant reason of The Great Trade Collapse, they are not sufficient to convince economists that it was the reason of the collapse. There are three main aspects of the compositional effect analyses that has to be examined in order to clarify its significance. The first one is the validity of the methodologies. Since it is a new growing literature, the methods that investigate the compositional effect is not examined in a detailed way. Most works that focus on The Great Trade Collapse and the compositional effect refer to Levchenko, Lewis and Tesar (2010) paper as the main evidence of compositional effect. However, the methodology of that paper has not been examined in a detailed way. The second one is the lack of applications of these methodologies to different kind of countries. Different works use different theoretical and applied models, but they generally focus on the same set of countries, especially US, when it comes to investigating the compositional effect, but how many and which countries were affected by the compositional effect is a question as important as whether a specific country has been effected by it. The third one is the investigation of this effect in previous crises. Since trade did not fall as the last one in the old crises, the existing knowledge about this particular effect is not sufficient to explain why it did not cause a trade collapse in the previous crises. For this reason, some further study must be done so as to verify the significance of the compositional effect.

This study has two main goals. The first one is to examine the only existing econometric model to study on the compositional effect, which is the model proposed by Levchenko, Lewis and Tesar (2010) and conduct econometric analysis to see whether a change or extension to this model is necessary. The second one is to use the newly created model on a new country which has not been investigated in the context of the compositional effect before. It is wise to choose Turkey as the new country. As it was mentioned before, the studies in this particular literature is usually focusing on US and EU countries. The main reason of this focus is probably the availability of data. However, this focus causes a bias on the studies in this literature, because almost all the countries in this country group are developed ones. Therefore, there is a lack of information on the significance of compositional effect for emerging and developing economies during the recent trade collapse. This study will not focus on the compositional effect in the past crises, because there is not enough available data to investigate this hypothesis during the past crises. The next chapter makes a detailed analysis on Levchenko, Lewis, Tesar (2010) model.

CHAPTER 3

VALIDATION OF EXISTING COMPOSITIONAL EFFECT MODEL

As we mentioned before, results of the econometric model that Levchenko, Lewis and Tesar (2010) proposed and used is one of the most cited analyses in this literature. There are several theoretical studies as was mentioned in the previous chapter, however they do not include any empirical support for the compositional effect. Levchenko, Lewis and Tesar (2010) results are important especially for trade analysis and the impact of economic crisis on the volume of trade. However, the construction of their empirical tests warrants further analysis. This chapter is devoted to check the validity and robustness of the results of Levchenko, Lewis and Tesar (2010) paper.

Our empirical work starts with reexamination of the Levchenko, Lewis and Tesar (2010) results. The first step will be to reproduce the same results for the same period and with their durable goods classification. The empirical study will continue to extend their model to check whether the results are consistent. First sensitivity test is to use a different durable good classification. Then the empirical work continues to estimate the model for different time periods. We will conduct a study with alternative models to estimate the impact of durable goods in the import changes during crisis.

Levchenko Lewis, Tesar (2010) model is a linear regression model which uses US data that is highly disaggregated in terms of classification. The model takes percentage change in imports or the percentage change in exports as dependent variable and the percentage change in domestic absorption as independent variable. The analysis is focusing on a dummy variable which takes "1" for durable goods and "0" for non-durable goods. If the coefficient of this durable dummy is statistically significant, then it means that durable goods have significant role in the proportional change of demand and the US trade, so the compositional effect would be a possible explanation of the recent trade collapse. They added some control variables which are share of the sector in imports (and respectively exports). The other control variables are labor intensity of the sector and elasticity of substitution between goods within a sector. The model has no time dimension, the only dimension is the cross-section of different good classes. The percentage changes refer to the period between 6^{th} month of 2008 and 6^{th} month of 2009.

$$PerImp_i = \beta_0 + \beta_1 Dummy_i + \beta_2 PerAbs_i + \beta_3 Share_i + \beta_4 Labor_i + \beta_5 ES_i + u_i$$

The data that have been used for this estimation are as important as the model, because it could effect the results as much as the model. They have been estimated the coefficients only for US, so the only necessary data is US datasets. They used US trade data in 6-digit level NAICS (North American Industrial Classification System) classification which is the most disaggregated level in NAICS. Sector shares can be also computed using the information in the same data source. Elasticity of Substitution data is taken from Broda and Weinstein (2006) in SITC Rev.2 (Standardized International Trade Classification), so the values can be used only after they are converted to

NAICS codes.[3] The compensation of employees values are used for labor intensities and the import price data from Bureau of Labor Statistics (BLS) is used to find the price adjusted imports.[4]

The first important part is their domestic absorption variable, because they used a proxy for it. Since there is no available data for demand, especially at this industry level, they used industrial production index as a proxy for domestic absorption. A further analysis to check whether industrial production is a good proxy for absorption is necessary. The second issue is their durable sector in NAICS classification, reported in Table B.1. To explain this issue, a detailed example would be useful. They assumed that the durable sectors are construction, chemical, plastics and rubber products, nonmetallic minerals, metal, machinery, computer/electronic, transportation, and miscellaneous manufacturing (23X, 325-339). Therefore, their NAICS classification labeled chemical products as durable goods, but the products of this sector are generally nondurables such as fertilizers, medicine, pharmaceuticals, paint etc. It can be easily seen by looking at the 4-digit sub-sectors of chemical product manufacturing. Furthermore, there are some sectors which are not included as durable, but they seem to be durable sectors such as wood product manufacturing (321). The products of this sector are "lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile homes), and prefabricated wood buildings" (Industries at a Glance, BLS, 2014).[5] From this product list, it is fair to say that this sector is more like a durable sector. Under these circumstances, the effect of this alternative durable classification is an important factor that needs further analysis.

[3]They did not mention how they converted the data or which concordance table they used, but this work will do this conversion with the help of United States International Trade Commission (USITC) Concordance Tables.

[4]The main analysis has been made with nominal values in Levchenko, Lewis and Tesar (2010). However, they used the price data and make a sub-analysis with real import values in their paper.

[5]Please see Table B.1 for the detailed representation of two different durable definitions.

The first is to check whether industrial production is a good proxy for absorption or not. An analysis on this disaggregation level is extremely difficult, because we do not have enough data to make it convincing. However, industrial production has been used as a proxy for absorption in other studies as well. Eaton et al (2011) uses production of non-exported goods as absorption in their analysis. Moreover, there is no available proxy for domestic absorption which can be labeled as more appropriate than industrial production. Nevertheless, we put GDP instead of industrial production index as a robustness check with our next panel data model. Table B.11 shows the output of the estimation. Therefore, the original proxy for domestic absorption which is industrial production can be used after doing some robustness check.

The second is to control for the robustness of their results with the new durable good classification. Levchenko, Lewis, Tesar (2010) used 6-digit level data for both trade and industrial production. Unfortunately, the data at this level of disaggregation is not publicly available online (may be reached by special requests) and the available data is not as broad as Levchenko, Lewis, Tesar (2010) used. This study will work with available online data. Therefore, it will cover 4-digit level manufacturing sectors[6] to estimate the parameters. Since the output table that is shown in Levchenko, Lewis, Tesar (2010) is the estimation that has been made with nominal values, we decide to make the first estimation with nominal values. Table 3.1 shows the estimation outputs of the regressions with Levchenko-Lewis-Tesar durable definition (with LLTDummy) and new BLS durable definition (NewDummy). The percentage changes are computed from 2^{nd} quarter of 2008 to 2^{nd} quarter of 2009 instead of 6^{th} month of 2008 to 6^{th} month of 2009 in this exercise, because sum of the datasets do not have available data at our disaggregation level.

[6] See Table B.2 for detailed list of the sectors that are included.

Theoretically, there are three control variables. These are elasticity of substitution within the sector, share of the sector in imports, and labor intensity of the sector. Elasticity of substitution within the sector is in the model to capture the change in demand after a change in relative prices of the goods within a sector. For example, assume that elasticity of substitution within a sector is high. Then, during recession consumers have a tendency to decrease the demand for a good which experiences a high price increase and they replace it with another good, which probably becomes relatively cheaper, from the same sector. If the cheaper good is a domestic good while the previous choice of the consumers is an imported good, then this would cause a sudden decrease in imports of this particular sector. On the other hand, high elasticity of substitution within a sector could have a positive impact on imports. If the new cheaper good is an imported good and the previously consumed good is a domestic good, this would cause an increase in the imports even if demand for the goods of this particular sector is decreased. Therefore, the sign of elasticity of substitution depends on which effect will be dominant. Share of sector in total imports is controlling for the sector size. It is a proxy for domestic demand and sector level prices. Higher sector size means that this sector could be effected more from a recession, so the expected sign is negative for this variable. Low labor intensity is usually an indicator of high technology in a sector. High-technology sectors and durable sectors might have a significant intersection and a decrease in demand of high-technology sectors could easily be understood as a decrease in durable sectors. Sign of the labor intensity variable should have a negative sign.

The interpretation of the signs and significance of the variables are important for our analysis. Both coefficients are not statistically significant, even though LLT-Dummy has a slightly low p-value. Hence, it can be said that their results are sensitive to frequency of data or disaggregation level. The output of this both estimations suggest that durable sectors do not really have a significant impact on percentage changes in imports. Only the percentage change in industrial production (PerIP) and share of sectors in imports (share) are statistically significant and it is very similar to the results of Levchenko, Lewis and Tesar (2010).

Before making a final comment on the differences in results, we should see the outputs with price-adjusted variables. For example, the change in import price of a specific good would definitely effect the nominal import values even if the quantity of imported goods has not changed. For a more reliable estimation, it is important to adjust values with prices. Table 3.2 presents the outputs of estimations with percentage change in real imports as dependent variable.

The significances of durable dummies point out a crucial fact. The significance of durable dummy is sensitive to durable classification and the durable classification which was created by Levchenko, Lewis and Tesar (2010) might help them to find the coefficient of durable dummy significant.[7] Especially, in the price-adjusted estimations the significance has changed dramatically even if it is not above the 90 percent confidence threshold.[8]

Obviously, the results are implying that the compositional effect is not an important factor for the trade collapse and this is exactly the opposite of what Levchenko, Lewis, Tesar (2010) claims. Therefore, a simple sensitivity analysis could be useful. Since their data have monthly frequency, the time period that they have focused is slightly different than this work. This could be the reason of the differences in results. In other

[7]Table B.2 shows the percentage change in US imports and percentage change in durable imports in the same graph.

[8]With the mentioned purpose of labor intensity variable in the model, a regression without this particular variable could be necessary. We check the robustness by doing a regression without labor intensity. Table B.9 shows the estimation output of it.

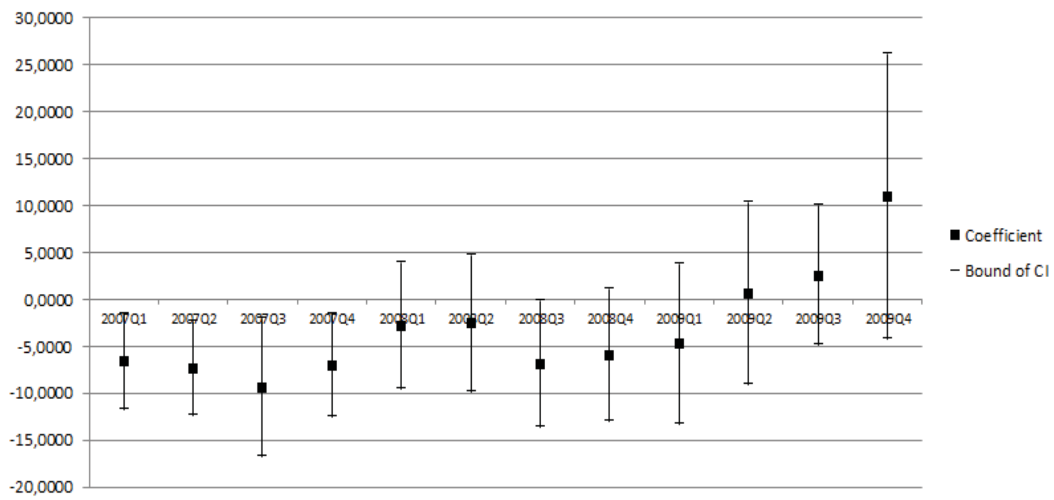

Figure 3.1: *Coefficient and Confidence Intervals of Durable Dummy*

Note that 2007Q1 refers to the regression made in the time period of 2007 quarter 1 and 2008 quarter 1. The logic is similar for the other years and quarters. High and Low values are referring to the boundaries of 95 percent confidence interval.

words, there is a possibility that the compositional effect hypothesis holds only for a specific time period. To explore this possibility, we applied the model to different time periods. Figure 3.1 shows the coefficients and confidence intervals of durable dummy for different time periods.[9] Note that this analysis is made with newly introduced durable dummy based on BLS durable definition.

Figure 3.1 shows that for the periods which include some parts of 2007 and 2008, the coefficient of durable dummy is not zero with 95 percent confidence. Moreover, coefficients of durable dummy in the regressions which are made during a period between 2007 and 2008 are seem to be statistically different than zero. Although the trade increases in 2007, a sudden decline in the growth rate at the beginning of 2008 and a sudden fall of trade in the middle of 2008 might have an impact on this result. It

[9]The regression has been made with Levchenko, Lewis, Tesar (2010) model with BLS durable definition and with quarterly frequency data. Table B.10 shows the exact values of durable dummy coefficient and the boundaries of 95 percent confidence interval.

proves that the whole analysis in this chapter is very sensitive to the time period that we choose for the compositional effect analysis. Table 3.3 shows the estimation results for the estimations which have non-zero durable dummy coefficients.[10]

[10]The graph shows that the coefficient could be positive of negative for different time periods. For a better understanding, we add interactive dummies with all the variables. The model becomes $PerImp_i = \beta_0 + \beta_1 Dummy_i + \beta_2 PerAbs_i + \beta_3 PerAbs_i Dummy_i + \beta_4 Share_i + \beta_5 Share_i Dummy_i + \beta_6 Labor_i + \beta_7 Labor_i Dummy_i + \beta_8 ES_i + \beta_9 ES_i Dummy_i + u_i$ Figure B.3 is the graph of the interactive dummy with domestic absorption in the rolling regression analysis with interactive dummies. Table B.8 shows the estimation outputs of all estimations with the interactive dummies. Note that interactive dummies with percentage change in industrial production and share of the sector in imports, and intercept dummy are statistically significant for some time periods. However, the dummies are insignificant for most cases.

Table 3.1: Regression with Nominal Variables

Variable	with LLT Definition Dependent Variable: PerImp	with new BLS Definition Dependent Variable: PerImp
constant	-13.84490	4.02173
	(0.0009)	(0.0005)
LLTDummy	-4.0175	
	(0.2785)	
NewDummy		-3.633361
		(0.3311)
PerIP	0.3995***	0.1399***
	(0.0054)	(0.0095)
Share	-219.0753***	73.3262***
	(0.0037)	(0.0040)
Labor	0.000171	0.000154
	(0.2893)	(0.3296)
ES	0.0002	0.0002
	(0.3744)	(0.3740)
R-squared	0.207244	0.205034
Adjusted R-squared	0.159487	0.157144
S.E. of regression	14.75722	14.77777
Sum squared resid	18075.36	18125.75
Log likelihood	-362.7438	-362.8677
F-statistic	4.339603	4.281394
Prob(F-statistic)	0.001476	0.001633
Mean dependent var	-26.25552	-26.25552
S.D. dependent var	16.09653	16.09653
Akaike info criterion	8.286377	8.289161
Schwarz criterion	8.454150	8.456934
Hannan-Quinn criter.	8.354002	8.356785
Durbin-Watson stat	1.850154	1.828501

Dependent variable PerImp is referring to the percentage change in US imports. The numbers in parenthesis are statistical probabilities. LLTDummy is the durable dummy according to the definition of Levchenko, Lewis, Tesar (2010). NewDummy is the newly introduced durable dummy which is based on the BLS durable definition. PerIP, Share, Labor and ES variables refer to the percentage change in industrial production index, the share of sector in imports, labor intensity of the sector and elasticity of substitution between goods within a sector, respectively. We do Breusch-Pagan-Godfrey Test and White's Heteroscedasticity Test for both regressions. The results are indicating that there is no heteroscedasticity.

Table 3.2: Regression with Price-Adjusted Variables
Dependent Variable: Real PerImp

Variable	with LLT Definition	with new BLS Definition
constant	-8.922787	-9.813015
	(0.0259)	(0.0138)
LLTDummy	-5.069316	
	(0.1632)	
NewDummy		-2.565846
		(0.4856)
PerIP	0.508263***	0.535305***
	(0.0004)	(0.0004)
Share	-8.227406	-4.803928
	(0.9090)	(0.9472)
Labor	9.34E-06	-3.16E-05
	(0.9527)	(0.9778)
ES	-0.015002	0.011417
	(0.9705)	(0.8391)
R-squared	0.226171	0.212373
Adjusted R-squared	0.179555	0.164925
S.E. of regression	14.43703	14.56518
Sum squared resid	17299.52	17608.00
Log likelihood	-360.7915	-361.5780
F-statistic	4.851778	4.475958
Prob(F-statistic)	0.000609	0.001165
Mean dependent var	-22.39210	-22.39210
S.D. dependent var	15.93871	15.93871
Akaike info criterion	8.242506	8.260181
Schwarz criterion	8.410279	8.427954
Hannan-Quinn criter.	8.310131	8.327805
Durbin-Watson stat	1.739687	1.724272

Dependent variable PerImp is referring to the percentage change in US real imports. The numbers in parenthesis are statistical probabilities. LLTDummy is the durable dummy according to the definition of Levchenko, Lewis, Tesar (2010). NewDummy is the newly introduced durable dummy which is based on the BLS durable definition. We do Breusch-Pagan-Godfrey Test and White's Heteroscedasticity Test for these regressions. The results are indicating that there is no heteroscedasticity.

Table 3.3: Outputs with Non-zero Dummy Coefficient

Dependent Variable: PerImp

Variable	2007Q1-2008Q1	2007Q2-2008Q2	2007Q3-2008Q3	2007Q4-2008Q4	2008Q3-2009Q3
constant	0.458878	2.386819	8.462841	1.744211	-13.66667
	(0.8592)	(0.3713)	(0.0349)	(0.5853)	(0.0003)
Dummy	-6.593319**	-7.358909***	-9.424924**	-7.077103**	-6.891123*
	(0.0117)	(0.0044)	(0.0126)	(0.0125)	(0.0452)
PerIP	0.140928	0.225814*	0.463822***	0.460120***	0.265450*
	(0.2013)	(0.0480)	(0.0076)	(0.0008)	(0.0774)
Share	43.38570	37.82509	50.50281	84.80919	-3.222063
	(0.5601)	(0.5917)	(0.6222)	(0.2410)	(0.9609)
Labor	0.000180	7.49E-05	-9.70E-05	-0.000127	0.000210
	(0.1595)	(0.5460)	(0.5911)	(0.3469)	(0.1529)
ES	-0.644228**	-0.672281**	-0.449657	0.154944	-0.141279
	(0.0427)	(0.0361)	(0.3418)	(0.6627)	(0.7126)
R-squared	0.131839	0.135875	0.133746	0.231810	0.167063
Adjusted R-squared	0.079540	0.083819	0.081562	0.185534	0.116886
S.E. of regression	11.08015	11.07753	16.64669	12.56010	13.62160
Sum squared resid	10189.89	10185.07	23000.32	13093.76	15400.49
Log likelihood	-337.2385	-337.2174	-373.4664	-348.3964	-355.6171
F-statistic	2.520876	2.610176	2.562964	5.009249	3.329486
Prob(F-statistic)	0.035584	0.030463	0.033073	0.000465	0.008638
Mean dependent var	-3.330613	-3.798672	-1.743191	-7.695904	-20.21653
S.D. dependent var	11.54897	11.57317	17.37013	13.91735	14.49506
Akaike info criterion	7.713224	7.712750	8.527336	7.963963	8.126226
Schwarz criterion	7.880997	7.880523	8.695109	8.131736	8.294000
Hannan-Quinn criter.	7.780849	7.780375	8.594960	8.031588	8.193851
Durbin-Watson stat	1.658977	1.400290	1.587427	1.836428	1.492151

Dependent variable PerImp is referring to the percentage change in US imports. The numbers in parenthesis are statistical probabilities. Dummy is the newly introduced durable dummy which is based on the BLS durable definition. We do Breusch-Pagan-Godfrey Test and White's Heteroscedasticity Test for all regressions. The results are indicating that there is no heteroscedasticity.

The analysis of this chapter shows that Levchenko, Lewis and Tesar (2010) model is sensitive to some specific changes in the methodology such as frequency of data, time period and durable classification definition. Especially, the durable definition that they use might be an important factor to label the compositional effect as a significant hypothesis for US. Note that since we do not have exact dataset that they have, we could not actually reproduce their results. It would be a very important step to understand insights of this analysis. Before finishing this part of the analysis, we can suggest it as an important future work in this literature.

There could be one more improvement on the Levchenko-Lewis-Tesar methodology. Their analysis is only focusing on the period that trade collapse happens sharply. However, adding some other periods could be beneficial. For example, recovery period after the crisis could be as informative as the collapse period, because the compositional effect hypothesis may indirectly imply that the main factor which helps the recovery of international trade after the crisis is the recovery of durable demand. It will also allow to add new variables that changes over time. Therefore, an analysis which covers a broader period of time would be more informative than the current analysis. The next chapter will introduce a model which is suitable for this analysis.

CHAPTER 4

COMPOSITIONAL EFFECT ESTIMATON WITH PANEL DATA

Most of the studies are conducted before the onset of the crisis however this study with its panel data is able to examine the pre-crisis and post-crisis periods. This chapter of the thesis will be focused on a wider period in order to determine the impact of being a durable good on the volatility in international trade.

The model that has been used in the previous chapter only has one dimension which consists of the cross-sections of different manufacturing sectors. This feature is limiting the options for control variables. For instance, it is impossible to use variables that change over time, but does not change across cross-sections such as economic variables like real exchange rate. The movement of the real exchange rate could be a significant factor which has a direct impact on imports of a country. Moreover, as we see from Figure 3.1 the results of the analysis might be affected by the selected time period, so examining the compositional effect hypothesis in a broader time period could give more useful information for our analysis. Therefore, adding the time dimension to the current model and changing our analysis to a panel data estimation would improve our results.

To be able to examine the recent economic crisis we limit our analysis to the period of 2007, 2008 and 2009. The periods are defined as 2007 quarter-1 to 2008 quarter-1, 2008 quarter-1 to 2009 quarter-1 and 2009 quarter-1 to 2010 quarter-1. Percentage changes will be computed according to these time periods. Since share of sector in imports, labor intensity and elasticity of substitution within a sector does not change drastically in such time periods, they will be assumed as constant over time. From now on, only the BLS durable classification will be used.

Since there are more than one way to estimate a panel data model, we have to determine which one is the most appropriate one for our analysis. In order to choose the most suitable one, we will make a detailed analysis which includes some panel data estimations and some hypothesis tests to compare different models. In this initial set of estimations, we exclude the cross section classification of the durable good as well as some of other explanatory variables that does not have time variations, such as elasticity of substitution and labor intensity. Column 1,2 and 3 of Table 4.1 show the estimation outputs of pooled estimation, fixed effect estimation and random effect estimation, respectively.

We apply two different statistical tests in order to determine which model is most suitable one for our analysis. First hypothesis test is F-test to compare pooled regression and fixed estimation models. The computed p-value of F-test is 0.00000 where the null hypothesis is that the fixed effects are all jointly zero. Therefore, we decide that the fixed effect estimation is more appropriate than pooled regression. Second hypothesis test is Hausman test based on Hausman (1978) where the null hypothesis is that both estimators are consistent but only the random effect is efficient and alternative is that only the fixed effect estimation is consistent. The p-value of Hausman test result is 0.1847. It means that we cannot reject the null hypothesis even with 90 percent confidence. Since we have the same cross sectional variables for each time period, random effects and fixed effects estimations are more suitable than the pooled regression for this particular model.[11]

From now on, we will continue with only random effects model. The result of random effect estimation with all variables is the column 4 of Table 4.1. Note that durable dummy is significant even at 99 percent confidence. However, before making a judgment on this output, we can benefit from having a time dimension and add more control variables. Therefore, the next step is to add variables that are not suitable for the model of the previous chapter. For example, a change in the proportion of import price and domestic price of a specific good could be a reason to change import of that particular good. For this reason, relative change in import price and domestic price is a suitable control variable that has to be added to the model. After the addition of the variable, the panel data model becomes the following.

$$PerImp_{it} = \beta_0 + \beta_1 Dummy_i + \beta_2 PerIP_{it} + \beta_3 Share_i + \beta_4 Labor_i + \beta_5 ES_i + \beta_6 RelP_{it} + uit$$

Note that RelP represents relative change in import price and domestic price. Another variable for relative price change in imported goods is the real exchange rate (Rer) in the economy over the years. This variable is also added instead of the relative price changes as another robustness check. Since a change in the real exchange rate would directly effect the relative prices, including the both Rer and RelP variables at the same time is not correct. RelP variable differs across time and cross sections

[11]Theoretically we know that random effects estimation is more suitable for panel data models that have less time varying variables. Because of durable dummy, it is impossible to do fixed effect estimation in latter stages anyway.

while Rer variable only differs across time. Therefore, putting RelP instead of Rer and making comments with the help of this estimation would be the best practice for this analysis[12]. The estimation output of the above model with random effects is the column 5 of Table 4.1. Note that share of sector in imports, labor intensity and elasticity of substitution within a sector variables are not the percentage changes, they are assumed to be constant over time.[13]

The newly added control variable seems to be highly explanatory. Moreover, with its explanatory power, the coefficient of durable dummy becomes significant for 99 percent confidence.[14]. It is a vital result for compositional effect hypothesis. The previous results do not seem to support this hypothesis. However, when we look at the question with a time perspective in a panel data model with time varying control variables, the results are supporting it.

Adding the relative price change variable is important in this step, because in the previous models we tried to capture price changes by using share of sector as proxy which may not capture a significant part of the price movements. This particular variable also differentiate the domestic price movements and foreign price movements. It indirectly captures the movement of exchange rates. We can say that this new variable creates some additional information for our estimation.

Having a time dimension is important even though we do not put a new variable into the model. As we know from the previous chapter, the significance of durable dummy is very sensitive to the selection of time period that we examine. The analysis

[12]The same analysis has been made with Rer variable instead of Relp. Table B.11 shows the estimation output with Rer variable. The results are very similar to estimation with RelP variable.

[13]We tried to change the share of sector variable over time. But the results were unchanged.

[14]In order to see a detailed analysis of how the significance of durable dummy evolves with every additional explanatory variable, see Table B.14. We also make an analysis to see the results of estimation without share of sector variable, because relative change in the import price and domestic price variable might capture the price level changes in panel data estimation.

in this chapter shows that by looking from a broader perspective, compositional effect is important for change in imports. We can briefly concluding this chapter by claiming that the compositional effect was a significant factor for US trade during the period 2007-2010.

Table 4.1: Pooled, Fixed and Random Effect Estimations for US
Dependent Variable: PerImp
Periods: 3, Cross Sections: 89, Total Obs: 267

Variable	Restd. Pooled	Restd. FE	Restd. RE	RE Estimation	RE with Relp	Pooled with Relp
constant	-4.114884	1.197533	-2.362420	2.046268	2.396846	-0.034772
	(0.0002)	(0.7838)	(0.0458)	(0.2640)	(0.1869)	(0.9834)
Dummy				-5.799566***	-5.359664***	-5.362370***
				(0.0008)	(0.0019)	(0.0010)
PerIP	0.444515***	0.681317***	0.561121***	0.562686***	0.618363***	0.475425***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share	21.17554	-247.9100	26.17506	36.03097	40.41091	37.62998
	(0.6221)	(0.5517)	(0.5614)	(0.4466)	(0.3914)	(0.4065)
Labor				1.51E-05	-7.04E-06	-1.21E-05
				(0.8600)	(0.9343)	(0.8800)
ES				-0.374155*	-0.303409	-0.158081
				(0.0885)	(0.1677)	(0.4433)
RelP					-0.421398***	-0.464951
					(0.0030)	(0.0000)
R-squared	0.173865	0.436917	0.232679	0.257608	0.291949	0.255971
Adjusted R-squared	0.167607	0.148977	0.226866	0.243385	0.275610	0.238802
Sum squared resid	73950.87	53316.92	72655.66	70295.29	67043.54	69025.86
F-statistic	27.78026	1.517389	40.02720	18.11321	17.86757	14.90816
Prob(F-statistic)	0.000000	0.009776	0.000000	0.000000	0.000000	0.000000
Mean dependent var	-5.304140	-5.304140	-5.304140	-5.304140	-5.304140	-5.304140
Durbin-Watson stat	2.568501	3.277408	2.472654	2.554717	2.513653	2.667156

The numbers in parenthesis are statistical probabilities. Dependent variable is the percentage change in US real imports. ”Restd.” refers to the word restricted. ”FE” and ”RE” refers to fixed effects estimation and random effects estimation, respectively. Dependent variable is the percentage change in US real imports.

CHAPTER 5

COMPOSITIONAL EFFECT ESTIMATON FOR TURKEY WITH PANEL DATA

Until this chapter, model has been modified to include further factors and the analysis has been made with this modified model for US. This chapter will extend the analysis to another country which has fundamentally different characteristics than US. As we mentioned in the earlier chapters, an analysis on Turkey would be helpful to explore the importance of the compositional effect. Turkey is a non-EU developing country and this feature distinguishes them to the most of the countries that has been analyzed in this literature. The previously examined countries are generally developed countries such as US and Canada. A few of them are developing countries, however their trade is heavily depend on crisis countries. For instance, Mexico and China were examined before, but their one of the biggest trade partners is US which is the main crisis country.

To begin the analysis, we must know whether Turkey is a crisis country. Even if the recent crisis had a huge impact on developed economies, it did not effect the developing countries at the same level. The most important criterion is whether Turkey had a trade

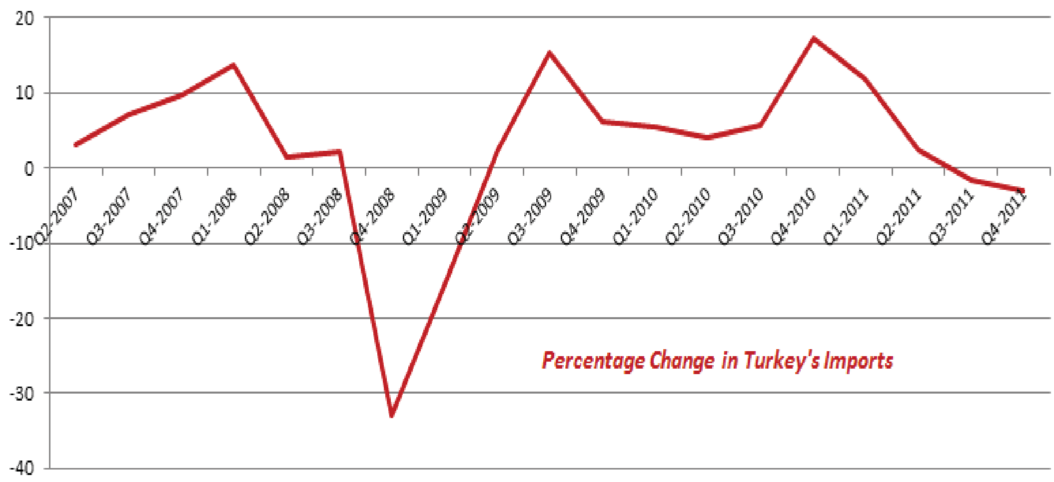

Figure 5.1: *Quarterly Percentage Change in Imports of Turkey*

Data Source: OECD Statistics Database

collapse during the recent crisis. Figure 1.2 includes Turkey and some other countries and clearly all countries had a trade collapse during 2008. In order to see it more clearly, we show only the graph of Turkey's imports. Figure 5.1 shows the time series graph of the imports of Turkey.

This is a strong fact which indicates the trade collapse of Turkey. However, the reason could simply be the sharp fall of GDP which has been attributed to trade collapse. Hence, a comparison of the GDP and trade of Turkey during the recession would give more certain information about the country. Figure 5.2 shows the percentage changes of GDP and imports of Turkey during the period of 2007-2011.

Figure 5.1 and Figure 5.2 clearly prove that Turkey is one of the countries which experienced The Great Trade Collapse. The change in GDP is much smaller than change of imports during the crisis period. Hence imports are not exactly proportional to GDP change. This requires an explanation and compositional effect hypothesis explanation may be one the possible explanations. Therefore, a similar analysis with

Figure 5.2: *Quarterly Percentage Change in GDP and Imports of Turkey*

Data Source: OECD Statistics Database

chapter 4 is possible for Turkey, too.

To conduct the same analysis, we need similar data. Even though level of disaggregation is not 4-digit level NAICS, it is possible to obtain same data for Turkey from the website of Turkish Statistical Institute (TurkStat). We only couldn't reach the data for elasticity of substitution within a sector variable. There are some slight differences between datasets of two countries and the most important one is the classification of manufacturing sectors. While the US data is disaggregated with NAICS classification, the data for Turkey is constructed with NACE classification which is more common in Europe. The number of cross sections available is 26 at 2-digit level classification.

Panel data model for Turkey has dependent variable as annual percentage change in imports from the first quarter of one year to the first quarter of the following year. 3 years are examined. A total of 78 observation is available. As it was mentioned before, all datasets are easily accessible in TurkStat database except elasticity of substitution data. However, this data can be found at the same source that US elasticity of substitution is obtained, so the data for Turkey is obtained from Broda and Weinstein (2006) in 3-digit level HS Classification. In this exercise, the concordance tables that are provided by United Nations Statistics Division (UNStat) is used to convert the classification form HS 3-digit to NACE Rev.2 2-digit. Note that labor earnings data and domestic producer price data from TurkStat are used for compensation of employees and domestic price of goods, respectively. Since some variables do not change over quarters such as elasticity of substitution, they have same values for a good in different time periods. The durable and investment sectors in NACE classification are provided in the website of European Commission.[15]

The objective is to see whether the durable goods are changing differently and hence the import equation is estimated with a durable good dummy. The estimation results will indicate whether the imports for the durable goods are significantly different than the rest of the imports. To account for the cross section heterogeneity , initial tests are conducted to select an appropriate model. However, since durable good classification is part of the heterogeneity, the durable good dummy variable and other variables such as share of sector in imports, labor intensity and elasticity of substitution within a sector are left out of these initial estimations. The output of pooled OLS and fixed effects estimation for Turkey is the columns 1 and 2 of Table 5.1.

Table 5.1 shows that the output of both fixed effect and pooled OLS estimations are very similar. We run an F-test to clarify which one is a more suitable for analysis of Turkey. P-value of F-test is 0.0000 and it shows that the null hypothesis is rejected, so fixed effect estimation is more appropriate choice. Next step is to choose between fixed effect estimation and random effects estimation. Column 3 of Table 5.1 shows the estimation output of random effect estimation.

[15]The durable classifications in NACE Rev.2 based on European Commission is Table

We do Hausman test to determine which one is more suitable between fixed effect and random effect estimations. P-value of Hausman test statistics is 0.8972 which is much greater than the critical p-value, so we cannot reject the null hypothesis of Hausman test and selecting random effect estimation is the better option. Column 4 of Table 5.1 shows the estimation output of random effect estimation with all variables. We reject the null hypothesis of Hausman test in this estimation again with 0.9049 p-value.[16]

The estimation output of random effect estimation shows that none of the independent variables have a significant explanatory power over dependent variable.[17] However, the same model works well with data of another country in previous chapters. The problem could be the small number of observations compared to the previous example. As the next step, making this estimation with greater number of observations can be crucial for this analysis. Since we do not have more disaggregated data for cross sectional dimension, we can do the same econometric analysis with higher frequency data to check the sensitivity of the analysis.

1^{st} column of Table 5.2 show that the independent variables PerIP and RelP have explanatory power on the dependent variable. The crucial part is the significance of durable dummy. The dummy variable is not significant and it means that compositional effect does not have a significant impact on trade collapse of Turkey. However, there is an important feature of this estimation. Figure 5.3 shows the residual-actual-fitted

[16] We face with a problem when doing Hausman tests. The statistical software displays a warning that the robust standard errors may not be consistent with the assumptions of Hausman test variance calculation. Hence we do the same estimation with GLS weights. The most suitable choice for our analysis is Period SUR GLS weights because we have a large number of cross sections with a small number of time periods. Column 6 of Table 5.1 shows the estimation output of pooled OLS estimation with GLS weights. Note that the coefficient of durable dummy is not significant in this case as well.

[17] Actually, the estimation outputs shows that none of the estimations have enough explanatory power, because F-statistics of all regressions are very small and p-values are very high. This is a strong indicator that we have to improve the model.

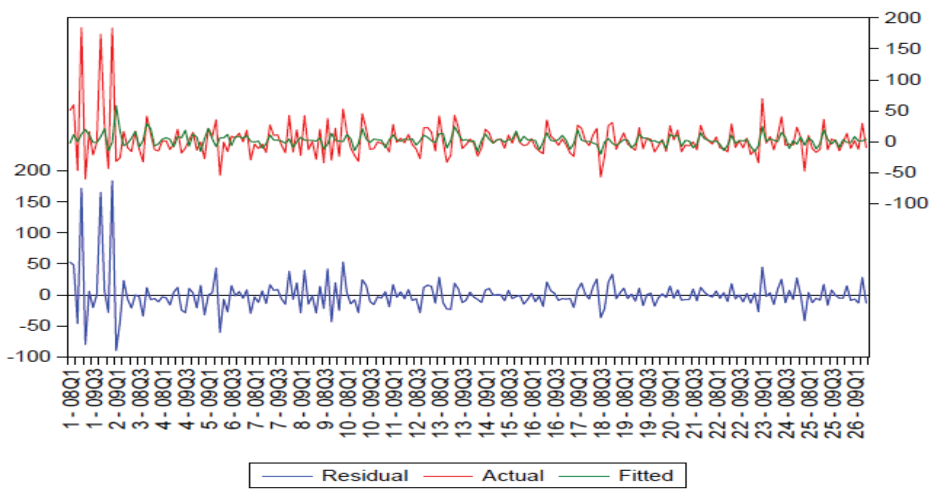

Figure 5.3: *Actual-Fitted-Residual Graph of Quarterly Estimation*

graph of the quarterly estimation. It can be easily seen that the first two cross sections are outliers for this dataset. These outliers are the sectors "Mining of Coal and Lignite" and "Mining of Metal Ores". After these two are removed from the dataset, an estimation can be made to check the robustness. The estimation output of the model without the outliers is the 2^{nd} column of Table 5.2. Variables PerIP and RelP are statistically significant in this estimation, too. In this estimation, the explanatory power of the model becomes relatively higher than the previous ones because this estimation has significantly higher R-square value.

As it is seen in the estimation outputs of this chapter, the methodology that has been introduced in the previous chapter could not find a support for the existence of a significant compositional effect for Turkey during The Great Trade Collapse. The reason could be that Turkey is not labeled as a crisis country but it is effected through trade channel. Consumers in Turkey might think that this sudden GDP decrease as a temporary shock and they might not postpone their durable good consumptions significantly. As we mentioned before, percentage change in industrial production and relative change in import prices and domestic prices are statistically significant for Turkey data, too. It means that a change in domestic absorption is correlated with a change in imports of Turkey. Similarly, relative change in import prices and domestic prices has an impact on change in imports.

A further and more detailed analysis is necessary for Turkey, because disaggregation level of our data might be accepted as questionable. As a future work, we can recommend that the methodology which is applied in this chapter could be done with more disaggregated data to check the robustness. Other hypotheses for trade collapse such as vertical linkage effect and trade finance effect should be investigated in Turkey case as well because they are more appropriate to explain trade collapses for non-crisis countries. Note that one of the control variables that has been added in the previous chapter is found to have a good explanatory power on percentage change of imports, again. It strengthens the argument which was claimed in the previous chapter and shows that the panel data model that was introduced in chapter 4 provides some improvements on the analysis of compositional effect.

Table 5.1: Estimations for Turkey
Dependent Variable: PerImp
Periods: 3, Cross Sections: 26, Total Obs: 78

Variable	Restd. Pooled	Restd. FE	Restd. RE	RE Estimation	Pooled OLS	Period SUR GLS
constant	25.03039	25.55029	25.03039	10.82795	10.82795	4.578811
	0.0156	0.0195	0.0170	(0.6612)	(0.7054)	(0.7401)
Dummy				-12.94853	-12.94853	-2.905809
				(0.5000)	(0.5757)	(0.7763)
PerIP	0.327218	0.152152	0.327218	0.366944	0.366944	0.516801**
	0.4925	0.7795	0.4318	(0.4140)	(0.4459)	(0.0425)
Share				-265.2872	-265.2872	-46.98467
				(0.2271)	(0.3134)	(0.6903)
Labor				0.011166	0.011166	0.006429
				(0.2691)	(0.3528)	(0.2360)
ES				1.120830	1.120830	0.399221
				(0.3459)	(0.4215)	(0.5321)
RelP	0.008941	0.087662	0.008941	0.142522	0.142522	0.280612
	0.9947	0.9515	0.9948	(0.9157)	(0.9157)	(0.7965)
R-squared	0.009032	0.276935	0.009032	0.055875	0.055875	0.080406
Adjusted R-squared	-0.017394	-0.113520	-0.017394	-0.023911	-0.023911	0.002694
Sum squared resid	586357.9	427838.9	586357.9	558640.9	558640.9	64.22681
F-statistic	0.341780	0.709263	0.341780	0.700314	0.700314	1.034664
Prob(F-statistic)	0.711605	0.830832	0.711605	0.650221	0.650221	0.410281
Mean dependent var	25.80117	25.80117	25.80117	25.80117	25.80117	0.483202
Durbin-Watson stat	2.630833	3.563419	2.630833	2.777660	2.777660	1.974286

The numbers in parenthesis are statistical probabilities. Dependent variable is the percentage change in Turkey real imports. We do not use the some variables in the econometric models of first three column because they prevent us to do fixed effect estimation.

Table 5.2: RE Model with Quarterly Turkey Data
Dependent Variable: PerImp Periods: 8, Cross Sections: 26, Total Obs: 208

Variable	RE Estimation	RE without Outliers
constant	0.721865	-0.738935
	(0.8552)	(0.6354)
Dummy	-1.778243	0.192559
	(0.5702)	(0.8760)
PerIP	0.327170***	0.506268***
	(0.0076)	(0.0000)
Share	-31.35398	-0.443962
	(0.3829)	(0.9750)
Labor	0.001817	0.000852
	(0.2642)	(0.1861)
ES	0.066547	-0.008796
	(0.7283)	(0.9110)
RelP	-0.695418***	-0.830712***
	(0.0010)	(0.0002)
R-squared	0.093457	0.322058
Adjusted R-squared	0.066396	0.300071
Sum squared resid	170290.8	50623.81
F-statistic	3.453572	14.64745
Prob(F-statistic)	0.002867	0.000000
Mean dependent var	2.899011	0.668934
Durbin-Watson stat	2.755912	2.831885

The numbers in parenthesis are statistical probabilities. The estimation has been made with Period SUR (PCSE) standard errors and covariance. Probability of Chi-Sq. Statistic of Hausman test is 0.6655 for the random effects model without dummy variable. The random effect specifications use Swamy and Arora estimators for the component variances.

CHAPTER 6

CONCLUSION AND FUTURE WORKS

Although there are some evidences that show the significance of compositional effect during The Great Trade Collapse, its scope and the magnitude of its impact are still being investigated. This thesis examines the compositional effect from a different point of view, because its focus was the validity of an existence model which tries to find out the importance of compositional effect. From the theoretical analysis and the results of empirical works, three important conclusions appear as a contribution to the corresponding literature.

First one is the empirical analysis of Levchenko, Lewis, Tesar (2010). As it was explained in the corresponding chapter, the econometric framework has some features that should be investigated. The approach which was used to determine the significance of compositional effect could be improved with slight changes. The analysis in the corresponding chapter shows that their durable classification may not be correct and this incorrect durable classification might help them to find the compositional effect highly significant. Moreover, the control variables which were used in the original work have somehow weak explanatory power because of lacking time dimension and some explanatory variables which changes over time. As a consequence of the econometric setup of analysis, it was difficult to check the explanatory power of some other variables such as change in real exchange rate and relative change in import prices and domestic prices.

Second important conclusion is that after increasing the dimension of the analysis by adding the time dimension, the control variable set has more explanatory power on change in trade. More importantly, this extra dimension increases the number observations that are used in the analysis dramatically, so the econometric analysis can be done with more information with the time dimension. The significance of compositional effect can be clarified by this panel data model more clearly, because the model gives the freedom to analyze both collapse and recovery periods of trade at the same time. In the corresponding chapter, the panel data model was used to determine the importance of compositional effect during the recent trade collapse for US and the empirical results show that it is a significant factor for the fall of US imports during the recession.

Third and the last conclusion is that the results may change across countries even for the same period of time. The panel data model was used to determine the relation between compositional effect and the trade collapse of Turkey. The empirical results show that compositional effect is not a significant factor for the fall of imports of Turkey during the recent recession.

Lastly, we have to make comments about the future works that can contribute the Great Trade Collapse literature. There are more than one work that investigate the importance of compositional effect, so an analysis on the approaches that were used by these works is a necessity in order to validate their results. For example, results of Eaton et al (2011) are highly influential and an analysis on the validity of their methodology and robustness of their results would be a significant contribution to this literature. Furthermore, the panel data model in this thesis can be used for some other countries that were not examined before. Especially, there is a lack of analysis about the importance of compositional effect for the emerging countries. A further analysis which investigates the impact of compositional effect during the previous economic crisis is necessary. Analyses on how it effects trade during a previous global crisis and during a local crisis would provide some valuable information about it and will certainly be helpful to clarify its importance on the recent trade collapse.

BIBLIOGRAPHY

Auboin, Marc. 2009. ”Restoring Trade Finance: What the G20 Can Do” In Baldwin, Richard and Simon J. Evenett, eds., *The Collapse of Global Trade, Murky Protectionism, and the Crisis: Recommendations for the G20.* VoxEU.org, 75-80.

Baldwin, Richard (ed.) 2009. *The Great Trade Collapse: Causes, Consequences and Prospects.* VoxEU.org.

Baldwin, Richard. 2009. ”The Great Trade Collapse: What Caused It and What Does It Mean?” In Baldwin, Richard, ed., *The Great Trade Collapse: Causes, Consequences and Prospects.* VoxEU.org, 1-14.

Baldwin, Richard and Simon J. Evenett. 2009. *The Collapse of Global Trade, Murky Protectionism, and the Crisis: Recommendations for the G20.* VoxEU.org.

Bems, R., R. C. Johnson and K. Yi. 2013. ”The Great Trade Collapse.” *Annual Review of Economics* 5: 375-400.

Boileau, Martin. 1999. ”Trade in Capital Goods and The Volatility of Net Exports and The Terms of Trade.” *Journal of International Economics* 48 (2), 347-365.

Broda, Christian and David E. Weinstein. 2006 ”Globalization and the Gains from Variety.” *Quarterly Journal of Economics* 121 (2), 541-585.

di Giovanni, Julian and Andrei A. Levchenko. 2010 ”Putting the Parts Together: Trade, Vertical Linkages, and Business Cycle Comovement.” *American Economic Journal: Macroeconomics* 2 (2), 95-124.

Eaton, J., S. Kortum, B. Neiman and J. Romalis. 2011. ”Trade and the Global Recession.” *NBER Working Paper* No. 16666.

Engel, Charles and Jian Wang. 2011 ”International Trade in Durable Goods: Understanding Volatility, Cyclicality, and Elasticities” *Journal of International Economics* 83 (1), 37-52.

Erceg, C. J., L. Guerrieri and C. Gust. 2008. ”Trade Adjustment and The Composition of Trade.” *Journal of Economic Dynamics and Control* 32 (8), 2622-2650.

Francois, Joseph F. and Julia Woerz. 2009. ”Follow The Bouncing Ball Trade and The Great Recession Redux” In Baldwin, Richard, ed., *The Great Trade Collapse: Causes, Consequences and Prospects.* VoxEU.org, 87-93.

Iacovone, Leonardo and Veronika Zavacka. 2009. ”Banking Crises and Exports: Lessons From The Past” *Policy Research Working Paper* 5016, The World Bank

Levchenko, A., T. Lewis and L. Tesar. 2010. ”The Collapse of International Trade During the 2008-2009 Crisis: In Search of the Smoking Gun.” *IMF Economic Review* 58 (2), 214-253.

Mora, Jesse and William M. Powers. 2009. ”Did Trade Credit Problems Deepen The Great Trade Collapse?” In Baldwin, Richard, ed., *The Great Trade Collapse: Causes, Consequences and Prospects.* VoxEU.org, 115-125.

Yi, Kei-Mu. 2003. ”Can Vertical Specialization Explain the Growth of World Trade?.” *Journal of Political Economy* 111 (1), 52-102.

APPENDICES

DATA

The data which is used in this thesis is collected from various reliable sources. Since the econometric model of the thesis needs different type of datasets, we had to work with a lot of datasets. Note that all data in this thesis are collected from the online sources of governmental institutions or academic studies. When giving information about data, it is better to follow the sequence of their use in thesis. Therefore, this chapter will start with the information about data which is used in the introduction part.

In the introduction chapter, there were three figures which are the only parts of the chapter that needs data. The data of Figure 1.1 was taken from OECD Statistics Database. It has been downloaded as quarterly value of world trade and directly turned to a percentage change data. The data for Figure 1.2 is also taken from OECD Statistics Database as it includes quarterly trade data for all OECD member states and some non-member countries.

Chapter 3 requires lots of data as it includes an econometric estimation. US imports data has been downloaded from the online source of United States International Trade

Commission (USITC). It was in 4-digit level NAICS disaggregation. US industrial production index data is downloaded from the data download system of FED St Louis. It was also in 4-digit level NAICS disaggregation. Elasticity of substitution data for US is taken from Broda and Weinstein (2009) in SITC Rev.2 classification. Therefore, it needs to be converted to 4-digit NAICS disaggregation and the concordance table of USITC is used in this thesis. Compensation of employees data is taken from input-output data of Bureau of Economic Analysis (BEA) and it was used as labor intensity of a sector. Both producer price indexes and import price indexes are downloaded from the online data source of Bureau of Labor Statistics (BLS) in 4-digit NAICS level disaggregation. Since there is no price data for some good classes, more broader 2-digit level price data has been used.

Chapter 4 includes all the data of chapter 3 with a small difference. While chapter 3 uses quarterly data, chapter 4 uses yearly US data. This particular chapter has one more data which is US real exchange rate data. This data has been downloaded from the online data source of Board of Governors Federal Reserve System as index of real exchange rate of US dollar.

Chapter 5 needs the same data with chapter 4, but it needs the Turkey versions of every single dataset. Imports, industrial production index, import prices and domestic prices data are available in the online data source of Turkish Statistical Institute (TurkStat). Therefore, we can drive the percentage change in real imports, percentage change in industrial production, the share of the sector in imports and relative price change between import prices and domestic prices variables. Labor earnings data are used instead of labor intensity in the analysis of this chapter. The classification system is NACE Rev.2 for Turkish data. The only lacking data in TurkStat in order to apply the panel data model to Turkey is elasticity of substitution between goods within a sector data. This dataset is available at the same data source that we take elasticity of substitution for US, so we take elasticity of substitution data for Turkey form Broda and Weinstein (2006).

APPENDIX B

ADDITIONAL TABLES AND FIGURES

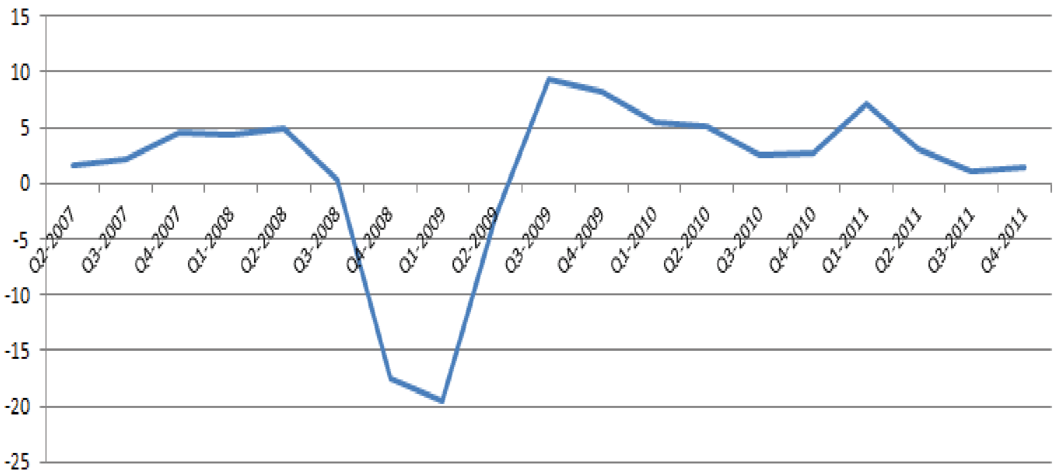

Figure B.1: *Percentage Change in US Imports*

Data Source: OECD Statistics Database

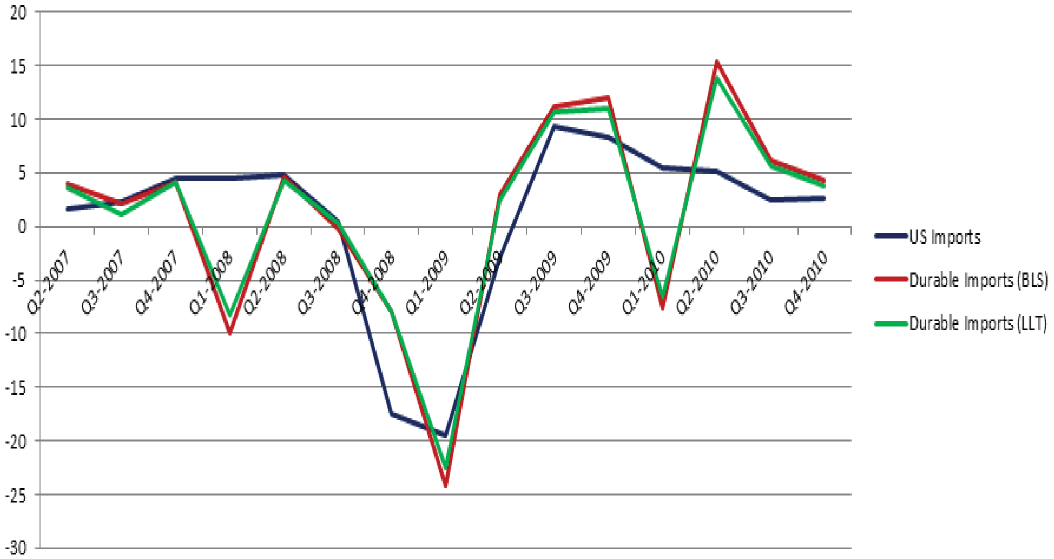

Figure B.2: *Change in Durable Imports vs Total Imports*

Source: Baldwin(2009)

Durable Imports (BLS) and Durable Imports (LLT) are referring to the the variables percentage change in durable good imports based on the durable definition of BLS and percentage change in durable good imports based on Levchenko, Lewis, Tesar (2010) durable good classification.

Table B.1: Durable Classifications Table for NAICS

NAICS Code	NAICS Class	LLT Durable	BLS Durable
321	Wood Products	⊠	✓
325	Chemical	✓	⊠
326	Plastic and Rubber	✓	⊠
327	Nonmetalic Mineral	✓	✓
331	Primary Metal	✓	✓
332	Fabricated Metal	✓	✓
333	Machinery	✓	✓
334	Computer and Electronics	✓	✓
335	Electrical Equipment	✓	✓
336	Transportation Equipment	✓	✓
337	Furniture	✓	✓
339	Miscellaneous Manuf.	✓	✓

A check mark box shows that the corresponding NAICS class is accepted as a durable sector for the above durable definition. A box with an ”x” refers that the corresponding NAICS class is accepted as nondurable for the above durable definition. All other manufacturing classes are accepted as nondurable for both durable definition.

Table B.2: NAICS 4-Digit Manufacturing Sectors

NAICS Code	NAICS Class (United States International Trade Commission)
2111	OIL AND GAS
2121	COAL AND PETROLEUM GASES
2122	METAL ORES
2123	NONMETALLIC MINERALS
3111	ANIMAL FOODS
3112	GRAIN AND OILSEED MILLING PRODUCTS
3113	SUGAR AND CONFECTIONERY PRODUCTS
3114	FRUIT AND VEGETABLE PRESERVES
3115	DAIRY PRODUCTS
3116	MEAT PRODUCTS AND MEAT PACKAGING PRODUCTS
3117	SEAFOOD PRODUCTS
3118	BAKERY AND TORTILLA PRODUCTS
3119	FOODS, NESOI
3121	BEVERAGES
3122	TOBACCO PRODUCTS
3131	FIBERS, YARNS, AND THREADS
3132	FABRICS
3133	FINISHED AND COATED TEXTILE FABRICS
3141	TEXTILE FURNISHINGS
3149	OTHER TEXTILE PRODUCTS
3151	KNIT APPAREL
3152	APPAREL
3159	APPAREL ACCESSORIES
3161	LEATHER AND HIDE TANNING
3162	FOOTWEAR
3169	OTHER LEATHER PRODUCTS
3211	SAWMILL AND WOOD PRODUCTS
3212	VENEER, PLYWOOD, AND ENGINEERED WOODS
3219	OTHER WOOD PRODUCTS
3221	PULP, PAPER, AND PAPERBOARD MILL PRODUCTS
3222	CONVERTED PAPER PRODUCTS
3231	PRINTED MATTER AND RELATED PRODUCT, NESOI
3241	PETROLEUM AND COAL PRODUCTS

Table B.4: NAICS 4-Digit Manufacturing Sectors (Continued)

NAICS Code	NAICS Class (United States International Trade Commission)
3251	BASIC CHEMICALS
3252	RESIN, SYNTHETIC RUBBER, and FIBERS and FILIMENT
3253	PESTICIDES, FERTILIZERS AND AGRICULTURAL CHEMICALS
3254	PHARMACEUTICALS AND MEDICINES
3255	PAINTS, COATINGS, AND ADHESIVES
3256	SOAPS, CLEANING COMPOUNDS, AND TOILET PREPARATIONS
3259	OTHER CHEMICAL PRODUCTS AND PREPARATIONS
3261	PLASTICS PRODUCTS
3262	RUBBER PRODUCTS
3271	CLAY AND REFRACTORY PRODUCTS
3272	GLASS AND GLASS PRODUCTS
3273	CEMENT AND CONCRETE PRODUCTS
3274	LIME AND GYPSUM PRODUCTS
3279	OTHER NONMETALLIC MINERAL PRODUCTS
3311	IRON AND STEEL AND FERROALLOY
3312	STEEL PRODUCTS FROM PURCHASED STEEL
3313	ALUMINA AND ALUMINUM AND PROCESSING
3314	NONFERROUS METAL (EXCEPT ALUMINUM)
3315	FOUNDRIES
3321	CROWNS, CLOSURES, SEALS AND PACKING ACCESSORIES
3322	CUTLERY AND HANDTOOLS
3323	ARCHITECTURAL AND STRUCTURAL METALS
3324	BOILERS, TANKS, AND SHIPPING CONTAINERS
3325	HARDWARE
3326	SPRINGS AND WIRE PRODUCTS
3327	BOLTS, NUTS, SCREWS, RIVETS AND TURNED PRODUCTS
3329	OTHER FABRICATED METAL PRODUCTS
3331	AGRICULTURE AND CONSTRUCTION MACHINERY
3332	INDUSTRIAL MACHINERY
3333	COMMERCIAL AND SERVICE INDUSTRY MACHINERY
3334	VENTILATION, HEATING, AIR-CONDITIONING
3335	METALWORKING MACHINERY
3336	ENGINES, TURBINES, AND POWER TRANSMISSION EQUIPMENT
3339	OTHER GENERAL PURPOSE MACHINERY

Table B.6: NAICS 4-Digit Manufacturing Sectors (Continued)

NAICS Code	NAICS Class (United States International Trade Commission)
3341	COMPUTER EQUIPMENT
3342	COMMUNICATIONS EQUIPMENT
3343	AUDIO AND VIDEO EQUIPMENT
3344	SEMICONDUCTORS AND OTHER ELECTRONIC COMPONENTS
3345	NAVIGATIONAL, MEASURING, ELECTROMEDICAL, AND CONTROL INSTRUMENTS
3346	MAGNETIC AND OPTICAL MEDIA
3351	ELECTRIC LIGHTING EQUIPMENT
3352	HOUSEHOLD APPLIANCES AND MISCELLANEOUS MACHINES, NESOI
3353	ELECTRICAL EQUIPMENT
3359	ELECTRICAL EQUIPMENT AND COMPONENTS, NESOI
3361	MOTOR VEHICLES
3362	MOTOR VEHICLE BODIES AND TRAILERS
3363	MOTOR VEHICLE PARTS
3364	AEROSPACE PRODUCTS AND PARTS
3365	RAILROAD ROLLING STOCK
3366	SHIPS AND BOATS
3369	TRANSPORTATION EQUIPMENT, NESOI
3371	HOUSEHOLD AND INSTITUTIONAL FURNITURE AND KITCHEN CABINETS
3372	OFFICE FURNITURE (INCLUDING FIXTURES)
3379	FURNITURE RELATED PRODUCTS, NESOI
3391	MEDICAL EQUIPMENT AND SUPPLIES
3399	MISCELLANEOUS MANUFACTURED COMMODITIES

Table B.8: Outputs with Interactive Dummies
Dependent Variable: PerImp

Variable	2007Q1	2007Q2	2007Q3	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4
Constant	3.695755	6.017494	8.703783	3.061028	-2.490295	-13.10548	-17.07272	-12.38819	11.06209	21.83350	17.42073	16.08725
	(0.2843)	(0.0934)	(0.1035)	(0.4825)	(0.6398)	(0.0136)	(0.0005)	(0.0024)	(0.0206)	(0.0006)	(0.0009)	(0.1023)
Dummy	-11.15088**	-13.57029***	-11.77080*	-10.40281*	-7.758297	3.564212	0.571812	-8.166951	-16.01246**	-8.005685	-8.164914	12.15449
	(0.0143)	(0.0036)	(0.0948)	(0.0816)	(0.3241)	(0.6724)	(0.9417)	(0.1899)	(0.0168)	(0.3340)	(0.2287)	(0.3738)
PerIP	0.299352	0.259173	0.191315	0.497515**	0.788025***	0.532908**	0.179687	-0.276133	0.885811**	0.882445**	0.681105**	0.127222
	(0.2320)	(0.3010)	(0.5808)	(0.0251)	(0.0008)	(0.0153)	(0.3900)	(0.2659)	(0.0173)	(0.0483)	(0.0318)	(0.8838)
PerIP*Dummy	-0.193144	-0.005847	0.357908	-0.076245	-0.367272	-0.005557	0.170692	0.213427	-0.777793**	-0.475071	-0.077169	-0.459099
	(0.4874)	(0.9832)	(0.3705)	(0.7825)	(0.2098)	(0.9852)	(0.5793)	(0.4939)	(0.0488)	(0.3110)	(0.8321)	(0.6355)
Share	16.19396	-33.64331	22.76521	141.2650	-6.293293	-23.70868	-25.09715	-104.2763	-60.03794	63.01252	28.68795	8.905404
	(0.8610)	(0.6718)	(0.8501)	(0.1021)	(0.9424)	(0.7683)	(0.7283)	(0.3077)	(0.7026)	(0.7034)	(0.8071)	(0.9725)
Share*Dummy	102.4881	307.1685**	131.2418	-216.4612	-144.6791	25.12041	152.4463	614.9316***	869.8219***	418.5934	264.3767	-187.5482
	(0.5097)	(0.0446)	(0.5772)	(0.1879)	(0.4723)	(0.9047)	(0.4607)	(0.0042)	(0.0059)	(0.2102)	(0.2722)	(0.6838)
Labor	-0.000120	-0.000273	-0.000326	-0.000162	-1.83E-06	0.000328	0.000442	0.000335	-0.000142	-0.000574	-0.000440	-0.000407
	(0.5690)	(0.1679)	(0.2793)	(0.4750)	(0.9943)	(0.2102)	(0.0748)	(0.1981)	(0.6774)	(0.1514)	(0.1633)	(0.5322)
Labor*Dummy	0.000409	0.000399	0.000299	0.000125	-0.000208	-0.000538	-0.000423	-0.000197	0.000252	0.000560	0.000240	0.000604
	(0.1290)	(0.1170)	(0.4406)	(0.6648)	(0.5359)	(0.1179)	(0.1904)	(0.5565)	(0.5641)	(0.2740)	(0.5524)	(0.4654)
ES	-0.530211	-0.569486	-0.426765	-0.103646	0.109466	0.055981	-0.004922	-0.387574	-0.812463	-0.576889	-0.204691	-0.609561
	(0.1561)	(0.1132)	(0.4499)	(0.8083)	(0.8218)	(0.9099)	(0.9916)	(0.4196)	(0.1744)	(0.4127)	(0.7094)	(0.5923)
ES*Dummy	-0.361631	-0.299813	0.131840	0.923261	0.494171	-0.319319	-0.499163	-0.124140	0.438848	0.564229	1.802103	-0.772177
	(0.6062)	(0.6597)	(0.9012)	(0.2473)	(0.5842)	(0.7306)	(0.5717)	(0.8915)	(0.6967)	(0.6694)	(0.0838)	(0.7183)
R-squared	0.181471	0.253590	0.163542	0.257893	0.288880	0.243787	0.190551	0.195936	0.282514	0.222159	0.261232	0.053788
Adjusted R-squared	0.088221	0.168556	0.068249	0.173349	0.207866	0.157636	0.098336	0.104333	0.200775	0.133544	0.177069	-0.054009
Sum squared resid	9607.346	8797.607	22209.19	12649.19	16209.87	16905.70	14966.21	16337.85	25445.17	35383.76	21577.46	92281.56
F-statistic	1.946068	2.982220	1.716207	3.050398	3.565819	2.829770	2.066366	2.138982	3.456304	2.507012	3.103869	0.498975
Prob(F-statistic)	0.057131	0.004156	0.099023	0.003487	0.000926	0.006153	0.042539	0.035536	0.001226	0.014058	0.003038	0.870994
Mean dependent var	-3.330613	-3.798672	-1.743191	-7.695904	-17.94389	-22.39210	-20.21653	-12.73796	5.362084	21.54413	19.28722	16.27864
Durbin-Watson stat	1.670513	1.478902	1.588880	1.846627	1.906367	1.596658	1.457935	1.698313	1.833100	2.098618	1.690987	1.975188

The table with all the interactive dummies and intercept dummy. PerIP*Dummy, Share*Dummy, Labor*Dummy and ES*Dummy are the interactive dummies with percentage change in industrial production, share of sector, labor intensity and elasticity of substitution, respectively.

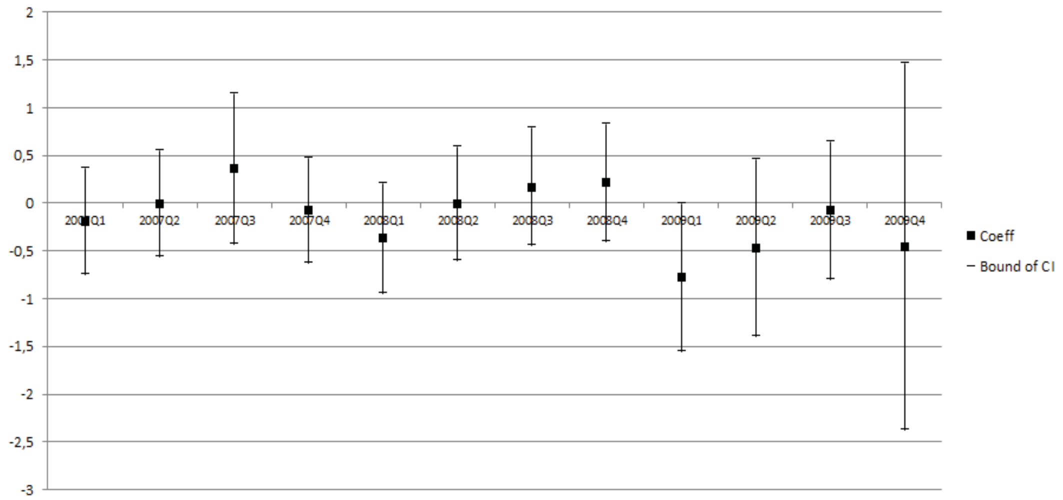

Figure B.3: *Coefficient and Confidence Intervals of Interactive Durable Dummy*

Note that 2007Q1 refers to the regression made in the time period of 2007 quarter 1 and 2008 quarter 1. The others are similar. High and Low values are referring to the boundries of 95 percent confidence interval.

Table B.9: Regression with Price-Adjusted Variables Without Labor Intensity
Dependent Variable: Real PerImp

Variable	with LLT Definition	with new BLS Definition
constant	-8.648595	-9.692829
	0.0205	0.0078
LLTDummy	-4.675772	
	0.1660	
NewDummy		-3.041513
		0.3820
PerIP	0.517424	0.527844
	0.0002	0.0003
Share	-31.84892	-34.28791
	0.6279	0.6042
ES	0.088537	0.100895
	0.8225	0.8000
R-squared	0.234852	0.224197
Adjusted R-squared	0.198416	0.187254
S.E. of regression	14.05927	14.15682
Sum squared resid	16603.69	16834.91
Log likelihood	-358.9646	-359.5801
F-statistic	6.445668	6.068714
Prob(F-statistic)	0.000142	0.000244
Mean dependent var	-22.01675	-22.01675
S.D. dependent var	15.70320	15.70320
Akaike info criterion	8.178981	8.192810
Schwarz criterion	8.318792	8.332621
Hannan-Quinn criter.	8.235334	8.249164
Durbin-Watson stat	1.707345	1.684183

Dependent variable PerImp is referring to the percentage change in US real imports. The numbers in parenthesis are statistical probabilities. LLTDummy is the durable dummy according to the definition of Levchenko, Lewis, Tesar (2010). NewDummy is the newly introduced durable dummy which is based on the BLS durable definition. We do Breusch-Pagan-Godfrey Test and White's Heteroscedasticity Test for these regressions. The results are indicating that there is no heteroscedasticity.

Table B.10: Durable Dummy Values of Rolling Regression Analysis

Time Period	Upper Bound	Coefficient	Lower Bound
2007Q1-2008Q1	-1,5049	-6,5933	-11,6817
2007Q2-2008Q2	-2,3638	-7,3589	-12,3540
2007Q3-2008Q3	-2,0713	-9,4249	-16,7786
2007Q4-2008Q4	-1,5595	-7,0771	-12,5947
2008Q1-2009Q1	3,8795	-2,8684	-9,6163
2008Q2-2009Q2	4,7231	-2,5658	-9,8548
2008Q3-2009Q3	-0,1474	-6,8911	-13,6348
2008Q4-2009Q4	1,1304	-5,8984	-12,9272
2009Q1-2010Q1	3,7850	-4,7411	-13,2672
2009Q2-2010Q2	10,2826	0,6314	-9,0197
2009Q3-2010Q3	9,9765	2,5193	-4,9378
2009Q4-2010Q4	26,1549	10,9474	-4,2602

Upper bound and lower bound values are referring to the upper and lower bounds of 95 percent confidence interval for durable dummy coefficient, respectively. The regression are done with OLS estimation.

Table B.11: Robustness Checks with Random Effect Estimation
Dependent Variable: PerImp
Periods: 3, Cross Sections: 89, Total Obs: 267

Variable	With Rer	With GDP
constant	-0.689366	-1.484854
	(0.6947)	(0.3251)
Dummy	-5.940086***	-6.208814***
	(0.0003)	(0.0001)
PerIP	0.368963***	
	(0.0000)	
GDP		3.993040***
		(0.0000)
Share	40.15850	47.19478
	(0.3661)	(0.2764)
Labor	4.90E-05	0.000114
	(0.5426)	(0.1315)
ES	-0.336958	-0.265707
	(0.1001)	(0.1703)
Rer	-0.572608***	
	(0.0000)	
R-squared	0.313819	0.269269
Adjusted R-squared	0.297984	0.255270
S.E. of regression	15.80808	
Sum squared resid	64972.79	69191.14
F-statistic	19.81810	19.23527
Prob(F-statistic)	0.000000	0.000000
Mean dependent var	-5.304140	-5.304140
S.D. dependent var	18.86712	18.86712
Durbin-Watson stat	2.509772	2.623349

The numbers in parenthesis are statistical probabilities. The estimation has been made with Period SUR (PCSE) standard errors and covariance. The random effect specifications use Swamy and Arora estimators for the component variances.

Table B.12: Random Effects without Share of Sector Variable
Periods: 3, Cross Sections: 89, Total Obs: 267

Variable	Dependent Variable: PerImp
constant	2.441447
	(0.1806)
Dummy	-5.414600***
	(0.0018)
PerIP	0.618896***
	(0.0000)
Labor	2.38E-05
	(0.7599)
ES	-0.283995
	(0.1960)
RelP	-0.419670***
	(0.0030)
R-squared	0.290650
Adjusted R-squared	0.277061
S.E. of regression	16.04192
F-statistic	21.38852
Prob(F-statistic)	0.000000
Mean dependent var	-5.304140
S.D. dependent var	18.86712
Sum squared resid	67166.56
Durbin-Watson stat	2.505842

The numbers in parenthesis are statistical probabilities. The estimation has been made with Period SUR (PCSE) standard errors and covariance. The random effect specifications use Swamy and Arora estimators for the component variances.

Table B.13: Durable Class List for NACE Rev.2

NACE Code	NACE Class
16	Manufacture Of Wood And Cork, Except Furniture
23	Other Non-Metallic Mineral Products
24	Basic Metals
25	Fabricated Metal Products, Except Machinery And Equipment
26	Computer, Electronic And Optical Products
27	Electrical Equipment
28	Machinery And Equipment N.E.C.
29	Motor Vehicles, Trailers And Semi-Trailers
30	Other Transport Equipment
31	Furniture

All the goods of the included NACE classes are accepted as durable or investment goods based on the classification of European Commission. All other classes are accepted as nondurable throughout this thesis.

Table B.14: Random Effect Estimation with All Variables Together
Dependent Variable: PerImp

Variable	PerImp	PerImp	PerImp	PerImp	PerImp	PerImp	PerImp
constant	-2.234901	0.865112	0.561655	0.517341	2.046268	2.396846	-0.689366
	(0.0525)	(0.5273)	(0.6992)	(0.7463)	(0.2640)	(0.1869)	(0.6947)
Dummy	-5.463246***	-5.250550***	-5.268023***	-5.288614***	-5.799566***	-5.359664***	-5.940086***
	(0.0004)	(0.0021)	(0.0020)	(0.0023)	(0.0008)	(0.0019)	(0.0003)
PerIP		0.561749***	0.559010***	0.558577***	0.562686***	0.618363***	0.368963***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share			28.40801	26.76071	36.03097	40.41091	40.15850
			(0.5065)	(0.5724)	(0.4466)	(0.3914)	(0.3661)
Labor				6.44E-06	1.51E-05	-7.04E-06	4.90E-05
				(0.9408)	(0.8600)	(0.9343)	(0.5426)
ES					-0.374155*	-0.303409	-0.336958
					(0.0885)	(0.1677)	(0.1001)
RelP						-0.421398***	
						(0.0030)	
Rer							-0.572608***
							0.0000
R-squared	0.020719	0.251124	0.251937	0.251948	0.257608	0.291949	0.313819
Adjusted R-squared	0.017024	0.245451	0.243404	0.240527	0.243385	0.275610	0.297984
S.E. of regression	18.70583	16.38888	16.41110	16.44227	16.41130	16.05801	15.80808
Sum squared resid	92725.64	70909.18	70832.23	70831.20	70295.29	67043.54	64972.79
F-statistic	5.606778	44.26421	29.52486	22.06073	18.11321	17.86757	19.81810
Prob(F-statistic)	0.018609	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
height							

The numbers in parenthesis are statistical probabilities. The estimation has been made with Period SUR (PCSE) standard errors and covariance. The random effect specifications use Swamy and Arora estimators for the component variances.