THE REAL EXCHANGE RATE and ECONOMIC GROWTH

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ABSTRACT

THE REAL EXCHANGE RATE and ECONOMIC GROWTH

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It is controversial in the literature whether depreciation of real exchange rate is expansionary or contractionary for the economy. The main aim of this thesis is to empirically examine the effect of real exchange rate changes on economic growth. Firstly, the growth effects of real exchange rate changes are investigated using a wide panel data set of countries. To this end, we apply not only the conventional panel data estimation procedures but also panel cointegration and the recent procedures taking into account the possible common correlated effects such as global shocks. Secondly, given the importance of sectoral heterogeneity of the impact of real exchange rates on the response of industrial production of Turkish manufacturing industry, the impact of real exchange rate changes on imports, exports, and production of Turkish manufacturing industry sub-sectors is examined taking into account also some sector-specific characteristics. The results showed that depreciation of the real exchange rate is contractionary for developing countries while real exchange rate changes have not any significant effect for developed countries. Additionally, this contractionary effect for developing economies increases with the degree of liability dollarization. Regarding the results of industry-level analysis, output growth of industries is negatively affected from real depreciations whereas this negative effect is larger for high and medium-high technology sectors. Additionally, this negative effect declines as the export share of the sector increases and it rises as its import dependency increases.

Keywords: Real exchange rate, growth, common correlated effects, Turkish manufacturing industry, sectoral analysis.

ÖZ

REEL DÖVİZ KURU VE EKONOMİK BÜYÜME

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Reel döviz kurundaki değer kaybının ekonomi üzerindeki etkisinin genişletici mi yoksa daraltıcı mı olduğu iktisat yazınının tartışmalı konularındandır. Bu çalışmanın temel amacı, reel kur değişmelerinin ekonomik büyüme üzerindeki etkisini ampirik olarak incelemektir. İlk olarak, reel kur değişmelerinin büyüme üzerindeki etkisi geniş bir ülke panel veri seti kullanılarak incelenmiştir. Bu bağlamda, geleneksel panel veri tahmin yöntemlerinin yanısıra, panel eşbütünleşme ve küresel şoklar gibi ortak bağıntılı etkileri dikkate alan yeni yöntemler kullanılmıştır. İkinci olarak, Türkiye imalat sanayi sektörlerinin üretimlerinin reel kur değişmelerine vereceği tepkinin sektörel bazdaki heterojenliği göz önüne alınarak, reel kur değişmelerinin imalat sanayi ithalat, ihracat ve üretimi üzerindeki etkisi, sektörlere özgü özellikler dikkate alınarak incelenmiştir. Elde edilen bulgular, reel kurdaki değer kaybının gelişmekte olan ülkelerde daraltıcı olduğunu ancak gelişmiş ülkeler için herhangibir etkiye sahip olmadığını göstermiştir. Ek olarak, gelişmekte olan ülkelerdeki bu daraltıcı etki, ülkelerin borç dolarizasyon oranı arttıkça artmaktadır. Sektörel bazdaki sonuçlara ilişkin olarak da, sektörel üretimdeki büyümenin ülke parasının değer kaybetmesinden negatif olarak etkilendiği ve bu negatif etkinin yüksek ve orta-yüksek teknolojili sektörler için daha fazla olduğu bulunmuştur. Ayrıca, reel kurdaki değer kaybının üretim üzerindeki olumsuz etkisi, sektörün ihracat oranı arttıkça azalırken, ithalat bağımlılığı arttıkça artmaktadır.

Anahtar Kelimeler: Reel döviz kuru, büyüme, ortak bağıntılı etkiler, Türkiye imalat sanayi, sektörel analiz

To My Family

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CHAPTER 1

INTRODUCTION

As a key relative price affecting the economy through many channels, the implications of real exchange rate changes for economic growth have become a growing focus of attention in the recent policy debate. One of the main reasons behind the increased attention on the growth effects of real exchange rates is the growth experiences of East-Asian countries which have been assessed as pursuing a successful export-led growth strategy maintaining a competitive and stable exchange rate policy. The other factor is the financial effect of exchange rate movements which mainly operates through private sector balance sheets due to the increased liability dollarization in developing countries. Since this liability dollarization process often generates a currency and maturity mismatch between the debt and revenues of the firms, depreciation of real exchange rate tend to generate losses and thereby declines in economic activity.

According to the standard Mundell-Flemming model, currency depreciation is expansionary through its expenditure switching effects between domestic and foreign goods.[1] However, contrary to the traditional view, New Structuralist School has provided several demand-side and supply-side channels through which devaluations can have adverse effects on output.[2] Severe output losses and economic instability followed by the devaluations in East Asia and Latin America in 1990s have led academics and policy makers to point out balance sheet effects as the mechanism behind the output collapses.[3] When a considerable amount of borrowing of firms is

[1] Under the assumption that Marshall-Lerner conditions are satisifed.

[2] See Diaz-Alejandro (1963), Krugman and Taylor (1978), Bruno (1979), Van Winjbergen (1986), Edwards (1986) among others.

[3] See Frankel (2005), Aghion *et al.* (2001), Calvo *et al.* (2004), Krugman (1999), Gertler, Gilchrist and Natalucci (2007), Devereux and Lane (2003),Calvo and Reinhart (2002).

denominated in foreign currency and aggregate demand is constrained with agents' net worth, real depreciations worsen balance sheets of firms which lead to contractions in investment, output and employment.

Even though there exists a large number of studies which investigate the effect of real exchange rate on economic growth based on cross-country or individual country data, they have generally provided mixed results. One group of studies provide empirical evidence that real exchange rate depreciations tend to be contractionary in developing countries pointing out to the negative balance sheet effect in emerging and developing countries due to the financial dollarization process taking place over the past decades (Cavallo et al, 2002; Cespedes, 2005; Bebczuk et al., 2006; Bleaney and Vargas, 2009; Blecker and Razmi, 2008). On the other hand, the other group, empirically shows that an undervalued real exchange rate fosters economic growth in developing countries. These studies relate the expansionary effect of undervalued exchange rate to various channels such as the development of tradable sector (Rodrik, 2008), and savings and investment (Levy-Yeyati and Sturzenegger, 2007; Gala, 2008; Gluzmann et al., 2012) which any sufficient supportive empirical evidence have not provided yet. These recent empirical attempts on the issue generally show similarity in their empirical methodology and in their real exchange rate measure used. They generally apply GMM methodology to the panel data growth models by using mostly Rodrik (2008)'s Balassa-Samuelson adjusted index of undervaluation. However, the common use of this undervaluation index creates doubt about the impact of this measure on the expansionary effect of undervaluation result that emerges as Woodford (2009) stresses.

In this framework, the first goal of this study is to make an empirical contribution to the cross-country evidence on the relationship between real exchange rate and growth mainly addressing some econometric and empirical issues which we think are important and ignored by the previous studies. Taking into account the time series properties of the variables in the equation which is often neglected by the growth literature, we estimate the long run relationship between real exchange rate and real

GDP per capita for a wide panel data set by differentiating the effects for developed and developing countries. In doing so, we apply not only the conventional panel data estimators but also Pesaran (2006)'s Common Correlated Effects methodology which controls the effects of common global shocks. Since the effect of real exchange rate movements can differ in the short run, we also estimate the short run dynamics by employing a very recent approach of Chudik and Pesaran (2013) which extends the Common Correlated Effects (CCE) approach of Pesaran (2006) to ARDL models. Additionally, in order to check robustness of our results to potential simultaneity and endogeneity issues and compare our results with the results of previous studies, we apply GMM methodology of Arelleno and Bond (1991) and Arellano and Bover (1995).

Despite the large number of studies on the impact of real exchange rate changes on economic growth, they generally consider aggregate country panel data ignoring industry-specific dynamics. However, the reaction of manufacturing industry and its sub-sectors - as the main engine of economic growth - to the changes in real exchange rate is highly crucial for the growth effects of real exchange. The responses of exports and production of manufacturing industry sub-sectors will be highly heterogeneous depending on their different characteristics such as export orientation, import dependency, technology intensity and financial structure. For instance, depreciation of real exchange rate is likely to be contractionary for internationally non-tradable sectors or sectors with high import dependency ratios via trade and balance sheet impacts. The responsiveness of export sectors, on the other hand, are basically determined by their real exchange rate elasticity of exports and degree of liability dollarization. Real exchange rate elasticity of trade tend to decline in sectors with high degrees of intra-industry trade and vertically integrated sectors with high imported input ratios (Jones and Kierzkowski, 2001; Arndt and Huemer, 2004; Kharroubi, 2011). The impact of real exchange rate changes on production and international trade dynamics will also vary with technology intensity and product complexity of industries. These features together determine how exports, imports and production of individual sectors react to the movements of real exchange rate and the relative weights of these industries in total manufacturing industry will determine the response of the whole economy.

Therefore, analyzing how these individual industry characteristics affect the real exchange rate elasticity of production of industries is highly crucial for the decisions of policy-makers. Having knowledge about the factors which are effective on the industry-specific responses to real exchange rate changes, and analyzing the structure of manufacturing industry in these factors together with the relative weights of sub-sectors in total manufacturing industry will provide an important information to policy-makers when they make their exchange rate policies.

There are only a few studies on the impact of real exchange rate movements on industrial production in the literature. Branson and Love (1986) examine the impact of real exchange rate changes on employment and output of U.S. manufacturing industry, while Kandil and Mirzaei (2002) estimate the effect of anticipated and unanticipated exchange rate movements on output of nine U.S. sectors, Agriculture, Construction, Finance, Manufacturing, Mining, Retail Trade, Services, Transportation and Wholesale Trade.[1] Even though there exists a number of studies that empirically examine the impact of real exchange rate movements on sectoral exports and imports of Turkish manufacturing industry, to the best of our knowledge, there is not any study which examines the effect of real exchange rate changes on industrial production.[2] As a related research, Kesriyeli, Özmen and Yiğit (2011) investigate the balance sheet channel in Turkish manufacturing industry, focusing on the investment, profit and sales of 26 non-financial sectors. Filiztekin (2004) explores the impact of exchange rate changes on employment and wages using a panel data of 27 Turkish manufacturing industry sectors.

Given the importance of sectoral heterogeneity of the impact of real exchange rates and the lack of empirical evidence on the response of industrial production of Turkish manufacturing industry, the second part of this study aims to investigate effect of real exchange rate movements on output growth using a disaggregated analysis. As the first step, we analyze the structure and transformation of production, exports and

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[1] A relatively large number of studies focus on the implications of real exchange rate changes on employment such as Campa and Goldberg (2001), Galindo et al. (2007), Alexandre *et al*. (2001).

[2] See Togan and Berument (2007), Saygılı (2010), Saygılı and Saygılı (2011), Aldan *et al*. (2012).

imports of Turkish manufacturing industry since 1990s in terms of characteristics such as intra-industry trade, import dependency, technology intensity, product complexity, revealed comparative advantage, export and import ratios of production and liability dollarization. These are the potential factors that can play role in the exchange rate sensitivity of production and trade. Then, using a panel data set of 22 ISIC 2-digit Turkish manufacturing sectors, we estimate the effect of real exchange rate changes on industrial output growth and analyze how the impact varies with sector-specific factors including trade exposure (namely export orientation and imported-input use), technology intensity and liability dollarization.

This study is organized as follows. In Chapter 2, the literature is reviewed in two main parts. In Section 2.1, theoretical arguments and empirical studies on the effect of real exchange rate on economic growth based on cross-country and individual country data are presented. In Section 2.2, studies that analyze the industry-level effects of real exchange rate changes are reviewed.

In Chapter 3, we empirically analyze the effect of real exchange rate on economic growth using a cross-country panel data growth model. As the first step, we analyze the time series properties of the variables in our growth model by conducting panel unit root and cointegration tests in Section 3.2. Empirical results of the estimations are presented in Section 3.3. Based on the evidence that the variables are integrated of order one and they are cointegrated, we first estimate the long run relationship between real exchange rates and GDP per capita with fixed effects methodology for the whole sample, developing and developed countries samples separately. Since the contractionary devaluation hypothesis mainly emerged for developing countries in which negative balance sheet effects due to the dollarization of liabilities arises, it is important to differentiate the impact of the changes in real exchange rate for developed and developing countries. Then, we estimate the long run equation with Pesaran (2006)'s Common Correlated Effects Pooled Estimator (CCEP) which provides consistent estimates in the presence of cross sectional dependency. Unobserved common shocks which affects all individual units differently cause cross sectional correlation or dependence across the errors of the regression and this cross sectional correlation is especially important for cross-country studies. Estimation results of long run equation by fixed effects and CCEP estimator are presented in Section 3.3.2. Then, in Section 3.3.3., we estimate the short run effects of real exchange rate movements on economic growth by using a panel ARDL-CCEP framework of Chudik and Pesaran (2013) which controls cross-section correlation in dynamic models. Next, as a robustness check of the results against potential simultaneity and endogeneity problem and in order to make comparison with the results of the previous studies, System GMM (Generalized Methods of Moments) estimator introduced by Arellano and Bond (1991), and Arellano and Bover (1995) is considered in section 3.3.4. In the subsequent section, we analyze whether the long run growth effect of real exchange rate differs for East-Asian Countries which have been seen as benefiting from competitive real exchange rates for achieving their high growth rates since 1980s. Lastly, we investigate the effect of liability dollarization and some other factors such as financial development, openness to trade and financial integration by interacting these variables with real exchange rate in long run regressions.

In Chapter 4, we analyze the structure and transformation of Turkish Manufacturing Industry's production, exports and imports since 1990s in order to construct a basis for Chapter 5 in which we empirically estimate the impact of real exchange rate changes on industrial production and trade. In Section 4.1 and 4.2, we first examine the composition of manufacturing production, exports and imports focusing on the shares of 2-digit ISIC manufacturing industry sub-sectors since 1990. Then, we investigate the characteristics of sectors in terms of intra-industry trade, import dependency, technology intensity, product complexity, revealed comparative advantage, export to production and import to supply ratios which are the potential factors that can play role in the exchange rate sensitivity of production and trade. Lastly, we examine the financial structure of industries in terms of liability dollarization in order to analyze the balance sheet effect in industrial basis.

In Chapter 5, we aim to provide a more disaggregated analysis on the growth effects of real exchange rate movements by considering industry-level data. For this purpose, we first document the possible impacts of real exchange rate depreciations on sectors with different characteristics discussing the various channels through which depreciations affect sectoral production, exports and imports in Section 5.2. We also represent the bivariate relationship between real exchange rate and sectoral production. Then, we estimate the effect of real exchange rate changes on industrial output growth and analyze how the impact varies with sector-specific factors including trade exposure (namely export orientation and imported-input use), technology intensity and liability dollarization by employing fixed effects and GMM procedures. To this end, we consider a panel data set of 22 ISIC 2-digit Turkish manufacturing sectors. Lastly, in Section 5.4, we estimate the real exchange rate sensitivity of manufacturing industry exports and imports since the production of industries is highly related with their export and import performances. Finally, the last chapter concludes the study summarizing the findings.

CHAPTER 2

REVIEW OF LITERATURE

2.1. REAL EXCHANGES RATES AND ECONOMIC GROWTH

2.1.1. THEORETICAL ARGUMENTS

According to the conventional Keynesian open economy model, internal balance (full employment and price stability) and external balance (current account compatible with long run capital flows) can be maintained by two types of policies: expenditure-switching and expenditure-reducing policies. Expenditure-switching policies affect the composition of countries' expenditure on tradable and non-tradable goods. Expenditure-reducing policies aim to control aggregate expenditures. The exchange rate is the main instrument of the first type of policies whereas monetary and fiscal policies are used as classical instruments of the second type of policies.

The traditional Mundell (1963)-Fleming (1962) model proposes that an increase in the exchange rate (currency depreciation or devaluation) is expansionary assuming that the Marshall-Lerner conditions are satisfied.[3] Due to this standard textbook model, the depreciation of the exchange rate boosts aggregate demand by encouraging exports and creating a substitution from imports to domestic goods. This "orthodox" view is originated by the money-less Keynesian model of Meade (1951) and it is extended by the monetary approach of Dornbusch (1973, 1986). Based on this orthodox view, it is believed that by stimulating the export sector, real devaluations of the currency help countries to avoid financial crisis and provide sustained growth. Introducing an intertemporal approach to traditional Mundell-Fleming model,

[3] Marshall-Lerner conditions hold if the sum of the absolute values of export and import price elasticities exceed unity.

Obstfeld and Rogoff (1995) provided support for the expansion of aggregate demand due to devaluations. Therefore, the exchange rate has been used in stabilization programs of developing countries under the monitoring of IMF since early 1950s.

There was no serious controversy over the positive effects of devaluation on economic growth until the late 1970s. However, the recessions that took place in some Latin American countries which implement orthodox adjustment programs have raised the possibility that devaluations can be in fact contractionary especially for developing countries. Some "structuralist" economists proposed several theoretical reasons why, contrary to the traditional view, devaluations can be contractionary and generate a decline in economic growth. These authors stressed mainly the negative real balance effects, income distribution effects and supply-side effects of devaluation which are ignored by orthodox view of devaluation.

2.1.1.1. Contractionary Devaluation Hypothesis

Diaz-Alejandro (1963) and Cooper (1971) are among the first who suggest that devaluations can be contractionary for developing countries. The advocators of this contractionary devaluation hypothesis provided some theoretical channels through which real devaluations can negatively affect economic activity. These channels can be divided into three categories: demand side channels, supply side channels and balance sheet channel. The first two channels are the ones which are emphasized by the earliest supporters of contractionary devaluation mechanism. The last one, balance sheet channel, emerged subsequent to the previous two channels stressing mainly the financial effect of real exchange rate depreciation. We can summarize these channels as follows:[4]

a. Demand-side channels:

i. *Distribution of income:*

[4] See Lizondo and Montiel (1988) for a broad analytical review of these theoretical channels.

Leading to higher relative prices for traded goods, devaluation increases profits in export and import competing industries. This increase in the price level leads to a decline in real wages. Since the marginal propensity to save from profits is assumed to be higher from the marginal propensity to save from wages, this transfer of income from workers to profit earners cause aggregate demand to fall (Diaz- Alejandro, 1963; Krugman and Taylor, 1978).

ii. *Reduction of real income*:

The increases in price of traded goods relative to non-traded goods after devaluation will increase the general price level which will cause the real money balances to fall. The eventual impact on real income depends on whether traded goods have a higher share in consumption or in income. The larger the share of traded goods in consumption, the larger the fall in real income so the fall in expenditures (Bruno, 1979; Hanson, 1983). Besides, if there is a trade deficit in the economy, the increase in traded goods prices immediately reduce real income at home and increase it abroad which reduces aggregate demand (Krugman and Taylor, 1978).

iii. *Tax channel*:

If there are ad volarem taxes on exports and imports, since the value of exportable and importable goods increase after a devaluation, tax revenue of the government will increase. This means an income transfer from private sector to the public sector. This will induce a reduction in aggregate demand since the marginal propensity to consume of public sector is lower than the marginal propensity to consume of private sector (Krugman and Taylor, 1978).

iv. *Decrease in investment*:

New investment in developing countries requires imported capital goods. Since a real depreciation will raise the price of capital in terms of domestic goods, new investments will fall leading to a decline in aggregate demand (Branson, 1986; Buffie, 1986).

b. Supply-side Channels:

i. <u>Imported input cost:</u>

When inputs for manufacturing are largely imported and cannot be substituted easily by domestic production, real depreciations will increase the costs of inputs. This negative effect on production due to higher input prices can outweigh the positive effect that result from higher relative prices of traded goods (Bruno, 1979; van Winjbergen, 1986).

ii. <u>Wage indexation</u>:

If nominal wages are indexed to current prices in the economy, such an increase in wages can induce adverse supply effects (van Winjbergen, 1986; Hanson, 1983; Edwards, 1986)

iii. <u>Cost of working capital</u>:

In case of a devaluation, since the real balances will decline, real volume of credit in the market decreases and interest rates tend to rise. This will negatively affect the cost of production and the quantity supplied (van Winjbergen, 1986; Bruno, 1979).

c. Balance Sheet Channel:

Despite those theoretical channels of contractionary devaluations are emphasized by a number of authors, it was believed that the negative effects of a devaluation will be offset by the positive effects of increased exports and the overall effect will turn out to be positive. This was the dominant view before the currency crises of 1990s. After the recessions followed by the devaluations in 1990s, some authors like Frankel (2005) and Calvo and Reinhart (2002) point out the balance sheet effects and assert that the negative effects of the devaluation can be stronger than the positive effects. Frankel (2005) stresses that the balance sheet effect is the dominant reason that explains the recessions following many of the 1990s devaluations rather than the pass through from exchange rate changes to import prices since this coefficient fell in the 1990s (see also Frankel, Parsley and We, 2005).

Foreign currency denominated debt burden of countries was first stressed by Cooper (1971). Van Winjbergen (1986) also pointed out the foreign borrowing of least developed countries when analyzing the contractionary effects of devaluation.[5] After the currency crashes of 1990s, this problem is called as "*financial dollarization*" which is a problem of most of the developing economies. Since emerging markets cannot generally borrow from international markets in their own currency - the so called "*original sin*" by Eichengreen and Hausmann (1999), the residents of developing countries generally borrow in foreign currency. This produces a currency mismatch in the economy as a whole. When firms' assets are denominated in domestic currency and liabilities are denominated in foreign currency, this currency imbalance creates balance sheet problems in the case of sharp real exchange rate depreciations (Krugman, 1999; Calvo and Reinhart, 2000; Frankel, 2005). Aghion, Bacchetta and Banerjee (2001) point out that since there is not a complete pass-through from exchange rates to domestic prices, real depreciations reduce the net worth of domestic firms indebted in foreign currency leading to a decrease in their investment and output.[6] According to Calvo, Izquierdo and Mejia (2004) real depreciations coupled with domestic liability dollarization are the key determinants of probability of experiencing Sudden Stops - large negative reversal of capital inflows - which are indicated as the cause of the crises such as Mexico (1994) and East Asia (1997) experienced. Large amounts of foreign currency debt also constrain the ability of monetary and fiscal policies in dealing with adverse shocks (Jeanne and Zettelmeyer, 2002).

Cespedes, Chang and Velasco (2003, 2004), Gertler, Gilchrist and Natalucci (2007) and Devereux and Lane (2003), among others, have constructed models for small open economies where balance sheets of firms play an explicit role. Cespedes *et al.* (2004) analyze the balance sheet effects using a small open economy model in

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[5] Gylfason and Risager (1984) and Edwards (1986) also stressed the contractionary effects of devaluation in the presence of foreign debt by considering the increase in the value of real interest payments and the reduction in real wealth.

[6] Bernanke and Gertler(1989) and Bernanke, Gertler and Gilchrist (1999) analyze the link between net worth and investment in the context of 'financial accelerator' model.

which liabilities are dollarized and the country risk premium is endogenously determined by domestic net worth. They distinguish between a highly indebted and financially vulnerable economy and lowly indebted and financially robust economy. In a financially robust economy, the balance sheet effect sharply magnifies the effects of foreign disturbances because of the increase in country risk. On the other hand, they point out that the asset side effects of the corporate balance sheets need to be taken into account which operate in the opposite direction of the contractionary liability side. They also mention about the defending role of the flexible exchange rate regimes against real external shocks in the case of financial imperfections and balance sheet effects. Similarly Cespedes *et al.* (2003), utilizing from a IS-LM-BP model, show that negative BS effects dominate competitiveness effect when financial markets are less developed, the ratio of total debt to net worth is high and the share of foreign debt in total debt is high.

2.1.1.2. Productivity and Capital Accumulation (Saving) Effects of Real Exchange Rate

Contractionary devaluation hypothesis have intensively been discussed through its demand side and supply-side channels beginning from 1960s and the balance sheet channel since 1990s. With the successful experiences of East Asian countries like China, India and South Korea in recent years, some additional channels have emerged through which real exchange rate depreciations affect growth positively. The “Productivity” channel and the “Capital Accumulation” channel are the two mechanisms as referred in Montiel and Serven (2008). These channels are also emphasized by some recent studies on the growth effects of real exchange rate.

The productivity channel is not new in the literature but it has drawn interest in recent years.[7] Since learning by doing externalities and technology and skill spillovers are higher and faster in traded goods sector than in non-traded goods sector,

[7] It is also discussed in Dutch Disease literature in 1980s. See van Winjbergen, 1984; Krugman, 1987; Torvik, 2001 among others.

the expansion of traded goods sector will increase productivity and growth (Balassa, 1964; Hahn and Matthews, 1964). Depreciation of the real exchange rate shifts production from non-traded to traded goods therefore contributes to the productivity growth by expanding the tradable sector. Rodrik (2008) proposes that developing countries can achieve higher growth by increasing the profitability of their tradable sector. According to Rodrik (2008), tradable sector is special because it suffers disproportionately from institutional weaknesses and market failures. An undervalued real exchange rate can therefore be used as a second-best policy to reduce these distortions, increase profits in the sector and accelerate growth.

Capital accumulation channel can also be referred as "saving" channel. The depreciated real exchange rates and high saving rates of high growing East Asian countries lead the saving channel to be discussed. In this channel, a real depreciation increase the saving rate, a higher saving rate spurs growth through the increase in the rate of capital accumulation. However, neither theoretical arguments nor the empirical evidence on the positive effect of real exchange rate depreciations on saving rate is convincing yet. Some authors assert different mechanisms from depreciated real exchange rate to higher saving rate.[8] According to Dooley, Folkerts-Landau and Garber (2005), the depreciation of the real exchange rate increases saving rate because a real depreciation shifts demand from traded goods to non-traded goods which requires an increase in interest rates to maintain internal balance. This increase in interest rates leads to higher saving rates. Levy-Yeyati and Sturzengger (2007) argue that a competitive real exchange rate reduces real wages and transfers income from workers to profit-earners. Since the marginal propensity to save (MPS) of profit earners is greater than the MPS of workers, this leads to an increase in the saving rate. This saving channel was believed to be contractionary by Diaz-Alejandro (1963) due to the negative effect on consumers and decline in domestic demand. However, due to Levy-Yeyati and Sturzenegger (2007), this saving channel is expansionary since higher savings relax the financial constraint on firms with foreign currency liabilities.

[8] However, according to Bernanke (2005), causation runs from a high saving rate to a depreciated real exchange rate.

Finally, Montiel and Serven (2008) examine the role of savings in the real exchange rate and growth relationship both by analyzing international experiences of countries and by a theoretical model. Since the real exchange rate and saving rate are both positively correlated with level of per capita income, when they controlled for income per capita, they do not find a robust correlation between depreciated real exchange rate and higher saving rate. So, they conclude that saving does not provide a mechanism through which the real exchange rate affects growth.

2.1.2. INDIVIDUAL COUNTRY or TIME-SERIES STUDIES

Although contractionary effects of real devaluations have been discussed theoretically in late 1960s, its empirical investigation has begun only after the 1997 East Asian and 1994 Mexico crises. Therefore, some studies conducted time series analysis mostly focusing on Asian countries and some Latin American countries like Mexico and Chile.

Upadhyaya and Upadhyay (1999) examine the effects of devaluation on output for six Asian countries, India, Pakistan, Sri Lanka, Malaysia, Thailand and Philippines. They employed a reduced model for output consisting of government consumption, money supply and terms of trade as the explanatory variables. Their results show that for almost all countries devaluation does not have any significant positive effect on output growth either in the short run, medium run or long run. One exception is Philippines for which real devaluation has expansionary effects in short and medium term. Similarly, Bahmani-Oskooee, Chomsisengphet and Kandil (2002) investigate short run and long run response of real output to real devaluations in Indonesia, Korea, Malaysia, Philippines and Thailand. Conducting a cointegration and error correction approach, they examine the short run and long run dynamics of output in these five Asian economies. Their models provide mixed results as real depreciations are found to be contractionary for Indonesia and Malaysia in the long run, while they are expansionary for Philippines and Thailand. Korea’s real output does not significantly respond to real exchange rate. Kim and Ying (2007) compare the effects of currency devaluations in seven East Asian countries, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand, along with two Latin American countries, Mexico and Chile. They conduct both bivariate Granger Causality analysis and a multivariate Vector Autoregressive Regression (VAR) Model. In order to account for the structural break in the series due to 1997 financial crises, they distinguished pre-1997 period in their analysis. Their results show differences according to the period used. In pre-1997 period, devaluation is not contractionary for East Asian countries while it is strongly contractionary for Mexico and Chile. However, for the whole period, devaluation is contractionary for Latin American countries but also for some East Asian countries like Malaysia, Indonesia and Philippines.

Real devaluations are observed to be associated with economic contractions whereas real appreciations are followed by expansions in Mexico over the past decades. Kamin and Rogers (2000) examine whether this negative correlation between real depreciations and real output is robust empirically when some possible factors such as reverse causation, spurious correlation with third factors and temporary contractionary effects of devaluation are controlled for. Using a Granger Causality analysis and a VAR model, they conclude that even after accounting for spurious correlation and reverse causation, devaluation of the real exchange rate is inflationary and leads to the contraction of output in Mexico.

Bahmani-Oskooee and Kandil (2008) evaluate the effects of exchange rate depreciation on output growth for a sample of fourteen MENA countries. By applying cointegration and error correction modeling, they differentiated the growth effects of deprecation in the short run and long run. They also distinguish the anticipated and unanticipated components of real exchange rate. Their results indicate that anticipated depreciation is expansionary for Bahrain, Oman, Saudi Arabia, Syria and Tunisia but contractionary for Lebanon and Libya in the long run. Unanticipated depreciation has no expansionary effect in the long run while it is only evident in the short run. In contrast, it has a contractionary effect in Jordan, Kuwait and Qatar in the long run.

There are only a few studies which examine the effect of real exchange rates on output in Turkey. Berument and Paşaoğulları (2003), conducting a VAR analysis consisting the variables of U.S. interest rate, the real exchange rate, government size, inflation, output, capital account and current account, conclude that devaluation has a negative and permanent effect on output and it is also inflationary in Turkey. With similar empirical methods, Ardıç (2006) shows that real exchange rate shocks are important in real output variations and real depreciation leads to contraction of the output in Turkey. Domaç (1997) examines the effect of real devaluations in Turkey for 1960-1990 period by distinguishing the growth effects of anticipated and unanticipated devaluations. He estimated an empirical model for real output growth which is a function of money supply, real government spending, real exchange rate and the real energy price. The results suggest that unanticipated devaluations have a positive impact on real economic activity, while anticipated devaluations do not have a significant effect on output.

Some earlier studies estimated the real exchange rate elasticity of exports and imports in Turkey. These studies generally provided mixed results. Some authors support the traditional view that real exchange rate depreciations expand exports and decline imports therefore provides an improvement in the trade balance. Akbostancı (2004) estimates the effect of real exchange rate changes on Turkey's trade balance by utilizing from a vector error correction model (VECM). According to her results, real exchange rate is the main factor influencing the trade balance. The author also suggests that trade balance improves in response to real exchange rate depreciations in the long run while the results do not support J-curve hypothesis in the short run. Neyaptı *et al.* (2007) estimates export and import functions in order to investigate the effect of Customs Union (CU) on Turkey's trade. They show that real depreciations are positively correlated with exports and negatively correlated with imports as traditional theory predicts. Their results also indicate that the effect of real exchange rate on export to European Union countries is stronger after the CU whereas real exchange rate changes are no longer a significant determinant of imports after CU agreement. According to Togan and Berument (2007) exports and imports give traditional responses to real exchange rate changes and the Marshall-Lerner conditions hold as the absolute values of the elasticity of exports and imports sum up to more than unity. Since these elasticities may not be constant over time, Aydın *et* *al.* (2007) estimated the export supply and export demand functions by Kalman Filter approach which allows the coefficients to vary over time. They show that the elasticity of export supply and demand is not constant over time but rather changes significantly. The responsiveness of export supply and export demand to the changes in real exchange rate decreased significantly during 1987-2006 period. Coşar (2002) supports the results of Aydın *et al.* (2007) by estimating the export equation via panel cointegration technique. Using the bilateral trade flows of Turkey with six trade partners, he concludes that Turkish exports can be mainly explained by foreign income changes rather than the real exchange rate changes since the real exchange rate elasticity of exports is much lower than the foreign demand elasticity. Aydın, Çıplak and Yücel (2004) estimate the export and import demand functions of Turkey by using cointegration and VAR modeling. They show that real exchange rate is a significant determinant of imports whereas not of exports. Exports are mainly determined by unit labor costs, export prices and national income.

Contrary to the predictions of traditional theory, Şahinbeyoğlu and Ulaşan (1999) and Aydın et al. (2004) provide evidence of positive elasticity of exports to the changes in real effective exchange rates in the long run. Observing the notable increase in export performance between 2001 and 2003 despite high real appreciation of TL, Aydın et al. (2004) examined the export dynamics in Turkey. By using error correction and structural VAR modeling, they show that the appreciation of real exchange rate affect exports positively in Turkey. They explained this result with the strong dependence of production on imported intermediate goods.

2.1.3. CROSS-COUNTRY PANEL STUDIES

The earliest empirical studies which investigate the effects of real devaluations on economic growth generally focused on a number of devaluation episodes. Since these studies examine the position of some macroeconomic variables of countries before and after these devaluation episodes, this empirical approach is referred to as "Before-After Approach". Cooper (1971) is possibly the earliest study that examines the effect of devaluation on output empirically. He analyzes 24 devaluation episodes in 19 different countries in the 1959 – 1966 period and shows that devaluations are contractionary in the short run in most of the cases. After Cooper (1971), Edwards (1986) examined the behavior of real output, growth and investment three years before and after 30 devaluation episodes occurred in 22 developing countries. His analysis provided mixed results observing a contraction in the period following the devaluation in only one third to one half of the episodes. One problem with this study was that it was unclear whether the reduction in output is due to devaluation or to changes in other exogenous variables. Edwards (1986) extends his study dealing with this problem. He set up a reduced form equation for output controlling for the effects of fiscal policy, monetary policy and foreign shocks. Using a pooled data of 12 developing countries, he confirms that devaluation is contractionary in the short run while it is neutral in the long run since the contemporaneous and lagged effects of real exchange rate cancel each out.

Agenor (1991) analyzes the effect of real exchange rate changes on output for a group of 23 countries over the period 1978-87. His empirical analysis is based on an output equation explicitly derived from a rational expectations macro-model with imported intermediate goods. He distinguishes the effects of anticipated and unanticipated effects of real depreciations. By applying fixed effects estimation technique to his panel data sample, he provides evidence that an anticipated depreciation of RER has a negative impact on output, while an unanticipated depreciation has a positive effect. Contrary to the results of Edwards (1986), the contractionary effect of unanticipated depreciation remains significant even after a year. That is, he proposes that depreciation is not neutral but continue to be contractionary in the medium to long run. Regarding the differences in the estimation results with Edwards (1986), Agenor (1991) emphasizes the importance of appropriate specification of the output equation and the adequate definition of the real exchange rate. He prefers to use multilateral (effective) real exchange rates instead of bilateral real exchange rates which Edwards (1986) used.

Morley (1992) conducts a cross-section study on the effect of real devaluations on capacity utilization during stabilization programs in least developed countries. He shows that devaluations reduce output, but it takes at least 2 years to have the full effect. Moreover, by checking the change in the share of private and total consumption and fixed investment in GDP, he shows that the recessions due to devaluations are not caused by a rise in saving, but instead by a sharp fall in investment.

After these earliest empirical studies, some studies such as Kamin and Klau (1997) and Magendzo (2002) stress some shortcomings of these studies and by adopting different empirical approaches they show the contractionary devaluation findings of the prior studies may in fact not be so robust. Kamin and Klau (1997) provide a comprehensive study on the output effects of real exchange rates pointing out some limitations of previous studies. They stress the importance of clear distinction of short run and long run effects of real exchange rate depreciations with the possibility that the contractionary effects of real depreciations can vanish through time and they can be expansionary in the long run.[9] They also control for the spurious correlation and reverse causation problem by adding some control variables to the model and applying Two Stage Least Squares (TSLS) procedure. Additionally, they differentiate the effects of depreciation in Latin American and East Asian countries since these two regions have drawn attention with their different exchange rate policies. Most of the Latin American countries have resisted to devaluation whereas many Asian countries have kept their exchange rates competitive in order to increase their exports.[10] They also include industrial countries into the analysis which are thought to exhibit conventional expansionary devaluation hypothesis. To this end, they estimate error correction models for a panel data sample of 27 countries which is comprised of 6 Latin American, 6 Asian and 13 industrial countries. Their results are as follows: real depreciations are neither expansionary nor contractionary in the long run since they failed to find statistically significant coefficients on the long run terms. The

[9] The previous cross-country studies Edwards (1986) and Agenor (1991) test the long run effects by summing the coefficients of a few lags of the exchange rate variable.

[10] See Sachs (1985) and Dollar (1992) for a detailed analysis.

devaluations are contractionary in the short run but the effect vanishes significantly when spurious correlation and reverse causation is controlled for. Depreciation of the real exchange rate is not more contractionary in Latin American countries than Asian or industrial countries. The results also do not support expansionary devaluations for industrial countries.

According to Magendzo (2002), the reason behind the contractionary devaluation findings of previous studies is "*selection bias*". He argues that some variables that affect the likelihood of a devaluation also determine the output growth. He controlled for selection bias by using Matching Estimator method for large dataset of 155 countries for the period of 1970-1999 which consists 264 devaluation episodes. The idea behind the matching estimators is to compare similar countries that are devalued and not devalued. When the selection bias is not accounted for, the author finds out that devaluations are contractionary. However, when the selection bias is controlled for, his findings show that the contractionary effect of devaluations vanishes and it has no significant effect on output growth.

Ahmed, Gust, Kamin and Huntley (2003) investigate whether the devaluations under fixed exchange rate regimes and depreciations under floating exchange rate regimes are similarly destructive for the economy. Developing countries generally have to abandon their pegged exchange rate regime in case of devaluation since governments run out of their reserves. This abandonment of exchange rate policy leads to a decline in the confidence of investors, a sharp capital outflow and economic contraction. Therefore, it is not clear whether devaluation itself have led to adverse outcomes, or rather the abandonment of pegged exchange rate regimes after devaluations. The negative consequences of devaluation under pegged exchange rate regimes may not be observed in case of normal depreciations under floating exchange rate regimes. For this purpose, Ahmed *et al.* (2003) estimate VAR models to compare the responses to devaluation of developing economies which consist of Latin American and East Asian countries that are altered between fixed and floating exchange rate regimes and two types of industrial economies those that have consistently floated, and those that have sustained fixed exchange rate regimes as well.

They find that both types of industrial countries show expansionary responses to devaluation shocks whereas devaluations are contractionary for developing countries. They interpret their results as the contractionary effects of devaluation cannot be solely attributed to the exchange rate regimes. Some structures of developing countries lead devaluations to have non-conventional contractionary effects on the economy.

2.1.3.1. Cross-country studies on Balance Sheet Effect

As already reviewed in the previous parts, a number of studies analyzed theoretically the balance sheet effects of depreciation due to the dollarization of countries' liabilities by the help of various open economy macro-models. Despite the bulk of theoretical studies on the balance sheet channel of contractionary devaluation, the number of cross-country empirical studies is relatively scarce. Some studies analyze the devaluation and crisis episodes in order to assess the evolution of real exchange rate and output. Since several currency crises in emerging markets are associated with large real depreciations, Cavallo, Kisselev, Perri and Roubini (2002) focus on the 23 crises episodes in 1990s. Investigating the empirical relation between net debt, exchange rate overshooting and output contraction, they show that countries with more foreign debt, the magnitude of the overshooting increases during crisis.[11] Moreover, their results support the view that the severity of a country's post-crisis output contraction depends on balance sheet effects. The more depreciation a country experiences and the heavier its debt burden, the deeper its post-crisis output contraction will be.

Cespedes (2005) analyzes 82 large devaluation episodes for a set of middle income and developed countries during the period of 1980-2001. He interacts real exchange rate with external debt to capture balance sheet effects. His findings support that balance sheet effect has a significant negative effect on output, while there is also

[11] They define fundamental depreciation as the percent deviation of the equilibrium REER from the observed pre-crisis real effective exchange rate. Overshooting is the additional depreciation above and beyond fundamental depreciation.

a positive effect of real devaluation due to the competitiveness effect. Since this expansionary effect is less significant in the first year after the devaluation, for countries with large foreign-denominated external debt, the real exchange rate depreciation is likely to generate significant output losses in the short-run. However, the competitiveness effect becomes a significant determinant of output growth in the second year. Therefore, in the medium term, the expansionary effect of the real devaluation tends to dominate the balance sheet effect, which implies a positive effect on output in the medium term. He also finds that the countries with deeper financial markets experience lower output losses after a devaluation.

A few studies examine the balance sheet effect of real depreciations using cross-country panel data methods. By incorporating interaction terms to their panel data growth model, Bebczuk, Galindo and Panizza (2006) evaluate whether foreign currency denominated debt is important for the effect of real depreciation on GDP growth. Based on a sample of 57 countries (35 developing, 22 industrial) for the period of 1976-2003, they find that in countries with no dollarization, a 20 percent real devaluation increases per capita GDP growth by approximately half of a percentage point. As dollarization increases, the expansionary effect of devaluations diminishes. When the dollar denominated external debt exceeds 84 percent of GDP, devaluations become contractionary. Similarly, Bleaney and Vargas (2009) analyze the relationship between net capital inflows, real exchange rate movements and growth for twenty emerging markets and twelve developed countries over the period 1985–2004. In order to examine valuation effects that arise from foreign indebtedness, they constructed a debt-weighted real exchange rate. Their results show that real exchange rate depreciations tend to be contractionary in emerging markets, whereas they are expansionary in developed countries and this finding is not only valid for crisis periods. They also point out that the debt-weighted real effective exchange rate rather than the trade-weighted one is associated with the contractionary devaluation hypothesis which indicates that it is the result of valuation effects on foreign debt. Blecker and Razmi (2008) test the twin hypotheses-Fallacy of Composition (FOC) and Contractionary Devaluation empirically, utilizing from a data of 18 developing countries and 10 industrialized countries covering the years 1983–2004.[12] They choose all major developing countries for which manufactures constitute more than 70% of total exports as of 2000. Their results suggest that real depreciations for these developing countries relative to the industrial countries are contractionary. Moreover, contractionary effects are stronger in the subsample of countries with high external debt burdens than for the less indebted countries.

2.1.3.2. Recent Studies on the Impact of Real Exchange Rates

Over the past several decades, some developing countries such as South Korea, Taiwan, Hong Kong, Singapore and China have been performing high growth rates by promoting their manufactured exports. Their export-led growth strategy based on stable and cheap currency policy has drawn the attention of policy-makers and it has begun to be discussed again that maintaining a competitive or undervalued real exchange rate can foster economic growth. Beginning with Rodrik (2008), some other authors argued that developing countries can achieve high and sustainable growth rates such as these East-Asian countries by pursuing an undervalued currency policy.

Rodrik (2008) provides empirical evidence for the positive growth effects of real exchange rate undervaluation for a panel data sample of 184 countries. The distinguishing feature of Rodrik (2008) from previous studies analyzing the growth effects of real exchange rates is his **undervaluation index** used as the real exchange rate measure. In his undervaluation index, he adjusts the PPP-based real exchange rate measure with Balassa-Samuelson effect. According to Balassa (1964) and Samuelson (1964), since the productivity in traded goods will be greater in developed countries, the non-traded goods will be more expensive in developed countries than in developing countries. Then the real exchange rate is expected to be lower in developed countries. Based on this argument, Rodrik (2008) corrects for the Balassa- Samuelson effect by

[12] Fallacy of composition (FOC) hypothesis is as follows: a reduction in the relative price of one developing country's exports (i.e., a real depreciation) with respect to competing developing nations' exports has a positive effect on that country's growth rate but a negative effect on the growth rate of its competitors (in the short run).

regressing the real exchange rate on a variable related to the degree of development of each country (typically, real GDP per capita) and then defines undervaluation as the difference between the observed and the predicted real exchange rate.[13] Using this Balassa-Samuelson adjusted index of undervaluation, Rodrik (2008) estimates panel data growth models for developing and developed countries by adopting Fixed Effects (FE) and Generalized Method of Moments (GMM) estimators. His results show that undervaluation of currency stimulates economic growth especially for developing countries. He argues that the main mechanism behind this result is the tradable sector that, by increasing the profitability of the tradable sector which suffers disproportionately from the institutional weaknesses and market failures, undervaluation of the real exchange rate facilitates economic growth in developing countries. Woodford (2009) heavily criticizes Rodrik (2008) mainly due to his undervaluation index, as the use of this index exaggerates the strength and the robustness of the effect of real exchange rate on growth. According to Woodford (2009), there is no need to adjust for the B-S effect because the panel growth regression of Rodrik (2008) already includes country fixed effects which accounts for the differences in the real exchange rate levels of countries due to the per capita income differences. Woodford (2009) also criticizes the definition of developing countries of Rodrik (2008). Rodrik (2008) defined developing countries as the ones which have per capita income lower than $6000. Woodford (2009) shows that as one changes the definition of developing countries to the ones with per capita GDP lower than $8000, the coefficient of undervaluation reduces by one-third. Moreover, the coefficient reduces to one-half and becomes insignificant when lowest income countries (countries with per capita income lower than $1000) are excluded from the sample of developing countries.

Despite the criticisms on Rodrik (2008)'s undervaluation index, some recent studies such as Gala (2008), Di Nino, Eichengreen, and Sbracia (2011), Rapetti, Scott and Razmi (2012) and Nouira and Sekkat (2012), Gluzmann, Levy-Yeyati and

[13] In fact, Rodrik (2008) is not the first that uses this undervalaution index. Dollar (1992) used this index as a measure of real exchange rate distortion in his study which examines the effects of outward orientation on growth.

Sturzenegger (2012) conduct panel data analysis based on this undervaluation index. Mostly focusing on the theoretical channels through which real exchange rate levels can affect economic development, Gala (2008) finds a positive correlation between real exchange rate undervaluation and growth for a panel of 58 developing countries for the period 1960–1999. Gluzmann, Levy-Yeyati and Sturzenegger (2012) explore the effect of undervalued currency on different components of GDP such as consumption, investment, saving, exports, imports and employment in order to determine the channels of this effect. They show that, for developing countries, undervaluation does not seem to affect the tradable sector by promoting exports or creating a substitution from imports but instead leads to greater domestic savings and investment, as well as employment. Di Nino, Eichengreen, and Sbracia (2011) extended Rodrik's study by using a more recent Penn World Tables (PWT) dataset, by extending the time span which goes back to 1861 and by using alternative real exchange rate measures such as the WPI and CPI-based measures of PWT dataset. Their results verify the results of Rodrik (2008). Rapetti, Scott and Razmi (2012) modify the study of Rodrik (2008) by changing the definition of developing and developed country samples. They show that his finding is sensitive to the criterion used to divide the sample between developed and developing countries. Rodrik (2008) classifies developing (developed) countries as those with a real GDP per capita of less (more) than \$6000. If the cut-off point is selected from anywhere between \$9000 and \$15.000, the estimated coefficient becomes highly significant for developed countries as well. This suggests that the asymmetry between developed and developing countries may depend critically on the choice of the GDP per capita cut-off.

There are also some other studies which provide empirical support to the conventional effects of real exchange rate depreciation. Levy-Yeyati and Sturzenegger (2007) examine the evolution of the exchange rate regimes in recent years and point out that there is a tendency to intervene to depreciate local currency which they called as "fear of appreciation".[14] Showing that these interventions

[14] Calvo and Reinhart (2002) defined the de facto exchange rate intervention in officially floating regimes as "fear of floating" which is in fact used as the fear of depreciation in financially dollarized economies. This concept is the inverse of "fear of appreciation".

managed to preserve a depreciated real exchange rate, they provide empirical evidence that this fear of appreciation leads to higher output and productivity growth which is not only restricted to short term cyclical changes but also leads to higher long term GDP growth. They also investigate the potential channels through which this effect works and showed that this positive effect of fear of appreciation comes from increased domestic savings and investment rather than export-led expansions or import substitution. This saving channel was believed as contractionary by Diaz-Alejandro (1963) due to the negative effect on consumers and decline in domestic demand. Levy-Yeyati and Sturzenegger (2007) stress the financial constraint that firms with foreign currency liabilities are faced in case of a devaluation and combining this modern view with Alejandro (1963)' s story, they claim that real devaluations should be expansionary. Because in this modern view, real devaluation relaxes the borrowing constraints binding firms by the means of saving channel.

2.1.4. REAL EXCHANGE RATE MISALIGNMENTS AND GROWTH

There is a body of literature which is interested on the impacts of real exchange rate misalignments on economic performance rather than the real exchange rate itself. This literature has become popular at the beginning of 1990s. It argues that keeping the real exchange rate at wrong levels may create distortions on the economy. The real exchange rate misalignment is defined as the deviations of the real exchange rate from its equilibrium level. Three different ways have generally used to measure RER misalignments. The first one is *PPP-based measures of misalignment*. It uses the deviations of the RER with respect to parity in some determined equilibrium year. The undervaluation measure of real exchange rate used by Rodrik (2008) and other authors mentioned in the previous section is in fact a modified version of PPP-based misalignment measure. The second measure of misalignment is based on the difference between black market and official exchange rates and called as *black market premium*. It is a proxy that captures better the degree of foreign exchange controls and may not be capturing misalignments due to increasing international financial integration. The third one is *model-based or fundamentals-based measures of RER misalignment*. In this approach, the RER misalignment is calculated as the deviation of the actual RER from some equilibrium path of the RER. In the fundamental-based approach, a long run relationship is estimated between the real exchange rate and its fundamentals such as net foreign assets, relative productivity differentials, and the terms of trade etc., as Edwards (1989) exposed.

Cottani, Cavallo and Khan (1990) and Ghura and Grennes (1993) were among the first which emphasized the negative impacts of real exchange rate misalignments on economic performance by using these different measures of RER misalignments. According to Razin and Colins (1997) misalignments can have very different effects on growth depending on whether it represents overvaluation and undervaluation. To this aim, they differentiate positive and negative misalignments and their findings show that overvaluation have a negative and significant effect on growth while there is not a significant relationship between undervaluation and growth. When they divide the overvaluation and undervaluation into low, medium, high and very high categories, their results indicate that only very high overvaluations have negative effect on growth, while moderate to high (not very high) undervaluation promote economic growth. Similarly, Aguirre and Calderon (2005) estimate the growth effects of currency misalignments based on model-based misalignment measures for a panel data sample of 60 countries. Using dynamic panel data techniques, they find that RER misalignments hinder growth but the effect is non-linear: the growth effect is more negative, the larger the size of the RER overvaluation. On the other hand, they also show that growth effect is positive for small undervaluations (up to 12 percent) and negative for larger undervaluations (see also Berg and Miao, 2010, Gala and Lucinda, 2006, and Macdonald and Vieira, 2010). Bereau, Villavicencio and Mignon (2009) and Couharde and Sallenave (2013) show the nonlinear effects of misalignments using nonlinear panel data techniques such as Panel Smooth Transition Regressions. Their findings are in line with Aguirre and Calderon (2005). These studies generally applied fixed effects and GMM methodologies in estimating the effects of currency misalignments on growth. The stationary property of the variables they used in the equations is mostly ignored. Nouira and Sekkat (2012) conduct panel cointegration estimates besides GMM estimates in order to deal with nonstationarity of the variables of interest. Differently from other studies, his estimation results show that currency misalignments have not any statistically significant effect on growth. That is, they fail to support the view that real exchange rate misalignments are detrimental for economic growth.

2.2. REAL EXCHANGE RATE AND INDUSTRY-LEVEL PERFORMANCE

2.2.1. Real Exchange Rate, Industrial Production, Employment and Growth

According to the trade channel that standard Mundell-Flemming model suggests, assuming that the Marshall-Lerner condition holds and the expansion in exporter sectors is greater than the contraction in non-exporter sectors, depreciation of the real exchange rate positively affects trade and production. The expansionary effect of real exchange rate depreciations depends on the hypothesis that real devaluations shift the resources from non-tradable sectors to tradable sectors which have higher productivity and therefore increase export and economic growth. In the context of this trade channel, expansionary effect of real depreciations are positively correlated with countries' openness to foreign trade, relative weight of tradable sectors in the economy and ratio of the domestic (not imported) input in the production (Calvo *et al.*, 2004; Frankel, 2005). Rodrik (2008) proposes that, for developing countries, depreciations increase the profitability of tradable sectors which are affected relatively more from market failures and thereby accelerate economic growth. Tornell and Westermann (2005) show that the effect of real exchange rate can be different in tradable and non-tradable sectors depending on their financial constraints and open positions in exchange rate.

Despite the arguments that sector-specific responses to real exchange rates have important implications for the response of the whole economy, there exist only a few studies that empirically examine the response of sectoral output or production to real exchange rate changes. Branson and Love (1986), one of the earliest empirical studies on the sectoral effects of real exchange rates, examine the impact of real exchange rate movements on employment and output of U. S. manufacturing industry for the period of 1963-1985. They construct a reduced model for employment and output from a simple supply and demand model which consists of 3 sectors: exportables, import-competing goods and non-tradable good sector. Based on 2-digit, 3-digit and 4-digit ISIC manufacturing industries, they conclude that exchange rate movements have had important effects on the U.S. manufacturing sector. The largest losses in employment and output due to the appreciation of the dollar are seen in durable goods sector including primary metals, fabricated metal products, and non-electrical machinery. It also has negative effect on stone, clay and glass products, transportation, instruments, textiles and apparel, chemicals, rubber and leather goods. Similarly, Revenga (1992) estimates the effect of real exchange rate changes on U. S. manufacturing sector employment of 38 3-digit and 4-digit SIC manufacturing industries mostly focusing on the import competition of sectors. She provides empirical evidence that appreciation of the dollar between 1980 and 1985 reduce employment on average by 4.5 to 7.5 percentage points. She also states that the higher the import share of an industry, the more the dollar appreciation damages domestic labor market.

Kandil and Mirzaei (2002), on the other hand, decomposing the movement of the exchange rate into anticipated and unanticipated components, estimate output and price equations for nine U.S. sectors: Agriculture, Construction, Finance, Manufacturing, Mining, Retail Trade, Services, Transportation and Wholesale Trade. They argue that the expansionary and contractionary effects of the dollar appreciation on industrial real output growth offset each other since the changes in real exchange rate have not any statistically significant effect in all sectors. However, unanticipated depreciation of the dollar negatively affects the real output growth in Wholesale Trade, while unanticipated dollar appreciation decreases Finance real output growth significantly. Using the same theoretical model, Kandil, Berument and Dinçer (2007) examine the effect of real exchange rate fluctutations on aggregate real output and price level of Turkey. They show that anticipated appreciation of exchange rate negatively affects output growth whereas unanticipated changes has asymmetric effects. The effect of unanticipated depreciation is more important than the effects of unanticipated appreciation where unanticipated depreciation decrease real output growth through the cost of imported goods.

Another related research has focused on the implications of real exchange rate movements for labor markets, specifically employment and wages, emphasizing different channels through which the changes in exchange rates bring about these effects. Campa and Goldberg (1993) mainly focus on the role of export sales and imported input ratio in production on the linkage between exchange rates and investment. Constructing the Index of Effective Exposure (IEE)-difference between export exposure and imported input exposure- for 2-digit U.S. manufacturing industries, they show that most of the U.S manufacturing industries evolved from being net exporters in 1970s to being net importers in 1980s due to the increase in the imported inputs. Consistent with the pattern in their trade exposure, their estimation results indicate that exchange rate appreciations reduce investment in 1970s and stimulate investment after 1983 in durable goods sector. In contrast, in nondurable goods sectors, appreciations did not have a statistically significant effect since these sectors tend to absorb exchange rate changes into price over cost markups. Similarly, Campa and Goldberg (2001) estimate the link between real exchange rate movements, employment and wages in U.S. manufacturing sectors by identifying 3 distinct channels: exports, import competition and imported inputs. However, using again only two channels, exports and imported inputs for identification issues, they provide evidence that especially in industries with low price-over-cost markups, the depreciation of dollar increases wages and this affect magnifies with export orientation and declines with imported input use of the industry. Also, they suggest that the effects of a permanent exchange rate change on industry employment are smaller and less significant than the wage effects. As one of the industry-level studies that examine the impact of real exchange rate changes on employment, Alaxandre *et al.* (2011) analyze how the degree of openness to trade and technology level affect the response of employment and job creation in 20 Portugese manufacturing sectors.[15] Their estimates suggest that highly open low-technology sectors are the most affected sectors from the movements of real exchange rate, whereas less open high-technology sectors are generally insensitive sectors to exchange rate changes.

There are also a number of recent studies which focus on these trade-related channels of Campa and Goldberg (2001) using firm-level data. Ekholm, Moxnes and Ulltveit-Moe (2012) investigate the impact of a change in international competitive pressure due to a real appreciation on industrial employment, production, investment, and productivity using Norwegian manufacturing firm data. Using Differences in Differences and the Seemingly Unrelated Regressions (SURE) methodology, they find that real appreciation has a positive effect on output and labor productivity for firms with high net exposure (export exposure less import input exposure). Their estimates indicate that the positive impact of the RER shock is greater, the larger the share of the firm's export sales and the smaller the share of its intermediates imported. On the other hand, output declines in sectors with high import penetration whereas labor productivity is not affected. Also, increased competitive pressure due to real appreciation led to reduced employment among export-oriented firms as well as import-competing firms. Similarly, Nucci and Pozzolo (2010) analyze the effect of exchange rate movements on employment of Italian firms. They document a statistically significant effect of exchange rate variations on employment, hours worked and wages depending on firms' exposure to foreign sales and their reliance on imported inputs.

Besides these trade-related channels, some other lines of research have analyzed the impact of real exchange rate movements on the real economy focusing on the role of liability dollarization. Traditional expansionary devaluation hypothesis that emphasize the trade channel does not mainly take the financial channel- balance sheet effect- into account. According to the advocators of this channel (Aghion *et al.*,

[15] Technology level is used as the indicator of productivity considering that high-technology sectors are more productive than low-technology sectors. They mainly follow Berman et al. (2012) which conclude that the heterogeneity in the productivity of firms lead to different responses to exchange rate movements.

2004, Cespedes *et al*., 2004, Frankel, 2005, Bebczuk *et al.*, 2006, Gertler *et al.*, 2007), under financial fragilities such as high foreign currency indebtedness of the sectors with domestic currency revenues (liability dollarization) and original sin (Eichengreen *et al*., 2004; Özmen and Arinsoy, 2005), real exchange rate depreciations lead to negative balance sheet effects and thereby economic contraction. In this sense, Galindo, Izquierdo and Montero (2007) extend Campa and Goldberg (2001)'s setup by including the financial channel of balance sheet effects. Galindo et al. (2007) is the first industry-level study that attempts to analyze the effect of exchange rates on employment in the presence of liability dollarization. They interact real exchange rate with three channels of exports, import penetration and balance sheet channel in their panel data GMM regressions.[16] Their analysis is based on a panel data sample of 3-digit level 28 manufacturing industries of 9 Latin American countries. Their econometric evidence supports the view that real exchange rate depreciations can affect employment growth positively, but this effect is reversed as liability dollarization increases. In industries with high liability dollarization, the overall impact of a real exchange rate depreciation can be negative. Kesriyeli, Özmen and Yiğit (2011) investigate the balance sheet channel in Turkish manufacturing industry, focusing on the investment, profit and sales of 26 non-financial sectors during the period of 1992-2003. They find evidence that real exchange rate depreciations are contractionary for investment and profits especially for sectors with higher liability dollarization. Additionally, they show that as the export levels of the sectors increase, their liability dollarization also increases. However, since the negative balance sheet effect dominates the positive competitiveness effect, they conclude that firms only partially match the currency denomination of their liabilities with their export income.

There is also a large body of literature that analyzes the firm-level effects of currency depreciations especially for Latin American countries. Using the data for 450 non-financial firms in 5 Latin American countries, Argentina, Brazil, Chile, Colombia

[16] In fact Campa and Goldberg (2001)'s theoretical model identified also imported input channel as one of the trade channel. Since Galindo *et al.* (2007) cannot provide the data for imported input channel, they do not use it.

and Mexico, Bleakley and Cowan (2008) estimate the effect of real exchange rate changes on the investment of dollar-indebted firms. Their estimates indicate that firms holding more dollar debt do not invest less than others in the period after a depreciation since for firms holding higher levels of dollar debt, negative balance sheet effect is more than offset by higher current and future earnings due to the competitiveness effect of the depreciation. Similarly, in their analysis for Colombian firms, Echeverry, Fergusson, Steiner and Aguilar (2003) show that firms generally match their currency denomination of liabilities and revenues and they do not find any significant negative balance sheet effect of depreciation on investment. Using the data of a large number of firms from 42 countries, Forbes (2002) examines the impact of 12 "major depreciations" between 1997 and 2000. She evaluates the firm performance by focusing on sales, net income, market capitalization and asset value in which sales and net income capture the short-run impact of depreciations on firm performance while changes in market capitalization and asset value capture the long-term impact. Forbes (2002) also analyzes how the effect of depreciations on firm performance change depending on the individual firm characteristics, such as output type, foreign sales exposure, production structure, debt outstanding, size, and profitability. Her results suggest that in the year after depreciations, firms have significantly higher growth in market capitalization, but significantly lower growth in net income which implies that even if firms benefit from depreciations in the long run, its short run impact may be negative. Among the firm characteristics that are found to be deterministic for the impact of depreciations on individual firm performance, the strongest and most robust result one is that firms with greater foreign sales exposure have significantly better performance after depreciations.

2.2.2. Real Exchange Rate, Sectoral Exports and Imports

As traditional international trade literature suggests, foreign trade dynamics are mainly determined by relative prices, real exchange rate and domestic and foreign demand conditions. In this sense, by providing internationally competitive advantage to the export sectors, real depreciation of domestic currency increases exports and shifts production into these internationally competitive export sectors. Under the assumption that Marshall-Lerner conditions are satisfied and exporter sectors are relatively more productive than others, real depreciations will shift the composition of production towards tradable sectors and boost economic growth in the long run. As we observe from the experiences of East Asian countries, depreciated or competitive exchange rate policy plays a positive role on the current account balances and growth through its effects on foreign trade dynamics.

Due to the low price elasticities of exports and imports, a number of studies asserts that the Marshall-Lerner conditions do not hold in practice and this is also referred to as "elasticity pessimism" (Orcutt, 1950).[17] In estimating the trade dynamics, ignoring the differences in sectoral production structures is one of the factors behind elasticity pessimism. In fact, mixed results provided by the estimation of aggregate export and import functions of countries point out to the problem of *aggregation bias*.[18] Different sectors can have different responses to real exchange rate changes, therefore opposite responses from different sectors can offset each other leading to a decrease in the aggregate response of a country. Disaggregated analysis enables us to see which sectors' performance are more elastic or inelastic to the changes in exchange rates and determine the factors that affect these elasticities.

The industry-level empirical studies on the real exchange rate and trade dynamics find that real exchange rate elasticities significantly differ across industries. Van der Meulen Rodgers (1998) estimates the structural export function of main non-oil export sectors of Indonesia and finds that non-oil exporters respond positively to exchange rate devaluation, with the strongest impact in textiles, garments, and sawn wood. Bahmani-Oskooee and Ardalani (2006) investigate the impact of real depreciation of dollar on exports and imports of United States' 66 industries using

[17] For example, Metzler (1948), Marquez (1990), Rose (1991), Hooper, Johnson and Marquez (1998), Gagnon (2003). There are also some other studies that show Marshall-Lerner conditions are satisfied. These are for examle, Goldstein and Khan (1985), Bahmani-Oskooee (1998), Bahmani-Oskooee and Niroomod (1998) and Boyd *et al*. (2001).

[18] See Orcutt (1950), Imbs and Majean (2009) and Dekle, Jeong and Ryoo (2009) among others.

bilateral trade data of U.S with her major trading partners. Their cointegration analysis shows that in the long run real depreciation of the dollar stimulates export earnings of many U.S. industries, whereas it has no significant impact on most importing industries. As Bahmani-Oskooee and Ardalani (2006), other studies that estimate bilateral trade elasticities for U. S. and some other countries mostly concluded that the real exchange rate is a significant determinant of bilateral trade balance.[19] However, the findings of Bahmani-Oskooee and Scott (2010) tells us that among the 69 export sector in Mexico only 10 of them has statistically significant real exchange rate elasticities in the long run. According to Aziz and Li (2008) who estimate the export and import elasticities of SITC 2-digit industries of China, sectoral differences in export price elasticities are more pronounced than those for import price elasticities. Their estimates show that real exchange rate elasticities of exports are highest for capital goods such as electric and electronics and machinery. They also indicate that, as product sophistication of the products increase, exports become more sensitive to external demand and real exchange rate.[20] Berman, Martin and Mayer (2012) analyze the heterogeneity of the responses of exporter firms to exchange rate movements by using a large French firm-level dataset. They emphasize the differences in the productivities of firms as the most important factor behind their responses to real exchange rates. Their estimates indicate that export volumes of the firms with higher productivity levels are less sensitive to exchange rate movements since they mostly absorb this effect in their mark-ups. Using the firm-level data for England manufacturing industry, Greenaway, Kneller and Zhang (2010) show that the negative effect of real appreciations on exports are partially offset by the decline in imported input costs.

With the increased globalization of the world economy over the past decades, intra-industry trade and vertical integration in international trade have become one of

[19] See for example Bahmani-Oskooee (1986), Bahmani-Oskooee (1998), Bahmani-Oskooee and Ghoswami (2004), Bahmani-Oskooee and Hajilee (2009), Cushman (1987), Marquez (1990), Di Nino, Eichengreen and Sbracia (2011).

[20] They use the product sophistication index of Hausmann, Hwang and Rodrik (2007) which is constructed by taking a weighted average of the per-capita GDPs of the countries exporting a product, where the weights reflect the revealed comparative advantage of each country in that product.

the most important determinants of the real exchange rate elasticities of exports and imports. International trade and globalization of the production have led countries to develop different specialization areas in their trade and production structures. Instead of completing all stages of production in one country, firms are provided to use different parts and components produced in different countries in their production of final goods. In this case, one country specializes in one stage of the production and the final good is produced stage by stage in different countries. Consequently, intra-industy trade has increased substantially in international trade. In this process, countries need to import in order to produce its export goods and import-export chain realizes in more than one country till the production of the final good. This process which is defined as 'vertical integration' (Hummels et al., 2001; Irvin, 2002), 'global supply chains' (Krugman, 1995; Baldwin, 2011) or 'product fragmentation' (Jones, 2000; Athukorala, 2005), increases the import dependency of production and affects the real exchange rate elasticities of exports and imports.

There exist different views in the literature about the effects of intra-industry trade (IIT) and vertical integration on the real exchange rate elasticities of exports and imports. On the one side, IIT increases the sensitivity of trade balance to the changes in real exchange rate by increasing the substitutability between the types of goods imported and exported (Obstfeld, 2002; Rauch and Trindade, 2002; Kharroubi, 2011). Obstfeld (2002) suggests that firms can react more strongly to the changes in exchange rates given that the major part of the IIT is performed within the different units of the same firm in different countries and therefore trade becomes more sensitive to the real exchange rate. On the other side, the development of global supply chains and vertical integration patterns increase the complementarity between exported and imported goods. The complementarity between exported and imported goods can be positively related with the divisibility of production processes into different parts. In this sense, as product complexity and technology intensity increases, we can expect that vertical integration and IIT tend to increase and real exchange rate elasticity of trade tend to decline in vertically integrated sectors with high imported input ratios (Jones and Kierzkowski, 2001; Arndt and Huemer, 2004; Kharroubi, 2011). Import dependency of exports and production is high in vertically integrated sectors since imports are used in the production of exports. The comovement of exports and imports will decrease the real exchange rate elasticity of foreign trade dynamics. According to IMF (2007), the ignorance of vertical integration and the interdependence of exports and imports in standard trade equations is one of the reasons behind the low elasticity estimates of empirical literature.

Most of the empirical studies analyzing the effect of vertical integration on the exchange rate elasticities of exports show that these elasticities decline significantly as the vertical integration increases. Arthukorala and Suphachalasai (2004) investigate the role of exchange rate on export performance in Thailand and compare the real exchange rate elasticity of four sectors: chemicals, basic (resource-based) manufacturing, machinery and transport equipment. Their results point out significant differences in the degree of elasticity across the four categories and the real exchange rate elasticity is lowest for machinery and transport equipment which have a high degree of vertical specialization. Similarly, Jongwanich (2010) estimates the export equations of total merchandise, manufacturing and machinery and transport equipment sectors in 8 East and Southeast countries. Their estimates indicate that the elasticity of exports to real exchange rate is highest for merchandise exports while lowest for machinery and transport equipment exports. Focusing on the U.S-Mexico trade, Arndt and Huemer (2004) and Bahmani-Oskooee and Hegerty (2009) show that export responses to the movements of exchange rate declines as vertically integrated production process increases.[21] Using a gravity model for the 38 trading pairs from 10 countries, Oguro *et al.* (2008) provides empirical support to the view that the extent of IIT decreases the exchange rate sensitivity of exports. Kharroubi (2011) estimate a panel data model for 20 OECD countries over the period 1995-2008 in order to examine the effect of two channels, namely IIT and vertical integration, on the sensitivity of trade balance to real exchange rate.[22] His results show that IIT increases

[21] Production sharing between the U.S. and Mexico constructed their maquiladora system and continues under the North American Free Trade Agreement (NAFTA). It plays a key role in several industries, including textiles and apparel, motor vehicles, electronics, and processed foods.

[22] He used Grubel and Lloyd (1975) index for intra-industry trade which is defined as $IIT_t = 1 - \sum|X_{it} - M_{it}|/\sum|X_{it} + M_{it}|$ where X_i and M_i denote respectively exports and imports of goods of

the trade responses to real exchange rate whereas vertical integration decreases it. However, in contrast to these studies, estimating the export function in the United States under vertical specialization during 1967q1–2007q1, Chinn (2005) shows that exports become more sensitive to changes in real exchange rate under vertical specialization.

A number of studies provided extensive analysis on the structure of Turkish manufacturing industry, mainly focusing on the main global trends in international trade. Examining Turkish manufacturing industry 3-digit and 5-digit SITC sectors, Erlat and Erlat (2003) and Erlat *et al.* (2007) show that IIT has steadily increased since 1993 and have become dominant in Turkey's international trade which also reflects the general tendency of world trade as Fontagne *et al*. (2006) suggests. Consistent with this finding, Aydın et al. (2007), Yükseler and Türkan (2008) and Saygılı *et al.* (2010) examine the structure of Turkish exports, imports and production and point out to the high import dependency of exports and production of manufacturing industry in recent years. Yükseler and Türkan (2008) document the structural transformation that Turkish manufacturing industry experienced between 1997 and 2007 using the export/production, export/supply, import/production and import/supply ratios of sub-sectors constructed by the input-output tables. According to their analysis, after 2001 financial crisis, the weight of exports in GDP has explicitly increased and the composition of exports has shifted towards capital and intermediate goods from consumption goods. According to Yükseler and Türkan (2008), the change of the production structure in favor of the sectors with high imported input use and increased intra-industy trade and vertical integration patterns are the main reasons behind the high import dependency of manufacturing exports and production. Conducting a survey on 145 large-scale firms, Saygılı *et al.* (2010) also investigate the factors that increase the imported input use in Turkish manufacturing industry. According to the results of the survey, besides the shift of production from labor-intensive sectors towards capital-intensive sectors with high imported input use, insufficient domestic

sector i . His measure of vertical integration is the import content of exports which is measured using input-output tables. Both IIT and import content of exports are from OECD STAN database.

production of basic inputs of intermediate and capital goods, cheap inputs from China and India, foreign trade regime such as inward processing regime and Customs Union, appreciation of TL, and global production chains (vertical integration) are among the main factors behind the increased imported input use of Turkish manufacturing industry.

The studies that examine the relationship between real exchange rate and sectoral trade dynamics in Turkey provide important potential contributions to the literature. Aldan *et al.* (2012) investigates the short run dynamics of imports between 2003 and 2011 employing Kalman Filter approach to obtain time-varying parameters for income and exchange rate. Their results show that imports of intermediate goods are not sensitive to real exchange rates whereas consumption goods and capital goods are responsive to the changes in exchange rates. They also provide empirical evidence that income elasticity of imports is higher than that of real exchange rates which holds for all subgroup except for transportation goods for which real exchange rate is highly important. These results support the findings of Togan and Berument (2007) which find that the exchange rate and income elasticities of consumption good imports are higher than elasticities of capital and intermediate goods imports in the short run, while income elasticity is much higher than real exchange rate elasticity of all groups in the long run. Using aggregate import data, Aydın *et al.* (2004), Bahmani-Oskooee and Kara (2005), Yavuz and Güriş (2006) and Kalyoncu (2006) are the other studies which find that income elasticity of imports is higher than the relative price or real exchange rate elasticities of Turkey.

Saygılı (2010) estimates the export dynamics of 17 manufacturing subsectors by employing panel cointegration techniques for 1995q1-2006q2 period. According to her estimates, real appreciation increases exports of manufacturing sectors which is consistent with their high import dependency. As Şahinbeyoğlu and Ulaşan (1999) and Sarıkaya (2004), which provide similar results using aggregate data, Saygılı (2010) explains the positive effect of appreciation of TL by firms' import of basic inputs and production factors. Additionally, she finds that exports of capital-intensive sectors are more sensitive to the changes in real exchange rate relative to labor-intensive sectors.

Moreover, real exchange rate elasticity increased in capital-intensive sectors whereas it decreased in labor-intensive sectors after 2001. Lastly, Saygılı and Saygılı (2011) examine the structural change in Turkish exports in 1987q1-2008q1 period and estimate the export supply and demand functions of 96 products that are pooled into two groups as traditional and non-traditional.[23] Consistent with the vertical integration concept, they find evidence that the real exchange rate elasticities are lower but import elasticities are higher for non-traditional commodities relative to the traditional ones.

[23] Following Pineres and Ferrantino (1997), traditional and non-traditional commodities are as follows: Traditional commodity is the one in which its export experience is concentrated at the earlier years of the period analyzed, whereas export experience function of the non-traditional commodity is concentrated at the later years of the period.

CHAPTER 3

REAL EXCHANGE RATES AND ECONOMIC GROWTH: A CROSS-COUNTRY EMPIRICAL ANALYSIS

3.1. INTRODUCTION

Since the real exchange rate is a key relative price which affects the economy through many channels, the effect of real exchange rate changes on economic growth is one of the most important issues of the recent policy debates. According to the traditional Mundell-Fleming model, depreciation of the real exchange rate is expansionary via its effects on trade balance assuming that the Marshall-Lerner conditions are satisfied. Dornbusch (1980) is one of the main advocators of this view.[24] On the other hand, real devaluations can have contractionary effects on real economy especially in developing countries. Diaz- Alejandro (1963), Krugman and Taylor (1978), Edwards (1986) and Van Winjbergen (1986) are among the first that give theoretical support to contractionary devaluation mechanism. Inflationary effects of an increase in real exchange rate, income distribution effects, real income effects and negative supply side effects such as increased cost of imported inputs are the main channels emphasized by contractionary devaluation hypothesis. Despite the supply side channels affect output unambiguously negatively, the demand side effects can be negative or positive under different macroeconomic conditions. [25] Since the net effect of a depreciation is not clear theoretically, the empirical evidence on the effects of real exchange rate on economic performance gains importance.

The empirical evidence provided by the earliest studies is generally mixed. Some of those studies such as Cooper (1971) and Edwards (1986) analyzed the effects of devaluation episodes in different countries. Some of them estimated reduced form

[24] See also Dornbusch and Werner (1994).

[25] See Lizondo and Montiel (1989) for a broad analytical overview.

output equations for a single country or for a pooled sample of countries or constructed VAR models in order to examine the effects of real exchange rate shocks (Edwards, 1986; Agenor, 1991; Morley, 1992; Kamin and Klau, 1997; Kamin and Rogers, 2000; Ahmet *et al*., 2001). Possibly the earliest paper that studies the issue from an empirical perspective is Cooper (1971) which shows that the contractionary effects of devaluation tend to be significant but they have only short-run effects. Consistent with this result, Edwards (1986) showed that devaluations generate a small contractionary effect on output in the first year. However, this negative effect is completely reversed by the second year. Therefore, in his analysis, devaluations are neutral in the long run. Morley (1992), again showed that devaluations reduce output, but it takes at least 2 years to have the full effect in his analysis. According to Kamin and Klau (1997), regardless of the short run effects of devaluation, there appears to be no contractionary effect in the long run. On the other hand, their results fail to confirm the conventional or textbook view that devaluations are expansionary in the long run. Similarly, based on the results of several VAR models, Kamin and Rogers (2000) concluded that real devaluation has led to high inflation and economic contraction in Mexico.

After the wave of financial crises in Latin America (Mexico in 1994-1995 and Argentina in 2001-2002) and East Asia (1997-1998), this literature came into prominence stressing a different problem this time. This new branch of the contractionary devaluation hypothesis emphasized mostly the financial channel of contractionary devaluation hypothesis in the light of the financial dollarization process taking place in a number of emerging economies over the last decades. These studies generally stress the mismatch between foreign currency denominated debt and domestic currency denominated revenues which is referred as *Balance Sheet (BS) effect*. If a considerable amount of agents' borrowing is dominated in foreign currency, the depreciation of the real exchange rate reduces the net worth of agents by weakening their balance sheets and this leads to difficulties in the repayment of debt burden and reduction in investment and output. This balance sheet effect is pointed out as the main mechanism that explains the recessions following many of the 1990s devaluations (Frankel, 2005; Aghion *et al*., 2001; Calvo *et al*., 2004; Krugman, 1999). However, some authors argued that contractionary balance sheet effect is more likely to dominate standard competitiveness effect under certain economic conditions. Cespedes *et al*. (2003), utilizing from an IS-LM-BP model, showed that negative BS effects dominate competitiveness effect when financial markets are less developed, the ratio of total debt to net worth is high and the share of foreign debt in total debt is high. Using different dollarization measures, for a panel data sample of 57 countries, Bebczuk *et al.* (2006) showed that when dollarization exceeds a level, contractionary effect of devaluation can dominate the expansionary effect which is the case for most of the developing countries. Galindo *et al.* (2006) provided similar results as Bebczuk *et al.* (2006) by concentrating on industrial employment data.[26]

Recently, successful experiences of China and other East Asian countries strengthen the view that maintaining an undervalued or competitive real exchange rate foster economic growth. Especially with the wake of global financial crisis, China's weak currency policy lead academics and policy makers to question the merits of export-led growth strategies. Although there is a great uncertainty about the advanced countries' capacity to continue absorbing developing countries' exports, according to the supporters of this view, tradable sector is the main driver of the economy in which the technology transfer and the learning by doing externalities are relatively rapid. Rodrik (2008) is one of the main advocators of this view. According to Rodrik (2008), by increasing the profitability of the tradable sector which suffers disproportionately from the institutional weaknesses and market failures, undervaluation of the real exchange rate facilitates economic growth in developing countries. Some other studies also provided empirical evidence on expansionary devaluation by justifying different channels. Using the same Balassa-Samuelson adjusted index of undervaluation as Rodrik (2008), Gala (2008) suggested again a positive effect of undervaluation on growth arguing that the channels through which exchange rate levels affect long term growth can be related to investment and technological change. Levy-Yeyati and Sturzenegger (2007) examined the evolution of the exchange rate regimes in recent

[26] There are also firm-level studies especially on Latin American countries which show that the increase in real exchange rate (real depreciation) affects investments, sales and profits negatively in the high dollarized economies (see Galindo *et al.* 2003, Bleakley and Cowan, 2008; Echeverry *et al*. 2003; Forbes, 2002; Aguiar, 2005).

years and pointed out that there is a tendency to intervene to depreciate local currency which they called as “fear of appreciation”. Showing that these interventions managed to preserve a depreciated real exchange rate, they provided empirical evidence that this fear of appreciation leads to higher output and productivity growth which is not only restricted to short term cyclical changes but also leads to higher long term GDP growth. They also argued that this positive effect of fear of appreciation comes from increased domestic savings and investment rather than export-led expansions or import substitution. This saving channel was believed to be contractionary by Diaz-Alejandro (1963) due to the negative effect on consumers and decline in domestic demand. Levy-Yeyati and Sturzenegger (2007) stressed the financial constraint that firms with foreign currency liabilities are faced in case of a devaluation and combining this modern view with Alejandro (1963)’s story, they claimed that real devaluations should be expansionary. Real devaluations relax the borrowing constraints binding firms by the means of saving channel in this modern view. Gluzmann *et al*. (2011) is the other study which suggests that real depreciations are expansionary by the channel of savings and investment rather than foreign trade dynamics. However, according to Montiel and Serven (2008), international experience does not provide support for a growth strategy based on the increased saving rate by the help of depreciated real exchange rate. Therefore, despite some authors’ support to the conventional expansionary effects of depreciation, there is not convincing empirical evidence on the channels of this effect-tradable sector and saving channels- yet.

Except these advocators, some authors are more skeptical to the undervalued real exchange rate. For example, Eichengreen (2008) warns about keeping real exchange rate low in that it has costs as well as benefits especially when the economy is sticked with the policy for too long. He emphasizes that a stable and competitive real exchange rate should be thought as a facilitating condition for economic growth and the timing of the exiting the strategy is very important. There is the risk that the cheap currency policy can weaken the efforts for upgrading and productivity growth while increasing the dependence of growth on expansion on foreign markets (Akyüz, 2009).

Despite the bulk of studies on the effect of the changes in real exchange rate on growth, they can significantly differ in the results they reach so the issue of whether depreciation of the real exchange rate is detrimental or beneficial for the economy has not solved yet. With the recent global crisis, it has been discussed by policy makers intensively in the context of exchange rate wars and global imbalances.

The main goal of this part is to make an empirical contribution to the ongoing debate on real exchange rate and growth relationship in several aspects. Recent empirical attempts on the issue generally show similarity mainly in the econometric methods they use and in their approach to the real exchange rate measure used. They generally apply GMM methodology to the panel data growth models by using mostly Rodrik's Balassa-Samuelson adjusted index of undervaluation. In this study, we aim to investigate the effects of real exchange rate on economic growth mainly addressing some econometric and empirical issues which we think are important and ignored by the previous studies. As Jones (1995) and Easterly (2001) emphasize, most of the previous growth regressions investigating the growth effects of real exchange rates are mis-specified in the way that they regress a stationary variable (growth) on non-stationary variables of macroeconomic policy variables or initial conditions. Therefore, in this study, we take the non-stationarity properties of variables into account. Firstly, by using a wide panel data set of countries, we estimate the long run relationship between real exchange rate and real GDP per capita income by differentiating the effects for developed and developing countries. By doing so, we apply not only the conventional panel data estimators but also Pesaran (2006)'s Common Correlated Effects (CCE) methodology which controls the effects of common global shocks. Secondly, we differentiate the long run and short run effects of real exchange rate by employing panel data version of Autoregressive Distributed Lag (ARDL) procedure of Pesaran and Shin (1999) and a very recent method of Chudik and Pesaran (2013) which extends the Common Correlated effects methodology to dynamic models in order to control for cross-section dependency. Thirdly, in order to check the robustness of our results to potential simultaneity and endogeneity issues and compare our results with the results of previous studies, we apply GMM methodology of Arelleno and Bond (1991). After estimating the relationship between the real exchange rate and economic growth for industrial and developing countries, we examine whether there are differences among regions. Since the East Asian countries are seen as utilizing from competitive real exchange rate in order to sustain high growth rates, we also investigate whether East Asian countries are different from other regions or not. Lastly, we examine whether the effect of the changes in real exchange rate differ according to the liability dollarization level of countries. We also investigate whether some other country characteristics such as financial sector deepness, trade openness and financial openness are relevant factors for the real exchange rate and growth relationship.

3.2. DATA and EMPIRICAL METHODOLOGY

3.2.1. The Data and the Econometric Specification

We use the following conventional growth model which is a panel data version of Barro (1991):

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta' RER_{i,t} + \gamma' X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{1}$$

where y is the real GDP per capita, RER is the real exchange rate, X is a set of control variables, μ_i is the unobserved country-specific effects, ε is the error term. The subscripts i and t represent the country and time period, respectively. The lagged per capita income, $y_{i,t-1}$, is used as the conditional convergence term in standard growth equations. The control variables other than the initial income per capita are government consumption (GOV), trade openness (TRADE) and financial depth (LIQ) as the macroeconomic policy variables and fixed investment (INV). These are the standard control variables used in empirical growth models.[27] All variables except

[27] As Sala-i Martin (1997) indicated, 60 variables can be found that are significant in growth regressions. We selected our control variables following Temple (1999) and some empirical growth studies such as Loayza and Ranciere. (2006), and Levine *et al.* (2000). We do not include terms of trade and inflation because terms of trade is highly correlated with our main variable of interest, real

financial development are from World Bank, World Development Indicators (WDI) Database. The real effective exchange rate, our main variable of interest, is from Bank of International Settlements (BIS) for the countries whose data are not available in WDI. The ratio of liquid liabilities to the GDP is used as the measure of financial development. The data on liquid liabilities are obtained from Beck, Demirgüç-Kunt and Levine (2000). All variables are expressed in natural logarithms and all control variables are defined as ratio to the GDP. The list of variables and their sources are given in Table A1 in Appendix A.

As our main variable of interest explaining economic growth, real exchange rate, has a central importance in our study. As the measure of real exchange rate, we use *real effective exchange rates* which is the weighted average of bilateral real exchange rates with its trading partners. Since the real effective exchange rate expresses the national currency in terms of other currencies, an increase in the real effective exchange rate reflects appreciation and a decrease in real effective exchange rate reflects depreciation. We prefer to use multilateral real exchange rates instead of bilateral real exchange rates since they can move in different, and even opposite directions after the collapse of Bretton Woods system.[28] The use of bilateral indexes can result in misleading and incorrect inferences regarding the evolution of a country's degree of competitiveness (Edwards, 1989). Therefore, it is necessary to use a multilateral index of real exchange rate especially when evaluating policy related situations.

There are some alternative measures of real exchange rate in the literature. Recent studies often follow two approaches to this end. The first one is an earlier one interested in the impacts of real exchange rate misalignments rather than the real exchange rate itself. These studies often argue that keeping the real exchange rate at

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exchange rate and inflation is generally considered as a short term determinant of growth as in Temple (1999).

[28] Among the studies on the real exchange rate-growth relationship, some studies such as Bebzcuk *et al.* (2006), Bleaney and Vargas (2008) and Blecker and Razmi (2008) used the real exchange rate itself but they mostly used the bilateral real exchange rates. Moreover, they used the first difference of the RER which constrains the analysis to the short run effects.

wrong levels may create distortions in the economy. Under the maintained hypothesis that the purchasing power parity hypothesis is valid, the real exchange rate misalignment is defined as the deviations of the real exchange rate from its equilibrium level (Mundell, 1971; Dornbusch, 1974, 1980; Frenkel and Mussa, 1985). Recent studies mostly use the definition of Edwards (1989), which defines equilibrium real exchange rate (ERER) as the relative price of traded and non-traded goods that achieves internal and external equilibrium simultaneously.[29] Based on this definition of ERER, empirical efforts on the calculation of real exchange rate misalignment generally use the "single equation approach".[30] In this approach, a long run relationship is estimated between the real exchange rate and its fundamentals such as net foreign assets, relative productivity differentials, the terms of trade etc. (see among others Cottani *et al*., 1990; Ghura and Grennes, 1993; Razin and Collins, 1999; Aguirre and Calderon, 2005; Macdonald and Veiera, 2010; Bereau *et al*., 2009). Inspite of its simplicity and popularity, the single equation approach is criticized in academic circles that it may lead to misleading results and their suggestions about disequilibrium patterns of countries contradict with each other. As discussed in more detail in Edwards and Savastano (1999), the estimation of RER misalignments are subject to a number of limitations. For example, most of these single equation models assume that the RER has been, on average, in equilibrium during the estimation period. But it is highly possible that RER has been entirely overvalued or undervalued in that period. Ignorance of the stock variables and the relationship between capital flows and real exchange rate are among the other issues that are criticized.

The other popular approach on the measure of real exchange rate is the PPP based measure adjusted for Balassa-Samuelson effect which is first used by Dollar (1992) but gained popularity with Rodrik (2008).[31] According to Balassa (1964) and

[29] Edwards (1989) defines internal equilibrium as the situation in which non-traded goods market clears and the unemployment rate is in its natural level. External equilibrium is attained when current account is compatible with long run sustainable capital flows.

[30] Williamson (1985, 1991) built General Equilibrium Simulation Models to determine equilibrium real exchange rate which are less frequently used.

[31] Dollar (1992) used this index as a measure of real exchange rate distortion in his study which examines the effects of outward orientation on growth.

Samuelson (1964), since the productivity in traded goods will be greater in developed countries, the non-traded goods will be more expensive in developed countries than in developing countries. Then we expect the real exchange rate to be lower (appreciated) in developed countries. Based on this argument, Rodrik (2008) corrects for the Balassa- Samuelson effect by regressing the real exchange rate on a variable related to the degree of development of each country (typically, real GDP per capita) and then defines undervaluation as the difference between the observed and the predicted real exchange rate. Following Rodrik (2008), some studies used this index of undervaluation while investigating the growth effects of real exchange rates (see Gala, 2008; Di Nino *et al*., 2011, Gluzmann *et al*., 2012). However, Rodrik (2008)'s index of undervaluation is heavily criticized by Woodford (2009) as the use of this index exaggerates the strength and the robustness of the effect of real exchange rate on growth. According to Woodford (2009), there is no need to adjust for the B-S effect because the panel growth regression of Rodrik (2008) already includes country fixed effects which accounts for the differences in the real exchange rate levels of countries due to the per capita income differences. Moreover, the Balassa-Samuelson effect is not fully confirmed by the data. While there is no compelling evidence for industrial countries (Froot and Rogoff, 1996; Rogoff, 1996), the support for the emerging countries is also weak (Savastano and Edwards, 1999).

Our sample consists of an unbalanced panel of 80 countries over the period 1960 – 2009. These are the countries which we have the data for real effective exchange rates. The sample is composed of 23 industrial and 57 developing countries. We tried to hold the dataset as large as we can, but we had to exclude the countries with the poorest data.

The growth equation above can be rewritten as a dynamic panel data model as in Islam (1995),

$$y_{i,t} = \alpha y_{i,t-1} + \beta' RER_{i,t} + \gamma' X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (2)$$

There are some econometric issues that we need to deal with when we estimate this regression equation. The first empirical issue to consider is the time series properties of the variables in the equation which is often neglected by the growth literature. Before proceeding to the estimation we need to investigate the integration properties of the variables. If the variables are difference stationary, we should apply panel cointegration techniques in which we estimate the long run relationship among the variables. The existence of a cointegration relationship among the variables allows us to differentiate the short run and long run dynamics in a panel ARDL framework. The other issue that we need to consider is the potential cross sectional dependence. There can be common shocks that affect all countries which will cause cross-section correlation between the regression error terms. Ignoring this cross section dependence can lead to inconsistent estimates (Phillips and Sul, 2003; Coakley, Fuertes and Smith, 2006; Pesaran, 2006). To the best of our knowledge, there is not any other study on the real exchange rate and growth relationship to deal with this important problem. The last issue is the dynamic nature of the regression equation and the possible endogeneity of the real exchange rate and other control variables. One can use the GMM procedure which provides a consistent estimator for dynamic panel data models with potential endogenous explanatory variables. This is the most common method used in previous empirical studies which investigates the effect of real exchange rate on economic growth (see Rodrik, 2008; Aguirre and Calderon, 2005; Di Nino *et al*., 2011; Gala, 2008; Macdonald and Vieira, 2010; Galiani *et al*., 2003 among others). Consequently, we also consider the GMM estimation method in estimating our growth equation in this paper. Besides its convenience in dealing with the endogeneity and the reverse causation problem, it will also allow us to make comparison with the previous studies' results.

In the light of these econometric issues, first, we estimate the long run relationship between the real exchange rate and the real GDP per capita by setting up the panel cointegration equation due to the time series properties of the data.[32] Second, utilizing from an ARDL model, we estimate both long run and short run effects of real exchange rate on growth. Previous studies mostly relied on 5-year averaged data in

[32] Among the panel data studies, the only study which takes the time series properties of the variables into account is Nouira and Sekkat (2012) in this context.

order to focus on long run growth effects. This approach is useful for smoothing out business cycles but yearly or short term information is often missed. By using annual data and by means of an ARDL framework, we use the advantage of both short term and long term effects. Third, by using Pesaran (2006)'s Common Correlated Effects methodology, we also deal with the cross sectional dependence issue which is ignored by previous studies.

3.2.2. Unit root and Cointegration Tests

As the above discussion implies, the first step in the analysis is to examine the time series properties of the data. In Table 3.1, Levin, Lin and Chu (2002), Maddala and Wu (1999), Im, Pesaran and Shin (2003) panel unit root tests are performed. LLC, MW-ADF and IPS are in the class of first generation panel unit root tests which assume cross sectional independence. The difference between LLC and IPS is that the alternative null hypothesis in the former is the stationarity of all series while it is the stationarity of a fraction of series in the latter. MW agrees on the heterogeneity of the alternative null hypothesis as IPS, but MW panel unit root test uses aggregated p-values from individual time series unit roots whereas IPS test uses averaged test statistics across individual panels. In order to account for the potential cross-country dependence in the data, we also employ CIPS test of by Pesaran (2007) which removes the cross section dependence by augmenting the ADF regression with the cross-section averages of lagged levels and first-differences of the individual series. Table 3.2 reports the results of Pesaran (2007)'s panel unit root test. We report these results for lag orders 0, 1, 2, and 3. All unit root tests are conducted for both levels and first differences of the variables. The results of the first generation tests on the levels of the variables are generally mixed. But for the first differences of the variables, all three tests reject the null hypothesis of unit root at the 5% significance level. According to the CIPS test statistics for different lag orders, the null hypothesis of unit root cannot

Table 3.1: *Panel Unit Root tests*

Variables	**LLC**	**MW-ADF**	**IPS**
Real GDP per capita	0.446	329.982*	-1.429
ΔReal GDP per capita	-22.046*	1522.08*	-31.013*
real exchange rate	0.807	137.635	-6.076*
Δreal exchange rate	-39.247*	1889.37*	-30.655*
gov. consumption	6.736	114.832	-8.050*
Δgov. consumption	-60.506*	4573.53*	-52.055*
trade openness	7.563	71.977	-5.475*
Δtrade openness	-66.562*	5643.17*	-57.068*
financial development	-0.391	227.449	3.458
Δfinancial development	-33.688*	1449.54*	-31.642*
investment	-1.756*	136.463	-8.305*
Δinvestment	-54.638*	3373.29*	-43.476*

Notes: LLC is the panel unit root test developed by Levin, Lin and Chu (2002), MW is the Fisher's panel unit root test developed by Maddala and Wu (1999), IPS is the panel unit root test developed by IM, Pesaran and Shin (2003). Lag lengths, chosen by Schwartz Information Criteria. (*) denotes the rejection of unit root at the 5% level.

Table 3.2: *Pesaran (2006)'s CIPS Panel Unit Root Test Statistics*

Lags	0	1	2	3
Real GDP per capita	5.551	1.885	5.297	5.304
ΔReal GDP per capita	-31.552*	-23.214*	-14.687*	-11.041*
real exchange rate	-6.112*	-4.946*	-1.731	-1.382
Δreal exchange rate	-27.284*	-19.955*	-11.080*	-11.945*
gov. consumption	-3.800*	-2.799*	0.687	0.793
Δgov. Consumption	-40.671*	26.429*	-16.812*	-12.888*
trade openness	-3.471*	-3.267*	1.006	0.601
Δtrade openness	-38.173*	-26.492*	-14.924*	-9.015*
financial dev.	0.807	-1.619	3.506	5.858
Δfinancial dev.	-23.215*	-18.172*	-9.214*	-1.703*
investment	-4.179*	-6.228*	-1.694	1.531
Δinvestment	-	-	-	-

Note: (*) indicates that the test is significant at the 5% level.

be rejected for the levels of the variables except for a few lags. However, the first differences of the variables are stationary for all lags.

Concluding that the variables are integrated of order one, the next step is to test for the existence of a cointegration relationship among the variables. To this end, we use the standard panel cointegration test of Pedroni (1999). The results of panel cointegration test of Pedroni (1999) are reported in Table 3.3. The first four of the statistics given in Table 3.3 represents the within dimension panel cointegration statistics and the last three represents the between dimension panel cointegration statistics. All of the seven statistics reject the null hypothesis of no cointegration. The evidence of cointegration is also confirmed by the significance of the error correction term in error correction models estimated in subsequent parts.

3.3. EMPIRICAL RESULTS

3.3.1. Long Run Effect of Real Exchange Rates on Real GDP per Capita

Based on the evidence of cointegration among the variables, we construct the long run relationship by estimating the level equation, Equation 2, which is nothing more than a reparametrization of Equation 1. While Equation 2 consists of lagged level of GDP per capita, y_{it-1}, as the standard conditional convergence term in growth literature, we exclude it from the cointegration equation since by definition such a lagged variable cannot be included in static cointegration regression.[33] Secondary schooling is also excluded since it is not available annually. A linear time trend is also included in the long run equation.

Table 3.3: *Pedroni (1999) Panel Cointegration Test Results*

Panel v-statistic	-3.457***
Panel rho-Statistic	14.039***
Panel PP-Statistic	3.932***
Panel ADF-Statistic	3.381***
Group rho-Statistic	17.582***
Group PP-Statistic	-2.302***
Group ADF-Statistic	-2.766***

Note: *** denotes the rejection of the null hypothesis at the 5% significance level.

We first estimate the long run equation for real GDP per capita with fixed effects methodology by splitting our sample into developing and industrial countries. Since the contractionary devaluation hypothesis mainly focused on developing countries in which balance sheet effects can be large, it will be more appropriate to

[33] y_{it-1} is included as the initial income level into the growth regressions and some studies include the real per capita income level at the beginning of the period considered as the initial income level. For an unbalanced annual data this approach will not be suitable.

examine the effects of the changes in real exchange rate for developed and developing countries separately. There is not a common conclusion for both developed and developing countries that is agreed upon. For developing countries, while some authors showed that the standard Mundell-Fleming result may hold even in the presence of balance sheet effects, some others suggest that depreciations can be contractionary if the balance sheet effects are large enough. Table 3.4 shows the fixed effects estimation results of long run equations for three different samples, whole sample, developing countries and industrial countries. The coefficients of the real effective exchange rate are 0.225 and 0.221 and highly statistically significant for whole sample and developing countries sample, respectively. Since the increases of real effective exchange rate demonstrate appreciations, these coefficients imply that the appreciation of the real effective exchange rate increases real GDP per capita. In other words, real depreciations are found to be contractionary for whole countries and developing countries sample. This result is in line with the suggestions of the authors like Frankel (2005), Calvo and Reinhart (2001), Bebzcuk *et al.* (2006) which stress the balance sheet effect that exist in most of the developing countries. The third column of Table 3.4 shows the estimation results for the industrial countries. The coefficient of the real effective exchange rate is 0.053 but not statistically significant. Theoretical and empirical literature mostly argue that the traditional expansionary effects of a real depreciation continue to hold for industrial countries. Unlike developing economies, they can continue to benefit from the competitiveness effect of devaluation since they do not generally face with problems of foreign currency denominated debt. Our results do not support expansionary devaluation hypothesis for industrial countries.According to our estimations, real exchange rate is not a significant determinant of economic growth for industrial countries in the long run.

Regarding the control variables, in all countries and developing countries sample, all control variables except for government consumption are positive and statistically significant as expected. Trade openness, financial development and investment affect real GDP per capita positively as theory predicts. Insignificance of government consumption in the long run is also consistent with economic theory. In

Table 3.4: *Long Run Equations-Fixed Effects Estimation Results*
Dependent variable: Real GDP per capita

	whole sample	**developing**	**industrial**
REER	0.225***	0.221***	0.053
	(0.046)	(0.046)	(0.066)
Gov. Consumption	-0.084	-0.112	-0.054
	(0.070)	(0.076)	(0.116)
Trade Openness	0.235***	0.246***	0.018
	(0.073)	(0.084)	(0.097)
Fin. Development	0.175***	0.231***	-0.022
	(0.055)	(0.069)	(0.044)
Investment	0.166***	0.163***	0.240***
	(0.053)	(0.059)	(0.084)
trend	0.014***	0.012***	0.021***
	(0.002)	(0.002)	(0.002)
Constant	-20.587***	-17.220***	-32.706***
	(3.199)	(4.676)	(2.927)
Observations	2,024	1,273	751
No. Countries	80	57	23
R-square	0.668	0.567	0.899
LLC	-11.049***	-8.926***	-3.304***
	[0.000]	[0.000]	[0.000]
MW	407.302***	273.235***	44.266
	[0.000]	[0.000]	[0.540]

Notes: Robust standard errors in parentheses. *significant at 10%; ** significant at 5%, *** significant at 1%. LLC and MW denotes the Levin, Lin and Chu (1994) and Maddala and Wu (1999) panel unit root test statistics. The values in [.] are the p-values.

industrial countries sample, investment is the only significant variable. The LLC and MW reported at the bottom of the table are the panel unit root test statistics for the residuals of the regressions estimated. They confirm the cointegration relationship among the variables since they all reject the null hypothesis of unit root in the residuals.

3.3.2. Cross Section Dependence

In recent years panel data econometrics has emphasized the unobserved time-varying heterogeneity induced by unobserved common shocks which affects all individual units differently. These unobserved common factors cause cross sectional correlation or dependence across the errors of the regression. This cross sectional correlation is especially important for macroeconomics in which cross-country studies are widely used. One major source of this cross sectional dependence in cross-country data is global shocks, e. g. oil price shocks and international financial crises (Bai and Kao, 2005). Except for global shocks, spatial spillover effects and increased financial and trade linkages among the countries cause dependence across countries. The ignorance of this cross section dependence may lead to inconsistent parameter estimates if unobserved common factors are correlated with explanatory variables (Phillips and Sul, 2003; Coakley, Fuertes and Smith, 2006; Pesaran, 2006).

The SUR-GLS approach to deal with cross section dependence for small N large T panels does not work when N is of the same magnitude or greater than T since the estimated contemporaneous variance-covariance matrix cannot be inverted. In the panel time-series where both N and T are large, the usual approaches have been either to ignore the possibility of cross-section dependence produced by time-specific heterogeneity or deal with it by including period dummies or fixed effects. But this assumes that the global shocks have identical effects on each unit which seems quite restrictive. In recent years, factor models have been largely used to characterize the cross sectional dependence (Bai and Ng, 2002; Coakley *et al.*, 2006; Phillips and Sul, 2003; Moon and Perron, 2004; Bai and Kao, 2004; Breitung and Eickmeier, 2005; Pesaran, 2006). In these models, the disturbances are assumed to contain one or more unobserved factors which may influence each unit differently.

In this study, we employ the Common Correlated Effects Pooled (CCEP) Estimator introduced by Pesaran (2006). The general factor model that is used by Pesaran (2006) is as follows:

$$y_{i,t} = \alpha_i' d_t + \beta_i' x_{i,t} + \gamma_i' f_t + \varepsilon_{i,t} \tag{3}$$

where d_t is a nx1 vector of variables that do not differ across units; x_{it} is a kx1 vector of observed regressors which differ across units; f_t is a rx1 vector of unobserved factors, which may influence each unit differently and which may be correlated with x_{it}; ε_{it} an identically and independently distributed disturbance term.

Pesaran (2006) uses the cross sectional means of the dependent variable and the explanatory variables as the proxies for the unobserved common factors. Thus, he suggests including the means of y_{it} and x_{it} as additional regressors to remove the effect of these factors as follows:

$$y_{i,t} = \alpha_i' d_t + \beta_i' x_{i,t} + \gamma_i' f_t + \delta_{0i} \overline{y_t} + \delta_i' \overline{x_t} + u_{i,t} \tag{4}$$

Pesaran (2006) showed that the parameters of this auxiliary regression which is constructed by augmenting the original regression by the cross sectional averages of the dependent and explanatory regressors can be consistently estimated by OLS. This estimator is called Common Correlated Effect (CCE) estimator. Pesaran (2006) proposes a pooled version, Common Correlated Effects Pooled Estimator (CCEP) in which the fixed effects estimator is augmented by cross-section averages of the dependent and the independent variables, which we employ in this study.[34] Kapetanios, Pesaran and Yamagata (2006) showed that this estimator is robust to a wide variety of data generating processes and has lower bias than alternative estimation methods. The results of the CCEP estimator are reported in Table 3.5. The effect of real depreciation on GDP per capita is still negative and significant but somewhat smaller than the FE estimates for whole sample and developing countries. Contractionary effect of depreciation still holds for developing countries after controlling for the unobserved common factors while the coefficient of interest is again insignificant for industrial countries sample.

[34] Pesaran (2004) suggested a formal test for cross section dependency. However, we cannot apply this test because of degrees of freedom problems.

Table 3.5: *Long run Equations-CCEP Estimation Results*
Dependent variable: Real GDP per capita

	whole sample	**developing**	**industrial**
REER	0.215***	0.194***	0.071
	(0.045)	(0.048)	(0.078)
Gov. Consumption	-0.086	-0.111	-0.051
	(0.071)	(0.074)	(0.125)
Trade Openness	0.233***	0.236**	0.023
	(0.081)	(0.091)	(0.121)
Fin. Development	0.167***	0.219***	-0.011
	(0.056)	(0.073)	(0.048)
Investment	0.155***	0.137**	0.231**
	(0.053)	(0.056)	(0.095)
trend	0.014***	0.005	-0.003
	(0.003)	(0.004)	(0.005)
Constant	-21.173***	-4.778	2.892
	(5.266)	(8.455)	(7.870)
Observations	2,024	1,273	751
No. Countries	80	57	23
R-square	0.672	0.586	0.905
LLC	-11.221***	-8.250***	-0.052
	[0.000]	[0.000]	[0.479]
MW	398.45***	275.155***	69.260**
	[0.000]	[0.000]	[0.014]

Notes: Robust standard errors in parentheses. *significant at 10%; ** significant at 5%, *** significant at 1%. LLC and MW denotes the Levin, Lin and Chu (1994) and Maddala and Wu (1999) panel unit root test statistics. The values in [.] are the p-values.

3.3.3. Short run Dynamics

After estimating the long run equation, we estimate a panel error correction model based on the cointegration relationships estimated in the previous section. In the time series context, the estimation of the long run relationships among I(1) variables are studied by Engle and Granger (1987), Johansen (1995) and Phillips and Hansen (1990). These approaches propose that the long run relationships only exist between integrated variables and the standard estimation and inference are incorrect. Pesaran and Smith (1995) and Pesaran and Shin (1999) argue against these approaches showing that the long run relationship between both integrated and stationary variables can be consistently and efficiently estimated by small modifications to standard methods. In Pesaran and Shin's (1999) ARDL approach to long run modeling, there is no need to pretesting the order of integration of the variables because the method is valid for both I(0) and I(1) variables. The main requirement for the validity of this methodology is that there exist cointegration relationship among the variables of interest. The errors of the dynamic specification needs to be serially uncorrelated and the regressors need to be strictly exogenous in order to find consistent and efficient parameter estimates. As Pesaran and Shin (1999) showed, this prerequisite can be met by sufficiently augmenting the lag orders of the dynamic model. Based on these advantages, we will estimate the short run and long run effects of the real exchange rate on economic growth by the panel version of ARDL approach. This approach will allow us to confirm the cointegration relationship in our long run models for different subsamples and analyze whether the contractionary devaluation result we found for all countries and developing countries sample from the estimation of long run equations is still valid in the short term.

We estimate the following panel ARDL (p, q, r, …, r) model,

$$y_{it} = \mu_i + \sum_{j=1}^{p} \lambda_j y_{i,t-j} + \sum_{j=0}^{q} \gamma_j RER_{i,t-j} + \sum_{j=0}^{r} \delta_j X_{i,t-j} + \varepsilon_{it} \tag{5}$$

where y is the logarithm of real GDP per capita, RER is the logarithm of real exchange rate, X is a set of control variables which consists the logarithm of government consumption, trade openness, financial development and investment, μ_i is the unobserved country-specific effects. This panel ARDL model can be reparameterized as an error correction model (ECM) which is given in equation (6) as,

$$\Delta y_{it} = \mu_i + \emptyset\left(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1}\right) + \sum_{j=1}^{p-1} \lambda_j^* \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \gamma_j^* \Delta RER_{i,t-j} + \sum_{j=0}^{r-1} \delta_j^* \Delta X_{i,t-j} + \varepsilon_{i,t} \tag{6}$$

where Δ is the first difference operator. The stationary residuals from the cointegration equations estimated in the previous part are used for the error correction term $(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1})$ which indicates the deviations from the long-run equilibrium. Ø denotes the speed of adjustment. A negative and significant coefficient on Ø ensures the existance of the cointegration relationship among the variables. θ_1 and θ_2 are considered as long run coefficients and λ_j, δ_j and γ_j are short run coefficients. The lag orders p, q and r are assumed to be equal. The maximum lag length is set to be 3. The optimum lag order is selected by using Akaike and Schwarz Information Criteria.[35] Thus, panel ARDL (2,2,2, …, 2) model is estimated for all samples based on the cointegration equations estimated in the previous part.

Chudik and Pesaran (2013) extend the Common Correlated Effects (CCE) approach of Pesaran (2006) to dynamic models with weakly exogenous regressors. They show that CCE type estimators perform well in case of dynamic models when they are augmented by a sufficient number of lags of cross section averages of regressors. After estimating the standard panel ARDL model, we also employ the approach of Chudik and Pesaran (2013) to the panel ARDL model in order to account for the cross section dependence of errors. The estimated panel ARDL-CCEP model is the following:

$$\Delta y_{i,t} = \mu_i + \emptyset\left(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1}\right) + \sum_{j=1}^{p-1} \lambda_j^* \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_j^* \Delta RER_{i,t-j} + \sum_{j=0}^{r-1} \gamma_j^* \Delta X_{i,t-j} + \sum_{j=0}^{m} a_j \bar{y}_{t-j} + \sum_{j=0}^{m} b_j \overline{RER}_{t-j} + \sum_{j=0}^{m} c_j \bar{X}_{t-j} + \varepsilon_{i,t} \quad (7)$$

According to Chudik and Pesaran (2013), a necessary condition for CCE approach to be valid in the context of panel ARDL models is that the number of cross-sectional averages must be at least as large as the number of unobserved common factors minus one. Since the number of unobserved common factors are unknown in practice, the maximum number of unobserved common factors are generally assumed

[35] The unrestricted ARDL model is estimated for lags 3, 2 and 1 for all three samples. Akaike Information criteria (AIC) chose 3 lags for all three samples while Schwarz Information Criteria (SIC) chose 2 lags for developing developed countries sample and 1 lag for whole countries sample. Since the 3rd lags are insignificant in all estimations and the results do not change significantly when we drop the 3rd lags, we preferred to estimate the ARDL model by using 2 lags following SIC. AIC and SIC values for PARDL models with different lag lengths are given in Appendix C.

to be relatively small.[36] Chudik and Pesaran (2013) set $m=T^{1/3}$ which gives the values of m=3,3,4 for T=40,50,100, respectively. Since the maximum number of time period of our unbalanced panel data set is 50, we set m as equal to 3.

The parameter estimates of the panel ARDL model for all countries, developing countries and industrial countries samples are represented in Table 3.6. Since the regressors which are found to be insignificant in the long run equation can be significant in the short run, we included all regressors in the short run dynamics while excluding the insignificant regressors of the long run equation from error correction term. Error correction coefficient (Φ) is negative and significant in whole and developing countries sample indicating that there exist a cointegration relationship among the variables of the long run equation for these samples. The insignificance of the error correction coefficient of industrial countries sample is not surprising since all regressors except for the investment were insignificant in the long run equation.

The short run coefficient of the real exchange rate, namely ΔREER, is positive and significant in all samples. In developing countries the depreciation of real exchange rate affects per capita GDP growth negatively in the short run as well as in the long run. The short run coefficient of real exchange rate is also positive and significant for industrial countries though we failed to have enough evidence on contractionary devaluation hypothesis in the long run. According to this result, for industrial countries, the depreciation of real exchange rate can have negative growth effects in the short term while it has no effect in the long term. Among the control variables, the effect of the financial development on per capita GDP growth is negative and significant in the short run even though its effect is positive in the long run. This point is consistent with the suggestions of Aghion, Bacchetta and Banerjee (2004) which stress that countries which are going through a phase of financial development may become more unstable in the short run. The same result verified by Loayza and Ranciere (2006) empirically. Trade openness has a positive and significant coefficient

[36] As in Pesaran and Chudik (2013) indicated, the studies such as Stock and Watson (2002) and Giannone et al. (2005) assume the maximum number of unobserved factors as two, while Bai and Ng (2007) estimate four factors and Stock and Watson (2005) estimate seven factors.

Table 3.6: *ARDL Estimations*

	whole sample	**developing**	**developed**
Error corr. term	-0.057***	-0.061***	-0.002
	(0.009)	(0.011)	(0.011)
Δrgdp per capita	0.343***	0.319***	0.501***
	(0.048)	(0.056)	(0.051)
ΔREER	0.050**	0.050**	0.034***
	(0.022)	(0.023)	(0.012)
ΔREER(-1)	-0.006	-0.004	-0.011
	(0.011)	(0.013)	(0.010)
Δfinancial dev.	-0.040**	-0.037*	-0.055***
	(0.016)	(0.019)	(0.015)
Δfinancial dev.(-1)	-0.002	-0.011	0.034**
	(0.012)	(0.013)	(0.012)
Δtrade open.	0.046**	0.036	0.062***
	(0.020)	(0.023)	(0.016)
Δtrade open.(-1)	0.055***	0.065***	-0.031**
	(0.017)	(0.019)	(0.012)
Δinvestment	-0.001	-0.002	0.000
	(0.002)	(0.003)	(0.002)
Δinvestment(-1)	-0.005***	-0.005***	-0.003*
	(0.001)	(0.002)	(0.002)
Δgov. cons.	-0.024	-0.010	-0.323***
	(0.017)	(0.016)	(0.043)
Δgov. cons.(-1)	-0.017	-0.015	0.026
	(0.016)	(0.016)	(0.038)
Constant	0.012***	0.012***	0.010***
	(0.001)	(0.001)	(0.001)
Observations	1,638	975	663
R-squared	0.191	0.176	0.545
Number of countries	76	53	23

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, *** significant at 1%.

in the short run as well as in the long run. The short run coefficient of investment and government consumption are negative but mostly insignificant.

Table 3.7 represents the parameter estimates of the panel ARDL-CCEP model in which we augment the ARDL model with the lags of cross-section averages of the dependent and independent variables. The coefficient of the error correction term is again negative and significant in whole countries and developing countries sample while insignificant in industrial countries sample. The real exchange rate is positive and significant in the short run for whole countries and developing countries samples implying that depreciation of the real exchange rate is contractionary in the short run as well as long run for developing countries. However, it is no longer significant in in developed countries sample as opposed to the result in panel ARDL estimation. The parameter estimates of control variables are mostly similar to the estimates of panel ARDL model.

3.3.4. Endogeneity

As it is given at the beginning of this chapter, Equation 1 is the standard growth regression used in the growth literature. In the previous sections, we estimated the level equation, Equation 2, which is nothing more than a reparametrization of Equation 1. We constructed the panel cointegration relationships based on the time series properties of our variables. Estimation of Equation 1 including the initial income per capita as a control variable is the most common approach used in the growth literature and especially in the literature of real exchange rate and growth relationship. The standard estimators like "fixed effects" (within) estimator will be inappropriate for the estimation of this dynamic model. GMM estimators which are introduced by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995) are generally used as the optimal estimators in dynamic panel data models which accounts for the biases induced by the inclusion of initial income level and controls for the reverse causality and potential endogeneity of the explanatory variables. Therefore, we also employ the GMM method and estimate the growth

Table 3.7: *ARDL-CCEP estimations*

	whole sample	**developing**	**developed**
Error corr. term	-0.053***	-0.053***	-0.023
	(0.008)	(0.010)	(0.014)
Δrgdp per capita	0.319***	0.258***	0.457***
	(0.049)	(0.059)	(0.047)
ΔREER	0.031**	0.029*	0.015
	(0.015)	(0.017)	(0.017)
ΔREER(-1)	-0.001	-0.003	-0.004
	(0.010)	(0.010)	(0.012)
Δfinancial dev.	-0.035**	-0.032*	-0.055***
	(0.016)	(0.018)	(0.016)
Δfinancial dev.(-1)	0.004	0.004	0.035**
	(0.012)	(0.013)	(0.014)
Δtrade open.	0.003	-0.001	0.025
	(0.019)	(0.020)	(0.024)
Δtrade open.(-1)	0.063***	0.064***	-0.002
	(0.016)	(0.018)	(0.016)
Δinvestment	-0.003	-0.005*	-0.002
	(0.003)	(0.003)	(0.002)
Δinvestment(-1)	-0.004***	-0.006***	-0.003
	(0.002)	(0.002)	(0.002)
Δgov. cons.	-0.007	0.001	-0.229***
	(0.015)	(0.015)	(0.043)
Δgov. cons.(-1)	-0.014	-0.012	0.025
	(0.016)	(0.015)	(0.035)
Constant	1.704***	-0.395	-1.985**
	(0.515)	(0.924)	(0.862)
Observations	1,638	972	663
R-squared	0.303	0.304	0.646
Number of countries	76	53	23

Notes: Robust standard errors in parentheses. *significant at 10%; ** significant at 5%, *** significant at 1%.

equation by including the initial income level in order to compare our results with other studies that investigate the effects of real exchange rate on economic growth. Since the GMM estimators are developed for "small T, large N" panel data models, studies generally use the non-overlapping five year averages of the time series. This also helps to smooth business cycle fluctuations and focus on long run growth effects. Therefore, we transform our time series data into non-overlapping five year averages when conducting GMM. The initial income variable is comprised as the first observations of every five-year period.

The "first difference GMM" estimator which is developed by Arellano and Bond (1991) transforms the variables into first differences in order to omit the individual fixed effects, then use the lags of the levels of the variables as instruments. Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Therefore, Arellano and Bover (1995) and Blundell and Bond (1997) introduced a "system GMM estimator" that combines the regression in differences and the regression in levels in a system. The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. Due to the persistency in our regressors, we employ a system GMM procedure using 5-year averaged data. We chose to use orthogonal deviations transformation instead of first-difference transformation since we have unbalanced panel data.[37] Since the number of instruments increases quadratic in T, we collapsed and restricted the instruments up to three lags. We also include time dummies which partially prevents cross-country correlation.

The results of the system GMM estimations are given in Table 3.8. The specification tests of Hansen and the second order serial correlation verify the validity of moment conditions and the absence of autocorrelation. The findings do not change

[37] First-difference transformation magnifies the gaps in unbalanced panel data since it subtracts the previos observation from the contemporenous one (Roodman, 2005). Instead, orthogonal deviations transformation subtracts the average of all future available observations.

Table 3.8: *GMM estimation results*
Dependent variable: Growth of real GDP per capita

	whole sample	**developing**	**developed**
initial income	-0.047*	-0.0789*	-0.0020
	(0.027)	(0.0418)	(0.0080)
REER	0.344***	0.2869**	0.1121
	(0.116)	(0.1246)	(0.0830)
trade openness	0.201**	0.2836**	0.0564*
	(0.086)	(0.1159)	(0.0331)
government consumption	-0.087	-0.2869*	-0.1880*
	(0.114)	(0.1634)	(0.1006)
financial development	0.119**	0.1270*	-0.0291
	(0.054)	(0.0711)	(0.0217)
investment	0.084	0.0885	0.0636
	(0.076)	(0.1115)	(0.0620)
constant	-2.343***	-1.6182*	-0.1381
	(0.754)	(0.8616)	(0.4910)
Observations	406	256	150
No. Countries	74	52	22
Hansen test (p-value)	0.153	0.161	0.734
2nd order AC (p-value)	0.215	0.272	0.571
1st order AC (p-value)	0.0280	0.0683	0.00594
No. of Instruments	31	31	31

Robust standard errors in parentheses. *significant at 10%; ** significant at 5%, *** significant at 1%.

when we control for endogeneity and reverse causation.[38] The effect of real exchange rate is still positive and significant for whole sample and developing countries sample. That is, GMM estimation results confirm the contractionary effect of depreciation in developing economies. The result for the industrial countries is also unchanged. The real exchange rate has no effect on economic growth for those economies. Among the control variables, investment becomes insignificant for all three samples when we control for the simultaneity problem.

Our main finding provided by fixed effects, Common correlated Effects, ARDL, ARDL-CCEP and system-GMM estimations is that the depreciation of real

[38] We also employed FMOLS estimation which controls for endogeneity problem in panel cointegration procedure. It again gave similar results.

exchange rate is contractionary for developing countries while it has not any significant effect on economic growth of industrial countries. This result is in line with the findings of Ahmed et al. (2003), Bebzcuk et al. (2006), Bleaney and Vargas (2009), Blecker and Razmi (2008) which provide empirical support for the contractionary effect of depreciations with GMM estimations except for Ahmed *et al.* (2003). However, our result is contrary to the findings of Rodrik (2008), Gala (2008), Eichengreen *et al*. (2011) which show that undervaluation of the exchange rate is expansionary in developing countries by using GMM estimations. However, the other common point of these studies apart from employing GMM estimation is their use of Balassa-Samuelson adjusted index of undervaluation as the real exchange rate measure. Their common results of expansionary effect of devaluation for developing countries may be due to their use of undervaluation index as Woodford (2009) suggests.

3.3.5. East Asian Countries

One of the most discussed issues in international economics is the regional differences in the economic performance of countries. East Asian countries have been performing higher growth rates than their counterparts in Latin America nearly for 30 years. Sachs (1985) point out their exchange rate management and trade regime as the main difference behind their growth performances. According to Sachs (1985), by pursuing an export-based industrialization strategy with the help of competitive exchange rates, East Asian countries achieved higher and sustainable economic performance relative to Latin American countries which followed generally an inward-oriented strategy with overvalued real exchange rates. In this context, using an outward orientation index based on real exchange rate distortion and variability, Dollar (1992) investigated the relationship between outward orientation and economic growth and concluded that shifting to an Asian level of outward orientation and real exchange rate stability, Latin American countries can have substantial gains regarding to economic growth.[39] This competitive real exchange rate policy pursued in East Asian countries strengthens the traditional expansionary devaluation view.

In the literature there are some empirical studies on this issue with different claims. According to Kamin and Klau (1998), there are not significant differences among the regions and devaluations are contractionary in Asian countries as well as Latin American countries in the short run. Upadhyaya and Upadhyay (1999) concluded that devaluation does not make any effect on output in Asian countries in short, medium and long run. Kim and Ying (2007) confirmed that devaluations are strongly expansionary in several East Asian countries in contrast to the case of Mexico and Chile in the pre-1997 crisis period. However, they indicated that devaluations could be contractionary in East Asian countries as well as Latin American countries when the post-crisis data are included into the estimation.

Remembering that our long run estimates indicated that real devaluations are contractionary for developing countries, in this section we investigate whether the same result holds for East Asian countries as well. To this end, we interact the East Asian countries dummy with the real exchange rate and add it to our long run equation of developing countries. The results are given in Table 3.9. The results of the fixed effects estimation show that the coefficient of the real exchange rate is 0.264 and the coefficient of the interaction term is -0.697. Both coefficients are statistically significant. This means that the coefficient of real exchange rate for East Asian countries is -0.433. Therefore, our long run regression estimates imply that East Asian countries are different from other developing countries and the depreciation of real exchange rate is expansionary in East Asian countries. This finding is also confirmed by CCEP estimation as well.

[39] East Asian countries are also known for their high levels of saving and investment. Dooley et al. (2004) and Bhalla (2007) associate these high saving levels to their undervalued currencies. The saving channel is one of the channels of real exchange rate-growth relationship which is not agreed upon yet. (see also Montiel and Serven, 2008; Levy-Yeyati and Sturzenegger, 2007).

Table 3.9: *Long run equation-East Asian countries*

	FE	**CCEP**
REER	0.264***	0.223***
	(0.046)	(0.050)
REER*East Asia	-0.697***	-0.727***
	(0.192)	(0.196)
Financial Development	0.193***	0.175***
	(0.048)	(0.048)
Trade Openness	0.208***	0.187***
	(0.065)	(0.066)
Government Consumption	-0.076	-0.072
	(0.063)	(0.059)
Investment	0.202***	0.174***
	(0.059)	(0.056)
Constant	-15.490***	-0.969
	(4.622)	(7.631)
Observations	1,273	1,273
R-squared	0.629	0.652
Number of countries	57	57

Robust standard errors in parentheses.

(***), (**) and (*) denote the significance at the 1% level, 5% level and 10% level respectively.

Then what can be the reason behind the result that East Asian countries are different from other developing countries in other regions such as Latin America, MENA and Sub-Saharan Africa? East Asian countries have in fact displayed some differences in a number of fundamental determinants of growth such as savings, investment, and industrialization over the last decades. Besides the existence of these fundamentals, a competitive and stable real exchange rate can be a facilitating condition and it can be critical for jump-starting growth. (Eichengreen, 2008). A competitive or depreciated real exchange rate alone could not be sufficient for a sustained growth and it needs to be combined with some other factors to achieve high growth rates (Akyüz, 2009). Table 3.10 represents a number of economic indicators of East-Asia, Latin America and Caribbean, MENA and Sub-Saharan Africa regions for the periods of 1980s, 1990s and 2000s. First of all, strong and sustained investment rates are among the basic features of East Asian countries. Contrary to the low and declining shares of investment which are below 20 percent in Latin America, MENA and Sub-Saharan Africa since 1980s, the share of investment in GDP has lied around 30 percent in East Asian countries. Besides the level of investments, their productivity is also important. Instead of the less productive categories of investment such as housing construction which is the case mostly for the other regions, East Asian countries mainly focused on the investment in machinery and equipment and construction of physical infrastructure (UNCTAD TDR, 2003). By utilizing from moderate devaluations and wage restraints, they also achieved to increase their export share of GDP over 70 percent since 2000s. As well as total exports share, their share of manufactured exports is far beyond the other regions. East Asian countries also achieved rapid and sustained industrialization which is a key of successful development experiences of industrial countries. Therefore, they combined rising investment with rising manufacturing value added. By contrast, in most countries of Latin America and Africa, the declining share of investment in GDP combined with a falling share of manufacturing value added. Another important factor for the East-Asian success is that these countries improved their international competitiveness mainly through productivity growth instead of devaluation of currency or wage cuts. Most of the countries in this region, especially Korea and Taiwan, the first industrializers of East Asia, based their trade on strong productivity growth. This point is emphasized in UNCTAD Trade and Development Report, 2003 as:

> Outside of East Asia, exchange rate depreciation or wage restraint appear to have been much more common routes to seeking greater competitiveness. But none of the countries that pursued this route achieved sustained improvements in export and value-added performance to the same extent as countries that succeeded in raising productivity and wages in a virtuous process of capital accumulation and employment growth (UNCTAD TDR; p. IX).

Additionally, the increase in investment and exports raised the profits and the increase in profits led to the rapid growth of savings in East Asia. Therefore, the investment-export nexus is complemented by an investment-profit nexus (Akyuz and Gore, 1996; Akyüz, 2009). However, most Latin American and African countries failed to sustain an interaction among export, investment and savings.

***Table 3.10**: Regional Economic Indicators*

		Latin America	MENA	Sub-Saharan Africa	East Asia
GDP Growth (%)	1980-1989	2.1	1.2	1.7	6.4
	1990-1999	2.9	4.2	2.0	6.4
	2000-2009	3.0	4.9	5.1	5.6
Exports (% GDP)	1980-1989	17.5	33.0	26.7	45.4
	1990-1999	18.9	31.7	27.4	57.6
	2000-2009	24.6	45.8	33.3	74.6
Investment (% GDP)	1980-1989	20.0	24.0	20.1	26.9
	1990-1999	18.5	21.9	16.3	31.3
	2000-2009	19.1	21.7	17.3	26.9
Domestic Saving (% GDP)	1980-1989	22.9	20.9	21.0	27.8
	1990-1999	19.3	22.3	16.4	33.0
	2000-2009	21.0	35.0	17.9	34.0
Manufacturing VA (% GDP)	1980-1989	25.8	9.6	15.9	24.0
	1990-1999	19.9	11.3	14.2	25.5
	2000-2009	17.9	11.5	12.3	27.1
Manufac. Exports (% of Exports)	1980-1989	25.8	27.4	8.9	43.7
	1990-1999	47.9	20.7	25.4	68.8
	2000-2009	50.0	16.9	27.9	75.0
Deposit Dollarization (%)	1980-1989	21.2	32.4	9.0	9.9
	1990-1999	28.4	27.3	24.3	14.0
	2000-2009	32.8	27.2	26.5	12.9

Source: All indicators except for dollarization are taken from World Development Indicators Database. Deposit dollarization data is provided by Levy-Yeyati (2006) which is the ratio of foreign deposits to total deposits.

The last factor presented in Table 3.10 related with different response of growth to depreciations is financial dollarization. Deposit dollarization ratios of East Asian countries have lied around 10 percent which is much lower than other regions. High foreign debt and deposit ratio in other regions, especially in Latin America and MENA, are highly likely to lead adverse balance sheet effects due to the currency mismatches in case of depreciations. Therefore, high financial dollarization ratios can be another reason for the contractionary effect of depreciations in regions except for East-Asia as stated by a number of studies.

These explanations show that real exchange rate depreciations can facilitate to achieve high and sustainable growth only when it is supported with other factors such as increased investment, improved manufacturing industry and productivity. Real exchange rate policy cannot be substitute to these fundamentals. For the other developing countries that cannot achieve this structural change, depreciation of the real exchange rate likely to have disruptive effects on economic growth.

3.3.6. The Effects of Financial Dollarization and Financial Development

Although the contractionary effects of devaluation is emphasized by authors such as Edwards (1986) and Morley (1992), it was believed that the negative effects of a devaluation will be offset by the positive effects of increased exports and the overall effect will turn out to be positive. This was the dominant view before the currency crisis of 1990s. After the recessions followed by the devaluations in 1990s, some authors like Frankel (2005) and Calvo and Reinhart (2001) pointed out to the balance sheet effects and asserted that the negative effects of the devaluation can be stronger than the positive effects. According to these authors, firms may not increase their production because of corporate financial distress, absence of trade credit and increased costs of imported inputs even for the purpose of exports. The main reason is the phenomenon called "financial dollarization" which is a problem of most of the developing economies. The foreign borrowing of the agents of developing countries creates a mismatch between their assets and liabilities. Then a real depreciation leads to deterioration in the balance sheet and net worth of firms which in turn leads to a decrease in their investment and output.

The studies that look for a firm-level empirical evidence for the balance sheet effect generally focused on Latin American countries for which the dollarization is more persistent. Aguiar (2005) studied the firm-level investment performance of Mexican firms after 1994 crisis. He concluded that while the exporters outperform non-exporters in terms of profits and sales after the devaluation, their investment is constrained by weak balance sheets. Focusing on 450 firms from five Latin American countries, Bleakly and Cowan (2005) showed that firms holding more dollar debt do not invest less than their counterparts after a depreciation. Since firms match the currency denomination of their liabilities with the exchange rate sensitivity of their profits, the negative balance sheet effects of a depreciation are offset by the larger competitiveness gains of these firms. Similarly, analyzing the investment and profitability of Colombian firms, Echeverry et al. (2003) find a negative balance sheet effect for profitability while the effect for investment is insignificant.

There are also a few studies which explore this balance sheet effect at the macro level (see Bebzchuk *et al.*, 2006; Cespedes, 2005). In this part, we first investigate the effect of dollarization on the real exchange rate and growth relationship. Financial dollarization literature generally uses two different measures of dollarization.[40] The first one is deposit dollarization which uses the ratio of foreign deposits to total deposits. According to Levy-Yeyati (2006), deposit dollarization can be used as a sensible proxy for domestic loan dollarization, since they often mirror each other due to presence of prudential limits on banks' foreign exchange positions. The other one is the liability dollarization that generally uses the ratio of external debt to GDP. We use the deposit dollarization as the measure of dollarization which is provided by Levy-Yeyati (2006).[41] In the first column of Table 3.11, we add the deposit dollarization and its interaction with real exchange rate to the long run regression in

[40] See Levy-Yeyati (2005), Arteta (2005) and Reinhart *et al.* (2003) for a broad discussion of financial dollarization and its measurement issues.

[41] The data is recently updated until 2009.

Table 3.11: *Effects of Financial Dollarization and Financial Development*

	Effect of Financial Dollarization	***Effect of Financial Development***		
	Whole Sample	**Whole Sample**	**Developing**	**Developed**
REER	0.092	0.520***	0.661***	-0.784*
	(0.056)	(0.159)	(0.194)	(0.396)
Fin.Development	0.076**	0.535**	0.833***	-0.918**
	(0.032)	(0.224)	(0.285)	(0.435)
Trade Opennes	0.039	0.186***	0.190***	0.032
	(0.051)	(0.057)	(0.061)	(0.093)
Investment	0.202***	0.186***	0.202***	0.234***
	(0.044)	(0.054)	(0.056)	(0.082)
Gov.Consumption	-0.089	-0.043	-0.063	-0.076
	(0.063)	(0.063)	(0.063)	(0.115)
trend	0.020***	0.015***	0.012***	0.021***
	(0.001)	(0.002)	(0.002)	(0.002)
Dollarization	-1.642**			
	(0.676)			
REER*Dollarization	0.303**			
	(0.139)			
REER*Fin. Development		-0.085*	-0.137**	0.199*
		(0.045)	(0.057)	(0.097)
Constant	-31.444***	-22.717***	-18.271***	-27.987***
	(2.562)	(3.401)	(4.937)	(3.762)
Observations	1,492	1,965	1,216	749
R-squared	0.835	0.699	0.584	0.902
Number of id	71	78	55	23

Notes: Robust standard errors in parentheses. (***), (**) and (*) denote the significance at 1% level, 5% level and 10% level respectively.

order to see how financial dollarization affects the long run relationship between real exchange rate and growth. We do not estimate the effect of liability dollarization separately for developing and developed countries since liability dollarization is a phenomenon which exists in developing countries. Dollarization in developed countries is very low even if it exists. We expect a negative coefficient on the dollarization variable and a positive coefficient on the interaction term which implies that dollarization itself negatively effects real GDP and the contractionary effect of real depreciations increases with the level of dollarization in a country. The results are compatible with our expectations. The coefficient of dollarization is negative indicating that dollarization is detrimental for economic growth. The coefficient of the interaction term is significant and positive which verifies that real depreciation becomes more and more contractionary as the dollarization ratio of a country increases.

We also examine how the effect of real exchange rate on growth varies with their financial sector development. As mentioned above, real devaluations can have negative effects on the economy if aggregate demand is constrained by the net worth of agents and if a considerable amount of the borrowing of these agents is denominated in foreign currency. However, a more financially developed market will help to reduce the negative effects of depreciation on aggregate demand by making the conditions of borrowing less sensitive to changes in net worth. Therefore, we can expect the contractionary effects of real depreciations be lower in economies where the financial markets are more developed. This point is stressed by a few studies such as Cespedes, Chang and Velasco (2003), and Cespedes (2005). In columns 2-4 of Table 3.11, we interact real exchange rate with financial sector development-which is measured by the ratio of liquid liabilities to GDP-for whole sample, developing and developed countries samples. The coefficient of real exchange rate is positive while the coefficient of interaction term is negative for whole sample and developing countries sample implying that as developing countries have more developed financial systems, contractionary effect of depreciations gets smaller. For developed countries, real exchange rate has a negative coefficient whereas the coefficient of interaction term is positive as the opposite of developing countries.

To sum up the findings of this chapter, the results of our long run equations support that the depreciation of the real exchange rate is contractionary in developing countries and this contractionary effect increases with the degree of dollarization of the country whereas decreases with countries' financial sector development. However, investigating whether the East Asian countries are different, we found that depreciations are expansionary for East Asian countries as opposed to other developing countries. For industrial countries, the changes in real exchange rates have not any significant effect in the long run. Our results are also supported by Pesaran (2006)'s Common Correlated Effects methodology and the GMM procedure implying that they are robust to the cross section correlation and reverse causality considerations. We also showed that depreciation of real exchange rate is again contractionary for developing countries in the short run as well as in the long run while it is also insignificant for industrial countries in the short run.

CHAPTER 4

STRUCTURE OF PRODUCTION AND TRADE IN TURKISH MANUFACTURING INDUSTRY

Achieving sustainable economic growth and improving international competitiveness in an economy crucially depend on productivity growth and technological progress. Manufacturing industry which provides high productivity and increasing returns, acts as the main engine of economic growth (Kaldor, 1966, 1967). Consistently with this Kaldorian view, rapid expansion of manufacturing production and exports is a common feature of rapidly growing developing countries, especially of East-Asian economies such as South Korea, Taiwan, China, Hong Kong, and Thailand (UNCTAD TDR 2003; chap. 5). In this sense, production and export performance of manufacturing industry are highly important for economic growth and development. Exchange rate policies are amongst the main determinants of manufacturing exports and production. The structure of manufacturing production and trade play a key role on the way how exports and thereby production of manufacturing industry react to the changes in real exchange rates.

There has been a transformation in the structure of trade and production of our manufacturing industry since 1990s due to a number of domestic and international factors such as Customs Union which is introduced in 1996, Asian Crisis in 1997-1998, the emergence of China as the center of world production, and internationalization of production with the effect of increased intra-industry trade. Especially after 2000, there has emerged some new tendencies in Turkish manufacturing industry trade. Yükseler and Türkan (2008) categorized this structural transformation in three titles as “increased import dependency”, “internationalization or intra-industry trade” and “Asianalized trade”. While specializing mainly on the exports of labor-intensive sectors such as Textiles and Wearing Apparels in 1980s, Turkish economy appears to have specialized on medium and high-technology sectors such as Machinery and Equipment, Motor Vehicles and Communication Equipments since mid-1990s.

In this chapter, we document the structure of manufacturing production, exports and imports since 1990s in order to set a basis for the next chapter in which we will econometrically estimate the impact of real exchange rate changes on manufacturing production and trade. As revealed in the literature, responses of manufacturing production and trade of manufacturing industry sectors to exchange rate movements are highly dependent on sector-specific factors such as export exposure, imported input use, intra-industry trade and vertical specialization, technology intensity, and debt dollarization. Relative weights of these sectors in total manufacturing production determine the reaction of total manufacturing industry thereby total economy against real exchange rate changes. To this end, in this chapter, we first analyze the composition of manufacturing production, exports and imports focusing on the shares of manufacturing industry sub-sectors since 1990s. Next, we document the characteristics of sectors in terms of intra-industry trade, import dependency, domestic value-added share of exports, technology intensity, product complexity, revealed comparative advantage, export to production and import to supply ratios which are the potential factors that can play role in the exchange rate sensitivity of production and trade. Lastly, we examine the financial structure of industries in terms of liability dollarization in order to analyze the balance sheet effect at industrial basis.

4.1. STRUCTURE OF MANUFACTURING PRODUCTION

4.1.1. Composition of Manufacturing Production

Table 4.1 shows the composition of production of manufacturing industry sectors between 1994 and 2009 according to 2-digit Industrial Classification of All

Economic Activities (ISIC) Rev. 3[42]. Comparing the production shares of manufacturing sub-sectors, it is clearly apparent that some sector's share changed significantly between 1994 and 2009, implying a transformation in the composition of Turkish manufacturing industry. In 1994 and 2002, Food and Beverages, Textile, Wearing Apparels, Basic Metal, Chemicals and Coke and Refined Petroleum Products are the sectors with the largest production shares. Among these sectors, Wearing Apparels has significantly increased its share from 5.6 percent to 9.3 percent between 1994 and 2002; whereas the shares of Coke and Refined Petroleum Products, Basic Metals and Chemicals have declined. In 2009, with an output share of 16.5 percent, Food and Beverages remained as the sector that has the largest share; while Basic Metal, Motor Vehicles, Textiles and Chemicals follow it with shares of 10 percent, 8 percent and 7.7 percent, respectively. Even though Textile sector has been still providing a considerable share of total manufacturing output, its share of 15.5 percent in 2002 declined to 7.7 percent in 2009. Similarly, despite the significant rise in its share between 1994 and 2002, Wearing Apparels' share in manufacturing sector output contracted by 2.5 percentage points in 2002-2009 period. Contrary to Textiles and Wearing Apparels, the share of Motor Vehicles has increased nearly by 2.5 percentage points and has become amongst the most important sectors of Turkish manufacturing industry since 2002. Similarly, Electrical Machinery displayed a great performance by increasing its share from 2.4 percent to 5.9 percent.

During the 1994-2009 period, Electrical Machinery is the sector which achieves the highest rise in production share with an increase of 3.8 percent. Furniture and Other Manufacturing, Motor Vehicles and Fabricated Metal Products are the other sectors with the largest increase in the production shares. On the other hand, Textiles, Coke and Refined Petroleum Products and Chemicals have the largest contraction in

[42] The codes and the definitions of ISIC Rev. 3 is given in Table D1 of Appendix D. TURKSTAT began to publish Industrial Production Statistics according to the Statistical Classification of Economic Activities in the European System of Account (NACE) since 2005. Therefore, Industrial Production Statistics are not available according to Industrial Classification of All Economic Activities (ISIC) after 2009.

Table 4.1: *Composition of Manufacturing Production*

ISIC Rev. 3 Code		**Manufacturing Production Shares (%)**			
		1994	**2002**	**2008**	**2009**
15	Food and Beverages	15.2	16.1	14.0	16.5
16	Tobacco Products	2.3	1.4	0.7	1.0
17	Textiles	13.4	15.6	8.0	7.7
18	Wearing Apparel	5.6	9.3	5.8	6.8
19	Leather products and footwear	0.8	1.4	0.8	0.8
20	Wood products	0.7	1.1	1.3	1.5
21	Paper and paper products	2.3	2.1	1.7	2.0
22	Printing and Publishing	1.6	1.8	1.6	1.1
23	Coke and Ref. Petroleum Products	10.1	5.0	6.0	4.0
24	Chemicals	9.9	7.9	6.0	7.1
25	Rubber and Plastic Products	3.1	3.8	4.8	5.0
26	Non-metallic Mineral Products	5.7	5.0	5.6	5.8
27	Basic Metal	10.9	7.3	13.6	10.1
28	Fabricated Metal Products	2.9	3.0	4.9	5.2
29	Machinery and Equipment	5.4	5.6	6.6	4.2
30	Office, Account. and Comp. Mach.	0.0	0.0	0.2	1.6
31	Electrical Machinery	2.1	2.4	3.4	5.9
32	Radio, TV, and Communication Eq.	2.0	2.3	1.2	1.2[a]
33	Medical, Precision and Optical Eq.	0.2	0.4	0.4	0.4[a]
34	Motor Vehicles	4.8	5.4	8.3	8.0
35	Transport Equipment	0.4	0.6	1.5	1.4
36	Furniture and Other	0.6	2.6	3.4	4.2

Source: Calculated by the author using the data from UNIDO.

[a] Share in 2008 since 2009 data is not available.

manufacturing output share between 1994 and 2009. The change in the shares of manufacturing production mainly shows that manufacturing production has developed mostly in favor of capital-intensive sectors such as Motor Vehicles, Electrical Machinery, Fabricated Metal Products rather than traditional labor-intensive sectors such as Textile, Wearing Apparels and Leather Products and Footwear between 1994 and 2009.

Table 4.2 shows the 2-digit sectors' shares in total manufacturing production between 2009 and 20112 according to NACE Rev. 2 (Statistical Classification of Economic Activities in the European Community).[43] Basic Metal, Motor Vehicles, Machinery and Equipment, Coke and Refined Petroleum Products, and Textiles are the sectors which increase their shares between 2009 and 2011.

4.1.2. Composition of Manufacturing Production According to the Technology Intensity

Table 4.3 and Figure 4.1 report the sectors' share in manufacturing production by grouping them according to their technology intensity.[44] In 1994-2009 period, low-technology industries had the largest share in manufacturing production which lies above 40 percent. In contrast, high-medium technology industries have had very low share remaining below 5 percent in all period. The share of Medium-high and medium-low technology industries generally realized close to each other. However, medium-high technology sectors has achieved to increase their share after 2001 reaching up to 27 percent in 2009. This group have had the highest growth rate in both 1995-2000 and 2002-2009 period. Despite the decline in its share in 2001, medium-low

[43] The codes and the definitions of NACE Rev. 2 are given in Table D2 of Appendix D. Due to the differences in the definitions of 2-digit NACE Rev. 2 and ISIC Rev. 3 classifications, production shares in 2009 is somewhat differ in Table 4.1 and Table 4.2.

[44] The groupings follow the technology classification of OECD. See Table D3 in Appendix D for OECD Technology Intensity classifications. OECD classifies manufacturing industries into four categories according to the technology intensity.

Table 4.2: *Composition of Manufacturing Production-NACE Rev. 2 Classification*

		Production shares (%)		
NACE Rev. 2 Code		**2009**	**2010**	**2011**
10,11	Food and Beverages	17.0	16.6	15.2
12	Tobacco Products	1.1	0.7	0.5
13	Textiles	7.9	8.7	8.8
14	Wearing Apparel	7.0	6.5	6.4
15	Leather and Related Products	0.9	0.9	0.9
16	Wood Products	1.5	1.4	1.3
17	Paper and Paper Products	2.1	2.1	2.0
18	Printing and Reprod. of Rec. Media	1.2	1.0	0.9
19	Coke and Ref. Petroleum Products	4.1	4.3	5.6
20, 21	Chemicals and Basic Pharm. Pr.	7.3	7.0	6.7
22	Rubber and Plastic Products	5.2	5.3	5.5
23	Non-metallic Mineral Products	5.9	6.0	5.6
24	Basic Metal	10.4	11.6	12.7
25	Fabricated Metal Products	5.4	5.4	5.5
26	Computer, Elect. and Optical Pr.	1.6	1.3	1.3
27	Electrical Equipment	6.1	5.5	5.1
28	Machinery and Equipment n.e.c.	3.7	4.1	4.4
29	Motor vehicles	8.2	8.5	8.6
30	Transport Equipment	1.5	1.0	0.9
31	Furniture and Other	4.3	3.6	3.6

Source: Author's calculations based on TURKSTAT database.

Table 4.3: *Composition of Manufacturing Production and Value-added According to Technology Intensity*

		1994	**2002**	**2008**	**2009**
Manufacturing Production Share	High-Technology	2.21	2.67	1.80	3.14
	Medium-High Tech.	22.63	21.87	25.79	26.61
	Medium-Low Tech.	32.61	24.13	34.92	30.15
	Low-Technology	42.56	51.31	37.33	41.68
Change in Manufacturing Production Shares, 1994-2009	High-Technology	0.93			
	Medium-High Tech.	3.98			
	Medium-Low Tech.	-2.45			
	Low-Technology	-0.88			
		1995-2000	**2002-2009**		
Average Annual Growth Rate of Production (%)	High-Technology	2.67	1.62		
	Medium-High Tech.	6.68	9.10		
	Medium-Low Tech.	3.70	4.12		
	Low-Technology	1.67	-0.06		
		1994	**2002**	**2008**	**2009**
Manufacturing Value Added Share	High-Technology	2.84	1.99	1.96	3.90
	Medium-High Tech.	24.78	24.31	29.37	30.69
	Medium-Low Tech.	34.90	21.90	32.39	27.11
	Low-Technology	37.49	51.79	36.25	40.16
Change in Manufacturing Value Added Shares, 1994-2009	High-Technology	1.06			
	Medium-High Tech.	5.92			
	Medium-Low Tech.	-7.79			
	Low-Technology	2.67			

Source: Author's calculations based on UNIDO Industrial Statistics and TURKSTAT.

Notes: Growth rates are calculated using the weighted average of the growth rates of sub-sectors.

technology industries have generally had 30 percent of the production of manufacturing industry.

As seen from Table 4.3, shares of manufacturing value-added are very similar to the shares of manufacturing production.

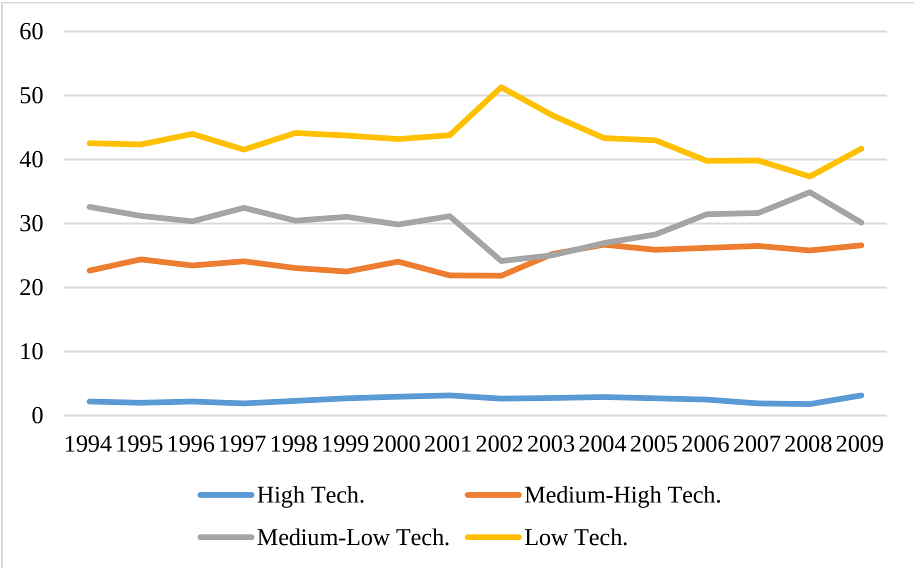


Figure 4.1. *Composition of Manufacturing Production According to Technology Intensity*

4.2. STRUCTURE OF TRADE

4.2.1. Composition of Exports and Imports

Table 4.4 reveals that the composition of manufactured exports is generally in line with the composition of manufacturing production. Although Textiles, Wearing Apparels and Food and Beverages were the largest exporter sectors of total manufacturing industry in pre-2001 period, their export shares have gradually declined until 2013. The drop in Textiles and Wearing Apparels' share is mainly due to the

Table 4.4: *Composition of Manufacturing Exports*

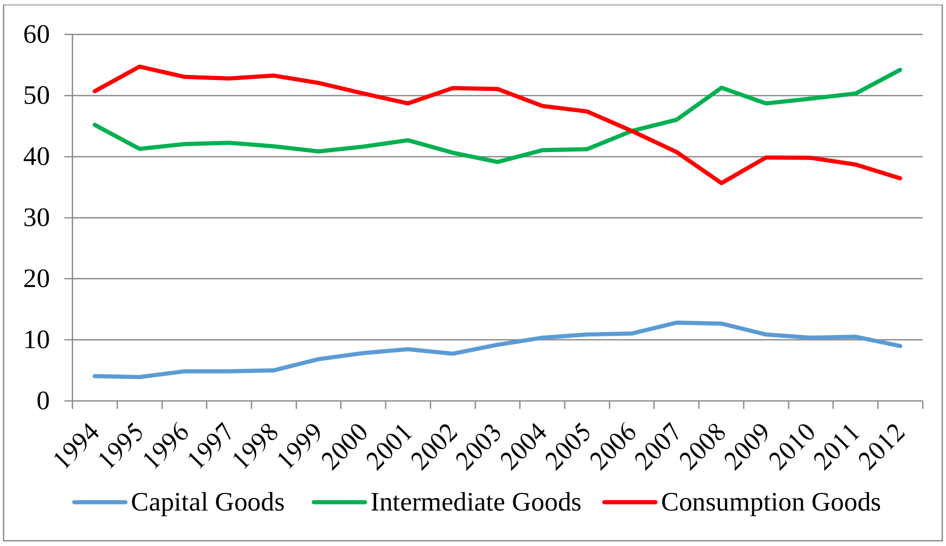
		Share in manufacturing exports (%)		
ISIC Rev. 3 Codes		**1994-2000**	**2002-2008**	**2009-2013**
15	Food and Beverages	10.54	5.58	6.76
16	Tobacco Products	0.43	0.21	0.28
17	Textiles	18.69	12.75	10.07
18	Wearing Apparel	23.43	14.52	9.34
19	Leather Products and Footwear	1.04	0.56	0.64
20	Wood Products	0.32	0.38	0.51
21	Paper and Paper Products	0.64	0.82	1.16
22	Printing and Publishing	0.19	0.14	0.13
23	Coke and Refined Petr. Pr.	1.21	3.58	4.42
24	Chemicals	5.72	4.25	5.15
25	Rubber and Plastic Products	2.67	3.55	4.66
26	Non-metallic Mineral Products	3.91	3.79	3.37
27	Basic Metal	10.74	11.67	15.15
28	Fabricated Metal Products	2.33	3.79	4.79
29	Machinery and Equipment	4.31	7.15	8.64
30	Office, Acc. and Comp. Mach.	0.15	0.11	0.11
31	Electrical Machinery	3.11	3.27	4.44
32	Radio, TV, and Com. Eq.	2.40	3.84	1.75
33	Medical, Pres. and Optic. Eq.	0.25	0.30	0.43
34	Motor Vehicles	4.83	14.38	13.07
35	Transport Equipment	1.62	2.39	1.72
36	Furniture and Other	1.47	2.97	3.41

Source: Author's calculations based on TURKSTAT database.

intensified competitiveness with Asia and Pacific countries, elimination of textile quotas with China, and relatively high labor costs and appreciation of Turkish Lira (Yükseler and Türkan, 2008). The position of these traditional sectors is replaced by Motor Vehicles and Basic Metals in 2009-2013 which export 13 percent and 15 percent of manufacturing industry, respectively. Despite their lower shares relative to these sectors, Machinery and Equipment, Fabricated Metal Products, Rubber and Plastic Products, and Coke and Refines Petroleum Products are remarkable with the substantial rise in their shares which more than doubled between 1994-2000 and 2009-2013 periods. As we will mention about later, increased intra-industry trade with developed countries can be the main factor behind the emergence of these capital and intermediate goods sectors as the main export drivers of Turkish manufacturing industry.

Figure 4.2 shows the evolution of the consumer, intermediate and capital goods export shares between 1994 and 2012.[45] The largest component of manufacturing exports has been consumer goods sector with a share of 50 percent up to 2006. However, its share has declined gradually and has fallen below the share of intermediate goods since 2006. Intermediate goods provided around 42 percent of manufacturing exports and its share has been remained nearly constant between 1994 and 2005. However, showing a rapid growth after 2005, it achieved to raise its share above 50 percent composing the largest category of manufacturing exports. On the other hand, capital goods sector's share has been very low (around 5 percent) since 1990s which has modestly increased since 1990s. The share of capital goods has reached above 10 percent since 2006. However, the performance of capital goods is relatively poorer than intermediate goods. The upward trend in their share seems to be reversed since 2008.

[45] It is based on 1-digit Broad Economic Categorization (BEC) classification.



Source: TURKSTAT.

Figure 4.2. *Composition of Exports*

Table 4.5 shows the composition of manufacturing imports. Chemicals, Basic Metal, Machinery and Equipment, and Motor Vehicles are the sectors that have the largest share in total manufacturing imports. We observe that the share of consumer goods sectors such as Food and Beverages, Textiles and Tobacco tend to decline. One exception in this category is Wearing Apparels which has raised its share in manufacturing imports. Chemicals, Basic Metals and Coke and Petroleum Products have had the largest share in intermediate goods imports. From Table 4.4 and 4.5, we can observe that main importer sectors such as Motor Vehicles, Machinery and Equipment, Basic Metal and Electrical Machinery are also among the largest components of manufacturing exports and production. This can be an indicator of import dependency of exports and production of Turkish manufacturing industry which is emphasized by a number of recent studies such as Yükseler and Türkan (2008), Aydın *et al.* (2007), Saygılı *et al.* (2010).

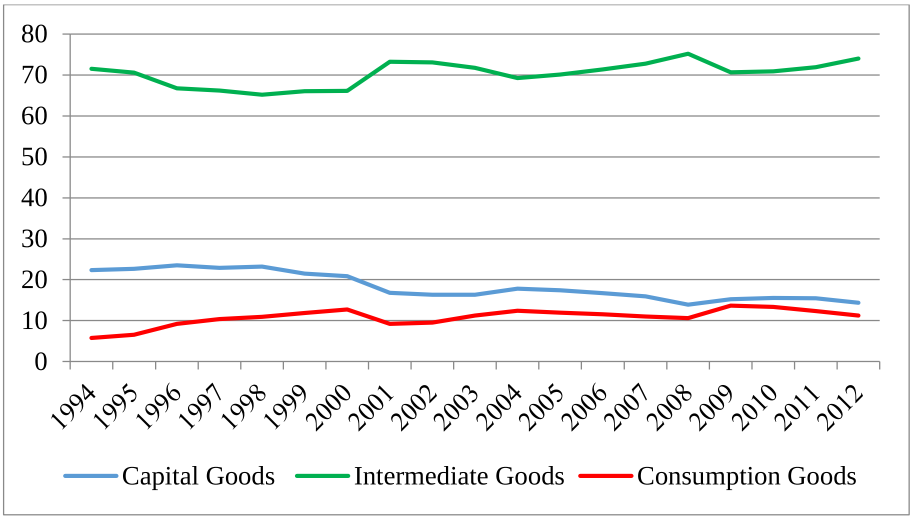
Figure 4.3 shows the distribution of manufacturing imports among consumer goods, intermediate goods and investment (capital) goods between 1994 and 2012.

Table 4.5: *Composition of Manufacturing Imports*

		Share in manufacturing imports (%)		
ISIC Rev. 3 Codes		**1994-2000**	**2002-2008**	**2009-2013**
15	Food and Beverages	4.48	2.51	2.66
16	Tobacco Products	0.14	0.09	0.07
17	Textiles	5.09	4.53	3.58
18	Wearing Apparel	0.50	0.90	1.47
19	Leather Products and Footwear	0.84	0.87	0.85
20	Wood Products	0.38	0.54	0.69
21	Paper and Paper Products	2.48	2.19	2.07
22	Printing and Publishing	0.46	0.41	0.36
23	Coke and Refined Petr. Pr.	3.43	6.31	9.88
24	Chemicals	19.11	18.83	18.19
25	Rubber and Plastic Products	2.29	2.40	2.47
26	Non-metallic Mineral Products	1.19	1.05	1.01
27	Basic Metal	8.41	14.74	14.38
28	Fabricated Metal Products	2.37	2.19	2.27
29	Machinery and Equipment	17.86	13.31	11.44
30	Office, Acc. and Comp. Mach.	2.71	2.29	2.02
31	Electrical Machinery	3.93	4.33	5.15
32	Radio, TV, and Com. Eq.	5.81	4.85	3.83
33	Medical, Pres. and Optic. Eq.	3.17	2.63	2.63
34	Motor Vehicles	9.37	11.42	10.16
35	Transport Equipment	4.77	1.94	3.02
36	Furniture and Other	1.22	1.68	1.79

Source: Author's calculations based on TURKSTAT database.

Consumer goods compose 10 percent of manufacturing imports and its share is nearly stable in all period. The share of investment goods has declined from around 20 percent in 1990s to nearly 15 percent in 2000s. On the other hand, intermediate goods consist 70 percent of manufacturing imports. Therefore, manufacturing imports' 85 percent is composed of intermediate and capital goods. This shows the importance of imports for the exports and production of Turkish manufacturing industry. The change in the production and specialization structure of Turkish manufacturing towards vertical integration and intra-industry trade is an important factor behind the high share of intermediate and capital goods imports. This structure of imports increases the imported input use of Turkish manufacturing industry, lowering the real exchange rate elasticities and raising the foreign demand elasticities of exports and production (Saygılı and Saygılı, 2011; Saygılı *et al.*, 2010, Aydın *et al.*, 2007).



Source: TURKSTAT.

Figure 4.3. *Composition of Imports*

4.2.2. Intra-Industry Trade and Import Dependency of Exports

Intra-industry trade (IIT) is defined as the simultaneous export and import of similar types of goods. IIT is generally classified as horizontal IIT and vertical IIT. Horizontal IIT refers to the international trade in similar products with differentiated varieties (*e.g.* cars of a similar class and price range). Vertical IIT is the trade in the same product categories with qualitative differences (such as Italia exports high-quality clothing and imports low-quality clothing). In recent years, as result of globalization, countries have begun to specialize in various stages of production with the transfer of different stages of production to different countries. This vertical specialization process or production chains can be also classified in vertical IIT since it refers to the simultaneous exports and imports of goods classified in the same sector but at different stages of processing. International product fragmentation or vertical specialization is common in technology-intensive industries such as electronic industry (in particular assembly of semi-conductor devices, hard disk drives etc), electrical appliances, automobile parts, electrical machinery and optical products, Radio, TV and communication equipment for which the transfer of component assembly operations are possible. As Taymaz *et al.* (2011) states, Turkey has achieved to benefit from the transformation in international product chains by mostly integrating to the product chains that are broken down from EU-15 but re-organized towards this region. Turkey has rapidly integrated to the global product chains of Motor Vehicles and Machinery and Equipment since the late-1990s.

The extent of IIT has had a rapid increase in developed countries since 1980s, while in developing countries it has considerably increased after 1990s. Despite it remains below most of the OECD countries, Turkish manufacturing industries' IIT has had a substantial increase since 2001.[46] The extent of IIT is commonly measured by Grubel- Lloyd (1971) index which is given by the following ratio:[47]

$$IIT_i = \left[1 - \left(\frac{|X_i - M_i|}{|X_i + M_i|}\right)\right] * 100$$

where X_i represents the export value of sector i and M_i represent the import value of sector i. IIT_i takes values between 0 and 100, whereas as IIT_i converges to 100, it means that the trade is in intra-industry form and as it converges to 0, it means that trade is in inter-industry form.

Table 4.6 shows the extent of IIT in Turkish manufacturing industry since 1994. Before 2001, IIT of Turkish manufacturing industry has been in low levels with an average of 47 percent. However, it increased to 62 percent and 66 percent in 2002-2008 and 2009-2013 periods, respectively. Among the consumer goods sectors, Furniture and Other Manufacturing, Leather and Footwear and Food and Beverages have had the highest IIT level whereas Wearing Apparels has had the lowest IIT since 1994. The level of IIT follows a downward trend in most of the consumer goods industries. In the intermediate goods category, Rubber and Plastic Products, Basic Metal and Wood Products are the sectors with the highest IIT. Although they have an upward trend, IIT is in low levels in Chemicals, Coke and Refined Petroleum, Paper and Paper Products and Printing and Publishing. Among the capital goods sectors, most of the sectors had high IIT ratios especially after 2002. Motor Vehicles had very strong IIT with around 95 percent after 2009. Fabricated Metal Products and Electrical

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[46] See Erlat and Erlat (2003) and Erlat, Erlat and Şenoğlu (2007) for a detailed analysis of IIT in Turkey.

[47] Hamilton and Kniest (1991), Greenaway et al.(1994) and Brülhart (1994) suggest alternative measures of IIT based on the modifications of Grubel-Lloyd (GL) index. Since IIT is not the main focus of our analysis in this chapter, we prefer to use only GL index as the most common measure.

Table 4.6: Intra-industry Trade

		1994-2000	2002-2008	2009-2013
ISIC Rev. 3 Codes	MANUFACTURING	*46.99*	*62.10*	*65.82*
15	Food and Beverages	77.46	73.25	68.44
16	Tobacco Products	58.47	71.78	49.41
17	Textiles	59.09	63.14	63.72
18	Wearing Apparel	6.67	15.98	34.49
19	Leather Products and Footwear	86.52	67.01	72.03
20	Wood Products	67.85	71.16	72.42
21	Paper and Paper Products	30.00	44.80	59.58
22	Printing and Publishing	43.12	41.00	42.81
23	Coke and Refined Petr. Pr.	41.59	58.87	50.47
24	Chemicals	33.04	29.64	35.32
25	Rubber and Plastic Products	85.17	93.61	82.51
26	Non-metallic Mineral Products	63.36	53.25	57.21
27	Basic Metal	86.07	75.20	84.37
28	Fabricated Metal Products	78.53	83.88	76.93
29	Machinery and Equipment	28.30	58.82	72.84
30	Office, Acc. and Comp. Mach.	6.48	7.02	8.26
31	Electrical Mechinary	68.50	73.23	79.39
32	Radio, TV, and Com. Eq.	41.93	74.16	51.47
33	Medical, Pres. and Optic. Eq.	10.04	16.17	22.15
34	Motor Vehicles	52.65	91.16	95.12
35	Transport Equipment	37.81	85.03	60.73
36	Furniture and Other	83.35	84.73	82.28

Source: Author's calculations based on TURKSTAT database.

Machinery have had high levels of IIT since 1994 whereas Machinery and Equipment and Transport Equipment sectors have raised their IIT in recent years. In contrast to these sectors, Office, Accounting and Computing Machinery and Medical, Precision and Optical Equipment have poorly performed in terms of the extent of IIT.

As seen from Table 4.6, Motor Vehicles, Electrical Machinery, Machinery and Equipment, Basic Metal, Fabricated Metal Products are among sectors which have the highest IIT level in Turkish manufacturing industry. At the same time, these sectors have become the largest producer and exporter sectors of manufacturing industry since 2001. Motor Vehicles realizes 8 percent of total manufacturing production, 13 percent of manufacturing exports and 10 percent of manufacturing imports in recent years. Basic Metals produces 10 percent of total manufacturing production and realizes 15 percent of manufacturing exports and imports. Similarly, Machinery and Equipment is the sector which produces 5 percent of manufacturing output, exports 9 percent of total manufacturing exports and imports 11 percent of total manufacturing imports. Besides producing, exporting and importing a large part of manufacturing industry, these sectors also have had a high growth performance. High import shares together with high IIT levels of these important sectors point out to the high import dependency of Turkish manufacturing industry exports and production.

After the financial and currency crises in 2001, as well as the increased export performance of manufacturing industry, imports have also increased substantially. Besides the increase in the extent of IIT, shift of manufacturing production in favor of sectors with high imported input use, insufficient domestic production of basic inputs of intermediate and capital goods, cheap inputs from China and India, foreign trade regime such as inward processing regime and Customs Union, and appreciation of TL are amongst the main factors behind the increased import dependency of Turkish manufacturing industry (Yükseler and Türkan, 2008; Saygılı *et al*., 2010). Imported input use of sectors can be calculated by using Input-Output tables. Yükseler and Türkan (2008) and Saygılı *et al*. (2010) calculated the imported-input coefficients of manufacturing industry sub-sectors using 1998 and 2002 input-output tables. Since, Input-output tables are not available after 2002, we cannot update the imported-input coefficients of manufacturing industry sub-sectors. However, we can make inference from these earlier calculations or from some indicators such as the Intermediate Import Ratios and Import Content of Exports which are reported by OECD STAN Input-Output Database.

Table 4.7 shows the ratio of intermediate imports to the total intermediate demand of each sector in 1996, 1998 and 2002. Intermediate import ratio is highest for Office, Accounting and Computing Machinery, Radio, TV and Communication Equipments, Medical, Presicion and Optical Instruments, Chemicals, Basic Metals, Motor Vehicles, Other Transport Equpiment and Machinery and Equipment. For most of the sectors, intermediate import usage increased significantly from 1996 to 1998 whereas it dropped considerably in a number of sectors in 2002. Since the decline in 2002 can mostly reflect the effect of 2001 crisis, we can expect the intermediate import ratios to be much higher than the ratios in the table. As seen from the ratios in 1998, the intermediate import ratio is over 80 percent in a number of sectors. On the other hand, Non-Metallic Mineral Products, Wood Products, Food and Beverages, Textiles, Wearing Apparels, and Leather and Footwear have used very low levels of imported intermediate input in their production. The imported intermediate input usage of high and medium-high technology sectors have generally been higher (nearly doubles) than low and medium-high technology sectors as expected.

Table 4.8 reports the import content of exports that is the contribution that imports make in the exports of goods and services. This indicator generally represents the degree of vertical specialization of industries. Import content of exports is highest for Radio, TV and Communication Equipments, Furniture and Other Manufacturing, Medical, Precision and Optical Instruments, Motor Vehicles, Basic Metals, Rubber and Plastic Products, Office, Accounting and Computing Machinery and Electrical Machinery. On the other hand, Coke and Refined Petroleum Products, Food, Beverages and Tobacco, Non-metallic Mineral Products, Wood Products are the sectors with the lowest import content of exports. In 1998-2002 period, the highest increase in the degree of vertical specialization is seen in Radio, TV and Communication Equipments, Furniture and Other Manufacturing, Wood Products and

Table 4.7: *Intermediate Import Ratio*

		1996	**1998**	**2002**
ISIC Rev. 3 Codes	*MANUFACTURING*	*0.24*	*0.29*	*0.25*
15-16	Food products, beverages and tobacco	0.12	0.10	0.10
17-19	Textiles, wearing app., leather and footwear	0.12	0.23	0.11
20	Wood products	0.06	0.07	0.09
21-22	Paper, paper products, printing and publish.	0.19	0.19	0.17
23	Coke, refined petroleum products	0.09	0.12	0.26
24	Chemicals	0.56	0.55	0.44
25	Rubber and plastics products	0.10	0.21	0.16
26	Non-metallic mineral products	0.05	0.07	0.07
27	Basic metals	0.40	0.42	0.41
28	Fabricated metal products	0.02	0.14	0.19
29	Machinery and equipment n.e.c	0.32	0.48	0.34
30	Office, accounting and computing mach.	0.72	0.86	0.74
31	Electrical machinery and apparatus n.e.c	0.36	0.37	0.27
32	Radio, television and com. Eq.	0.34	0.61	0.66
33	Medical, precision and optical inst.	0.65	0.84	0.59
34	Motor vehicles	0.44	0.56	0.41
35	Other transport equipment	0.65	0.82	0.36
36-37	Furniture and Manufac. n.e.c; recycling	0.15	0.25	0.24
	High-Medium High Technologies (ISIC 24,29-33,35)	*0.48*	*0.55*	*0.43*
	Low-Medium Low Technologies (ISIC15-23,36-37)	*0.17*	*0.22*	*0.20*

Source: OECD STAN.
Notes: Intermediate import ratio is calculated as the ratio of intermediate import amount to the total intermediate demand of each sector. It is calculated using 2002 I-O table.

Motor Vehicles whereas Chemicals and Electrical Machinery are sectors which show a decline in their vertical integration.

4.2.3. Domestic Value Added Share of Exports

With the increase in international production chains, intermediate goods trade rise more than final goods trade in lots of countries (Banga, 2013). Intra-industry trade leads value added gained from the production of a final good to be divided between various countries. Since foreign value added in exports increase as a result of this

Table 4.8: *Import Content of Exports*

		1996	1998	2002
ISIC Rev. 3 Codes	*MANUFACTURING*	*0.15*	*0.19*	*0.23*
15-16	Food products, beverages and tobacco	0.06	0.07	0.08
17-19	Textiles, wearing app., leather and footwear	0.15	0.20	0.21
20	Wood products	0.07	0.10	0.19
21-22	Paper, paper products, printing and publish.	0.14	0.16	0.22
23	Coke, refined petroleum products	0.01	0.01	0.06
24	Chemicals	0.22	0.27	0.23
25	Rubber and plastics products	0.31	0.28	0.29
26	Non-metallic mineral products	0.06	0.07	0.10
27	Basic metals	0.18	0.27	0.30
28	Fabricated metal products	0.19	0.23	0.26
29	Machinery and equipment n.e.c	0.17	0.21	0.25
30	Office, accounting and computing mach.	0.15	0.22	0.27
31	Electrical machinery and apparatus n.e.c	0.21	0.28	0.27
32	Radio, television and com. Eq.	0.21	0.30	0.45
33	Medical, precision and optical inst.	0.17	0.27	0.34
34	Motor vehicles	0.19	0.23	0.30
35	Other transport equipment	0.13	0.16	0.18
36-37	Furniture and Manufac. n.e.c; recycling	0.17	0.28	0.39
	High-Medium High Technologies (ISIC 24,29-33,35)	*0.20*	*0.26*	*0.30*
	Low-Medium Low Technologies (ISIC15-23,36-37)	*0.14*	*0.18*	*0.22*

Source: OECD STAN.
Notes: Import content of exports is the contribution that imports make in the production of exports of goods and services. It is the represents the degree of vertical specialization. Import contents of export = u Am $(I\text{-}Ad)^{-1}$ EX / Σ EX, where Am and Ad are the input-output coefficient matrices for imported and domestic transactions, respectively, I is the identity matrix, u denotes an 1xn vector each of whose components is 1 for corresponding import types, and EX is the export vector (OECD STAN).

process, announced export ratios do not reflect domestic value added of exports and net exports can be magnified. As a result of vertical specialization and global value chains in international trade, re-export and re-import of intermediate goods increase and because of the resulted double counting, countries' data on exports and imports depart from reflecting net value added of final good production. For this reason, OECD-WTO has recently announced the "Trade in Value Added (TIVA)" data for 58 countries and years of 1995, 2000, 2005 and 2008 by using the harmonized cross-country input-output tables. Based on this data, Table 4.9 reports the export ratio, domestic value added share of exports, export to import ratio of intermediate goods and normalized Revealed Comparative Advantage (RCA) according to the value added shares of Turkish Manufacturing sectors. RCA measure of Balassa (1965) can be calculated as:

$$RCA_1 = RCAX = \frac{X_{ij}/\sum_j X_{ij}}{\sum_j X_{ij}/\sum_i \sum_j X_{ij}}$$

where X_{ij} represents the exports of i^{th} sector of country j. RCAX takes the values between zero and infinity and RCA value which is greater than 1 indicates that the sector has comparative advantage in exports. In this section, normalized RCA values are given which is equal to (RCAX-1)/(RCAX+1) and positive values indicate the existence of revealed comparative advantage. According to the Table, domestic value added share of exports significantly dropped in all sectors in 2008 relative to 1995. This fall has realized as from 84 percent to 61 percent for Metal and Metal Products which comprise 18 percent of total manufacturing exports, from 83 percent to 61 percent for Transport Equipments which compose 14 percent of total manufacturing exports, from 82 percent to 57 percent for Chemicals and Minerals which constitute 13 percent of total manufacturing exports, from 87 percent to 71 percent for Machinery and Equipment with a share of 5 percent and from 84 percent to 70 percent for Electrical and Optical Equipment with a share of 4 percent in manufacturing exports in 2008. It is observed that sectors for which foreign value added share has dramatically increased are high and medium-high technology sectors. All these sectors

Table 4.9: *Domestic Value Added Share of Exports*

ISIC Rev. 3 Codes	Sector	Exports/ Total Exports (%)		Domestic Value Added Share of Gross Exports (%)		Exports/ Imports (Intermediate Goods) (%)		RCA	
		1995	**2008**	**1995**	**2008**	**1995**	**2008**	**1995**	**2008**
15,16	*Food products, beverages and tobacco*	5.4	3.9	90.6	83.8	18.3	10.6	0.17	-0.1
17-19	*Textiles, wearing apparels, leather and footwear*	24	14.7	84.4	80.1	40.7	32.6	0.72	0.53
20-22	*Wood, paper, paper products, printing and publishing*	0.5	1.1	89.5	75	12.7	23	-0.72	-0.55
24,26	*Chemicals and non-metallic mineral products*	6.5	12.8	82.3	57.3	17.5	25.5	-0.2	-0.2
27,28	*Basic metals and fabricated metal products*	7.9	17.7	84.3	61.1	15.3	49	0.2	0.3
29	*Machinery and equipment, nec*	1.4	5.2	86.6	71.4	13.7	27.7	-0.61	-0.23
30-33	*Electrical and optical equipment*	2.3	4.2	83.7	69.5	12.8	25	-0.64	-0.52
34,35	*Transport equipment*	2.3	13.7	82.8	68.7	15.3	47.7	-0.53	0.13
36,37	*Manufacturing nec; recycling*	1.1	2	89.5	82.6	18.3	31.8	-0.14	-0.22

Source: OECD-WTO TIVA (Trade in Value Added) have more than doubled their shares in total manufacturing industry exports since 1995. It can be told that this rise in export shares is realized due to the increased integration of sectors to global value chains. Consistently with this suggestion, re-exported imported intermediate good ratio (intermediate good exports/intermediate goods imports) has significantly increased. The share of intermediate imports in intermediate exports is nearly 50 percent for Metal and Metal Products and Transport Equipments in 2008 which is around 15 percent in 1995. It is above 20 percent for other sectors in 2008. This shows that the importance of imported intermediate goods has risen for manufacturing industry sectors after 2000s.

RCA values which are reported in the last two columns of Table 4.9 show that increased vertical integration has only made Transport Equipments to have the comparative advantage in exports for which RCA value has turned to positive after 2000s. On the other hand, Food Products, Beverages and Tobacco has lost its comparative advantage while RCA of Textiles, Wearing Apparels, Leather and Footwear which comprise nearly 15 percent (24 percent in 1994) of manufacturing exports fell significantly in 2008. Except for Machinery and Equipment, other sectors seem to have protected their RCA position.

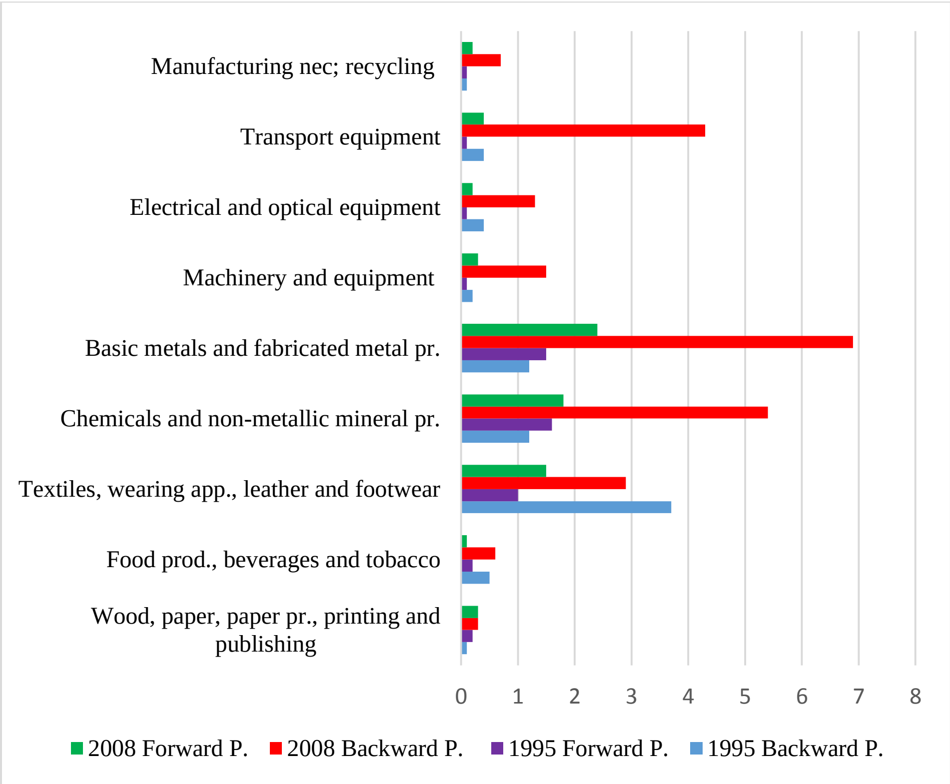
According to the Table, domestic value added share of exports is higher for low technology sectors such as Textiles, Wearing apparels, Wood Products, Food Products, Beverages and Tobacco and it has not changed much more since 1995. These higher domestic value added shares can be as a result of their low vertical integration levels. In this sense, examination of the Forward Participation, Backward Participation and Total Participation Indices and net integration gains which are provided by OECD-WTO-TIVA will be also informative for our analysis.

Countries can integrate to the global production chains by providing input to other countries' exports (Forward Participation, FP) or by importing intermediate goods to use for their exports and production (Backward Participation, BP) (Backer and Miroudot, 2013).[48] The total participation (TP) of FP (the share of exported goods

[48] These indicators of Forward Participation and Backward Participation are mainly proposed by Koopman *et al.* (2010).

and services used as imported inputs to produce other countries' exports) and BF (the share of imported inputs in the overall exports of a country) gives the degree of the countries' participation in global value chains. The ratio of FP to BP (FP/BP) can be used as an indicator of net gain from the integration to global production chains (Banga, 2013). If FP/BP ratio is greater than 1, it means that country produces and exports more domestic value added relative to foreign value added and net gain from participation to the global production chain is positive.

Figure 4.4. represents the forward participation (FP) and backward participation (BP) ratios of sectors in 1995 and 2008. Consistently with Table 4.9, participation degrees of low technology sectors is low (TP<1) except for Textiles, Wearing Apparels, Leather and Footwear. As one of the most important exporter sectors of Turkish manufacturing industry, BP ratio is higher than FP ratio for Textiles in both 1995 and 2008. Despite the decline in its share in total exports, FP/BP ratio increased to 0.52 in 2008. Since this ratio is below one, it implies that Textiles and Wearing Apparels continue to have negative net gains from global production chains. For other sectors, it is observed that BP ratio has significantly increased, even though the rise in FP is lower. In Chemicals and Non-metallic Minerals, BP ratio increased from 1.2 percent to 5.4 percent between 1995 and 2008. Since the FP is nearly stable in this period, net gain from participation has changed from its positive value (1.3) to a net loss (0.33). The other sector for which the net gain has turned to net loss from 1995 to 2008 is Metal Products. In that period, its BP ratio increased by 6 times while FP ratio increased only by 1.5 times. Similar trends are also observed for other sectors. For Transport Equipments, while BP therefore import dependency has jumped from 0.4 to 4.3, FP realized as 0.4 in 2008. These results show that, the share of exported goods used as imported inputs for other countries' exports has only displayed moderate increases, whereas imported input use of exports thereby production has jumped to very high levels in 2008 relative to 1995. Consequently, net gain from participating to



Source: OECD-WTO TIVA (Trade in Value Added)

Figure 4.4. *Participation Ratios to Global Value Chains (%)*

global value chains has significantly declined in all sectors except for low-technology industries.

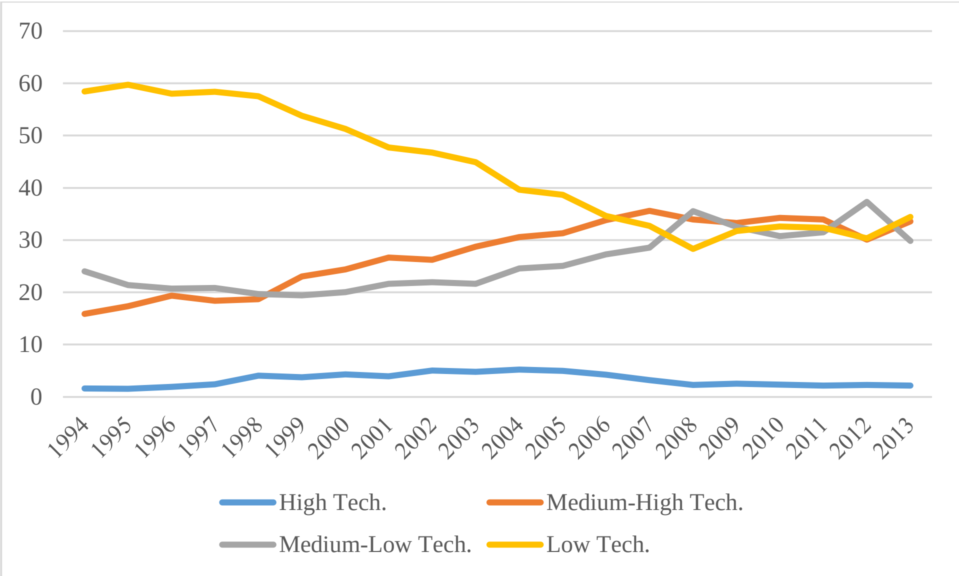
The information in Table 4.9 points out that the increase in the imported input use of high and medium-high technology industries is deterministic for the decline of domestic value added share of total exports of Turkey from 89 percent in 1995 to 74 percent in 2008. The rise in imported input share of exports and production shows that Turkey has participated more to global production chains. Participation to the global value chains increased the export share of industries while also increasing intermediate goods imports. Consistently, the results offered with Figure 4.4. show that FP has remained nearly stable for almost all sectors while BP and import dependency has considerably increased and the net gain from participation has significantly decreased.

This process can be expected to decline the real exchange rate elasticities of exports and imports.

4.2.4. Technology Intensity of Exports and Imports

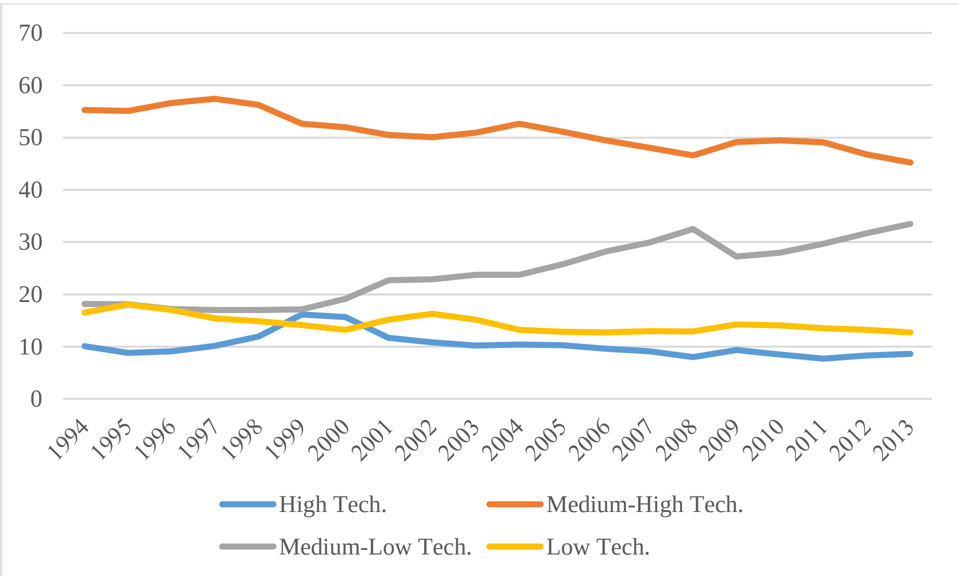
Since high-technology products have been among the most dynamic and productive components of international trade over the last decade, the ability to export high-technology goods is highly important for the countries' overall competitiveness in the world economy. According to the Figure 4.5, while exporting mainly low-technology products in 1990s, Turkish manufacturing industry has gradually shifted towards the exports of medium-low and medium-high technology products after 2001. The share of medium-low and medium-high technology exports follow an upward trend whereas low-technology exports show a downward trend between 1994 and 2013. Low-technology sectors have constructed the major part of Turkish manufacturing exports until 2005. However, their share decreased from 58 percent to 28 percent in 2008 while increasing again to 34 percent in 2013. On the other hand, high technology exports' share has been very low which lies around 5 percent in all period. After 2002, major part of manufacturing exports has been composed by medium-low and medium-high technology products.

Figure 4.6 shows the technology intensity of manufacturing imports between 1994 and 2013. Low-technology imports share is very low in the whole period, constituting nearly 15 percent of manufactured imports. Largest part of manufactured imports belongs to medium-high technology sectors which consist more than 50 percent in the whole period. Medium-low technology imports also show an increasing trend reaching to nearly 30 percent in 2013. High share of medium-high technology imports again reflects the high import dependency of manufacturing production and exports.



Source: TURKSTAT.

Figure 4.5. *Technology Intensity of Manufacturing Exports*



Source: TURKSTAT.

Figure 4.6. *Technology Intensity of Manufacturing Imports*

4.2.5. Product Complexity of Exports and Imports

High income countries generally export more sophisticated or complex products (Hausmann *et al*. 2007; Hausmann *et al*. 2011). Therefore, specialization in the production and exports of complex products is highly important for sustainable high growth rates. In this sense, Hausmann et al. (2007) calculated measures of product and economic complexity in which product complexity is measured as the weighted average of the income per capita of the countries that export this product. Hidalgo and Hausmann (2009) improved this product complexity measure using the information on the network structure of countries and products they export separately. Starting from a countries' diversification (number of products that a country exports with revealed comparative advantage) and a product's abiguity (number of countries that export the product with revealed comparative advantage), they calculated the complexity index of 722 products for 129 countries using SITC classification and 1241 products for 103 countries using 4-digit Harmonized System (HS) classification. Felipe *et al*. (2012) calculated this product complexity index for 5,107 products using 6-digit HS classification and aggregated all commodities into fifteen groups, corresponding to the sectors in the HS classification system. Calculating the average complexity of each group, they ranked them from the most complex to the least complex. In this section, we examine Turkish exports and imports in the context of product complexity using Felipe *et al*. (2012)'s complexity rankings.

Table 4.10 shows the export and import shares of sectors ranking them according to their product complexity.[49] In the first column, sectors are ranked from the most complex to least complex. According to Tables 4.8, among the most complex products group, Machinery and Electrical Equipments, Metals and Transport Vehicles have composed around 35 percent of total exports since 2001. Increasing its export share from 6 percent in 1990s to 15 percent in 2000s, Transport Vehicles has become one of the most important sectors in Turkish exports. Exports of Machinery and

[49] Since some sectors are not included, the sum of columns does not equal to 100.

Electrical Equipments also raised its share from 10 percent to 15 percent in 2000s. Consequently, the share of most complex product exports in total exports increased from 27 percent in 1990s to over 40 percent after 2001.[50] Except for Mineral Products, export share of other Medium Complex sectors has been generally low. In 2009-2013 period, Medium Complex sectors compose 12 percent of total exports. On the other hand, export share of Least Complex Products decreased from high levels such as 56 percent in 1990s to around 30 percent after 2001. Even though they still compose a large share of total exports, the decline in the export shares of Textile and Textile Products and partially the drop of the export shares of Prepared Foodstuffs, Beverages and Tobacco and Vegetable Products in recent years lead to a reduction in the share of Least Complex Products.

From Table 4.10, we observe that export structure has shifted from the Least Complex products to Most Complex products in recent years. As discussed before, as product complexity increase, intra-industry trade and vertical specialization also increases. Therefore, the real exchange rate elasticity of trade can be expected to decline. The change in the export structure of Turkey together with the real appreciation of TL after 2001 seem to be consistent with this hypothesis.

As seen from the import shares in Table 4.10, the most complex product imports have been composing more than half of total imports of Turkey. Among them, Machinery and Electrical Equipments, Chemicals and Transport Vehicles have been the largest import items. Imports of Medium Complex products have increased from 20 percent to 28 percent in recent years. Largest part of Medium Complex products

[50] These results are consistent with the results according to the technology-intensity of sectors.

Table 4.10: *Product Complexity, Exports and Imports*

	exports/total exports (%)			***imports/total imports(%)***		
Complexity Ranking	**1994-2001**	**2002-2009**	**2010-2013**	**1994-2001**	**2002-2009**	**2010-2013**
Most complex	***26.8***	***42.0***	***43.3***	***59.1***	***53.4***	***50.0***
Chemicals (VI)	3.4	2.9	3.7	11.2	9.9	8.7
Machinery and Electrical Eq. (XVI))	10.1	14.3	14.5	25.9	21.8	19.0
Optical Equipments (XVIII)	0.2	0.3	0.4	2.6	2.1	2.0
Plastic and Rubber Pr. (VII)	2.9	3.7	4.9	5.0	5.9	6.6
Metals(XV)	4.4	6.1	7.3	4.3	4.7	5.1
Transport Vehicles (XVII)	5.8	14.7	12.6	10.1	9.0	8.7
Medium complex	***7.9***	***10.9***	***12.9***	***19.7***	***23.6***	***27.5***
Miscallaneous Manufac. Art. (XX)	0.8	1.5	2.0	0.9	0.9	1.0
Stone, Plaster and Glass Pr.(XIII)	2.8	2.7	2.2	0.8	0.8	0.7
Wood and Wood Products (IX)	0.3	0.4	0.5	0.6	0.6	0.6
Paper and Paper Products (X)	0.7	0.9	1.0	2.2	1.9	1.7
Mineral Products (V)	3.4	5.5	7.3	15.1	19.5	23.5
Least complex	***55.7***	***36.1***	***29.2***	***13.0***	***10.3***	***10.3***
Live animals and Animal Pr. (I)	1.0	0.6	1.0	0.4	0.2	0.5
Prep. Food., Bever. and Tobacco (IV)	7.2	3.9	4.2	1.6	1.2	1.3
Rawhides and Skins, Leather (VIII)	2.0	0.9	0.5	1.6	0.9	0.5
Vegetable Products (II)	8.4	4.6	4.9	2.0	1.5	2.0
Textile and Textile Products (XI)	36.6	25.9	18.3	7.1	6.2	5.5
Footwear and Umbrellas (XII)	0.6	0.3	0.4	0.2	0.4	0.4

Source: Author's calculations using TURKSTAT database.

Notes: Roman numbers in parenthesis correspond to the Section of HS classification.

has been composed by Mineral Products which includes Petroleum and Energy imports. Shortly, Turkish imports do not show significant differences across periods in terms of product complexity.

Table 4.11 reports the exports/imports ratios according to product complexity classifications. Turkey seem to be in a net importer position in the Most Complex Products. However, the rise in the export to import ratio in recent years implies that the increase in exports has been more rapid than the increase in imports for Metals,

Table 4.11: *Product Complexity and Export/Import Ratios*

	Exports/import (%)		
	1994-2001	**2002-2008**	**2009-2013**
Most complex			
Chemicals (VI)	18.7	19.3	26.7
Machinery and Electrical Eq. (XVI))	24.5	43.0	48.3
Optical Equipments (XVIII)	5.4	8.7	12.0
Plastic and Rubber Pr. (VII)	36.5	40.8	47.4
Metals (XV)	63.8	85.5	90.5
Transport Vehicles (XVII)	39.3	109.0	93.7
Medium complex			
Miscallaneous Manufac. Art. (XX)	56.3	104.3	124.4
Stone, Plaster and Glass Pr.(XIII)	219.4	241.7	195.1
Wood and Wood Products (IX)	34.9	40.2	48.6
Paper and Paper Products (X)	20.3	29.9	35.9
Mineral Products (V)	14.3	18.0	19.9
Least complex			
Live animals and Animal Pr. (I)	196.5	215.1	148.5
Prep. Food., Bever. and Tobacco (IV)	283.8	218.6	197.5
Rawhides and Skins, Leather (VIII)	87.6	64.4	65.3
Vegetable Products (II)	288.9	217.8	156.4
Textile and Textile Products (XI)	320.9	270.6	211.7
Footwear and Umbrellas (XII)	189.1	64.1	53.6

Source: Author's calculations using TURKSTAT database.

Transport Equipment and Machinery and Electrical Equipments since 2000s. Turkey is again net importer in Wood and Wood Products, Paper and Paper Products and Mineral Products among the Medium Complex Products group. On the other hand, Turkey is net exporter in all Least Product sectors and has very high export to import ratios in this group.

4.2.6. Competitive Advantage and Product Complexity of Exports

Besides the export and import shares of industries according to the Product Complexity classification, international competitiveness in complex products is also important for sustainable growth. Balassa (1965) suggests the measure of "Revealed

Comparative Advantage (RCA)" to compare the economies' positions and competitive advantages in trade. RCA measure of Balassa (1965) can be calculated as:

$$RCA_1 = RCAX = \frac{X_{ij}/\sum_j X_{ij}}{\sum_j X_{ij}/\sum_i \sum_j X_{ij}}$$

where X_{ij} represents the exports of i^{th} sector of country j. RCAX takes the values between zero and infinity and RCA value which is greater than 1 indicates that the sector has comparative advantage in exports.

Since RCAX depend only on export performance and does not take imports into account, it does not give information about net export performances. Therefore, Vollrath (1991) suggests an alternative measure which also considers imports. Vollrath (1991)'s measure of RCA, RCA_2 is as follows:

$$RCAM = \frac{M_{ij}/\sum_j M_{ij}}{\sum_j M_{ij}/\sum_i \sum_j M_{ij}}$$

$$RCA_2 = \ln(RCAX) - \ln(RCAM)$$

where M_{ij} represents the imports of i^{th} sector of country j. If RCA_2 is greater than 1, it means that the sector has trade comparative advantage.

Table 4.12 represents the RCAX values in 1995, 2000, 2005, and 2011 according to the product complexity of sectors. According to the RCAX values which is based on export performance, Turkey has comparative advantage in "Metals" and "Chemicals" among the Most Complex Products. However, RCAX values of the remaining Most Complex product sectors tend to increase in the recent period. Among the Medium Complex sectors, Stone, Plaster and Glass Products is the only sector that we have comparative advantage in exports, despite the increase in RCA values of other sectors over time. Among the Least Complex sectors, with its very high values of RCA, Textile and Textile Products is differentiated from all other sectors. Vegetable Products, Food, Beverages and Tobacco, and Footwear and Umbrellas are the other Least Complex sectors which Turkey has comparative advantage.

Table 4.12: *Product complexity and RCA of Exports (RCA_1)*

	1995	2000	2005	2008	2011
Most complex					
Chemicals (VI)	1.44	1.62	1.10	1.10	1.50
Machinery and Electrical Eq. (XVI))	0.17	0.26	0.34	0.34	0.42
Optical Equipments (XVIII)	0.04	0.07	0.07	0.09	0.11
Plastic and Rubber Pr. (VII)	0.40	0.52	0.55	0.62	0.77
Metals (XV)	1.99	2.78	2.92	2.95	3.66
Transport Vehicles (XVII)	0.41	0.94	1.65	1.80	1.66
Medium complex					
Miscallaneous Manufac. Art. (XX)	0.29	0.45	0.68	0.73	0.94
Stone, Plaster and Glass Pr.(XIII)	1.75	2.82	2.56	2.16	2.34
Wood and Wood Products (IX)	0.22	0.20	0.32	0.50	0.68
Paper and Paper Products (X)	0.20	0.27	0.41	0.46	0.67
Mineral Products (V)	0.60	0.32	0.41	0.51	0.43
Least complex					
Live animals and Animal Pr. (I)	0.74	0.37	0.44	0.53	0.87
Prep. Food., Bever. and Tobacco (IV)	5.94	6.19	4.37	3.43	3.99
Rawhides and Skins, Leather (VIII)	2.48	2.05	1.07	0.91	0.96
Vegetable Products (II)	9.34	8.73	7.48	4.58	5.74
Textile and Textile Products (XI)	25.98	29.45	23.33	18.99	20.18
Footwear and Umbrellas (XII)	0.65	0.65	0.53	0.52	0.60

Source: Author's calculations based on TURKSTAT and COMTRADE database.

Considering that Chemicals sector's export to import ratio has been around 20 percent and Turkey has not played an important role in any stage of the Chemicals' production process in the world trade (Taymaz et al., 2011), RCAX measure which only takes exports into account can be misleading. High export advantage of Metals which has 90 percent export to import ratio is consistent with the hypothesis that this sector pursues its high exporter position by using imported imports. Especially for countries that import mostly Complex products like Turkey, instead of RCAX, it can be better to use RCA_2 which takes imports into account besides exports.

Table 4.13 shows the RCA_2 values of Turkish exports in 1995, 2000, 2005, 2008 and 2011 according to the product complexity of the sectors. Turkey has comparative advantage in only Metals and since 2005 in Transport Equipments among the Most Complex Product sectors. This result is also consistent with RCAX values

Table 4.13: *Product complexity and RCA of Exports (RCA2)*

	1995	**2000**	**2005**	**2008**	**2011**
Most complex					
Chemicals (VI)	-1.30	-1.10	-1.27	-1.12	-0.78
Machinery and Electrical Eq. (XVI))	-1.10	-0.75	-0.45	-0.31	-0.16
Optical Equipments (XVIII)	-2.86	-2.28	-2.18	-1.87	-1.69
Plastic and Rubber Pr. (VII)	-0.56	-0.45	-0.50	-0.36	-0.23
Metals (XV)	0.07	0.18	0.32	0.32	0.37
Transport Vehicles (XVII)	-1.08	-0.46	0.25	0.55	0.11
Medium complex					
Miscallaneous Manufac. Art. (XX)	-0.01	0.14	0.58	0.56	0.53
Stone, Plaster and Glass Pr.(XIII)	0.98	1.49	1.22	1.09	1.06
Wood and Wood Products (IX)	-0.44	-0.91	-0.66	-0.30	-0.15
Paper and Paper Products (X)	-1.50	-1.21	-0.80	-0.66	-0.37
Mineral Products (V)	-0.95	-1.59	-1.09	-0.87	-1.00
Least complex					
Live animals and Animal Pr. (I)	-0.20	0.64	1.09	1.26	0.20
Prep. Food., Bever. and Tobacco (IV)	1.40	1.33	1.30	1.04	1.22
Rawhides and Skins, Leather (VIII)	0.27	0.60	0.05	-0.05	0.05
Vegetable Products (II)	1.46	1.37	1.59	0.53	0.94
Textile and Textile Products (XI)	1.67	1.77	1.45	1.24	1.10
Footwear and Umbrellas (XII)	1.39	0.59	-0.16	-0.24	-0.23

Source: Author's calculations based on TURKSTAT and COMTRADE database.

and the findings of Taymaz et al. (2011) and shows that the imported input use of these sectors is effective on their export performance considering their export to import ratios of above 80 percent in recent years (Table 4.11). Contrary to the suggestion of RCAX index, according to the RCA_2 index, Turkey has not comparative advantage in Chemicals which has very high import ratios and very low export to import ratio. Among the Medium Complex sectors, only Stone, Plaster and Glass Products has comparative advantage. Though Turkey has comparative advantage in all sectors except for Footwear and Umbrellas in Least Complex group, it is observed that its comparative advantage tend to decline in recent years. In contrast to Least complex group, Turkey's comparative advantage has been increasing in Medium Complex and the Most Complex groups in recent periods.

4.2.7. Export and Import Ratios of Manufacturing Production

In this section, we analyze the export/production and import/production ratios of manufacturing industry. Yükseler and Türkan (2008) calculated the export/production and import/production ratios of manufacturing industry sub-sectors for the 1997-2007 period using 1996 Input-Output tables.[51] Using the same method with Yükseler and Türkan (2008), we calculated the export/production and import/production ratios of manufacturing industry sub-sectors using 2002 Input-Output tables for the 1994-2010 period.

Table 4.14, Figure 4.7 and Figure 4.8 show the export/production and export/supply ratios of manufacturing industry sub-sectors for 1994-2001 and 2002-2010 period[52]. Export/production ratio of manufacturing industry has increased from around 10 percent in 1994 to 30 percent in 2010. The rise in the export to production ratio of manufacturing industry has accelerated after 2001. This rapid increase in export to production ratio is more explicit in investment good sectors. Export/production ratio of investment goods sectors has become much higher than manufacturing industry average after 2001, reaching to 45 percent in 2009. The largest export share of production belongs to Other Transport Equipment with 154 percent on average in 2002-2010. Radio, Television and Communication Equipments and Motor Vehicles are the other sectors that have had the largest export/production ratio with 71 percent and 48 percent in 2002-2010, respectively. These three sectors seem to export more than half of their production after 2001.

[51] Based on the export/production and import/production ratios in 1996 I-O table, they updated the ratios using the changes in industrial production and export volume indices of manufacturing industry sub-sectors.

[52] In this section, manufacturing industry sub-sectors are grouped according to their general activities as consumption goods, intermediate goods and investment goods in the context of the production classification of T.R. Ministy of Development.

Export/production ratio of intermediate good sectors has increased from 10 percent in 1994 to 15 percent in 2001 and to nearly 30 percent in 2010. Coke and Refined Petroleum Products has provided the highest increase in export share of production due to the increase in oil export to Iraq after 2003. Basic Metal is another high exporter sector which exports 43 percent of its production in 2002-2010 on average. Though consumer goods sectors' export/production ratio has risen after 2001, it is below the manufacturing industry average. Among the consumer good sectors, Wearing Apparel and Textiles has had the largest export share of production with 43 percent and 33 percent in 2002-2010 period, respectively.

Export/production ratios in Table 14.14 reveal that sectors such as Other Transport Equipment, Radio, Television and Communication Equipments, Motor Vehicles, Basic Metal, Wearing Apparel and Textiles have begun to export a large fraction of their production since 2001. However, in order to make a more clear-cut analysis of their performances, we need to take their import use in production into account. Therefore, it is important to analyze the export/supply ratios for manufacturing industry sub-sectors.

Export/supply ratio of a sector is defined as the ratio of exports to the sum of production and imports of the sector. Based on the export/supply ratios in 2002 Input-Output Table, it is calculated using the changes in export and import volume and industrial production indices. The difference between export/production ratio and export/supply ratio is generally used as an indicator of the import dependency of that sector (Aydın et al., 2007; Yükseler and Türkan, 2008). The last two columns of Table 4.14 and Figure 4.8 show the export/supply ratio of manufacturing industry. The limited increase in the export/supply ratio of investment good sectors relative to the increase in their export/production ratio shows that the rise in their exports is mainly due to the increase in their import originated supply.

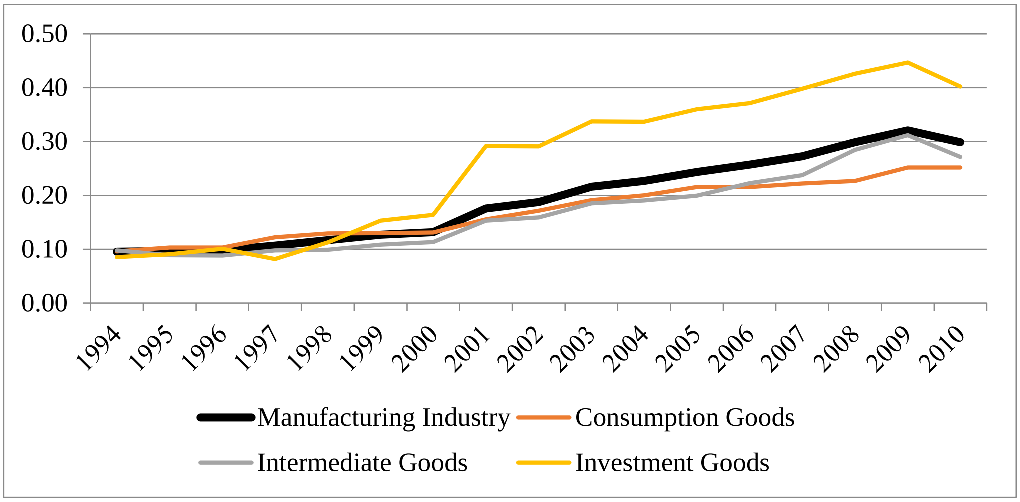
Even though Other Transport Equipment sector has been exporting 154 percent of its production, its export/supply ratio has been only 35 percent in 2002-2010 period. Therefore, we can say that import is an important determinant of export and production

Table 4.14: *Exports/Production and Exports/Supply ratios*

		export/production		**export/supply**	
ISIC rev. 3 codes		**1994-2001**	**2002-2010**	**1994-2001**	**2002-2010**
	Manufacturing	***0.12***	***0.26***	***0.10***	***0.18***
	Consumption Goods	***0.12***	***0.22***	***0.13***	***0.20***
15	Food and Beverages	0.05	0.07	0.05	0.07
16	Tobacco Products	0.05	0.07	0.05	0.07
17	Textiles	0.13	0.33	0.12	0.27
18	Wearing Apparel	0.27	0.43	0.32	0.44
19	Leather products and footwear	0.06	0.14	0.05	0.10
36	Furniture and Other	0.08	0.25	0.08	0.22
	Intermediate Goods	***0.11***	***0.23***	***0.08***	***0.14***
20	Wood products	0.03	0.10	0.03	0.09
21	Paper and paper products	0.03	0.10	0.03	0.07
22	Printing and Publishing	0.01	0.02	0.01	0.01
23	Coke and Ref. Petroleum Products	0.10	0.45	0.07	0.26
24	Chemicals	0.07	0.12	0.05	0.06
25	Rubber and Plastic Products	0.08	0.21	0.08	0.18
26	Non-metallic Mineral Products	0.09	0.22	0.08	0.20
27	Basic Metal	0.26	0.43	0.16	0.20
	Investment Goods	***0.14***	***0.37***	***0.09***	***0.21***
28	Fabricated Metal Products	0.06	0.24	0.06	0.20
29	Machinery and Equipment	0.09	0.25	0.05	0.14
30	Office, Account. and Comp. Mach.				
31	Electrical Mechinary	0.16	0.28	0.12	0.14
32	Radio, TV, and Communication Eq.	0.25	0.71	0.12	0.29
33	Medical, Presicion and Optical Eq.				
34	Motor Vehicles	0.17	0.48	0.11	0.27
35	Transport Equipment	0.48	1.54	0.21	0.35

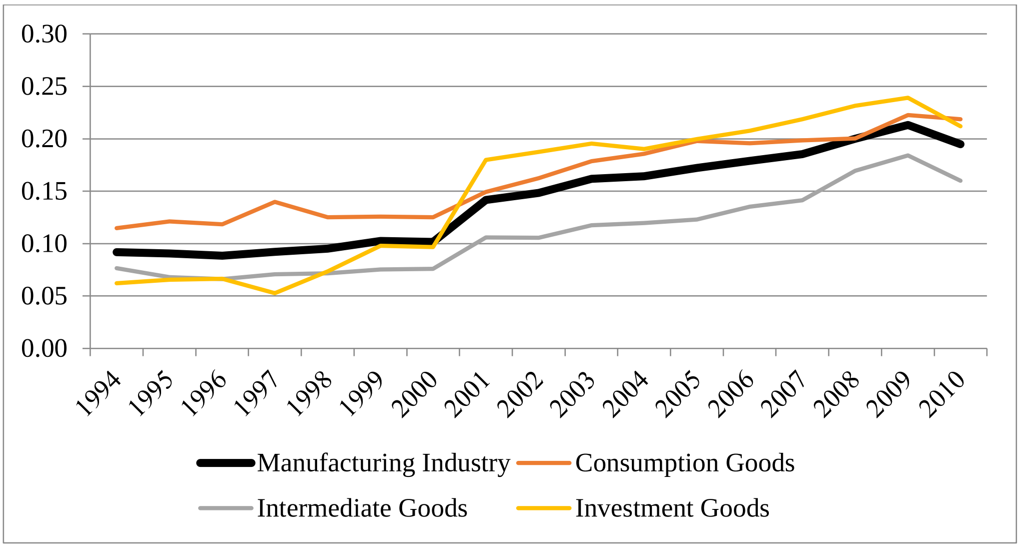
Source: Author's calculations. 2002 Input-Output table, TURKSTAT.

Notes: Since export volume indices of Office, Accounting and Computing Machinery and Medical, Precision, and Optical Equipment are not available, export/production ratio cannot be calculated for these sectors.



Source:Author's calculations. 2002 Input-Output table, TURKSTAT.

Figure 4.7. *Manufacturing Industry Export/Production Ratios*



Source:Author's calculations. 2002 Input-Output table, TURKSTAT

Figure 4.8. *Manufacturing Industry Export/Supply Ratios*

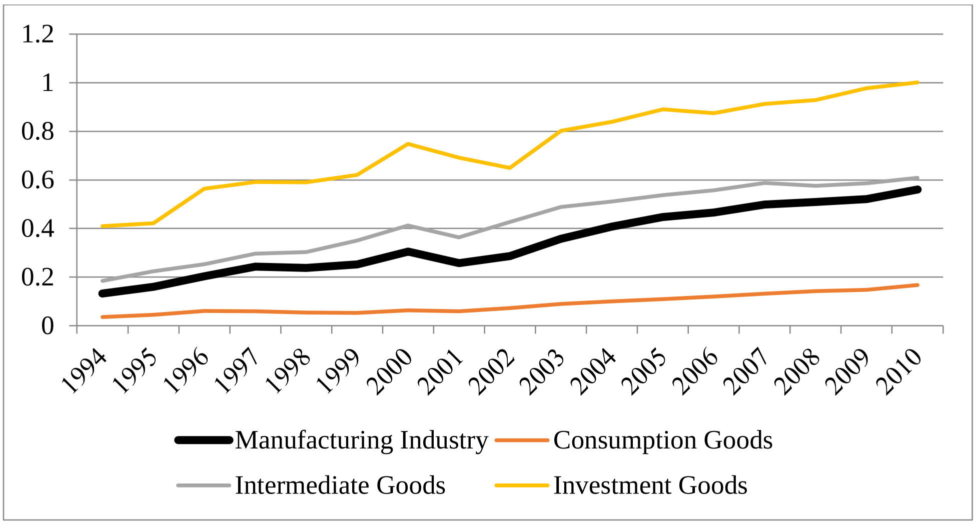
of this sector and some import products has been re-exported independently from production process. The same can hold for Radio, Television and Communication Equipments. The increase in imports has led to the significant decline of export/supply ratio of Motor Vehicles and Electrical Machinery which has had a high ratio of export/production since 2001. Among the intermediate good sectors, export/supply ratios of Coke and Refined Petroleum Products and Basic Metals have been significantly different from their export/production ratios. This large difference is mainly due to the inclusion of non-monetary gold imports into Basic Metal imports after 2001. Contrary to the investment and intermediate good sectors, the gap between export/production and export/supply ratios is very limited in consumer good sectors implying the low import dependency of these sectors. This is especially valid for Textiles and Wearing Apparel sectors. The increase in their exports together with their low imports contributed to the increase of export/supply ratio in Textiles, Wearing Apparel and Furniture sectors.

Table 4.15, Figure 4.9 and Figure 4.10 show the import/production and import/supply ratio of manufacturing industry sub-sectors between 1994 and 2010. Import/production ratio of manufacturing industry has an upward trend which goes up from 13 percent in 1994 to 56 percent in 2010. Investment good sectors are seem to be the main determinant of this increase in import/production ratio of manufacturing industry. Their import share of production has increased from around 40 percent levels in 1994 to 100 percent in 2010. Almost all of the investment good sectors have had very high import/production ratios since 1994. Among them, Office, Accounting and Computing Machinery rose from 585 percent in 1990s to 779 percent in 2000s. Similarly, after 2002, import/production ratios of Medical, Precision and Optical Equipment, Transport Equipment, Radio, TV and Communication Equipment has realized 417 percent, 363 percent and 172 percent, respectively. Import share of production has been also above 60 percent in Machinery and Equipment, Electrical Machinery and Motor vehicles in 2002-2010. Considering that domestic production occurs at negligible amounts in some of these sectors, these very high import/production ratios do not imply that the whole production is provided by imports in these sectors. However, it also arise from the fact that production and exports has

Table 4.15: *Imports/Production and Imports/Supply ratios*

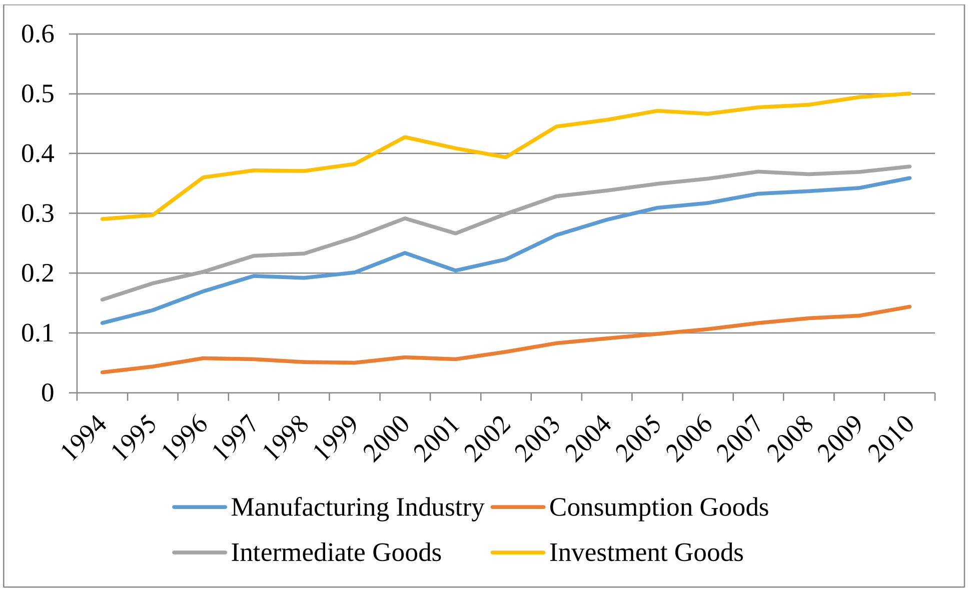
		import/production		**import/supply**	
ISIC rev. 3 codes		**1994-2001**	**2002-2010**	**1994-2001**	**2002-2010**
	Manufacturing	***0.22***	***0.45***	***0.18***	***0.31***
	Consumption Goods	***0.05***	***0.12***	***0.05***	***0.11***
15	Food and Beverages	0.05	0.06	0.05	0.06
16	Tobacco Products	0.02	0.04	0.02	0.04
17	Textiles	0.07	0.19	0.06	0.16
18	Wearing Apparel	0.01	0.08	0.01	0.07
19	Leather products and footwear	0.12	0.28	0.12	0.22
36	Furniture and Other	0.13	0.31	0.12	0.24
	Intermediate Goods	***0.29***	***0.54***	***0.23***	***0.35***
20	Wood products	0.07	0.25	0.06	0.20
21	Paper and paper products	0.20	0.39	0.17	0.28
22	Printing and Publishing	0.03	0.05	0.03	0.05
23	Coke and Ref. Petroleum Products	0.40	0.58	0.28	0.36
24	Chemicals	0.53	0.97	0.35	0.49
25	Rubber and Plastic Products	0.15	0.27	0.13	0.21
26	Non-metallic Mineral Products	0.05	0.10	0.05	0.09
27	Basic Metal	0.34	0.74	0.26	0.42
	Investment Goods	***0.56***	***0.87***	***0.36***	***0.47***
28	Fabricated Metal Products	0.13	0.28	0.13	0.22
29	Machinery and Equipment	0.77	0.91	0.44	0.48
30	Office, Account. and Comp. Mach.	5.51	7.79	0.84	0.88
31	Electrical Mechinary	0.30	0.90	0.23	0.46
32	Radio, TV, and Communication Eq.	1.35	1.72	0.56	0.60
33	Medical, Presicion and Optical Eq.	1.60	4.17	0.62	0.79
34	Motor Vehicles	0.42	0.61	0.29	0.38
35	Transport Equipment	1.01	3.63	0.46	0.76

Source: Author's calculations. 2002 Input-Output table, TURKSTAT.



Source:Author's calculations. 2002 Input-Output table, TURKSTAT.

Figure 4.9. *Manufacturing Industry Import/Production Ratios*



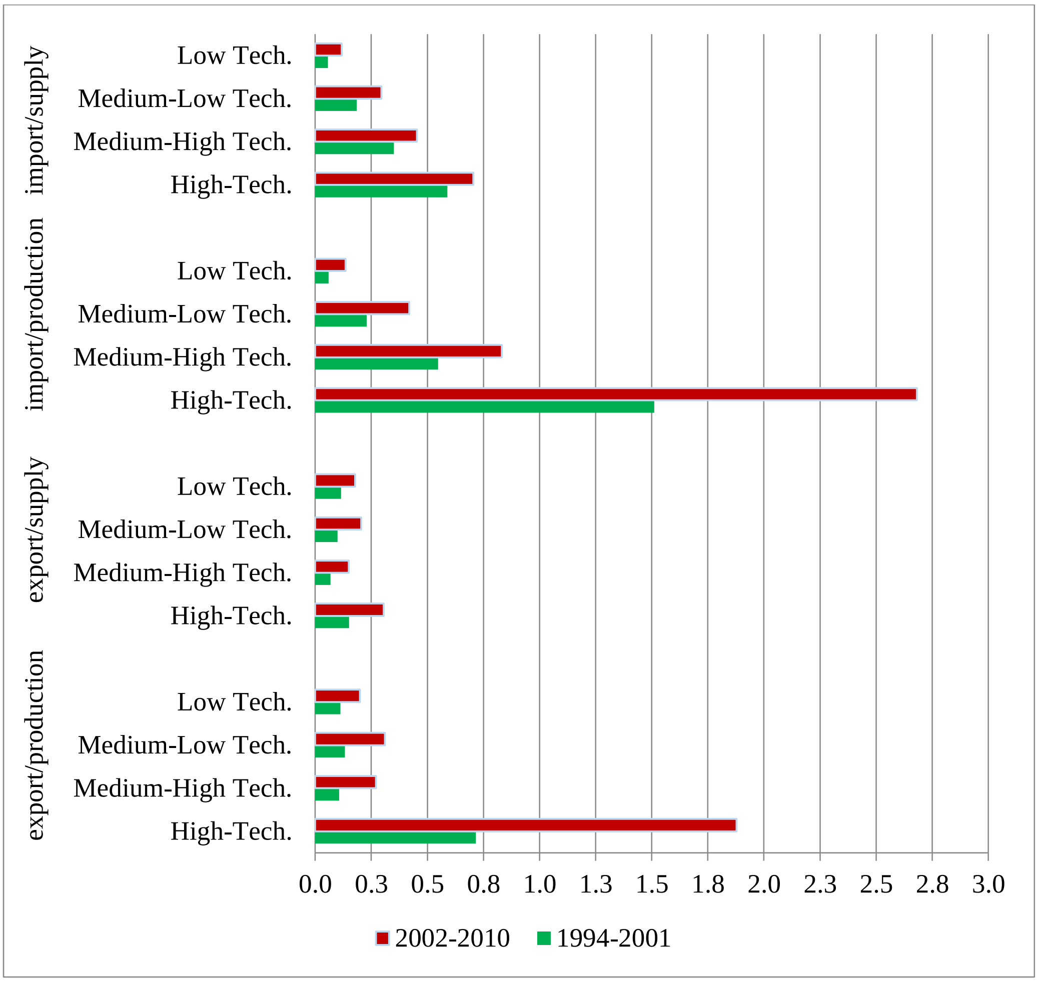
Source:Author's calculations. 2002 Input-Output table, TURKSTAT.

Figure 4.10. *Manufacturing Industry Import/Supply Ratios*

become highly dependent on imports in these sectors. Import/production ratio of intermediate good sectors has been above the manufacturing industry average which has reached to 60 percent in 2010. This increase is mainly due to the high import/production ratios of Chemicals, Basic Metals and Coke and Refined Petroleum Products. Even though the import/production ratio of consumption goods sectors has increased over time, it has been still below 20 percent. In Leather Products and Footwear and Furniture, import to production ratio has significantly risen, reaching to around 30 percent since 2002.

Import/supply ratios which are given in the last two columns of Table 4.15 and Figure 4.9 show the fraction of total supply that is provided by imports. As we see from the figure, a rising fraction of total supply of manufacturing industry is provided by imports over time. Average import/supply ratio of Turkish manufacturing industry increased from 11 percent in 1994 to 20 percent in 2001 and to 36 percent in 2010.

Figure 4.11 represents the export and import ratios of manufacturing production and supply according to the technology-intensity of the sectors. It is observed from the figure that import/production and import/supply ratios increases as the technology intensity increases. Import/production ratio has increased from 151 percent in 1990s to 268 percent after 2002 in high-technology sectors. In medium-high-technology sectors, imports were around 50 percent of production in 1990s whereas it increased to 85 percent in 2000s. On the other hand, high-technology sectors have had much higher export/production ratios relative to the other groups, rising from 70 percent in 1994 to 187 percent in 2002-2010. However, export /supply ratio of high-technology industries only increased from 15 percent to 30 percent and there is not such a big gap between high-technology sectors and others in terms of export/supply ratios. These are consistent with high import ratios and high import dependency of production and exports in high-technology sectors. Together with their high export/supply ratios, high import/supply ratios of high-technology and medium-high-technology industries imply that high export ratios of these industries are dependent on their imports. On the contrary, low-technology and medium-low technology industries have had significantly lower import ratios while having export/supply ratios which are



Source:Author's calculations. 2002 Input-Output table, TURKSTAT.

Figure 4.11. *Manufacturing Industry Technology Intensity and Trade-Production Ratios*

comparable with high and medium-high technology sectors. This implies that low and medium-low technology sectors are exporter sectors with lower import dependency.

4.3. FINANCIAL DOLLARIZATION OF TURKISH MANUFACTURING INDUSTRY

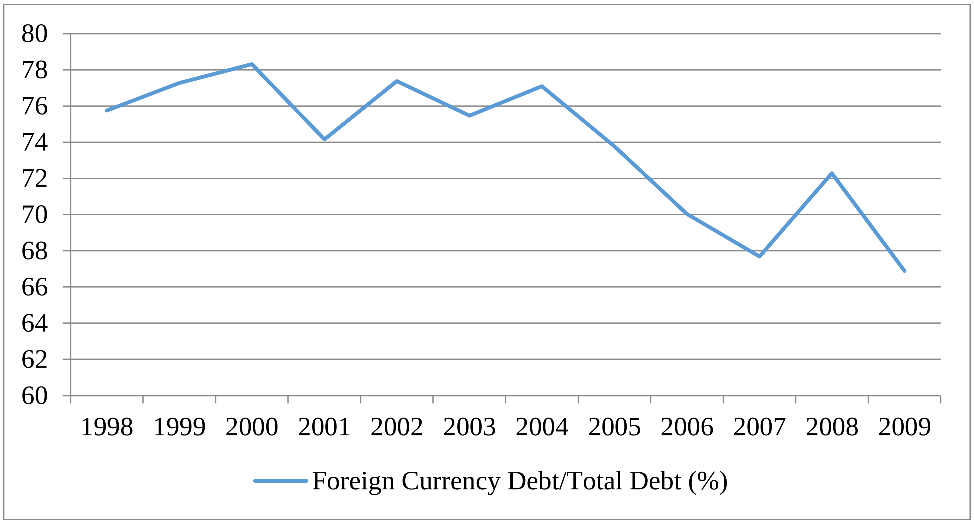
Economic contractions and financial instabilities in a number of developing countries due to real depreciations have led balance sheet channel to be intensively discussed in recent years. In the presence of liability dollarization, real depreciations can lead to the decline of firms' net worth and lose their ability to service their debt and thereby reduce their investment and production. Even though, the firms in export sectors can match their foreign currency denominated debt with their foreign currency denominated revenues, negative balance sheet effects especially matter for the sectors which produce only to the domestic market and sectors with high imported inputs. Therefore, the degree of liability dollarization in the manufacturing industry sub-sectors acts as an important factor in the reaction of sectoral production to real exchange rate changes.

Due to the sustained high inflation, high budget deficit, macroeconomic instability and thereby high uncertainty in the economy, there has been significant debt dollarization in Turkish economy. Liability dollarization ratio (foreign currency debt/total debt) has reached to the levels above the Latin American countries which are known as a highly dollarized region (IMF, 2005)[53]. Figure 4.12 plots the ratio of foreign currency debt to total debt between 1998 and 2009. Liability dollarization ratio was around 76 percent in 1998 and remained above 75 percent until 2004. Since 2004, it has followed a downward trend with the implementation of floating exchange rate regime and the relative improvement of macroeconomic conditions. It declined to 68 percent in 2007 while showed a sharp rise with the effect of global financial crisis in 2008. However, it turned back to 67 percent in 2009. Despite the decline since 2004,

[53] Latin american countries has witnessed a financial de-dollarization process since late-2000s by decreasing their liability dollarization to 33 percent from 45 percent in the early-2000s (World Bank, 2013).

liability dollarization of Turkish manufacturing industry is still so high. Apart from the share of foreign debt in total debt, the maturity of foreign debt is the other risk factor. Until 2000, the bulk of the foreign currency debt (nearly 80 percent) has been short-term, while the maturity of the debt has significantly increased after 2001 (Kesriyeli *et al.*, 2005; Özmen and Yalçın, 2007).

Table 4.16 represents the liability dollarization of Turkish manufacturing industry sub-sectors according to the ISIC Rev.3 classification. Balance sheet effect of real deprecations depends on the currency denomination of revenues and liabilities. Therefore, we need to analyze the share of export revenues of sub-sectors together with their share of foreign debt. Table 4.14 represents the liability dollarization and export shares of manufacturing industry sub-sectors for 1998-2001 and 2002-2009 periods. Liability dollarization is measured as the share of foreign currency debt in total debt and export ratio is measured as the share of foreign sales in total sales. Both ratios are taken from the Sectoral Balance Sheets reported by Central Bank of Turkish Republic. According to the table, foreign debt ratio has been very high in



Source: Sectoral Balance Sheets reported by Central Bank of Turkey.

Figure 4.12. *Liability Dollarization of Turkish Manufacturing Industry*

Table 4.16: *Financial Dollarization and Export Revenues*

		Liability Dollarization (%)		**Exports/Total Sales (%)**	
		1998-2001	**2002-2009**	**1998-2001**	**2002-2009**
ISIC Rev. 3 Codes	*Manufacturing*	*76.4*	*72.6*	*26.3*	*32.4*
15	Food Products and Beverages	66.1	57.4	20.4	17.6
16	Tobacco	66.5	60.5	43.7	31.9
17	Textiles	81.4	76.0	43.4	35.9
18	Wearing Apparel	81.7	69.4	54.8	53.9
19	Leather and Footwear	79.4	58.4	33.2	26.2
20	Wood Products	60.6	69.6	8.8	11.5
21,22	Paper, Paper pr., Print. and Publish.	76.2	65.1	9.0	12.2
23	Coke, Refined Petrol. Prod.	73.6	66.6	5.2	16.4
24	Chemicals	71.2	66.2	12.5	15.6
25	Rubber and Plastic Prod.	73.5	69.2	30.1	32.8
26	Non-metallic Mineral Products	79.1	65.0	23.1	24.2
27,28	Basic metals and Fabric. Metal Pr.	77.7	82.4	34.7	41.8
29	Machinery and Equipment	64.1	62.5	22.3	35.5
31,32,33	Elect. Mach., Radio, TV, Com.Eq. and Optical Inst.	78.9	75.5	39.3	51.5
34,35	Motor Vehicles and Other Transp. Eq.	81.1	81.6	32.2	52.0
36	Furniture and Manufac. n.e.c	74.1	63.3	21.5	22.8

Source: Sectoral Balance Sheets reported by Central Bank of Turkey.

Notes: Loan dollarization is the share of foreign currency loans in total loans of the sectors.

manufacturing sub-sectors before 2001, ranging from 60 percent to 82 percent. Textiles, Wearing Apparel, Leather and Footwear, Non-Metallic Mineral Products, Basic Metals and Fabricated Metal Products, Electrical Machinery, Radio, TV and Optical Instruments and Motor Vehicles and Other Transport Equipment are the sectors which has had the highest foreign debt ratio (around 80 percent) before 2001. Except for Non-Metallic Mineral Products, all these sectors are exporter sectors which export more than 30 percent of their total sales before 2001. Especially Textiles and Wearing Apparels had the highest export shares (43 percent and 55 percent) in this period. Apart from these sectors, Paper Products, Printing and Publishing, Coke and Refined Petroleum Products, Chemicals, Rubber and Plastic Products and Furniture and Other Manufacturing also had liability dollarization ratios which are above 70 percent before 2001. However, except for Rubber and Plastic Products, these sectors had very low export ratios which are mostly below 15 percent. There is a significant currency mismatch between the earnings and liabilities of these sectors before 2001. On the other hand, Machinery and Equipment, Food and Beverages and Tobacco have had relatively lower foreign debt ratios (around 65percent) and their export share has been nearly 20 percent except for Tobacco industry which seems to have exported 43 percent of its sales before 2001.

After 2001, almost all sectors have decreased their liability dollarization except for Basic Metals and Fabricated Metal Products, Motor Vehicles and Other Transport Equipment and Wood Products where the share of foreign debt have still been above 80 percent in 2002-2009 period. Electrical Machinery, Radio, TV and Optical Instruments and Textiles have followed them with foreign debt shares of 75 percent. Among these sectors, Electrical Machinery, Radio, TV and Optical Instruments, Motor Vehicles, Other Transport Equipment, Basic Metal and Fabricated Metal Products have significantly increased their export share which lies above 42 percent on average since 2001. Despite the decline in their foreign debt shares, Textiles and Wearing Apparels' liability dollarization ratios were still above 70 percent in 2002-2009. While Wearing Apparels has again exported 54 percent of its total sales, export ratio of Textiles has declined to 36 percent. Machinery and Equipment has decreased its liability dollarization to 62 percent whereas raising its export share to 36 percent after

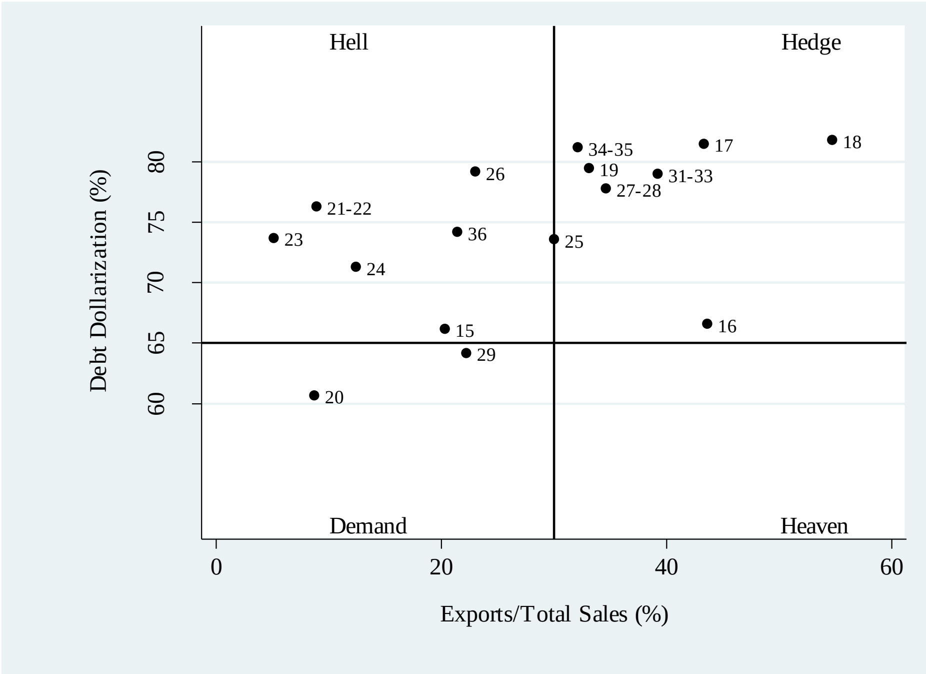
2001. On the other hand, intermediate good sectors such as Wood Products, Paper Products, Printing and Publishing, Coke and Refined Petroleum Products and Chemicals still continued to have very low export ratios, though they have foreign debt ratios which are above 65 percent.

Figure 4.13 and Figure 4.14 plot the liability dollarization and export ratio of manufacturing industry 2-digit sectors in 1998-2001 and 2002-2009 period. Following Echeverry et al. (2003b) and Kesriyeli et al. (2005), we defined four zones, hell, heaven, hedge and demand, according to the liability dollarization and export ratio combination of sectors.[54] If the sectors are highly dollarized (above 65 percent) and export a low proportion (under 30 percent) of their total sales, they are classified as being in hell.

These sectors are the ones which will be most severely affected from real depreciations. In the opposite case, sectors with a high export ratio and low ratio of foreign debt are classified in the heaven zone. Sectors are hedged if they have both high liability dollarization and high export ratio. Remaining sectors which have low foreign indebtedness and low export levels will only be subject to the demand channel of real exchange rate depreciations.

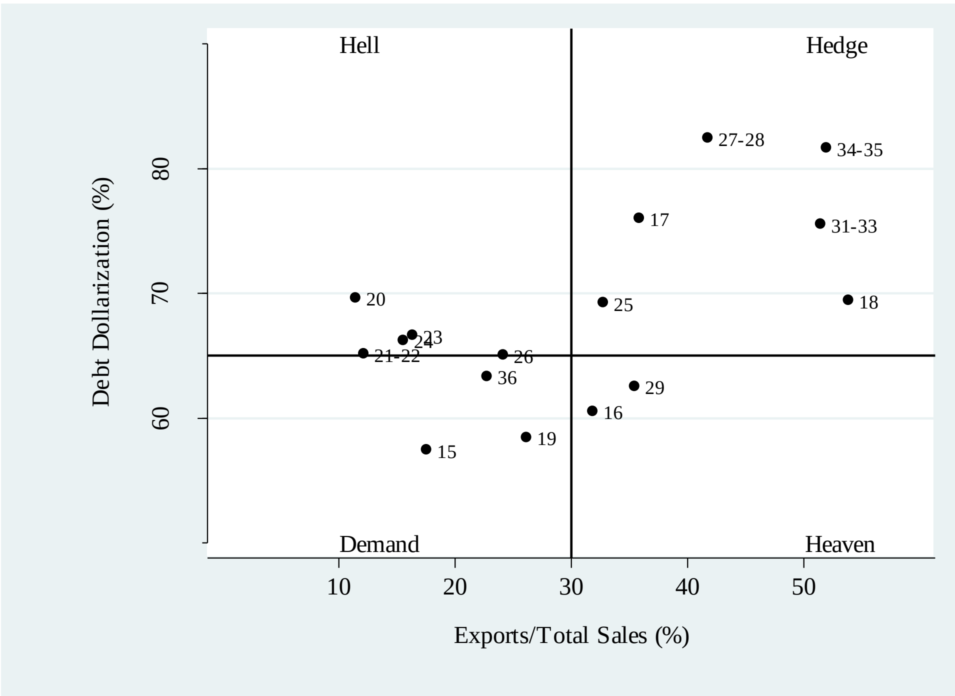
Figure 4.13 shows the foreign debt share and the export ratio of the sectors for the average of 1998-2001 period. Before 2002, while most of the sectors belong to hell or hedge zone, there is not any sector in the heaven zone. Bulk of the intermediate goods sectors, namely Paper Products, Printing and Publishing (21-22), Coke and Refined Petroleum Products (23), Chemicals (24) and Nonmetallic Mineral Products (26); and a few consumption good sectors such as Food and Beverages (15) and Furniture and Other Manufacturing (36) appear in the hell zone which are heavily indebted in foreign currency although they have low levels of export earnings. On the

[54] Our zone boundary for vertical axis (65 percent for debt dollarization) is lower than Echeverry et al. (2003b) and Kesriyeli et al. (2005) (50 percent). When their definition is considered (50 percent), all of the manufacturing sectors belong to the hell region. Following Alp (2013) , we set the boundary of debt dollarization as 65 percent.



Source: Sectoral Balance Sheets reported by Central Bank of Turkey.

Figure 4.13. *Manufacturing Industry Debt Dollarization and Exports – 1998-2001*



Source: Sectoral Balance Sheets reported by Central Bank of Turkey.

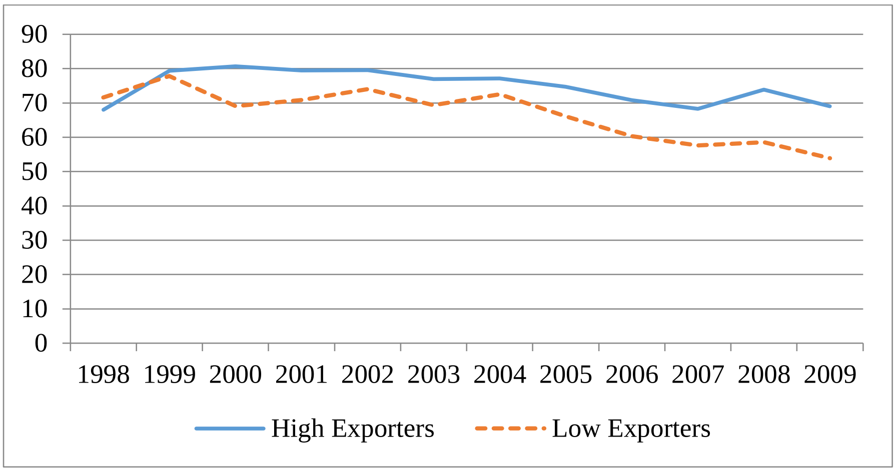
Figure 4.14. *Manufacturing Industry Debt Dollarization and Exports – 2002-2009*

other hand, Textiles (17), Wearing Apparels (18), Tobacco (16), Leather and Footwear (19), Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) belong to the hedge zone. Despite their high levels of foreign debt, these sectors are hedged against the risks of real depreciations due to their high export earnings. Lastly, Machinery and Equipment (29) and Wood Products (20) face only the demand channel of depreciations having relatively lower levels of liability dollarization and exports.

Figure 4.14 plots the foreign debt and export ratio of manufacturing industry sectors for the average of 2002-2009 period. After 2001, Paper Products, Printing and Publishing (21-22), Coke and Refined Petroleum Products (23), Chemicals (24) and Nonmetallic Mineral Products (26), Food and Beverages (15) and Furniture and Other Manufacturing (36) which appeared in the hell zone before 2001 shifted to the demand zone or to the boundary of demand zone by decreasing their foreign debt ratio. Textiles (17), Wearing Apparels (18), Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) continued to remain in the hedge zone. Among them, Medium-High and High Technology sectors of Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) are seem to increase their export ratios after 2001. Leather and Footwear (19) shifted to the demand zone since both its export ratio and liability dollarization decreased. In 2002-2009 period, two sectors, Tobacco (16) and Machinery and Equipment (29) begin to operate in heaven zone.

Figure 4.15 shows the evolution of liability dollarization of high exporter and low exporter sectors between 1998 and 2009. Sectors with an export ratio higher than the median of all sectors' export ratio at each year are classified as high exporter and the sectors with an export ratio lower than the median are classified as low exporter. According to this classification Textiles (17), Wearing Apparels (18), Rubber and Plastic Products (25), Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport

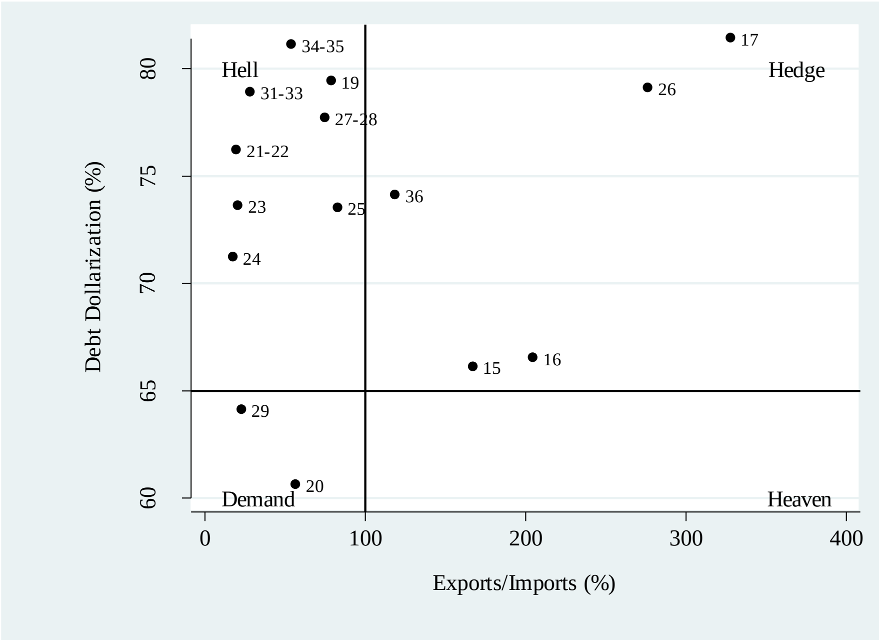
Equipment (34-35) are high exporter sectors. The remaining are the low exporter sectors. As Figure 4.13 shows, liability dollarization ratio tend to decrease in both groups. Average liability dollarization of high exporters has declined from around 80 percent in 1998 to 70 percent in 2009. Average foreign debt ratio of low exporter sectors has decreased from 77 percent in 1999 to 53 percent in 2009. As seen from the figure, liability dollarization of high exporter sectors is higher than liability dollarization of low exporters in all periods and the gap gets bigger in recent years.



Source: Sectoral Balance Sheets reported by Central Bank of Turkey.

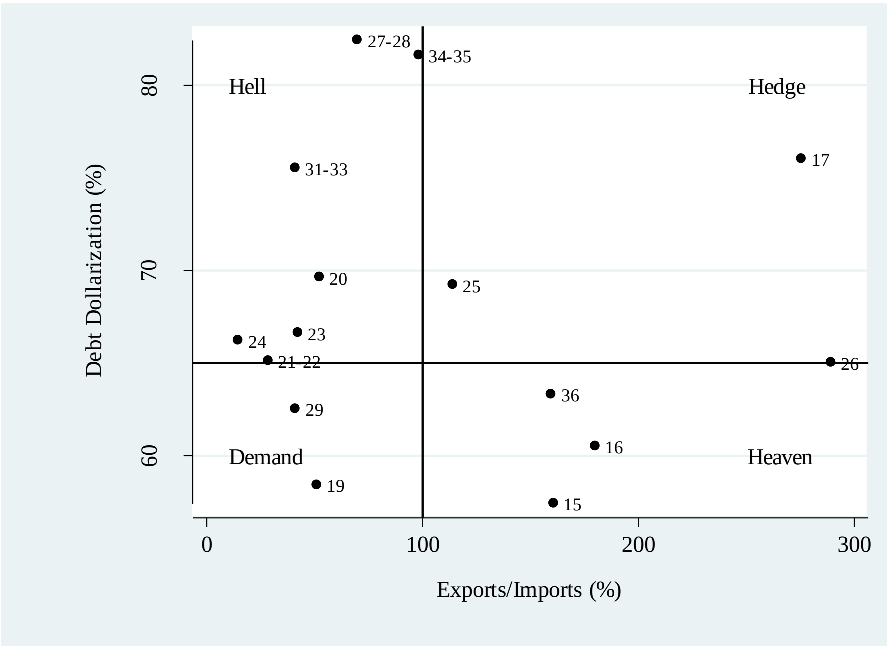
Figure 4.15. *Manufacturing Industry Debt Dollarization (%)*

Besides the export ratios, import ratios are also among the important determinants of financial conditions of sectors against real depreciations (Özmen and Yalçın, 2007). While the depreciation of the real exchange rate provides competitive advantage to exporter sectors, importer or imported-input dependent sectors are negatively affected. Therefore, analyzing the liability dollarization ratios together with export/import ratios of sectors will be more beneficial. Figure 4.16 and Figure 4.17 plot the liability dollarization and export to import ratios of manufacturing industry 2-digit sectors for 1998-2001 and 2002-2009 period, respectively. Wearing Apparels (18) cannot be placed into the figures because of its very high export/import ratio (above 1000



Source: OECD STAN, Sectoral Balance Sheets reported by Central Bank of Turkey.

Figure 4.16. *Manufacturing Industry Debt Dollarization and Exports to Imports Ratio – 1998-2001*



Source: OECD STAN, Sectoral Balance Sheets reported by Central Bank of Turkey.

Figure 4.17. *Manufacturing Industry Debt Dollarization and Exports to Imports Ratio – 2002-2009*

percent). An important point emerging from the figures is that medium-high and high technology sectors such as Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) which are seemed to be in the hedge zone in Figure 4.13 and 4.14, appear to be in the hell zone in both before and after 2001 since their export/import ratio is below 100 percent and they have high levels of liability dollarization. Despite their high export ratios, their imports are also in high levels due to their high import dependency of exports and production. Textiles (17) and Wearing Apparels (18) appear in the hedge zone in both periods. Besides, Food and Beverages (15), Tobacco (16) and Furniture and Other Manufacturing (36) shift from hedge zone to heaven after 2001.

To sum up, in this chapter, we reviewed the composition and the structure of Turkish manufacturing production, exports and imports between 1994 and 2013. To sum up, the data examined in this chapter reveal that manufacturing production and exports has developed mostly in favor of capital-intensive sectors such as Motor Vehicles, Electrical Machinery, Fabricated Metal Products, Basic Metals, and Machinery and Equipment rather than traditional labor-intensive sectors such as Textile, Wearing Apparels and Leather Products and Footwear after 2001. However, these favored sectors are also the main importer sectors of manufacturing industry which have the highest IIT levels and vertical specialization process. This has led to the increase of import dependency of manufacturing industry since 2001.

Regarding the technology-intensity of production and trade, we observe that while exporting mainly low-technology products in 1990s, Turkish manufacturing industry has gradually shifted towards the exports of medium and high-technology products. Low-technology sectors have constructed the major part of Turkish manufacturing exports until 2005. However, the share of high-technology and medium-technology exports follow an upward trend whereas low-technology exports show a downward trend between 1994 and 2013. At the same time, the largest part of manufactured imports belongs to high-technology sectors which consist more than 50 percent in the whole period. Medium-technology imports also shows an increasing trend reaching to nearly 30 percent in 2013.

We also analyzed the comparative advantage of Turkish exports according to the product complexity rankings of the sectors. Turkey has comparative advantage in only Metals and since 2005 in Transport Equipments among the Most Complex Product sectors. Though Turkey has comparative advantage in all sectors except for Footwear and Umbrellas in Least Complex group, it is observed that its comparative advantage tend to decline in recent years. In contrast to the Least complex group, Turkey's comparative advantage has been increasing in Medium Complex and the Most Complex groups in recent periods.

Export/production, export/supply, import/production and import/supply ratios which are calculated based on 2002 input-output tables and the changes in export, import and production indices also revealed consistent tendencies for the structure of manufacturing industry. There is a rapid increase in export to production ratios of investment good sectors such as Other Transport Equipment, Radio, Television and Communication Equipments and Motor Vehicles which seem to export more than half of their production after 2001. Among the consumer good sectors, Wearing Apparel and Textiles has had the largest export share of production with 43 percent and 33 percent in 2002-2010 period, respectively. However, the limited increase in the export/supply ratio of investment good sectors relative to the increase in their export/production ratio shows that the rise in their exports is mainly due to the increase in their import originated supply. Contrary to the investment and intermediate good sectors, the gap between export/production and export/supply ratios is very limited in consumer good sectors implying the low import dependency of these sectors. This is especially valid for Textiles and Wearing Apparel sectors. When we examine the export and import ratios of manufacturing production and supply according to the technology-intensity of the sectors, we observed that import/production and import/supply ratios increases as the technology intensity increases. Together with their high export/supply ratios, high import/supply ratios of high-technology and medium-high-technology industries imply that high export ratios of these industries are dependent on their imports. On the contrary, low-technology and medium-low technology industries have had significantly lower import ratios while having export/supply ratios which are comparable with high and medium-high technology sectors. This implies that low and medium-low technology sectors are exporter sectors with lower import dependency.

Lastly, we analyzed the liability dollarization of Turkish manufacturing sectors which is important for investigating the negative balance sheet channel of depreciations in sectoral basis. Despite the decline after 2004, liability dollarization is still so high in Turkish manufacturing industry lying above 68 percent on average. Intermediate goods sectors have belonged generally to the hell zone having high foreign currency debt and low export revenue, where most of these sectors have shifted to the demand zone after 2001. However, Textiles (17), Wearing Apparels (18), Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) are seem to be hedged against the risks of their high foreign debt with their high export revenues. But, when we also take their import dependency into account, medium-high and high technology sectors such as Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) which in the hedge zone before appear to be in the hell zone in both before and after 2001. Despite their high export ratios, their imports are also in high levels due to their high import dependency of exports and production. In contrast, due to their low import ratios Textiles (17) and Wearing Apparels (18) still seem to be hedged. Meanwhile, Food and Beverages (15), Tobacco (16) and Furniture and Other Manufacturing (36) shift from hedge zone to heaven after 2001.

CHAPTER 5

REAL EXCHANGE RATE, PRODUCTION AND TRADE IN TURKISH MANUFACTURING INDUSTY

5.1. INTRODUCTION

Exchange rate policies are amongst the main determinants of manufacturing industry exports and production. Export performance of an economy is highly dependent on the international competitiveness of its tradable sector. Being often defined as the relative price of tradables to non-tradables, the real exchange rate is widely used as the indicator of competitiveness of tradable sector. Besides playing an important role in the distribution of resources between tradable and non-tradable sectors, changes in the real exchange rate affect the relative profitability of investment in sectors with significant potential for increasing returns and productivity growth (Akyuz, 2009a).

As reviewed in Chapter 2, the studies on the impact of real exchange rate changes on economic growth investigating whether the conventional Mundell-Flemming model of expansionary devaluations based on trade channel or the recent contractionary devaluations based on balance sheet channel is valid, often consider aggregate panel data and ignore industry-specific dynamics. However, the responses of exports and production of manufacturing industry sub-sectors will be highly heterogeneous depending on their different characteristics such as export orientation, import dependency, technology intensity and financial structure. Depreciation of real exchange rate is contractionary for internationally non-tradable sectors or sectors with high import dependency ratios via trade and balance sheet impacts. The responsiveness of export sectors, on the other hand, are basically determined by their real exchange rate elasticity of exports and degree of liability dollarization. The impact of real exchange rate changes on production and international trade dynamics may expected not to be invariant to technology intensity and product complexity of industries. As well as these different features of sectors determine how their exports, imports and production react against real exchange rate movements individually, their relative weights in the economy will determine the response of the whole economy. Therefore, analyzing the effect of real exchange rate changes on industrial production is highly important for its impacts on the whole economy.

There are only very limited number of studies on the impact of real exchange rate movements on industrial production in the literature. Branson and Love (1986) examine the impact of real exchange rate changes on employment and output of U.S. manufacturing industry using different number of sectors at different levels of aggregation for the period of 1963-1985. They show that durable goods sectors such as primary metals, fabricated metal products, and non-electrical machinery are the most negatively affected ones from the appreciation of U.S. dollar. Kandil and Mirzaei (2002) estimate the effect of anticipated and unanticipated exchange rate movements on output of nine U.S. sectors, Agriculture, Construction, Finance, Manufacturing, Mining, Retail Trade, Services, Transportation and Wholesale Trade. Employing the same theoretical model with Kandil and Mirzaei (2002), Kandil, Berument and Dinçer (2007) examine the effect of real exchange rate fluctuations on aggregate real output and price level of Turkey. They show that anticipated appreciation of exchange rate negatively affects output growth whereas unanticipated changes have asymmetric effects. The effect of unanticipated depreciation is more important than the effects of unanticipated appreciation where unanticipated depreciation decrease real output growth through the cost of imported goods. Using Norwegian firm-level data, Ekholm, Moxnes and Ulltveit-Moe (2012) investigate the impact of a change in international competitive pressure due to a real appreciation on firm employment, production, investment, and productivity and find that real appreciation has a positive effect on output and labor productivity for firms with high net trade exposure (export exposure less import input exposure). Berman, Martin and Mayer (2012) show that, high and low productivity exporter firms react differently to a depreciation. According to Berman *et al.*, (2012) high productivity firms increase their mark-up rather than their export volume whilst low productivity firms choose the opposite strategy. Such a heterogeneity weakens the exchange rate elasticity of exports at an aggregate level. Since production and employment are closely related in terms of manufacturing industry performance, these studies focus on both of them when analyzing the effect of real exchange rate fluctuations.

A relatively large number of studies focus only on the implications of real exchange rate changes on employment.[55] A key contribution is that of Campa and Goldberg (2001), who examine the real exchange rate elasticities of employment and wages in two-digit ISIC U.S. manufacturing industries, focusing on the role of export orientation and imported input use of sectors as the trade-related channels. They provide evidence that positive effects of depreciations on employment rise with export orientation and decline with imported input use of the industry. Galindo, Izquierdo and Montero (2007) extend Campa and Goldberg (2001)'s setup by including the financial channel of balance sheet effects. Galindo *et al*. (2007) analyze the effect of exchange rates on employment in the presence of liability dollarization by interacting real exchange rate with three channels of export orientation, import penetration and balance sheet channel in their panel data regressions for a panel data sample of 3-digit level 28 manufacturing industries of 9 Latin American countries.

Given the crucial importance of sectoral heterogeneity of the impact of real exchange rates, this part of the study aims to empirically investigate this issue for Turkish manufacturing industry-level data. We first document the possible impacts of real exchange rate depreciations on sectors with different characteristics discussing the various channels through which depreciations affect sectoral production, exports and imports. Then, we proceed with the estimation of the effect of real exchange rate changes on industrial output growth and analyze how the impact varies with sector-specific factors including trade exposure (namely export orientation and imported-input use), technology intensity and liability dollarization. To this end, we consider a panel data set of 22 ISIC 2-digit Turkish manufacturing sectors. Besides providing us the advantage of examining the effect of exchange rate changes on output growth using a more disaggregated data, this analysis also allows us to investigate the implications

[55] See Revenga (1992), Alaxandre *et al*. (2011), Nucci and Pozzolo (2010), Demir (2010), Chen and Dao (2011) among others.

of heterogeneity of Turkish manufacturing industry sub-sectors in terms of sector-specific factors such as technology intensity, export orientation, import dependency and foreign debt on the response of production to exchange rate movements. Chapter 4 already provided a detailed analysis of the structure and transformation of Turkish manufacturing industry production and trade during the last three decades. Based on this analysis, we are now able to make inference on the response of output growth of whole economy in the light of the information on the relative weights of these sub-sectors in total manufacturing industry.

5.2. SECTORAL EFFECTS OF REAL EXCHANGE RATE DEPRECIATIONS

The structure of production and trade, especially import dependency of exports and production, the degree of intra-industry trade and vertical specialization, and the financial structure of firms are important factors affecting the real exchange rate, domestic income and foreign demand elasticities of exports, imports and thereby production. In this sense, the characteristics of sub-sectors and their relative weights in the economy highly determine the responsiveness of total production, exports and imports to the real exchange rate changes. Table 5.1 summarizes the sectoral effects of real depreciations. According to the trade channel that standard Mundell-Flemming model suggests, under the assumption of Marshall-Lerner conditions are satisfied, depreciation of the real exchange rate increases the production of exporter sectors whereas decreases the production of importer and non-tradable sectors[56]. In the context of this standard theory, expansionary effect of real depreciations on the whole economy is positively related with trade openness of the economy, relative weight of exporter sectors in the economy and domestic (not imported) input ratio of the production (Calvo *et al*., 2004; Frankel, 2005).

[56] According to Akbostancı (2004), for Turkey , Marhall-Lerner conditions hold in the long run. However, Aydın *et al*. (2004) finds that imports rather than exports are affected from real exchange rates.

As already showned in Table 4.4, Textiles, Wearing Apparels, Basic Metals, Machinery and Equipment and Motor Vehicles are the main exporter sectors of Turkish manufacturing industry. Despite the decline in their shares from 40 percent in 1990s to 20 percent in 2009, Textiles and Wearing Apparels are still among the important exporter sectors of the economy. Meanwhile, Basic Metals, Machinery and Equipment, and Motor Vehicles sectors have been increasing their export and production shares and become the engine sectors of Turkish manufacturing industry. On the other hand, a number of capital-intensive sectors such as Fabricated Metal Products, Electrical Machinery and Other Transport Equipment have been performing high growth rates in exports and production. In this sense, we can say that the structure of Turkish manufacturing industry has been developing in favor of technology-intensive sectors rather than labor-intensive sectors. However, one of the main differences between the first group and the second one is their import dependency of exports and production.

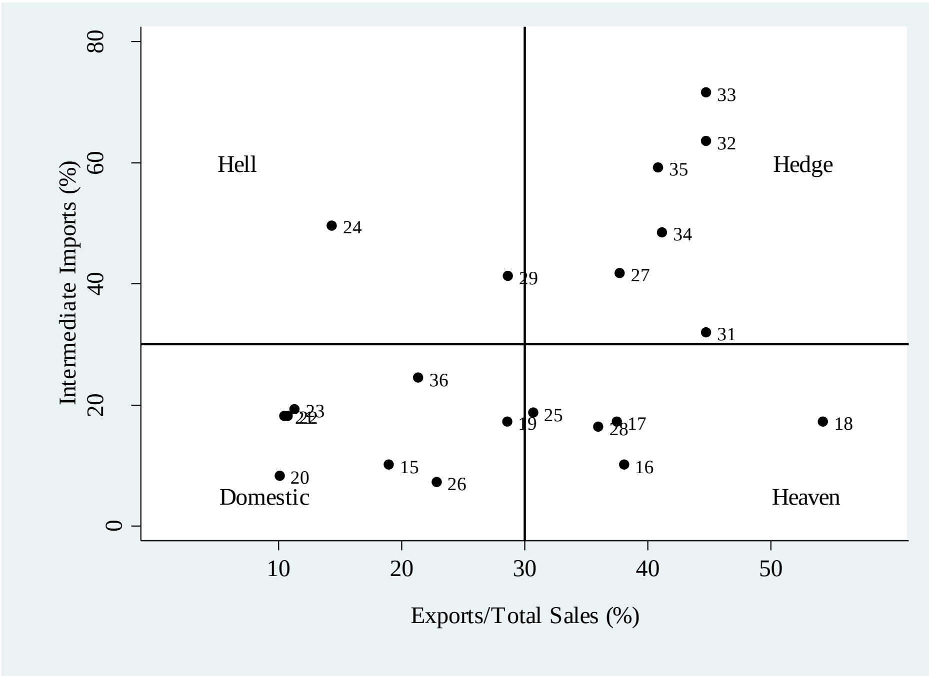
Tablo 5.1: *Sectoral Effects of Real Exchange Rate Depreciations*

	Exporter Sectors	Importer Sectors	Non-tradable Sectors	***Total***
Trade Channel	+	-	-	?
Financial Channel	-	-	-	-
Total	?	-	-	?

Source: Özmen and Yalçın (2006).

The impact of real exchange rate changes on the financial structure and performance of firms crucially depends on their intermediate import dependency and the degree of export orientation. For a given level of liability dollarization, the positive (negative) impact of real exchange rate appreciation may be expected to be substantially higher for the firms with higher (lower) import dependency and lower (higher) export orientation. Figure 5.1 shows the intermediate import ratio and the share of export sales in total sales of 2-digit ISIC manufacturing industries for the average of 1996-2009 period. Intermediate imported input ratio is the ratio of intermediate imports to the total intermediate use of each sector. In the context of the impact of real exchange rate changes, there appears to be four zones in the figure. We, albeit somewhat arbitrarily, identify each sector as belonging to one of four zones: *hell, heaven, hedge,* and *domestic*. In response to real exchange rate depreciations, sectors with low export orientation and high import dependency are classified as being in hell. In the opposite extreme, sectors in heaven, export a large proportion of their output, yet have a low level of import dependency. Sectors hedging their high import dependency with high export orientation are classified in the hedge zone. The rest of the sectors with low levels of exports and imports can be expected to face basically the domestic demand channel of a real exchange rate change.

According to Figure 5.1, Chemicals (24) and Machinery and Equipment (29) appear to be in the hell zone having low export sales (below 30 percent) and high intermediate input use (above 30 percent). Technology intensive sectors, namely Basic Metal (27), Electrical Machinery (31), Radio, TV, and Communication Equipments (32), Medical, Precision and Optical Equipment (33), Motor Vehicles (34) and Other Transport Equipment (35) belong to the hedge zone having both high export ratio and intermediate import usage. Most of these are the sectors which have increased their shares of production and exports in total manufacturing industry. Insufficient supply of domestic inputs and high degree of intra-industry trade (or vertical specialization) of these sectors are the main factors that play role in their import dependency of exports and production. In the case of high import dependency due to high imported input use or high degree of intra-industry trade, positive trade effect of real depreciations on exporter sectors can be offset by its negative effect on exports and production. Depending on the degree of intra-industry trade and the ratio of imported inputs, exports and production of these exporter sectors can become insensitive to the real exchange rate changes or can even be negatively affected from real exchange rate depreciations. Food and Beverages (15), Leather Products and Footwear (19), Wood and Wood Products (20), Paper and Paper Products (21), Printing and Publishing (22), Coke and Refined Petroleum Products (23), Non-Metallic Mineral Products (26) and Furniture and Other Manufacturing (36) are the sectors with low export ratio and intermediate import use that belong to domestic zone. Since the imports of these sectors are also low (see Table 4.5 and 4.13), we can also call them as non-tradable sectors. As Table 5.1 indicates, the effect of real depreciations can be expected to be negative for these importer or non-tradable sectors. Finally, as the sectors with high export sales and low imported input usage, Tobacco (16), Textiles



Source: Intermediate import ratios are from OECD-STAN. They are calculated using 1998 input-output tables. The share of export sales in total sales are from Sectoral Balance Sheets reported by Central Bank of Turkey. They represent the averages between 1996 and 2009.

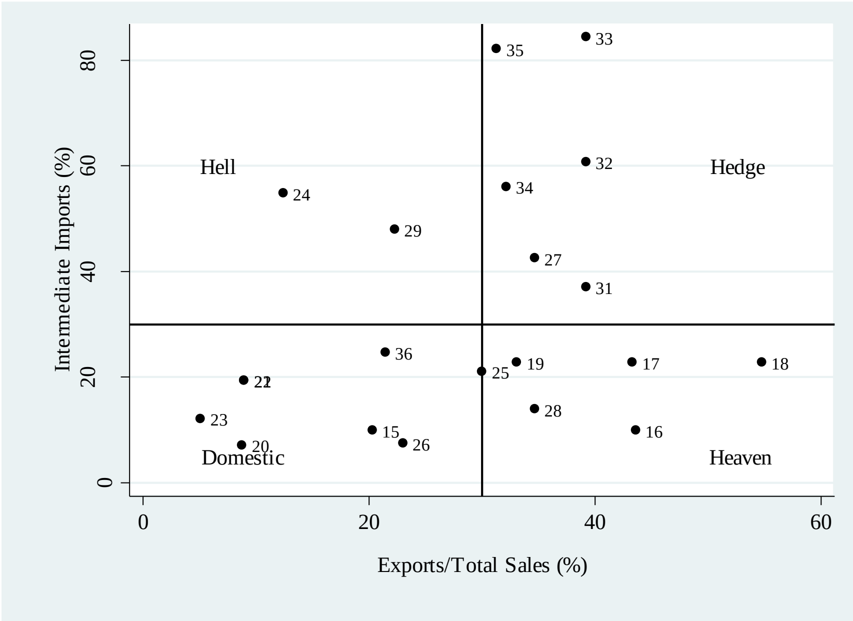
Figure 5.1: *Intermediate Imports and Exports – 1996-2009*

(17), Wearing Apparels (18), Rubber and Plastic Products (25) and Fabricated Metal Products (28) belong to the heaven region. Exports and production of these sectors are likely to be positively affected from depreciations through trade channel. Despite the decline in their shares in total manufacturing production, Textiles and Wearing Apparels are still among the most important exporter sectors of Turkey. On the other hand, even though their share in total manufacturing production is small, the share of Plastics and Rubber and Fabricated Metal Products have shown an upward trend which reached to 5 percent in 2009 (Table 4.1).

In order to see the effects of the structural transformation of manufacturing industry after 2001, we also plot the export sales ratios and intermediate import ratios of sectors for sub-periods of 1996-2001 and 2002-2009 in Figure 5.2 and 5.3. From the figures we see that, even though most of the sectors seem to be changed their places in their zones, only a few sectors changed their zones across two sub-periods.[57] Fabricated metal products (29) shifted from hell zone to hedge zone after 2001 by increasing its share of export sales. Similarly, Leather Products and Footwear (19) shifted from heaven zone to domestic zone after 2001 due to the decline in its export sales ratio.

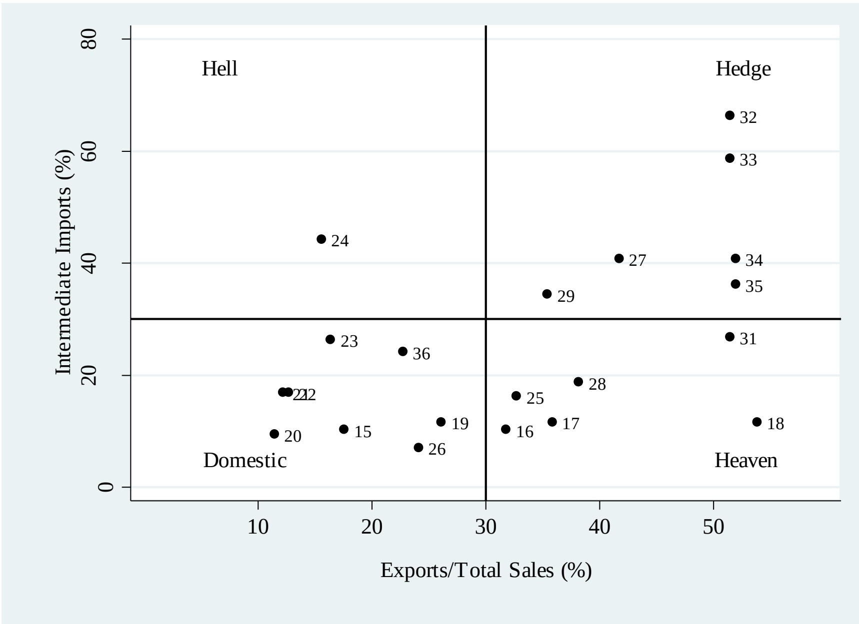
The other factor determining the sectoral effects of real exchange rate depreciations is the financial channel. In the presence of liability dollarization, since real deprecations increase the debt burden of firms and decrease their net worth, sectoral investments and production tend to decline (Aghion *et al*, 2004). Then, real deprecations can negatively affect importer and non-tradable sectors (Table 5.1). The effect of real depreciations on exporter sectors is mainly determined by their net revenues and the structure of their debt (Özmen and Yalçın, 2007). As pointed out in Section 4.3, main exporter sectors of Turkish manufacturing industry also have the highest liability dollarization ratios. Despite the decrease in their foreign debt ratios in recent years, they still have high ratios of liability dollarization. They mostly seen as hedging their exchange rate risk by at least partially matching their foreign debt with their export revenues (Figure 4.13 and 4.14). However, as Özmen and Yalçın (2007) state, it is the net revenues (revenues - costs) which is important when considering the actual risk of real exchange rate changes. When imports or costs due to the imported-input use are considered together with the export earnings, except for Textiles and Wearing apparels, almost all other exporter sectors seem to be in a risky position against real exchange rate depreciations (Figure 4.16 and 4.17). On the other hand, there are also some sectors such as Wood Products, Paper Products, Printing and

[57] For most of the sectors, intermediate import ratios seem to be declined after 2001. Since the intermediate import ratios of 2002-2009 period are calculated using 2002 input-output tables, this decline in intermediate import ratios can reflect the effects of 2001 crisis. Therefore, intermediate import ratios can be expected to be higher for 2002-2009 sub-period.



Notes: Intermediate import Ratios are calculated using 1996 input-output tables (OECD STAN). The share of export sales represent the averages between 1996 and 2001.

Figure 5.2: *Intermediate Imports and Exports – 1996-2001*



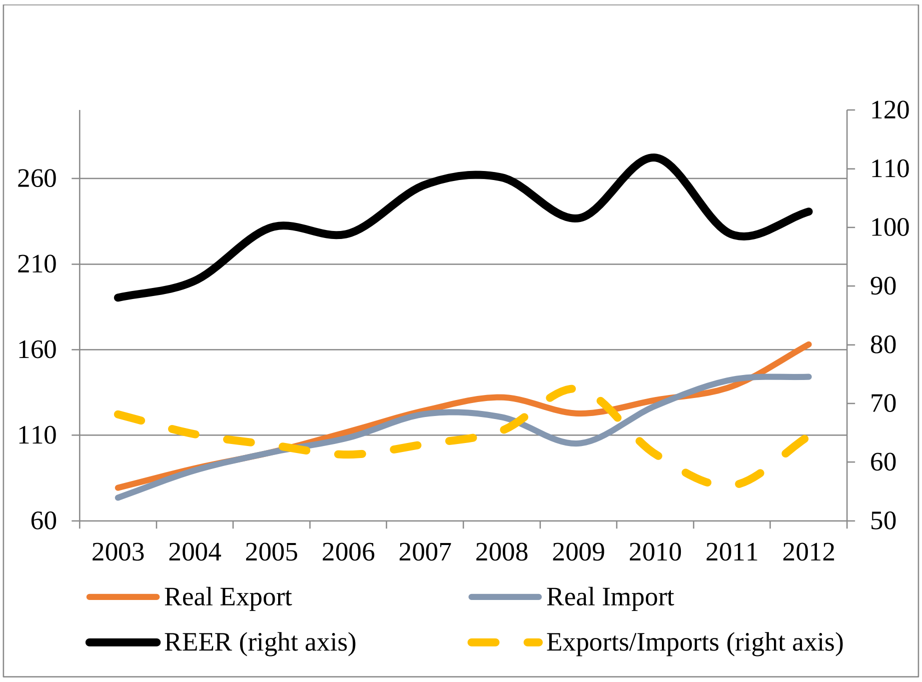
Notes: Intermediate import Ratios are calculated using 2002 input-output tables (OECD STAN). The share of export sales represent the averages between 2002 and 2009.

Figure 5.3: *Intermediate Imports and Exports – 2002-2009*

Publishing, Coke and Refined Petroleum Products and Chemicals which belong to the hell (low export-high dollarization) zone in all periods. Considering that Coke and Refined Petroleum Products and Chemicals are net importer sectors while Wood Products and Paper Products, Printing and Publishing mostly produce to the domestic market, these sectors will probably negatively affected from real exchange rate depreciations.

The analysis above documents the possible effects of depreciations on different sectors in the light of their sector-specific features such as export exposure, import dependency and liability dollarization. Before proceeding to the empirical analysis of the effect of real exchange rate changes on sectoral production and exports, it will be useful to see the whole picture of the economy on the evolution of total exports and imports together with real exchange rate. Figure 5.4 plots the real effective exchange rate, real export, real export and export/import ratio in 2003-2012 floating exchange rate regime period.[58] Real exchange rate systematically appreciated in 2002-2008 period and in 2010. In 2002-2008, real exchange rate appreciated by around 30 percent. Despite the appreciation of real exchange rate, real export increased nearly 100 percent while real import increased by 105 percent in the same period. Therefore, analyzing export/import ratio can be more informative in this case. Since real appreciation raised import more than export, export/import ratio declined in 2002-2006 period. However, export/import ratio tend to increase between 2007 and 2009 while real exchange rate appreciated in 2007, not changed significantly in 2008 and depreciated rapidly in 2009. In 2010 and 2011, the recovery period from the financial crisis, since imports increased more than exports, export/import ratio declined. During 2012 in which real exchange rate appreciated, exports grew more than imports and export to import ratio went up. During the period analyzed, export/import ratio has waved around 60-70 percent. Figure 5.4 shows that real exchange rate appreciations increase trade deficits by raising imports more than exports.   Favorable global liquidity conditions together with the positive conditions of the domestic economy have led to capital inflows which appreciates real exchange rate during the period. These dynamics supports economic

[58] Real effective exchange rate, real export and real import are all indexed as 2005=100.

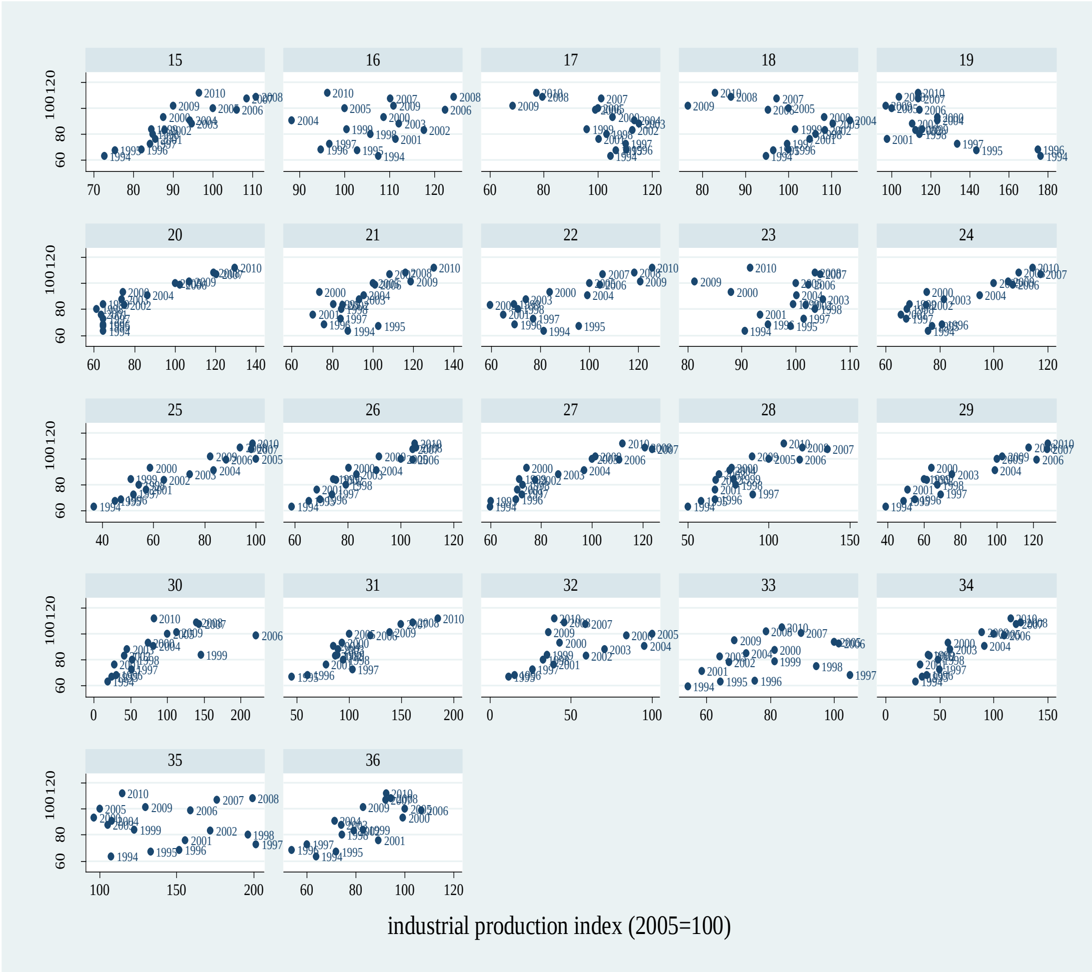


Source: TURKSTAT and BIS.

Figure 5.4. *Real Exchange Rate, Real Exports and Real Imports*

growth while increasing current account deficit due to the rise in consumption and investment.

Before estimating the effect of exchange rate movements on sectoral production, it may be informative to consider the bivariate relationship between real exchange rate and sectoral production. Figure 5.5 plots the relationship between real exchange rate and industrial production index of 2-digit ISIC Rev. 3 manufacturing industry sub-sectors. According to the figure, for most of the sectors there is a positive relationship between real exchange rate and industrial production index which implies that real appreciations increase production. This is especially true for high and medium (medium-high and medium-low) technology sectors with ISIC Rev. 3 codes from 23 to 35. Among these sectors, there appears a strong positive relation between real exchange rate and production for Chemicals (24), Rubber and Plastic Products (25),



Source: TURKSTAT and BIS.

Figure 5.5: *Real Exchange Rate and Sectoral Production*

Non-Metallic Mineral Products (26), Basic Metal (27), Fabricated Metal Products (28), Machinery and Equipment (29), Office, Accounting and Computing Equipment (30) and Electrical Machinery (31), and Motor Vehicles (34). This positive relationship is also valid for Radio, TV and Communication (32) and Precision, Medicine and Optical Equipment (33) but they are not so strong. On the other hand, there do not appear a significant relationship between the real exchange rate and production of Coke and Refined Petroleum Products (23) and Other Transport Vehicles (35). As we showed in Chapter 4, most of these high and medium technology sectors have a high degree of intra-industry trade and vertical integration which leads to the increase in import dependency. The increase of production in these sectors in case of real appreciations is consistent with our previous arguments that the postulations of standard Mundell-Flemming model may not be valid under the conditions of high import dependency, high intra-industry trade and high foreign debt ratio. Looking at the low technology sectors which lies between ISIC Rev. 3 codes of 15-22 and 36, we see that the relation between real exchange rate and industrial production index is more mixed. Strong positive relationship for Food and Beverages (15) is remarkable. On the hand, for Textiles (17), Wearing apparels (18) and Leather and Footwear (19), it seems that real appreciations decrease production consistently with the standard theory, remembering that these sectors are among the main exporters of manufacturing industry which also have relatively low levels of imported input use. For other low technology sector such as Wood Products (20), Paper and Paper Products (21) and Printing and Publishing (22), there exist a positive relation between real exchange rate and production especially after 2001.

5.3. REAL EXCHANGE RATES AND INDUSTRIAL PRODUCTION: EMPIRICAL RESULTS

In line with previous arguments, we estimate the following specification for industrial production growth:

$$\Delta PROD_{it} = \mu_i + \beta_1 \Delta REER_t + \beta_2 \Delta Y_t + \beta_3 \Delta Y_t^* + \beta_4 EXP_{it-1} + \beta_4 IMP_{it-1} + \beta_4 DOLL_{it-1} + \alpha_1 (EXP_{it-1} \times \Delta REER_t) + \alpha_2 (IMP_{it-1} \times \Delta REER_t) + \alpha_3 (DOLL_{it-1} \times \Delta REER_t) + \varepsilon_{it} \quad (8)$$

where Δ is the difference operator, and i and t denote industry and time, respectively. PROD is the natural logarithm (ln) of industrial production, REER is the ln of real effective exchange rate (increase implies appreciation), Y is the ln of domestic real GDP included to proxy aggregate demand changes, Y* is the ln of world income that controls for the foreign demand. The equation contains also three seasonal dummies for the first three quarters to control for possible deterministic seasonality. Following

Campa and Goldberg (1997, 2001), we include sector-specific trade-related variables, EXP and IMP. EXP is the share of exports in total production of each sector as the measure of export orientation, while IMP is the share of imports in total supply (production plus imports) of each sector as the indicator of import dependency.[59] As in Galindo *et al.* (2007), we also include a liability dollarization variable, DOLL, as the indicator of balance sheet channel. DOLL is the ratio of foreign currency debt to total debt of each industry and μ_i is fixed industry-specific effects which captures the unobserved heterogeneous industry characteristics such as productivity differences.

This specification allows us to estimate the effect of real exchange rate changes on industrial production growth controlling for the effects of domestic and foreign demand changes, and the sector-specific factors such as export orientation, import dependence and liability dollarization. As mentioned in the previous parts, the response of sectors' production will not be independent from their features such as export share, import dependence, technology intensity and dollarization of their debt. In this sense, we attempt to assess the role of trade and balance sheet channels through which real exchange rate affects industrial production by interacting these sector-specific factors with real exchange rate.

Our panel data consists 22 sectors based on 2-digit ISIC classification over the period of 1994q1-2010q4. The names and the ISIC codes of the sectors are given in the appendix. The source of the dependent variable, industrial production index, is TURKSTAT. The main variable of interest, real effective exchange rate is from Bank of International Settlements (BIS) database. Domestic real GDP is taken form IMF IFS database. Real GDP of OECD countries is used as the indicator of foreign income

[59] Imported input coefficient, namely the ratio of imported input to total output, which is calculated using the Input-Output tables is generally used as the measure of import dependency in the literature (see Campa and Goldberg, 1995; Yükseler and Türkan, 2008). Yükseler and Türkan (2008) and Saygılı et al. (2010) calculated the imported input coefficients for 2-digit ISIC Turkish manufacturing industry for 1998 and 2002, using 1998 and 2002 Input-Output tables, respectively. Since Input-Output tables are not available after 2002, we cannot calculate the imported input coefficients of Turkish manufacturing industry sub-sectors in yearly basis after 2002. As mentioned in Chapter 4, based on the import to total supply ratio calculated from 2002 input-output table, share of imports in total supply is calculated for each 2-digit ISIC sector before and after 2002 by using the changes in their import volume and production indices. In this sense, the share of imports in total supply can be used as the measure of import dependency of industries.

and its source is OECD Statistics Database. Sectoral export to production and import to supply ratios are not reported by TURKSTAT or any other source. Therefore, we follow the method of Yükseler and Türkan (2008) for the calculations of these trade-related factors. Based on the export/production and import/production ratios of 2002 input-output table and using the changes in industrial production and export volume indices of manufacturing industry sub-sectors, export to production ratio is calculated for 1994q1-2010q4 period. Import to supply ratio is calculated similarly. These trade shares, EXP and IMP are lagged one period to avoid issues of simultaneity. Liability dollarization, namely ratio of foreign currency debt to total debt, is taken from Sectoral Balance Sheets of Central Bank of Turkey Periodic Data. This data is available after 1998 in year basis.[60] We composed the quarterly data for liability dollarization by linear interpolation. Lastly, all index variables are transformed as 2005=100.

Since industry-specific fixed effects are expected to be correlated with export share, import dependence and liability dollarization, we estimate the model by within estimator which removes the fixed-effects before estimation. Considering the potential endogeneity of regressors such as domestic real GDP and trade shares, we also employ the system GMM estimator by Arellano and Bover (1995) and Blundell and Bond (1998) which appropriately uses the lagged values of independent variables as instruments.

In Table 5.2, we report the fixed effects estimation results of Equation 8. Estimation of the model begins with the preliminary regression which includes only the control variables of real GDP growth and foreign income growth. Then, we sequentially add other sector-specific variables and their interactions with real exchange rate. The first point that emerges from the reported results in Table 5.2 is that the coefficient of real exchange rate is positive and statistically significant for all the specifications except column 5 .This suggests that real exchange rate depreciations have a negative effect on industrial production growth. The variables proxying domestic and foreign demand, real GDP growth and foreign GDP growth, are positive

[60] Therefore, in regression which include dollarization, the number of observations is less than the others.

Table 5.2: *Production Equation -Fixed Effects Estimation*
Dependent Variable: ΔIndustrial Production (PROD)

	(1)	(2)	(3)	(4)	(5)
Δreer	0.434***	0.416***	0.496***	0.277***	-0.993*
	(0.076)	(0.081)	(0.088)	(0.096)	(0.560)
ΔY	0.412***	0.239**	0.231**	0.272***	0.795***
	(0.108)	(0.095)	(0.095)	(0.096)	(0.140)
ΔY*	2.266**	3.330***	3.505***	3.468***	2.969***
	(0.882)	(0.791)	(0.794)	(0.798)	(0.801)
L.EXP		0.075***	0.076***	0.038	0.095***
		(0.020)	(0.020)	(0.027)	(0.029)
Δreer×L.EXP		-0.417	-1.466***	-0.969***	-0.514
		(0.268)	-0.54	(0.345)	(0.350)
Δreer×L.EXP×H_HMTECH			1.167**		
			(0.522)		
L.IMP				0.146**	0.062
				(0.072)	(0.095)
Δreer×L.IMP				1.120**	0.839*
				(0.448)	(0.480)
L.DOLL					0.012
					(0.058)
Δreer×L.DOLL					1.354*
					(0.780)
Observations	1,474	1,340	1,340	1,323	900
R-squared	0.173	0.189	0.192	0.198	0.297
Number of industries	22	20	20	20	20

Standard errors in parentheses.
* significant at 10%; ** significant at 5%, *** significant at 1%.

and significant in all specifications as expected. The impact of foreign demand appears to be considerably higher than domestic demand. This may be consistent with an interpretation than higher world income growth not only proxies higher external demand but also represents better global financial conditions which stimulates capital flows to emerging market economies.

In column 2, we add first the trade-related channel, namely export share of the in total production and its interaction with real exchange rate. Export share itself is significantly positive indicating that the production growth increases as the sector exports higher proportion of its production. The competitiveness term, namely the interaction of export share with real exchange rate, has a negative sign but it is not statistically significant. In column 3, we interact the competitiveness term with high and medium-high technology industry dummy, in order to investigate whether this competitiveness effect differs for high and medium-high technology industries. The coefficient of competitiveness term becomes significantly negative this time, suggesting that for sectors with higher export shares, depreciations increase production growth. However, for high and medium-high technology industries, this competitiveness effect is significantly positive. It implies that the positive effect of depreciation for high exporters diminishes if the industry is a high and medium-high technology industry. Since the negative coefficient of the competitiveness term (-1.466) dominates the positive coefficient of the high and medium-high technology industries' competitiveness term (1.167), we can say that production of high technology and high exporter sectors continue to be positively affected from depreciations whereas this positive effect is lower than that for low and medium-low technology sectors. This result is consistent considering the high import dependency of production and exports of high and medium-high technology industries. Since their cost of production increases in case of depreciations, the competitiveness gain provided by depreciations are expected to be lower for high technology industries. In column 4, we add the other trade channel, import share, and its interaction with real exchange rate. The coefficient of competitiveness term is again significantly negative. Both import share and its interaction are significantly positive which suggests that the increase in import share affects production growth positively, and for sectors with high import share, depreciations negatively affect production growth. Since import shares increase the cost of production, this result is again in line with our expectations. In the last column, we finally add liability dollarization variable in order to account for the balance sheet effect. The coefficient of dollarization itself is positive but insignificant. The balance sheet effect variable (the interaction between real exchange rate and dollarization) is positive as expected but it is significant only at 10% significance level. Despite being not very robust, it implies that in case of high degree of debt dollarization, production growth is negatively affected from depreciations.

In Table 5.3, we report the estimated coefficients of the production equation for high and medium-high and medium-low and low technology industries separately.[61] The coefficient of real exchange rate is significantly positive in almost specifications (column 1 through 8) whereas it is higher for high and medium-high technology industries. It implies that, due to the factors such as higher dependence on imported input use, higher degree of intra-industry trade and vertical specialization, production of high and medium-high technology sectors benefit more from appreciations relative to low and medium-low technology sectors. The positive effect of foreign income growth is also higher for high and medium-high technology industries, which is again consistent with their high dependence on foreign demand through intra-industry trade and vertical integration processes. The coefficient of export share's interaction with real exchange rate is significantly negative for high and medium-high technology industries (column 2) whereas it is negative but insignificant for low and medium-low technology industries (column 6). The insignificance of this coefficient can be explained with relatively lower export shares of most of the low and medium-low technology sectors.[62] The interaction of import share with real exchange rate is negative for high and medium-high technology sectors but it is only significant at 10% significance level (column 3). Majority of high and medium-high technology sectors are high exporters whose production and exports are highly dependent on

[61] See Table D3 and D4 in Appendix D for the technology classification of industries.

[62] Among low-medium and low technology sectors, only export shares of textiles and wearing apparels are higher than or nearly equal to the export shares of high-medium high technology sectors.

imports through high imported input use and vertical specialization. Therefore, their production and exports can positively respond to depreciations as their import share increases. Regarding the balance sheet effect, liability dollarization and its interaction with real exchange rate is positive but insignificant for both groups. Thus, we cannot claim the existence of a negative balance sheet effect in case of depreciations. This can be due to the fact that most of the sectors with high liability dollarization ratios are appeared to be hedged their foreign currency debt with their high export revenues especially after 2001 (see Figure 4.12).

In Table 5.4, we re-estimate Equation 8 using the two-step system GMM estimator with Windmeijer finite-sample correction method using asymptotically robust standard errors.[63] Using the system GMM estimator, we aim to control for possible parameter endogeneity and simultaneity bias. The results from system-GMM estimation support our earlier findings.[64] Real exchange rate continues to be significantly positive suggesting that production growth is positively affected from appreciations. Real GDP and foreign income are again significantly positive as expected. Export share affects production growth positively in all specifications. The interaction of export share with real exchange rate is significantly negative confirming the previous result that for high exporters, production growth increases following depreciations. As regards the import dependence channel, its coefficient is positive and statistically significant in column 4, suggesting again that as import dependence of sectors increase, production is negatively affected from depreciation.

[63] See Bond (2002) and Roodman (2005) for details of system GMM estimation.

[64] We cannot estimate the model for high-medium high technology and low-medium and low technology industries seperately using system-GMM estimator since some of the variables are dropped due to insufficient number of observations.

Table 5.3: *Production Equation-Fixed Effects Estimation According to Technology Intensity*
Dependent variable: ΔIndustrial Production (PROD)

	HIGH-MEDIUM HIGH TECHNOLOGY				LOW-MEDIUM LOW TECHNOLOGY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δreer	0.721***	0.843***	1.389***	0.054	0.270***	0.308***	0.297***	-0.759
	(0.162)	(0.181)	(0.354)	(2.075)	(0.069)	(0.094)	(0.108)	(0.555)
ΔY	0.912***	0.513**	0.511**	1.176***	0.127	0.107	0.158	0.643***
	(0.231)	(0.205)	(0.204)	(0.296)	(0.099)	(0.099)	(0.101)	(0.150)
ΔY*	1.871	4.584***	5.060***	3.900**	2.492***	3.157***	3.248***	2.414***
	(1.883)	(1.702)	(1.717)	(1.643)	(0.806)	(0.853)	(0.858)	(0.890)
L.EXP		0.073***	0.048	0.109***		0.111**	0.021	0.031
		(0.025)	(0.036)	(0.039)		(0.048)	(0.060)	(0.064)
Δreer×L.EXP		-1.018***	-0.428	-0.259		-0.466	-0.619	0.227
		(0.386)	(0.506)	(0.612)		(0.523)	(0.594)	(0.610)
L.IMP			0.109	-0.020			0.234**	0.189
			(0.112)	(0.152)			(0.098)	(0.123)
Δreer×L.IMP			-1.898*	-0.648			0.117	0.700
			(1.052)	(1.411)			(0.723)	(0.715)
L.DOLL				0.090				0.000
				(0.162)				(0.062)
Δreer×L.DOLL				0.580				0.962
				(2.430)				(0.783)
Observations	536	402	402	270	938	938	921	630
R-squared	0.230	0.255	0.263	0.333	0.220	0.225	0.238	0.355
No. of industries	8	6	6	6	14	14	14	14

Standard errors in parentheses.*significant at 10%; ** significant at 5%, *** significant at 1%.

Table 5.4: *System-GMM estimation*
Dependent Variable: ΔIndustrial Production

	(1)	(2)	(3)	(4)
Δreer	0.430***	0.411***	0.760***	-0.548
	-0.09	-0.128	-0.212	-0.517
ΔY	0.552**	0.435*	0.261	0.544***
	-0.251	-0.222	-0.159	-0.144
ΔY*	2.146**	3.758***	4.396***	3.633***
	-0.851	-1.253	-0.999	-0.741
L.EXP		0.121***	0.035**	0.110***
		-0.037	-0.016	-0.021
Δreer×L.EXP		-0.595**	-1.605***	-0.572***
		-0.284	-0.607	-0.188
L.IMP			0.395***	-0.098
			-0.108	-0.085
Δreer×L.IMP			-0.727	1.445***
			-1.274	-0.362
L.DOLL				-0.065
				-0.113
Δreer×L.DOLL				0.719
				-0.735
Observations	1,474	1,340	1,323	900
Number of industries	22	20	20	20
Hansen test (p-value)	0.123	0.511	0.999	0.716
AR (2) (p-value)	0.435	0.458	0.515	0.984
AR (1) (p-value)	0.031	0.001	0.001	0.004
No. of instruments	21	25	36	27

Robust standard errors in parentheses. *significant at 10%; ** significant at 5%, *** significant at 1%.

Our results from the estimation of industrial production equation mainly reveal that production growth of industries is negatively affected from real depreciations whereas this negative effect is larger for high and medium-high technology sectors. Additionally, this negative effect declines as the export share of the sector increases and it rises as its import dependency increases. Though our estimates provide some evidence that the losses from real depreciations also increase with the degree of liability dollarization of the industry, it is not robust. Since the sectors with high ratios of debt dollarization are also the ones with the largest export share and the remaining are mostly reduced their foreign debt ratio after 2001, we cannot find sufficient evidence of negative balance sheet effects for Turkish manufacturing industry. Instead, trade-related channels of export orientation and import dependency are much more relevant for the effect of real exchange rate change on production growth. While imported-input use of sectors increase the negative effect of depreciations, export orientation works in opposite direction and decrease the damage of depreciations through its competitiveness effect. The overall effect of real exchange rate depreciations will depend on the relative magnitudes of this two trade channels. For the sectors with high export shares and low import dependency, competitiveness effects will dominantly work and they will most likely positively affected from depreciations. As among the main exporter sectors of Turkish manufacturing industry which use mostly domestic inputs, Textiles and Wearing Apparel are the strongest candidates for this category. However, the effect of import dependency seem to dominate the competitiveness effect for the production of high and medium-high sectors such as Basic Metal, Electrical Machinery, Radio, TV, and Communication Equipments, Medical, Precision and Optical Equipment, Motor Vehicles and Other Transport Equipment which have high export orientation and with high import dependency ratios.

5.4. REAL EXCHANGE RATES AND TRADE DYNAMICS

Since the production of industries is highly related with their export and import performances, estimating the real exchange rate sensitivity of manufacturing industry exports and imports will be informative for our analysis. Therefore, we also estimate standard export and import equations for the panel data of 2-digit ISIC Turkish manufacturing industry sectors over the 1994q1-2010q4 period. Estimated export and import equations are as follows:

$$\Delta X_{it} = \alpha_i + \gamma_1 \Delta REER_t + \gamma_2 \Delta Y_t + \gamma_3 \Delta Y_t^* + \gamma_4 \Delta M_{it} + u_{it} \tag{9}$$

$$\Delta M_{it} = \eta_i + \delta_1 \Delta REER_t + \delta_2 \Delta Y_t + \delta_3 \Delta Y_t^* + \vartheta_{it} \tag{10}$$

where X and M denote the logarithm of real exports and imports, respectively. As it is standard in trade models, domestic and foreign income are included as explanatory variables. In order to capture the effect of import dependency on exports, we also include real imports in export equation. Both equations also contain seasonal dummies. The data of real exports and imports are from TURKSTAT.

Table 5.5 reports the fixed effects estimation results of export and import equation separately for whole sample, high and medium-high technology and low-medium-low technology industries. The coefficient of real exchange rate is significantly negative for whole sample and low and medium-low technology sectors while it is positive and insignificant for high and medium-high technology sectors. This result implies that real depreciations increase exports of low and medium-low technology industries, whereas exports of high and medium-high technology industries are insensitive to the changes in real exchange rate. As we know from our previous analysis, high and medium-high technology sectors such as Machinery and Equipment, Office, Accounting and Computing Machinery, Electrical Machinery, Radio, TV and Communication Equipment, Motor Vehicles, and Transport Equipment

Table 5.5: *Export and Import Equation-Fixed Effects Estimation*

	All	**High-Medium High Tech.**	**Low-Medium Low Tech.**
Export Equation			
Δreer	-0.181*	0.017	-0.244**
	(0.104)	(0.194)	(0.119)
ΔY*	3.347***	4.183*	3.138**
	(1.185)	(2.218)	(1.362)
ΔM	0.012	0.113**	-0.088**
	(0.029)	(0.050)	(0.036)
Observations	1,323	402	921
R-squared	0.073	0.193	0.064
Number of industries	20	6	14
Import Equation			
Δreer	0.471***	0.571***	0.410***
	(0.104)	(0.179)	(0.124)
ΔY	1.320***	1.474***	1.243***
	(0.236)	(0.405)	(0.281)
Observations	1,457	536	921
R-squared	0.183	0.292	0.156
Number of industries	22	8	14

Standard errors in parentheses.*significant at 10%; ** significant at 5%, *** significant at 1%.

are exporter sectors with high import dependency and high degree of intra-industry trade. These sectors lie in the hedge zone in Figure 5.1. Insensitivity of exports of these sectors against real exchange rate depreciations is consistent with our previous arguments since export orientation and imported-input use work in opposite direction in case of depreciations. Positive and significant effect of imports in high and medium-high technology industries also confirms the high import dependency of these sectors. However, low and medium-low technology industry group contains high exporter sectors such as Textiles, Basic Metal, and Fabricated Metal Products and low exporter sectors such as Food and Beverages, Tobacco Products, Leather Products and Footwear, Wood and Wood Products, Paper and Paper Products, Printing and Publishing, Coke and Refined Petroleum Products, Rubber and Plastic Products, Non-Metallic Mineral Products which all have low levels of imported-input use. These sectors lie in heaven and domestic region of Figure 5.1. Therefore, consistently with their low import dependency and low intra-industry trade, their exports are positively affected from depreciations as standard Mundell-Flemming models suggests. Since imports in these sectors represent domestic import demand rather than imported-input use, imports negatively affect exports for low and medium-low technology industries. These results are in line with the arguments and the findings of Saygılı and Saygılı, (2011), Saygılı *et al.* (2010), Aydın *et al.* (2007), Jones and Kierzkowski (2001), Arndt and Huemer (2004), and Kharroubi (2011) who argue that real exchange rate elasticity of exports tend to decline in vertically integrated sectors with high imported input ratios. High coefficients of foreign income also consistent with the high dependency of exports to external demand especially for high and medium-high technology sectors. Lastly, parameter estimates of import equation are also consistent with our expectations. The coefficient of real exchange rate is significantly positive for all samples implying that imports increase with real appreciations.

CHAPTER 6

CONLUSION

This study mainly investigates the effect of real exchange rate movements on economic growth which has been one of the most discussed issues of the recent policy debate. As reviewed in Chapter 2, it is controversial in the literature whether depreciation of real exchange rate is expansionary or contractionary for the economy. One group of studies stresses that real depreciations are contractionary for developing countries due to the adverse balance sheet effects, whereas the other group suggests that they are expansionary attributing to the successful growth performances of East-Asian countries which are seen as benefiting from competitive exchange rates since a number of decades.

Given the mixed findings of the previous literature which mostly based on cross-country empirical evidence, in the first part of the study, we estimated the growth effects of real exchange rate changes using a wide panel data set of countries comprised of both developing and industrial economies. The results of long run equations which are estimated by fixed effects and Common Correlated Effects Pooled (CCEP) estimators showed that depreciation of the real exchange rate is contractionary for developing countries while real exchange rate changes have not any significant effect for developed countries in the long run. Additionally, this contractionary effect for developing economies increases with the degree of liability dollarization of the country consistently with balance sheet literature which stress the currency mismatch problem due to the fact that most of the developing countries borrow in foreign currencies.

Since the East Asian countries are seen as benefiting from competitive real exchange rates in order to sustain their high growth rates, we also investigated whether East Asian countries are different from other regions or not. Our findings showed that depreciations are expansionary for East Asian countries contrary to other developing countries. Regarding the reason behind the result that East Asian countries are different from other developing countries in other regions, we looked at a number of economic indicators of East-Asia, Latin America and Caribbean, MENA and Sub-Saharan Africa regions for the periods of 1980s, 1990s and 2000s. Differences in their performance of export, investment, domestic saving, and manufacturing value added shares of GDP and liability dollarization ratios explain why East-Asian countries have achieved to be separated from other regions in terms of high growth experiences. Combining high and productive investments with rising manufacturing value added, and increasing domestic savings with the help of increased profits from exports, they have succeeded to construct an interaction between productive investments, exports and savings. By doing so, they have utilized from moderate devaluations and wage restraints, in order to achieve the increase in their export share of GDP. However, these countries improved their international competitiveness mainly through productivity growth instead of devaluation of currency or wage cuts. In short, the experience of East-Asian countries revealed that real exchange rate depreciations can facilitate to achieve high and sustainable growth only when it is supported with other factors such as increased investment, improved manufacturing industry and productivity. Exchange rate policy cannot be substitute to these fundamentals to foster economic growth. Additionally, very low ratios of liability dollarization in East-Asian countries relative to the Latin America and MENA region is the other factor playing role on the expansionary effect of depreciations in East-Asia contrary to the other regions.

After estimating the long run regressions, we also analyzed the short run effect of real exchange rates on economic growth by employing panel error correction models augmented by cross-section averages in order to account for cross-section correlation as a method proposed by Chudik and Pesaran (2013). Parameter estimates showed that depreciation of real exchange rate is again contractionary for developing countries in the short run as well as in the long run while it is insignificant for industrial countries. Our results are also supported by the GMM procedure implying that they are robust against simultaneity and reverse causality considerations.

In the second part of the study, focusing on the production and trade of Turkish manufacturing industry, we aimed to investigate effect of real exchange rate movements on industrial output growth. Acting as the main engine of economic growth, production and export performance of manufacturing industry are highly important for economic growth and development. Exchange rate policies are amongst the main determinants of manufacturing exports and production. In this sense, the reaction of manufacturing industry and its sub-sectors to the changes in real exchange rate is highly crucial for the growth effects of real exchange. The responses of exports and production of manufacturing industry sub-sectors vary with factors such as export orientation, import dependency, technology intensity and financial structure. Since the structure of manufacturing production and trade play a key role on the way how exports and thereby production of manufacturing industry, we first analyzed the structure and transformation of production, exports and imports of Turkish manufacturing industry since 1990s.

The analysis of the composition of manufacturing output and exports revealed that manufacturing production and exports has developed mostly in favor of capital-intensive sectors such as Motor Vehicles, Electrical Machinery, Fabricated Metal Products, Basic Metals, and Machinery and Equipment rather than traditional labor-intensive sectors such as Textile, Wearing Apparels and Leather Products and Footwear after 2001. Since these favored sectors are also the main importer sectors of manufacturing industry which have the highest IIT levels and vertical specialization process, a significant increase is observed in the import dependency of Turkish manufacturing industry since 2001. Despite the decline in their share of manufacturing exports from 40 percent in 1990s to 20 percent after 2009, Textiles and Wearing Apparels are seen as among the main exporter sectors of Turkish manufacturing industry which make their production with lower imported input. Regarding the technology-intensity of production and trade, even though low technology sectors have constructed the major part of Turkish manufacturing exports until 2005, the share of medium-high and medium-low technology exports follow an upward trend. However, the share of high technology exports is very low which is below 5 percent. At the same time, the largest part of manufactured imports belongs to high technology sectors which consist more than 50 percent in the whole period. Medium-low technology imports also shows an increasing trend reaching to nearly 30 percent in 2013.

Updating forward and backward the ratios in 2002 input-output tables with the changes in export, import and production indices, we calculated export/production, export/supply, import/production and import/supply ratios of 2-digit ISIC manufacturing sectors which are used also in the regressions as export orientation and import dependency measures of the sectors . There seems to be a rapid increase in export to production ratios of investment good sectors such as Other Transport Equipment, Radio, Television and Communication Equipments and Motor Vehicles which seem to export more than half of their production after 2001. Among the consumer good sectors, Wearing Apparel and Textiles has had the largest export share of production with 43 percent and 33 percent in 2002-2010 period, respectively. However, it can be inferred from the limited increase in the export/supply ratio of investment good sectors relative to the increase in their export/production ratio that the rise in their exports is mainly due to the increase in their import originated supply. Contrary to the investment and intermediate good sectors, the gap between export/production and export/supply ratios is very limited in consumer good sectors implying the low import dependency of these sectors. This is especially valid for Textiles and Wearing Apparel sectors. We also observed that import/production and import/supply ratios increases as the technology intensity increases.

We also analyzed the liability dollarization of Turkish manufacturing sectors which is important for investigating the negative balance sheet channel of depreciations in sectoral basis. There exist a significant debt dollarization of manufacturing industry which has lied above 75 percent until 2004. With the decline after 2004, it has come back to around 68 percent on average which is still so high. Before 2002, majority of the intermediate goods sectors, namely Paper Products, Printing and Publishing (21-22), Coke and Refined Petroleum Products (23), Chemicals (24) and Non-metallic Mineral Products (26); and a few consumption good sectors such as Food and Beverages (15) and Furniture and Other Manufacturing (36) appeared in the hell zone which are heavily indebted in foreign currency although they have low levels of export earnings. However, these sectors mostly shifted to the demand zone or to the boundary of demand zone by decreasing their foreign debt ratio after 2002. Besides, Textiles (17), Wearing Apparels (18), Basic Metals and Metal

Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) are seem to be hedged against the risks of their high foreign debt with their high export revenues. But, when we also take their import dependency into account, medium-high and high technology sectors such as Basic Metals and Metal Products (27-28), Electrical Machinery, Radio, TV and Optical Instruments (31-33) and Motor Vehicles and Other Transport Equipment (34-35) which were in the hedge zone before appeared to be in the hell zone in both before and after 2001. Despite their high export ratios, their imports are also in high levels due to their high import dependency of exports and production. Contrary to these sectors, Textiles (17) and Wearing Apparels (18) continued to appear in the hedge zone in both periods after considering the export/import ratios. Additionally, Food and Beverages (15), Tobacco (16) and Furniture and Other Manufacturing (36) shifted from hedge zone to heaven after 2001.

After providing a detailed analysis of the structure and transformation of Turkish manufacturing industry production and trade during the last three decades, in Chapter 5, we first discussed the possible impacts of real exchange rate depreciations on sectors with different characteristics in the light of the various channels through which depreciations affect sectoral production, exports and imports. The impact of real exchange rate changes on the performance of firms crucially depends on the degree of export orientation and their intermediate import dependency. For a given level of liability dollarization, the positive impact of real exchange rate depreciation may be expected to be substantially higher for the firms with higher export orientation and lower import dependency. When we analyzed the export revenues together with the import dependency of 2-digit ISIC manufacturing industries for the average of 1996-2009 period, we mainly observed that high and medium-high technology sectors have both high export revenues and high import dependency ratios. Depending on the degree of intra-industry trade and the ratio of imported inputs, exports and production of these exporter sectors can become insensitive to the real exchange rate changes or can even be negatively affected from real exchange rate depreciations. However, low and medium-low technology sectors have mostly low export ratios with low import dependency facing only the demand channel of exchange rate depreciations or have high export ratios with low import dependency such as for Textiles, Wearing Apparels, Tobacco, and Rubber and Plastic Products. In this sense, these sectors can be expected to react consistently with the suggestions of standard Mundell-Flemming model. However, as showed in the analysis of liability dollarization, these sectors also have very high debt dollarization ratios. Therefore, the balance sheet effect can be expected to work in opposite direction generating contractionary reactions against depreciations for these sectors.

Then, in order to see whether our expectations regarding the possible effects of real depreciation on sectors with different features are supported by data, we proceeded with the estimation of the effect of real exchange rate changes on industrial output growth and analyzed how the impact varies with sector-specific factors including trade exposure (namely export orientation and imported-input use), technology intensity and liability dollarization. Our results from the estimation of industrial production equation mainly revealed that production growth of industries is negatively affected from real depreciations whereas this negative effect is larger for high and medium-high technology sectors. Additionally, this negative effect declines as the export share of the sector increases and it rises as its import dependency increases. Even though our estimates provided some evidence that the losses due to real depreciations also increase with the degree of liability dollarization of the industry, it is not robust. We cannot find sufficient evidence of negative balance sheet effects for Turkish manufacturing industry. Instead, trade-related channels of export orientation and import dependency are much more relevant for the effect of real exchange rate change on production growth. While imported-input use of sectors increase the negative effect of depreciations, export orientation works in opposite direction and decrease the damage of depreciations through its competitiveness effect. The overall effect of real exchange rate depreciations seem to depend on the relative magnitudes of this two trade channels. For the sectors with high export shares and low import dependency, competitiveness effects will dominantly work and they will most likely positively affected from depreciations. As among the main exporter sectors of Turkish manufacturing industry which use mostly domestic inputs, Textiles and Wearing Apparel are the strongest candidates for this category. However, the effect of import dependency seem to dominate the competitiveness effect for the production of high and medium-high sectors such as Basic Metal, Electrical Machinery, Radio, TV, and Communication Equipments, Medical, Precision and Optical Equipment, Motor Vehicles and Other Transport Equipment which have high export orientation and with high import dependency ratios.

Lastly, we examined the real exchange rate elasticity of manufacturing industry exports and imports since it will be complementary to our analysis of industrial production. Our results showed that real depreciations increase exports of low and medium-low technology industries, whereas exports of high and medium-high technology industries are insensitive to the changes in real exchange rate. Insensitivity of exports of these sectors against real exchange rate depreciations support our previous arguments since export orientation and imported-input use work in opposite direction in case of depreciations. Again, consistently with their low import dependency and low intra-industry trade, exports of low and medium-low sectors are positively affected from depreciations as standard Mundell-Flemming models suggests. Imports positively affect exports of high and medium-high technology industries while it negatively affect exports of low and medium-low technology industries. Since the impact of imports work through their imported-input use and vertical integration pattern for high and medium-high technology industries, this result is again consistent with our expectations. Regarding the import equation, our estimates showed that imports increase with real appreciations for all industry groups as expected.

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APPENDICES

APPENDIX A: DATA SOURCE AND COUNTRY SAMPLE OF CROSS-COUNTRY ANALYSIS

All data are collected in annual frequency.

Table A1: *Source of Variables*

Variable	Source
Real GDP per capita	World Bank, World Development Indicators
Real Effective Exchange Rate	World Bank, World Development Indicators; Bank of International Settlements
Government Consumption (% of GDP)	World Bank, World Development Indicators
Trade (% of GDP)	World Bank, World Development Indicators
Gross Fixed Investment (% of GDP)	World Bank, World Development Indicators
Liquid Liabilities (% of GDP)	“Financial Structure” dataset by Beck and Demirgüç-Kunt (2009) . Data available at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html.
Deposit Dollarization (Foreign Deposits/Total Deposits)	Updated version of the dataset by Levy-Yeyati (2006). Data available at http://www.utdt.edu/ver_contenido.php?id_contenido=4643&id_item_menu=8006.
Financial Integration (% of GDP)	"External Wealth of Nations Mark II" database by Lane and Milesi-Ferretti (2007). Data available at http://www.philiplane.org/EWN.html.

Table A2: *Sample of Countries*

Developing countries		Industrial Countries	East-Asian Countries
Algeria	Morocco	Australia	China
Argentina	Pakistan	Austria	Indonesia
Armenia	Paraguay	Belgium	Korea
Bahrain	Peru	Canada	Malaysia
Bolivia	Philippines	Denmark	Philippines
Brazil	Poland	Finland	Singapore
Bulgaria	Romania	France	Thailand
Burundi	Russian Federation	Germany	
Cameroon	Sierra Leone	Greece	
Central African Rep.	Singapore	Iceland	
Chile	Slovak Republic	Ireland	
China	Slovenia	Italy	
Colombia	South Africa	Japan	
Costa Rica	Thailand	Luxembourg	
Croatia	Togo	Netherlands	
Czech Republic	Tunisia	New Zealand	
Dominican Republic	Turkey	Norway	
Estonia	Uganda	Portugal	
Gabon	Uruguay	Spain	
Gambia	Venezuela	Sweden	
Georgia	Zambia	Switzerland	
Ghana		UK	
Guyana		US	
Hong Kong			
Hungary			
India			
Indonesia			
Israel			
Korea			
Latvia			
Lithuania			
Malawi			
Malaysia			
Malta			
Mexico			
Moldova			

APPENDIX B: SUMMARY STATISTICS OF THE VARIABLES IN CROSS-COUNTRY ANALYSIS

Table B1: *Whole Sample Summary Statistics*

Variable		Mean	Std. Dev.	Min	Max	Observations
ln(Y)	overall	10.322	2.317	-2.813	16.818	NxT = 3562
	between		2.226	5.603	15.578	N = 80
	within		0.505	1.906	12.274	T = 44.525
Δln (Y)	overall	0.024	0.168	-0.583	9.471	NxT = 3482
	between		0.025	-0.030	0.197	N = 80
	within		0.166	-0.544	9.297	T = 43.525
ln(REER)	overall	4.682	0.347	3.494	8.167	NxT= 2283
	between		0.207	4.269	5.248	N = 80
	within		0.279	3.319	7.602	T = 28.5375
ln(INV)	overall	3.039	0.326	0.973	4.104	NxT = 3243
	between		0.236	2.213	3.469	N = 80
	within		0.229	1.181	3.907	T = 40.5375
ln(GOV)	overall	2.647	0.370	0.950	3.999	NxT = 3491
	between		0.299	2.026	3.337	N = 80
	within		0.218	0.944	3.728	T = 43.6375
ln(TRADE)	overall	4.037	0.650	1.670	6.082	NxT = 3451
	between		0.608	2.787	6.006	N = 80
	within		0.303	2.102	5.210	T = 43.1375
ln(LIQ)	overall	3.730	0.724	1.505	9.639	NxT = 2821
	between		0.624	2.368	5.721	N= 80
	within		0.426	1.798	9.068	T = 35.7089
DOLL	overall	0.138	0.215	0.000	0.926	NxT= 1957
	between		0.207	0.000	0.772	N= 71
	within		0.079	-0.450	0.577	T= 27.5634
ln(FI)	overall	4.765	0.976	1.792	10.111	NxT = 2738
	between		0.875	3.434	9.539	N = 79
	within		0.580	2.645	7.457	T = 34.6582

Table B2: Developing Countries Sample Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ln(Y)	overall	10.227	2.579	-2.813	16.818	NxT = 2438
	between		2.448	5.603	15.578	N = 57
	within		0.560	1.811	12.179	T = 42.7719
Δln (Y)	overall	0.024	0.202	-0.583	9.471	NxT = 2381
	between		0.029	-0.030	0.197	N= 57
	within		0.200	-0.544	9.297	T = 41.7719
ln(REER)	overall	4.747	0.406	3.494	8.167	NxT = 1481
	between		0.226	4.269	5.248	N = 57
	within		0.338	3.384	7.666	T= 25.9825
ln(INV)	overall	3.005	0.372	0.973	4.104	NxT = 2195
	between		0.265	2.213	3.469	N= 57
	within		0.263	1.146	3.873	T= 38.5088
ln(GOV)	overall	2.546	0.372	0.950	3.999	NxT = 2367
	between		0.297	2.026	3.337	N = 57
	within		0.240	0.844	3.627	T= 41.5263
ln(TRADE)	overall	4.038	0.682	1.670	6.082	NxT= 2327
	between		0.635	2.787	6.006	N= 57
	within		0.333	2.103	5.211	T= 40.8246
ln(LIQ)	overall	3.486	0.725	1.505	9.639	NxT= 1790
	between		0.571	2.368	5.361	N= 57
	within		0.483	1.554	8.824	T= 31.9643
DOLL	overall	0.297	0.234	0.001	0.926	NxT = 885
	between		0.204	0.003	0.772	N= 48
	within		0.116	-0.291	0.736	T = 18.4375
ln(FI)	overall	4.598	0.838	1.792	8.137	NxT = 1883
	between		0.721	3.434	7.721	N= 57
	within		0.479	2.478	6.082	T = 33.0351

Table B3: Industrial Countries Sample Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ln(Y)	overall	10.528	1.587	7.841	15.294	NxT = 1124
	between		1.564	8.887	14.744	N = 23
	within		0.359	9.334	11.503	T = 48.8696
Δln (Y)	overall	0.024	0.027	-0.088	0.125	NxT= 1101
	between		0.006	0.013	0.035	N = 23
	within		0.027	-0.091	0.116	T = 47.8696
ln(REER)	overall	4.563	0.126	4.145	4.968	NxT = 802
	between		0.074	4.411	4.717	N = 23
	within		0.102	4.174	4.957	T = 34.8696
ln(INV)	overall	3.111	0.173	2.629	3.600	NxT = 1048
	between		0.112	2.896	3.370	N = 23
	within		0.132	2.555	3.489	T = 45.5652
ln(GOV)	overall	2.858	0.259	2.025	3.398	NxT = 1124
	between		0.205	2.304	3.203	N = 23
	within		0.162	2.317	3.283	T = 48.8696
ln(TRADE)	overall	4.035	0.579	2.231	5.789	NxT= 1124
	between		0.539	2.853	5.274	N= 23
	within		0.230	3.211	4.603	T = 48.8696
ln(LIQ)	overall	4.153	0.490	2.921	6.170	NxT= 1031
	between		0.457	3.489	5.721	N= 23
	within		0.304	3.029	5.248	T = 44.8261
DOLL	overall	0.006	0.031	0.000	0.352	NxT= 1072
	between		0.045	0.000	0.205	N = 23
	within		0.010	-0.071	0.154	T= 46.6087
ln(FI)	overall	5.131	1.145	3.178	10.111	NxT= 855
	between		1.098	4.355	9.539	N= 22
	within		0.755	3.699	7.823	T = 38.8636

APPENDIX C: LAG SELECTION FOR PANEL ARDL ESTIMATION

Table C: *AIC and SIC for Lag Order Selection in PARDL Models*

	All countries		***Developing countries***		***Developed countries***	
Lag	**AIC**	**SIC**	**AIC**	**SIC**	**AIC**	**SIC**
1	-3.694	-3.861	-3.579	-3.291	-5.583	-5.366
2	-4.048	-3.755	-3.654	-3.325	-5.760	-5.495
3	-4.077	-3.752	-3.679	-3.307	-5.793	-5.477

APPENDIX D: CODES AND DEFINITIONS OF SECTORAL CLASSIFICATIONS

Table D1: *2-Digit ISIC Rev. 3.1. Codes and Definitions*

ISIC Rev. 3.1 Code	Definition
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastics products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office, accounting and computing machinery
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; manufacturing n.e.c.

Source: United Nations Statistics.

Table D2: *2-Digit NACE Rev. 2. Codes and Definitions*

NACE Rev. 2 Codes	Definition
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and products of wood and cork;except furniture;manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing of reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products,except machinery and equipment
26	Manufacture of computer,electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles,trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing

Source: EUROSTAT.

Table D3: *OECD Technology Intensity Classification*

	ISIC Rev. 3 Code
High-technology industries	
Aircraft and spacecraft	353
Pharmaceuticals	2423
Office, accounting and computing machinery	30
Radio, TV and communciations equipment	32
Medical, precision and optical instruments	33
Medium-high-technology industries	
Electrical machinery and apparatus, n.e.c.	31
Motor vehicles, trailers and semi-trailers	34
Chemicals excluding pharmaceuticals	24 excl. 242
Railroad equipment and transport equipment, n.e.c.	352 + 359
Machinery and equipment, n.e.c.	29
Medium-low-technology industries	
Building and repairing of ships and boats	351
Rubber and plastics products	25
Coke, refined petroleum products and nuclear fuel	23
Other non-metallic mineral products	26
Basic metals and fabricated metal products	27-28
Low-technology industries	
Manufacturing, n.e.c.; Recycling	36-37
Wood, pulp, paper, paper products, printing and publishing	20-22
Food products, beverages and tobacco	15-16
Textiles, textile products, leather and footwear	17-19

Table D4: *2-digit ISIC Rev. 3. Technology Intensity Classification (with the names of sectors used in the text)*

	ISIC Rev. 3 Code
High and Medium-High technology	
Chemicals	*24*
Machinery and Equipment	*29*
Office, Acounting And Computing Machinery	*30*
Electrical Machinery	*31*
Radio, TV and Communication Equipment	*32*
Medical, Precision and Optical Equipment	*33*
Motor Vehicles	*34*
Transport Equipment	*35*
Medium-Low and Low technology Industries	
Food and Beverages	*15*
Tobacco Products	*16*
Textiles	*17*
Wearing Apparel	*18*
Leather products and footwear	*19*
Wood products	*20*
Paper and paper products	*21*
Printing and Publishing	*22*
Coke and Ref. Petroleum Products	*23*
Rubber and Plastic Products	*25*
Non-metallic Mineral Products	*26*
Basic Metal	*27*
Fabricated Metal Products	*28*
Furniture and Other	*36*

Note: It is based on OECD Technology Intensity Classification.

APPENDIX E

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

Degree	Institution	Year of Graduation
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WORK EXPERIENCE

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FOREIGN LANGUAGES

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CONFERENCE PRESENTATIONS

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"Real Exchange Rates and Economic Growth", 2nd PhD Student Conference in International Macroeconomics and Financial Econometrics, University of Paris Quest, France, 27 March 2013.

"Nonlinear Growth Effects of Financial Integration: A Panel Smooth Transition Approach", (with Prof. Dr. Nadir Öcal), Anadolu International Conference in Economics (Econanadolu), Eskişehir, 19-21 June 2013.

"Nonlinearities in the Relationship Between Financial Integration and Economic Growth", (with Prof. Dr. Nadir Öcal), EY International Congress in Economics, Ankara, 24-25 October 2013.

"Asymmetric Relationship Between Financial Integration and Economic Growth", (with Prof. Dr. Nadir Öcal), 7th CSDA International Conference on Computational and Financial Econometrics, University of London, UK, 14-16 December 2013.

RESEARCH PROJECTS

Research Assistant in BAP Project of METU entitled "Ekonomik Büyüme, Tasarruflar ve Reel Döviz Kuru", supervised by Prof. Dr. Erdal Özmen, BAP-04-03-2012-006, January 2012-December 2013.

Scholar in the Scientific and Technological Research Council of Turkey (TUBITAK) Research Project entitled "Real Exchange Rate, Productivity and International Trade Dynamics in Turkish Manufacturing Industry", supervised by Prof. Dr. Erdal Özmen, Project Number: 112K041, October 2012-April 2014.

APPENDIX F

TURKISH SUMMARY

Ekonomiyi birçok yoldan etkileyen kilit bir göreli fiyat olan reel döviz kurunun ekonomik büyüme üzerine etkisi, iktisat yazınının önemli tartışma konuları arasındadır. Standart Mundell-Fleming modeline göre, Marshall-Lerner koşulları[65] sağlandığı sürece, reel kurdaki değer kaybı ihracatı artırıp toplam talebin ithal mallardan yerli mallara kaymasını sağlayarak ticaret dengesini olumlu yönde etkileyecektir. Reel kur azalışlarının[66] ekonomiyi genişletici etkisi, ekonomideki kaynakları üretkenliği diğer ürünlerden daha yüksek olan dış ticaret ürünlerine aktaracağı ve dolayısıyla ihracat ve büyümeyi olumlu etkileyeceği önermesine dayanmaktadır. Dornbusch (1980) bu görüşün temel destekçilerindendir. Diğer yandan, Yeni Yapısalcı Okul'un öne sürdüğü 'daraltıcı devalüasyon' önermesine göre, reel kur değer kayıpları, özellikle gelişmekte olan ülke ekonomileri için önemli ölçüde daraltıcı olacaktır. Diaz- Alejandro (1963), Cooper (1971), Krugman and Taylor (1978), Bruno (1979), Hanson (1983), Edwards (1986) ve Van Winjbergen (1986), daraltıcı devalüasyon önermesine teorik olarak destek veren ilk çalışmalar arasındadır. Bu çalışmalara göre, reel kur azalışları, bazı talep-taraflı (enflasyonist etkisi, gelir dağılımı etkisi, reel geliri azaltıcı etkisi vb.) ve arz-taraflı (ithal girdi maliyetleri, nominal ücret artışları vb.) kanallar ile üretim ve büyümeyi olumsuz yönde etkileyebilecektir.[67] Bu teorik kanallardan arz-yanlı etkiler olarak üretim ve büyümeyi kesin olumsuz olarak etkilerken, talep-yanlı etkiler farklı makroekonomik koşullar altında olumlu ya da olumsuz etki yaratabilmektedir. Bu nedenle, reel döviz kuru azalışlarının ya da reel devalüasyonun ekonomik büyüme üzerindeki net etkisi teorik

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[65] İthalat ve ihracat reel kur esneklikleri mutlak değerleri toplamının birden büyük olması.

[66] Bu çalışmada, BIS (Bank of International Settlements) ve TCMB tanımlarıyla tutarlı olarak, reel kur azalışları ülke parasının reel olarak değer kaybetmesi anlamında kullanılmaktadır.

[67] Bu kanalların geniş bir analitik özeti Lizondo ve Montiel (1989)'da verilmiştir.

olarak belirsizdir. Konuyu ampirik olarak inceleyen ilk çalışmalar da yine farklı sonuçlara ulaşmıştır.[68]

Diğer yandan, 1990'larda görülen Doğu Asya ve Latin Amerika finansal krizlerinden sonra birçok gelişmekte olan ülkede görülen reel gelir daralması ve ekonomik istikrarsızlığın ardında yatan temel neden olarak reel kur değişmelerinin bilanço etkisi gösterilmiştir. Daraltıcı devalüasyon önermesinin finansal kanalını oluşturan 'Bilanço Etkisi' yaklaşımına göre, firmaların borçlarının önemli bir bölümünün yabancı para cinsinden olduğu ve toplam talebin ekonomideki ajanların öz valıkları ile kısıtlı olduğu durumda, reel kur değer kaybı karşısında, firmaların bilançoları önemli ölçüde zarar görmekte ve ekonomideki yatırımların, üretimin ve istihdamın azalmasına neden olmaktadır. Kendi ülke paraları cinsinden borçlanamayan gelişmekte olan ülkelerde görülen bu finansal dolarizasyon olgusu, 1990'larda birçok Doğu Asya ve Latin Amerika ülkesinde görülen ekonomik durgunluğun temel nedenleri arasında gösterilmiştir (Frankel, 2005; Aghion vd., 2001; Calvo *vd*., 2004; Krugman, 1999). Bazı çalışmalara göre, reel devalüasyonun daraltıcı bilanço etkisi, standart genişletici etkiye (ticaret kanalı) göre bazı ekonomik koşullar altında baskın hale gelmektedir. Cespedes vd. (2003), ülkelerin finansal piyasalarının az gelişmiş olduğu, toplam borcun öz valıklara oranının ve toplam borç içindeki yabancı para cinsinden borç oranının yüksek olduğu durumda bilanço etkisinin rekabetçi ticaret kanalı etkisine göre baskın hale gelip, reel kur azalışları karşısında ekonomik büyümenin olumsuz etkilendiğini göstermiştir. Bebczuk vd. (2006)'a göre, finansal dolarizasyon oranı belli bir seviyenin üzerine çıktığında reel kur azalışlarının daraltıcı etkisi genişletici etkisine göre daha etkin hale gelmektedir ki bu gelişmekte olan ülkelerin çoğu için geçerlidir.

Son dönemde ise, Çin ve Doğu Asya ülkelerinin zayıf ülke parası politikası ve beraberinde sergiledikleri yüksek büyüme performansı, sistematik olarak sürdürülen düşük değerli döviz kurunun genişlemeci etkisi tartışmalarını güçlendirmiştir. Neo-Merkantalist döviz kuru politikası olarak da tanımlanan

[68] Bkz. Cooper (1971), Edwards (1986), Morley (1992), Kamin ve Klau (1997).

(Levy-Yeyati ve Sturzenegger, 2007) bu yaklaşıma göre, ülke parasının reel olarak değer kaybetmesi ekonomik büyümenin ivmesini arttıracaktır (Hausmann, vd., 2005; Levy-Yeyati ve Sturzenegger, 2007; Rodrik, 2008; MacDonald ve Vieira 2010; Gluzmann, vd., 2012; Di Nino, vd., 2011). Rodrik (2008), düşük değerli döviz kurunun genişletici etkisinin, ticarete konu olan sektörlerdeki karlılığı artırıp bu sektörlerin büyümesini sağlama yoluyla gerçekleştiğini öne sürerken; Levy-Yeyati and Sturzenegger (2007), Gala (2008) ve Gluzman vd. (2012)'e göre temel mekanizma yatırım ve tasarruflardır. Ancak her iki kanal da henüz ampirik bulgularla desteklenebilmiş değildir.

Literaturde reel döviz kurunun ekonomik büyüme üzerindeki etkisini tek ülke ya da ülkelerarası verileri kullanarak inceleyen çok sayıda çalışma bulunmakla birlikte, bu çalışmalar reel kur azalışlarının genişletici mi yoksa daraltıcı mı olduğu konusunda genellikle farklı bulgular elde etmiştir. Bir grup çalışma, gelişmekte olan ülkelerin sahip olduğu yüksek finansal dolarizasyona bağlı olarak, reel kurdaki değer kayıplarının gelişmekte olan ülkeler için daraltıcı olduğu yönünde ampirik bulgular elde ederken (Cavallo vd., 2002; Cespedes, 2005; Bebczuk vd., 2006; Bleaney ve Vargas, 2009; Blecker ve Razmi, 2008); diğer grup çalışmalar ise düşük değerli reel döviz kurunun gelişmekte olan ve gelişmiş ülkelerde ekonomik büyümeyi olumlu yönde etkilediğini göstermişlerdir (Levy-Yeyati ve Sturzenegger, 2007; Rodrik, 2008; Gluzmann, vd., 2012; Gala, 2008). İkinci gruptaki çalışmaların çoğunun reel döviz kuru göstergesi olarak Rodrik (2008)'in Balassa-Samuelson etkisine karşı düzeltilmiş düşük değerleme endeksini kullanması ve ampirik yöntem olarak da genellikle benzer yöntemlerin kullanılmış olması, Woodford (2009)'un vurguladığı gibi, ulaşılan benzer sonuçlarda bu faktörlerin etkili olabileceği tartışmasını doğurmaktadır.

Bu çerçevede, bu çalışma ilk olarak, reel döviz kuru değişmelerinin ekonomik büyüme üzerindeki etkisini, önceki çalışmaların göz önünde bulundurmadığı bazı ekonometrik ve ampirik konuları ele alarak incelemeyi amaçlamaktadır. Bu bağlamda öncelikle, ekonomik büyüme literatürünün genellikle üzerinde durmadığı, değişkenlerin zaman serisi özellikleri göz önünde bulundurularak, reel döviz kuru ve kişi başına reel GSYİH arasındaki uzun dönem ilişki, gelişmiş ve gelişmekte olan ülkeler için ayrı ayrı olmak üzere, geniş bir panel veri ülke seti için tahmin edilmiştir. Bu amaçla, panel eşbütünleşme, GMM-sistem tahmini gibi geleneksel panel veri tahmin yöntemlerinin yanısıra, ortak küresel şokların yarattığı kesitlerarası bağımlılığı dikkate alan Pesaran (2006)'ın Ortak Bağıntılı Etkiler (Common Correlated Effects, CEE) yöntemi uygulanmıştır. Reel kur değişmelerinin büyüme üzerindeki etkisi kısa dönemde uzun döneme göre farklılaşabileceğinden, kısa dönem dinamikler, panel veri oto-regresif dağıtılmış gecikmeler modeli (ARDL) ve Ortak Bağıntılı Etkiler modelini dinamik modellere uyarlayan Chudik ve Pesaran (2013)'ın ARDL-CCEP modeli kullanılarak tahmin edilmiştir. Doğu Asya ülkelerinin son yıllarda sahip oldukları yüksek büyüme oranlarını sürdürebilmek için düşük değerli reel döviz kurundan yararlandıkları görüşü, iktisat yazının bu alandaki tartışma konuları arasında yer almaktadır. Çalışmada bu amaçla, reel döviz kuru-ekonomik büyüme ilişkisi, Doğu Asya ülkeleri için ayrıca tahmin edilmiştir. Çalışmanın bu ilk bölümünde son olarak, reel kurun ekonomik büyüme üzerindeki etkisinin ülkelerin borç dolarizasyonu ve finansal gelişmişlikleri ile nasıl değiştiği incelenmiştir.

Literatürde reel kur değişmelerinin ekonomik büyüme üzerindeki etkilerini inceleyen çok sayıda çalışma bulunmasına ragmen, bu çalışmalar genellikle toplulaştırılmış ülke panel verilerine dayanmakta ve sektörel dış ticaret, üretim vb. dinamikler göz ardı edilmektedir. Ekonominin lokomotifi konumunda olan imalat sanayi ve alt sektörlerinin reel döviz kurundaki hareketlere verdiği tepki, reel kurun ekonomik büyüme üzerindeki etkisinde önemli rol oynayacaktır. İmalat sanayi alt sektörlerinin ihracat ve üretimlerinin reel kur hareketleri karşısında gösterdiği değişimler, sektörlerin ihracat oranı, ithalat bağımlılığı, teknoloji yoğunluğu ve finansal durunlarına göre ciddi şekilde farklılık gösterecektir. Örneğin, reel kurdaki değer kayıplarının, uluslararası ticarete konu olmayan ve ithalat bağımlılığı yüksek olan sektörler için ticaret ve bilanço etkisi kanalları ile daraltıcı olması beklenebilir. Diğer taraftan ihracatçı sektörlerin reel kur karşısındaki tepkisi, ihracatın reel kur esnekliği ve sahip oldukları borç dolarizasyon oranları tarafından belirlenecektir.

Dış ticaretin reel kur esneklikleri, ithal girdi oranlarının yüksek olmasına bağlı olarak, yüksek endüstri-içi ticaret ve dikey bütünleşmeye sahip olan sektörlerde azalma eğilimindedir (Jones ve Kierzkowski, 2001; Arndt ve Huemer, 2004; Kharroubi, 2011). Sektörlerin teknoloji yoğunluğu ve ürün karmaşıklığı da yine üretim ve uluslarası ticaret dinamikleri üzerinde önemli rol oynayan faktörlerdendir. Bahsedilen bu özellikler bir bütün olarak imalat sanayi sektörlerinin ithalat, ihracat ve üretimlerinin reel kur hareketlerinden ne yönde etkineceğini belirlerken, alt sektörlerin toplam imalat sanayi içindeki göreli ağırlıkları da tüm ekonominin vereceği tepki üzerinde belirleyici olacaktır. Bu nedenle, imalat sanayi sektörlerinin bahsedilen özellikler açısından yapısının incelenmesi ve bu özelliklerin sektörel üretim ve dış ticareti üzerindeki etkisinin analiz edilmesi, politika-yapıcıların döviz kuru politikaları konusunda verecekleri kararlar açısından önemli bir bilgi kaynağı olacaktır.

Literatüre bakıldığında, reel kur hareketlerinin sanayi üretimi üzerindeki etkisini inceleyen çalışmaların sayısının oldukça sınırlı olduğu görülmektedir.[69] Branson ve Love (1986), reel kur değişmelerinin A.B.D. imalat sanayi istihdam ve üretimi üzerindeki ettkisini incelerken, Kandil ve Mirzaei (2002), beklenen ve beklenmeyen kur hareketlerinin A.B.D.'nin, Tarım, İnşaat, Finans, İmalat Sanayi, Madencilik, Perakende, Hizmetler, Taşımacılık ve Toptan Eşya sektörlerinin üretimleri üzerindeki etkisini tahmin etmiştir. Türkiye İmalat Sanayi üzerine yapılan çalışmalara bakıldığında, reel kur hareketlerinin Türkiye İmalat Sanayi ihracat ve ithalatı üzerindeki etkilerini inceleyen çalışmalar olmakla birlikte, reel kurun sanayi üretimi üzerindeki etkisini inceleyen herhangi bir çalışma henüz bilgimiz dahilinde değildir.[70] Konuyla ilgili olarak, Kesriyeli, Özmen ve Yiğit (2011), 26 finans-dışı sektörün yatırım, karlılık ve satışlarına odaklanarak, Türkiye İmalat Sanayindeki bilanço etkisini incelemiştir. Yine Filiztekin (2004), 27 imalat

[69] Bu alandaki çalışmaların büyük çoğunluğu reel kurun sektörel istihdam üzerindeki etkisi üzerindeki etkisi üzerinde yoğunlaşmıştır. Bkz. Campa ve Goldberg (2001), Galindo vd. (2007), Alexandre vd. (2001).

[70] Bkz. Togan ve Berument (2007), Saygılı (2010), Saygılı ve Saygılı (2011), Aldan vd. (2012).

sanayi sektöründen oluşan bir panel veri seti kullanarak, reel kur değişmelerinin sektörel istihdam ve ücretler üzerindeki etkisini araştırmıştır.

Gerek reel kurun sektörel etkilerinin heterojen olmasının önemi, gerekse Türkiye imalat sanayi üretiminin reel kur esnekliği konusunda literatürde bulunan boşluk nedeniyle, çalışmanın ikinci kısmında reel döviz kuru hareketlerinin büyüme üzerindeki etkilerinin sektörel bazda incelenerek bu alandaki iktisat yazınına katkı yapılması amaçlamaktadır. Bu bağlamda öncelikle, 1990'lardan itibaren Türkiye imalat sanayi ithalat, ihracat ve üretim yapısı ve dönüşümü, endüstri-içi ticaret, ithalat bağımlılığı, teknoloji yoğunluğu, ürün karmaşıklığı, açıklanmış karşılaştırmalı üstünlükler, ihracat ve ithalat oranları ve borç dolarizasyonu gibi üretim ve ticaretin reel kur esnekliklerinde potansiyel rol oynayan özellikler yönünden incelenmiştir. Sonrasında, reel kur değişimlerinin sanayi üretimi üzerindeki etkisi ve bu etkinin ihracat-oranı, ithal girdi kullanım oranı, teknoloji yogunluğu ve borç dolarizasyonu gibi sektörlere özgü faktörlerden nasıl etkilendiği, 22 adet ISIC Rev.3 2-basamak ayrıntısında imalat sanayi sektöründen oluşan bir panel veri seti kullanılarak tahmin edilmiştir.

Çalışmanın ilk bölümünde reel döviz kurunun ekonomik büyüme üzerindeki etkileri ülkeler arası panel veri büyüme modeli kullanılarak tahmin edilmiştir. Bu amaçla, Barro (1991)'in panel veri versiyonu olan bir büyüme modeli kullanılmıştır. Kullanılan panel veri seti dengesiz olup 23 tanesi gelişmiş, 57 tanesi gelişmekte olan toplam 80 ülkeden oluşmaktadır. Kullanılan dönem ise 1960-2009 yıllarını kapsamaktadır. Literatürde reel döviz kuru-büyüme ilişkisini ülkelerarası verilere dayanarak inceleyen çok sayıda çalışma olmakla birlikte, bu çalışmaların çoğunluğunun kullanılan ekonometrik yöntem ve reel döviz kuru ölçüsü yönünden benzer özellikler taşıdığı görülmektedir. Bu çalışmaların sıkça başvurduğu yöntem, Rodrik (2008)'in Balassa-Samuelson etkisine karşı düzeltilmiş reel döviz kuru endeksi kullanılarak, oluşturulan panel veri büyüme modelini GMM yöntemi ile tahmin etmektir. Bu yöntem, regresyonun sol tarafındaki durağan ekonomik büyüme değişkeninin sağ taraftaki durağan olmayan makroekonomik değişkenler üzerine regresyonunu kurarak, büyüme modelindeki değişkenlerin durağanlık özelliklerini görmezden gelmektedir. Oysaki bu durum, Jones (1995) ve Easterly (2001)'in vurguladığı üzere yanlış belirleme hatasıdır. Bu nedenle, bu çalışmada öncelikle modelde kullanılan değişkenlerin durağanlık özellikleri dikkate alınmıştır. İlk olarak kurulan panel veri büyüme modelindeki değişkenlerin durağanlık özellikleri 1. Nesil ve 2. Nesil panel veri birim kök testleri ile test edilmiştir. Yeniden parametrize edilerek yazılan modelde bağımlı değişken kişi başına reel GSYİH iken, bağımsız değişken olarak ise reel kur göstergesi olarak reel efektif döviz kuru ve diğer kontrol değişkenler-başlangıç geliri (koşullu yakınsama terimi olarak), sabit yatırımlar, hükümet harcamaları, ticaret açıklığı ve finansal gelişmişlik kullanılmıştır. Yapılan panel birim kök testleri sonucunda, modeldeki değişkenlerin 1. dereceden bütünleşik olduğu bulunmuş, bunun üzerine model değişkenleri üzerinde panel eşbütünleşme testi uygulanarak modeldeki değişkenlerin eşbütünleşik olup olup olmadığı test edilmiştir. Pedroni (1999)'nin panel eşbütünleşme testinin, modeldeki değişkenler arasında eşbütünleşme olduğu sonucunu vermesi üzerine öncelikle reel döviz kurunun kişi başına reel GSYİH üzerindeki uzun dönem etkisi, panel veri sabit etkiler yöntemi kullanılarak tahmin edilmiştir. Kontrol değişkenlerden başlangıç gelirinin, yani koşullu yakınsama teriminin, bağımlı değişkenin bir dönem gecikmesi olması ve gecikmeli değişkenlerin statik eşbütünleşme regresyonlarında yer almaması nedeniyle bu değişken uzun dönem regresyonundan çıkarılmıştır. Daraltıcı devalüasyon hipotezinin temelde gelişmekte olan ülkeler için geçerli olduğu iddia edildiğinden model tüm ülkelerin yanısıra, gelişmiş ve gelişmekte olan ülkeler için ayrı ayrı tahmin edilmiştir. Sabit etkiler modeli tahmin sonuçlarına göre, tüm ülkeler ve gelişmekte olan ülkeler alt-örneklemi için reel döviz kuru azalışları (ülke parasının reel değer kaybı) kişi başına reel GSYİH'yı azaltmakta yani daraltıcıdır. Model sadece gelişmiş ülkeler için tahmin edildiğinde ise, reel döviz kuru istatistiksel olarak anlamsız bulunmuştur. Başka bir deyişle, gelişmiş ülkeler için reel kur uzun dönemde büyüme üzerinde etkili değildir.

Yatay-kesit bağımlılığı, reel kur-ekonomik büyüme ilişkisi üzerine yapılan önceki çalışmaların dikkate almadığı bir diğer konudur. Sabit etkiler modeli, yatay kesitlerin birbirinden bağımsız olduğunu varsaymaktadır. Ancak, global şoklar, ülkeler arasındaki finansal ve ticari bağlantılar ve mekansal dağılma etkileri gibi nedenlerden dolayı ortaya çıkan gözlemlenmeyen ortak etkiler, yatay kesitler arasında bağımlılığa neden olmaktadır. Yatay kesitler arasındaki bu bağımlılık, ülkeler arası verilerde oldukça önemlidir. Yatay-kesit bağımlılığının ihmal edilmesi, gözlemlenmeyen ortak faktörlerin açıklayıcı değişkenlerle ilişkili olduğu durumda tutarsız parametre tahminlerine yol açabilmektedir (Phillips ve Sul, 2003; Coakley, Fuertes ve Smith, 2006; Pesaran, 2006). Kullanılan uzun dönem denklem bu amaçla, yatay-kesit bağımlılığı altında tutarlı parametre tahminleri veren Pesaran (2006) tarafından geliştirilen Ortak Bağıntılı Etkiler (Common Correlated Effects, CCE) yöntemi ile tekrar tahmin edilmiştir. Pesaran (2006), bağımlı ve bağımsız değişkenlerin yatay-kesit ortalamalarını, gözlemlenmeyen ortak faktörler yerine kullanmaktadır. Ortak Bağıntılı Etkiler modeli, sabit etkiler modeline bağımlı ve bağımsız değişkenlerin yatay-kesit ortalamaları eklenmesiyle tutarlı tahminler vermektedir. Ortak Bağıntılı Etkiler yönteminin parametre tahminleri, sabit etkiler modeline göre daha küçük katsayılar vermekle birlikte, sonuçlar sabit etkiler modelinin bulguları ile örtüşmektedir. Ortak Bağıntılı Etkiler tahmin sonuçlarına göre, ülke parasının reel değer kaybı gelişmekte olan ülkeler için uzun dönemde daraltıcı iken, gelişmiş ülkeler için istatistiksel olarak anlamlı bir etkiye sahip değildir.

Çalışmanın ilk bölümünde, reel döviz kuru ile kişi başına reel GSYİH arasındaki uzun dönem ilişkinin tahmin edilmesinin ardından, reel kurun büyüme üzerindeki kısa dönemdeki etkisi panel ARDL ve ARDL modellerinde kesitlerarası bağımlılığı dikkate alan Chudik ve Pesaran (2013) ‘ın geliştirdiği ARDL-CCEP modeli kullanılarak tahmin edilmiştir. ARDL modelinin tahmininde öncelikle optimal gecikme uzunlukları Akaike ve Schwartz bilgi kriterleri ile tespit edilmiştir. Sonrasında model bir hata düzeltme modeli olarak yeniden parametrize edilerek uzun dönemli ve kısa dönemli etkiler ayrıştırılmıştır. Önceki aşamada tahmin edilen uzun dönem denklemlerden elde edilen durağan kalıntılar, hata düzeltme modelinde hata düzeltme terimi olarak kullanılmıştır. ARDL-CCEP modeli, Pesaran (2006)’ın Ortak Bağıntılı Etkiler (CCE) modelini güçsüz dışsal değişkenlere sahip dinamik modeller için genişletmektedir. Chudik ve Pesaran (2013), CCE tahmincilerinin, model bağımlı ve bağımsız değişkenlerin yeterli sayıda kesit ortalamaları ile genişletildiğinde, dinamik modellerde de iyi performans sergilediğini göstermiştir. Bu nedenle standart panel ARDL modeli kesitlerarasındaki bağımlılığı dikkate almak amacıyla bağımlı ve bağımsız değişkenlerin kesit ortalamaları eklenerek tahmin edilmiştir. Panel ARDL ve ARDL-CCEP modelleri uzun dönem denklemlerde olduğu gibi tüm ülkeler, gelişmiş ülkeler ve gelişmekte olan ülkeler olmak üzere 3 ayrı örneklem için tahmin edilmiştir. Panel ARDL modeli tahmin sonuçları, reel kurdaki değer kayıplarının büyüme üzerindeki kısa dönemli etkisinin her 3 örneklemde de daraltıcı olduğunu gösterirken; ARDL-CCEP modeline göre ise, ülke parasındaki reel değer kaybı tüm ülkeler ve gelişmekte olan ülkeler örneklemlerinde büyümeyi kısa dönemde olumsuz olarak etkilerken, gelişmiş ülkelerde istatistiksel olarak anlamlı bir etkiye sahip değildir.

Kısa dönem dinamiklerin tahmininin ardından, modeldeki değişkenlerin potensiyel içsellik sorununu ve tersine nedenselliği kontrol etmek amacıyla, Arellano ve Bond (1991) ve Arellano ve Bover (1995) tarafından geliştirilen Genelleştirilmiş Momentler Metodu (GMM) yöntemi uygulanmıştır. GMM yönteminin uygulanması, elde edilen bulguların güçlülüğünün test edilmesinde sağlayacağı fayda yanında, reel döviz kuru-ekonomik büyüme literatüründe de en sık uygulanan yöntem olduğundan, elde edilen bulguları önceki çalışmalarla karşılaştırma imkanı sunması yönünden de yararlı olacaktır. GMM tahmincileri, ‘küçük T’ ve ‘büyük N’ panel veri modelleri için geliştirilmiş olduğundan, zaman serilerinin örtüşmeyen 5-yıllık ortalaması alınmıştır. Başlangıç geliri, her 5-yıllık dönemin ilk gözlemleri alınarak oluşturulmuş ve modele kontrol değişken olarak dahil edilmiştir. Elde edilen Sistem-GMM model bulguları, önceki sonuçlarla uyumludur. GMM tahmin sonuçlarına göre, reel kurdaki azalışlar gelişmekte olan ülkelerde daraltıcı iken, gelişmiş ülkelerde anlamlı bir etkiye sahip değildir.

Uluslararası ekonomi yazınının en çok tartışılan konularından biri bölgesel büyüme performansları arasındaki farklılıklardır. Doğu Asya ülkeleri yaklaşık 30 yıldır Latin Amerika ve Afrika ülkelerine göre çok daha yüksek büyüme performansı sergilemektedir. Bazı çalışmalar bunun nedeni olarak uygulanan güçsüz döviz kuru politikasını göstermişlerdir.[71] Çalışmada, gelişmekte olan ülkeler için elde edilen reel devalüasyonların daraltıcı olduğu sonucunun Doğu Asya ülkeleri için de geçerli olup olmadığının sınanması amacıyla, Doğu Asya ülkeleri kukla değişkeni reel döviz kuru değişkeni ile etkileştirilerek gelişmekte olan ülkeler için kurulan uzun dönem denkleme eklenmiştir. Elde edilen sonuca göre, diğer gelişmekte olan ülkelerin aksine, Doğu Asya ülkelerinde reel kurdaki değer kayıpları büyümeyi olumlu yönde etkilemektedir. Bu sonucun altında yatan nedeni, Doğu Asya ülkelerinin ekonomik büyümeye temel teşkil eden, yatırımlar, imalat sanayi ihracatının GSYİH içindeki payı, imalat sanayi katma değerinin GSYİH içindeki payı, tasarruf oranları gibi kritik göstergelerde 1980'lerden itibaren Latin Amerika, Orta Doğu ve Kuzey Afrika (MENA) ve Sahra-Altı Afrika bölgelerine göre gösterdiği ayrışma ortaya koymaktadır. Güçsüz döviz kuru politikası, ancak ve ancak büyümeye temel oluşturuan diğer faktörlerle birleştilirildiğinde ekonomik büyümeyi olumlu olarak etkileyecektir. Doğu Asya ülkeleri zaman zaman uyguladıkları güçsüz para politikasının yardımı ile yatırımlar-ihracat-tasarruflar üçlüsü arasında dinamik bir etkileşim kurmayı başarmış, bu da yüksek büyüme performansını beraberinde getirmiştir. Diğer taraftan, çok düşük borç dolarizasyonu oranları da Doğu Asya ülkelerini diğer bölgelerden ayıran bir diğer özelliktir. 1980'lerden itibaren, Doğu Asya ülkelerindeki mevduat dolarizasyonu oranı yüzde 10'ların altında seyrederken, Latin Amerika, MENA ve Afrika'da bu oran yüzde 30'lardadır. Diğer bölgelerin sahip olduğu yüksek dolarizasyon oranları, yaşanan olumsuz bilanço etkisi nedeniyle, bu ülkelerin ülke parasındaki reel değer kayıpları karşısındaki finansal kırılganlığını artırmakta, yatırım ve üretimi azaltarak büyümeyi olumsuz yönde etkilemektedir.

Çalışmanın bu ilk bölümünde son olarak borç dolarizasyonu ve finansal gelişmişliğin reel kur-büyüme ilişkisi üzerindeki etkisi incelenmiştir. 1990larda birçok Doğu Asya ve Latin Amerika ülkesinde yaşanan devalüasyonun ardından gelen ekonomik durgunluğun sebebi olarak birçok çalışma ülkelerin sahip olduğu yabancı para cinsinden borçları göstermiştir. Kur değişmelerinin 'bilanço etkisi' olarak adlandırılan bu finansal kanala göre, gelirleri temelde ülke parası cinsinden olan

[71] Bkz. Sachs (1985), Dollar (1992), Kim ve Ying (2007).

ekonomideki temel sektörlerin yabancı para cinsinden borçlanması (borç dolarizasyonu) ve temel günah (Eichengreen, vd., 2004, Özmen ve Arınsoy, 2005) vb. finansal kırılganlıklar, reel kur artışlarının olumsuz bilanço etkisine ve sonuçta ekonomik daralmaya yol açabilmektedir. Özellikle Latin Amerika ülkeleri firma düzeyi için yapılan çalışmalar, yüksek oranda borç dolarizasyonuna sahip olan ülkelerde reel kur artışlarının firmaların yatırım, satış ve karlılıklarını olumsuz etkilediğini göstermektedir (Galindo vd., 2007, Bleakley ve Cowan, 2008). Diğer yandan, finansal sektörün gelişmişliği, ekonomideki ajanların borçlanma koşullarını iyileştirerek reel kur değer kayıplarının toplam talep üzerindeki negatif etkinin azalmasına yardımcı olacaktır (Cespedes, Chang ve Velasco, 2003; Cespedes, 2005). Bu çerçevede çalışmada borç dolarizasyonu ve finansal gelişmişliğin reel kur-ekonomik büyüme ilişkisi üzerindeki etkisini incelemek amacıyla, borç dolarizasyonu ve finansal gelişmişlik değişkenleri reek döviz kuru ile etkileştirilmek suretiyle uzun dönem büyüme denklemine dahil edilmiştir. Bulgular beklentilerimizle uyumludur. Elde edilen sonuçlara göre, reel kur azalışlarının daraltıcı etkisi ülkelerin borç dolarizasyon oranı arttıkça artmaktadır. Diğer yandan, gelişmekte olan ülkelerin finansal gelişmişlikleri arttıkça, reel kurdaki değer kaybının büyüme üzerindeki negatif etkisi azalmaktadır.

Çalışmanın ikinci bölümünde reel kur değişmelerinin Türkiye imalat sanayi sektörel üretim ve dış ticareti üzerindeki etkisi incelenmiştir. İmalat sanayi üretim ve dış ticaret yapısı, üretim, ihracat ve ithalatın reel kur esnekliklerinde önemli rol oynamaktadır. Dolayısıyla bu bölümde öncelikle Türkiye imalat sanayiin endüstri-içi ticaret, ithalat bağımlılığı, teknoloji toğunluğu, ürün karmaşıklığı, açıklanmış karşılaştırmalı üstünlükler, ihracat ve ithalat oranları ve borç dolarizasyonu gibi üretim ve dış ticaretin reel kur hareketlerine verdiği tepkide önemli etkiye sahip olan özellikleri ve 1990'lardan itibaren sergilenen dönüşüm analiz edilmiştir.

Üretim ve ihracatının bileşenleri incelendiğinde, 2001 sonrasında imalat sanayi üretim ve ihracatının Tekstil, Giyim Eşyası ve Deri Ürünleri gibi geleneksel emek-yoğun sektörlerden Motorlu Taşıtlar, Elektrikli Makine, Ana Metal ve Metal Eşya ve Makine ve Ekipman gibi sermaye-yoğun sektörler lehine dönüştüğü gözlenmektedir.

Bu gelişen sektörlerin, yüksek endüstri-içi ticaret ve dikey uzmanlaşmaya da bağlı olarak imalat sanayiin temel ithalatçı sektörleri olması, 2001 sonrasında ithalat bağımlılığının ciddi oranda artmasına neden olmuştur. Tekstil ve Giyim Eşyası sektörlerinin imalat sanayi toplam ihracatı içindeki payı 1990'larda yüzde 40 civarında iken, 2009 sonrasında yüzde 20'lere düşüş göstermiştir. Ancak bu sektörler halen imalat sanayi ihracatının ithalat bağımlılığı düşük, temel ihracatçı sektörleri olmayı sürdürmektedir.

Uluslararası ticarette son dönemlerin en önemli gelişmelerinden biri ülkeler arasında üretim süreçlerinde ve dış ticaret yapılarında farklı uzmanlaşma alanlarının gelişmesi ve üretimin küreselleşmesidir. Dış ticaret açıklığı ve finansal küreselleşme sürecinde, bir çok sektörde firmalar bir ürünün tüm süreçlerini tek bir ülkede tamamlamak yerine, nihai ürün için farklı ülkelerde kendileri veya başkaları tarafından üretilen parçaları kullanabilmektedir. Bu süreçte, bir ülke ihraç edeceği ürünü üretmek için ithalat yapmakta ve ithalat-ihracat zinciri nihai ürün üretimine kadar birden fazla ülkede gerçekleşmektedir. Uluslararası ticarette dikey bütünleşme ya da küresel değer zincirleri olarak tanımlanan bu süreç, ihracatın ve üretimin ithalata bağımlılığını artırmakta ve dış ticaret bileşenlerinin reel döviz kuru esnekliklerini azaltmaktadır.

Uluslararası ticarette dikey bütünleşme ve küresel değer zincirleri sonucunda ithal edilen ara malları yeniden ihraç edilmekte ve bunun yarattığı çifte hesaplama nedeniyle ülkelerin ihracat ve ithalat verileri yurtiçi ve yurtdışı net katma değerleri yansıtmaktan uzaklaşmaktadır. OECD-WTO'nun 2013 yılında yayınladığı "katma değer dış ticareti" (Trade in Value added, TIVA) verilerine göre Türkiye'de ihracatta yurtiçi katma değerinin 2008 yılında % 74 olduğu ve bu oranın 1995 yılına göre (% 89) önemli ölçüde düştüğü gözlemlenmektedir. Bu düşüş, toplam ihracatın (2008 yılı) % 18'ini oluşturan Metal ve Metal Ürünleri'nde % 84'den % 61'e, % 14'ünü oluşturan Ulaştırma Araçları Teçhizatı'nda % 83'den % 69'a, % 13'ünü oluşturan Kimyasal ve Mineral'de % 82'den % 57'ye, % 5'ini oluşturan Makine ve Teçhizat'da % 87'den % 71'e, ve % 4'ünü oluşturan Elektrikli ve Optik Teçhizat'da % 84'den % 70'e biçiminde gerçekleşmiştir. Bu veriler, ihracattaki yurtiçi katma değer oranının 1995'deki % 89'luk düzeyinden 2008'deki % 74'lük düzeye düşmesinde, orta-yüksek ve orta teknoloji yoğunluğu ürünlerindeki yüksek ithal girdi payı artışının belirleyici olduğunu göstermektedir. İhracat ve üretimde ithal girdi payının artışı, Türkiye'nin küresel değer zincirlerine daha fazla eklemlendiğini göstermektedir. Küresel üretim/değer zincirlerine daha yüksek oranda eklemlenme, ilgili sektörerin toplam ihracat içindeki payını arttırırken ara malı ithalatının da artmasına neden olmuştur.

Ülkeler küresel değer/üretim zincirlerine, diğer ülkelerin ihracatına girdi sağlayarak (ileri eklemlenme, İE) veya üretim ve ihracatında kullanmak üzere ara malı ithal ederek (geri eklemlenme, GE) eklemlenebilirler (Backer ve Miroudot, 2013). İE (diğer ülkelerde ithal girdi olararak kullanılan sektör ihracatının ülke toplam ihracatına oranı) ve GE (sektöreki ithal girdilerin ülke toplam ihracatına oranı) toplamı (TE) ülkenin eklemlenme derecesini verecektir. İE/GE oranı ülkenin küresel değer/üretim zincirine eklemlenmesinin net kazancının bir ölçütü olarak kullanılabilir (Banga, 2013). TIVA verileri, tüm Türkiye imalat sanayi sektörlerinde, ileri eklemlenme oranının göreli olarak sabit kalırken, geri eklemlenmenin dolayısı ile ihracatta ithalat bağımlılığının çok yüksek oranda arttığını ve eklemlenenin net kazancının yüksek oranlarda düştüğünü (veya kaybın daha da yüksek oranda arttığını) göstermektedir. Bu olguların, ihracat ve ithalatın reel döviz kuru esnekliklerini azaltması beklenebilir.

Türkiye'de sektörel düzeyde ihracat-üretim ve ithalat-üretim oranları zaman serisi verileri bulunmamaktadır. Yükseler ve Türkan (2008), 1996 Girdi-Çıktı tablosundaki ihracat-üretim ve ithalat-üretim oranlarını temel alarak ve imalat sanayi alt sektörlerinin üretim, ihracat ve ithalat miktar endekslerini kullanarak, 1997-2007 dönemi için yıllık ihracat-üretim ve ithalat-üretim oranları verilerini oluşturmuştur. Yükseler ve Türkan (2008), bu dönem için, aynı yöntemi kullanarak, sektör ihracatı ve ithalatının sektör arzına (üretim ve ithalat toplamına) oranları biçiminde tanımladıkları ihracat-arz ve ithalat-arz oranlarını hesaplamıştır. Çalışmanın bu bölümünde, Yükseler ve Türkan (2008) tarafından kullanılan yöntemler uygulanılarak ve 2002 Girdi-Çıktı tablosu verileri kullanılarak 1994-2010 dönemi için, ihracat-üretim, ihracat-arz, ithalat üretim ve ithalat-arz oranları 2-basamak ayrıntısında ISIC sektörleri için hesaplanmıştır. Hesaplanan verilere göre, teknoloji-yoğun sektörler olan Diğer Taşıma Araçları, Radyo, TV ve İletişim Araçları ve Motorlu Kara Taşıtlar sektörlerinin ihracat-üretim oranları 2001 sonrasında hızla arttığı ve yüzde 50'lerin üzerine çıktığı gözlenmektedir. Teknoloji-yoğun sektörlerin ihracat-üretim oranlarındaki bu hızlı yükseliş yanında aynı dönemde ihracat-arz oranlarında görülen sınırlı artış, bu sektörlerin ihracatında yaşanan artışın büyük kısmının ithalat kaynaklı arza bağlı olduğu anlamına gelmektedir. Bunun yanında, düşük teknolojili sektörlerin ihracat-üretim ve ihracat-arz oranları arasındaki fark oldukça azdır. Bu durumun özellikle Tekstil ve Giyim Eşyası sektörlerinde geçerli olduğu görülmektedir. Diğer taraftan, sektörlerin ithalat bağımlılığın bir göstergesi olan ithalat-üretim ve ithalat-arz oranlarının da teknoloji-yoğun sektörlerde oldukça yüksek olduğu gözlenmektedir.

Çalışmanın bu bölümünde ayrıca reel kur değişmelerinin finansal kanalını oluşturan bilanço etkisini sektörel bazda inceleyebilmek amacıyla Türkiye imalat sanayi sektörlerindeki borç dolarizasyon oranları TCMB'nin yayınladığı Sektörel Bilançolar verisi kullanılarak incelenmiştir. Türkiye imalat sanayiinin borç dolarizasyon oranı (yabancı para cinsinden krediler/toplam krediler) oldukça yüksektir. Bu oranın 2004 yılına kadar yüzde 75'in üzerinde seyrettiği, 2004 sonrasında uygulanan dalgalı kur rejimi ve makroekonomik koşullardaki iyileşmeye bağlı olarak düşüş eğilimine girdiği ve 2007'de yüzde 68 dolaylarına düştüğü gözlenmektedir. 2008 yılında küresel krizin etkisiyle yeniden yükseliş gösterse de 2009'da yeniden yüzde 69'a gerilemiştir. Sektörlerin ülke parasındaki değer kaybı karşısında karşı karşıya olduğu riskin değerlendirilmesi açısından, alt sektörlerin borç dolarizasyon oranlarının ihracat oranları ile birlikte ele alınması daha doğru olacaktır. Bu amaçla çalışmada, 1998-2001 ve 2002-2009 dönemleri için sektörlerin ortalama borç dolarizasyonu oranı ve ihracat oranı (ihracat/toplam satış) grafikler yardımı ile incelenmiştir. Grafiklerde, reel kur değer kaybı karşısında sektörlerin sahip olduğu riske göre 'cehennem' (yüksek dolarizasyon-düşük ihracat), 'korunaklı' (yüksek dolarizasyon-yüksek ihracat), 'talep' (düşük dolarizasyon-düşük ihracat) ve 'cennet' (düşük dolarizasyon-düşük ihracat) olmak üzere 4 farklı bölge bulunmaktadır. 2002 öncesinde çoğunluğu düşük ve orta-düşük teknolojili sektörler grubunda yer alan, Kağıt Ürünleri, Kömür ve Rafine Edilmiş Petrol Ürünleri, Kimyasallar ve Metalik-Olmayan Mineral Ürünler gibi ara malı üreten sektörler ile Gıda ve İçecekler ve

Mobilya ve Diğer İmalat sektörleri gibi tüketim sektörlerinin, düşük ihracat-yüksek dolarizasyon yani cehennem bölgesinde yer aldığı görülmektedir. Ancak 2002 sonrasında bu sektörlerin çoğunluğunun yabancı para borç oranını düşürerek talep bölgesine geçiş yaptığı gözlenmektedir. Bunun yanında, Tekstil ve Giyim Eşyası sektörleri ile yüksek ve orta-yüksek teknolojili sektörler olan Ana Metal ve Metal Eşya, Elektrikli Makine, Radyo, TV ve Optik Araçlar, Motorlu Kara Taşıtları ve Diğer Taşıma Araçları sektörleri, sahip oldukları yüksek ihracat-yüksek dolarizasyon oranı ile 2002 öncesinde ve sonrasında reel kur değer kaybına karşı korunaklı bölgede yer almaktadır. Ancak, sektörlerin ithalat bağımlılıklarını da dikkate almak amacıyla, dolarizasyon oranları, ihracat/ithalat oranları ile birlikte ele alındığında, , bu yüksek ve orta-yüksek teknolojili sektörlerin 2002 öncesi ve sonrasında reel kur değer kaybına karşı riskli bölgede yani cehennemde yer aldığı görülmektedir. Bu sektörlerin aksine, Tekstil ve Giyim Eşyası sektörlerinin, ihracat/ithalat oranları dikkate alındığında da, korunaklı bölgede yer aldığı gözlenmektedir. Bunun yanında, Gıda ve İçecek, Tütün ve Mobilya ve Diğer İmalat sektörlerinin 2001 sonrasında korunaklı bölgeden cennet bölgesine geçtiği görülmektedir.

Çalışmada imalat sanayi üretim ve ticaretinin yapısı ve gösterdiği dönüşümün detaylı analizinin ardından sektörel üretim ve ticaretin reel kur esnekliklerinin incelendiği son bölümde öncelikle, reel kurdaki değer kaybının farklı kanallar yoluyla farklı özellikteki sektörler üzerindeki olası etkisi tartışılmıştır. Üretim ve ticaretin yapısı, özellikle de ihracat ve üretimdeki ithal girdi kullanımı, endüstri-içi ticaret ve dikey bütünleşme derecesi ve firmaların finansal yapısı, ihracat, ithalat ve üretimin reel kur esnekliklerinde önemli rol oynamaktadır. Reel kur değer kaybının sektörel etkileri temelde ticaret kanalı ve finansal kanal yoluyla gerçekleşmektedir. Ülke parasının reel olarak değer kaybetmesi karşısında ticaret kanalı, ihracatçı sektörleri pozitif olarak etkilerken, ithalatçı ve ticarete konu-olmayan sektörleri negatif olarak etkilemesi beklenir. Finansal kanal ise negatif bilanço etkisi nedeniyle, hem ihracatçı hem de ithalatçı sektörleri olumsuz olarak etkileyecektir. Belli bir borç dolarizayonu altında, reel kur değer kayıplarının pozitif etkisinin, yüksek ihracat ve düşük ithal-girdi oranına sahip sektörler için daha yüksek olması beklenmektedir. 1996-2009 dönemi için, 2-basamak ayrıntısındaki ISIC imalat sanayi sektörlerinin ihracat oranları ve ithalat bağımlılıkları incelendiğinde, yüksek ve orta-yüksek teknolojili sektörlerin hem ihracat oranlarının hem de ithal-girdi oranlarının oldukça yüksek olduğu gözlenmiştir. Bu sektörlerin üretim ve ihracatları, sahip oldukları endüstri-içi ticaret ve ithal-girdi oranlarına bağlı olarak, reel kur hareketlerine karşı duyarsız hale gelebilecek ya da negatif olarak etkilenebilecektir. Bunun yanında, düşük ve orta-düşük teknolojili sektörler çoğunlukla düşük ihracat ve ithal-girdi oranlarına sahip olduğundan, bu sektörler reel kur değişmelerinden sadece talep kanalıyla etkilenecektir. Düşük ve orta-düşük sektörlerden Tekstil, Giyim Eşyası, Tütün ve Kauçuk ve Plastik gibi sektörler ise yüksek ihracat oranlarının yanısıra düşük ithal girdi bağımlılığına sahip olmaları nedeniyle, reel kur harekeletlerinden büyük ölçüde Mundell-Fleming modelinin önermeleri ile tutarlı şekilde etkilenmeleri beklenir. Ancak, bu sektörlerin hemen hepsinin yüksek oranda yabancı para cinsinden borca sahip olmaları nedeniyle, bilançolarının reel kur azalışlarından olumsuz şekilde etkileneceğinden üretimlerinin negatif olarak etkilemesi söz konusu olabilecektir.

Bu çerçevede çalışmanın son bölümünde reel kur değişmelerinin sanayi üretimi büyümesi üzerineki etkisi ve bu etkinin sektörlere özgü ihracat oranı, ithalat bağımlılığı, teknoloji yoğunluğu ve borç dolarizasyonu gibi faktörlerden nasıl etkilendiği ampirik olarak incelenmiştir. Bu amaçla kullanılan panel veri seti, 2-basamak ayrıntısındaki ISIC Rev. 3 sınıflamasına göre 22 adet Türkiye imalat sanayi sektörü ve 1994q1-2010q4 döneminden oluşmaktadır. Tahmin edilen denkleme, bağımlı değişken olarak sanayi üretim endeksindeki büyüme, bağımsız değişkenler olarak ise ilgilenilen temel değişken olarak reel efektif kurdaki değişim, toplam yerli talepdeki değişimin göstergesi olarak reel GSYİH, dış talepteki değişmelerin göstergesi olan dünya gelirinin bir göstergesi olarak da OECD ülkelerinin reel GSYİH'sındaki değişim dahil edilmiştir. Bu değişkenlerin yanısıra Campa ve Goldberg (1997, 2001)'in yaklaşını izlenerek, ihracat oranı ve ithalat oranı sektörel değişkenleri modele dahil edilmiştir. İhracat oranı göstergesi olarak 2002 yılı Girdi çıktı tabloları ve ihracat, ithalat ve sanayi üretim endekslerindeki değişimleri kullanarak hesapladığımız ihracat-üretim oranları, ithalat bağımlılığı göstergesi olarak da yine aynı yolla hesaplanan ithalat-arz oranları kullanılmıştır. Ayrıca bu dış ticaretle ilişkili değişkenlere ek olarak, Galindo vd. (2007)'nin çalışmasında olduğu gibi, sektörel borç dolarizasyonu değişkeni olan yabancı para cinsinden borçların toplam borçlar içerisindeki payı da modele, imalat sanayiindeki bilanço etkisini incelemek amacıyla dahil edilmiştir. Sektörlere özgü sabit etkiler, ihracat oranı, ithalat bağımlılığı ve borç dolarizasyonu değişkenleri ile ilişkili olacağından, model sabit etkiler modeli ile tahmin edilmiştir. Bunun yanında, yerli reel GSYİH ve sektörel ihracat ve ithalat oranlarının potansiyel olarak içsel olma durumuna karşı model ayrıca Sistem-GMM yöntemi ile de tahmin edilmiştir.

Sanayi üretim denkleminin tahmininden elde edilen sonuçlar, reel kurdaki değer kaybının sanayi üretiminin büyümesini negatif yönde etkilediğini ve bu negatif etkinin yüksek ve orta-yüksek teknolojili sektörler için daha büyük olduğunu göstermektedir. Buna ek olarak elde edilen bulgulara göre, sektörün ihracat oranı arttıkça ülke parasının değer kaybının üretimdeki büyüme üzerindeki negatif etkisi azalırken, sektörün ithalata bağımlılığın artması ise bu negatif etkiyi arttırmaktadır. Sektörlerin borç dolarizasyonu oranlarının reel kur azalışlarının olumsuz etkisini arttırdığı yönünde ise yeterince güçlü bir kanıta ulaşılamamıştır. Diğer bir deyişle, çalışmada elde edilen bulgular Türkiye imalat sanayiinde reel kurun üretim üzerindeki etkisinin finansal kanaldan ziyade ticaret kanalları yoluyla oluştuğunu göstermektedir. Reel kurun sanayi üretimi üzerindeki nihai etkisi ihracata eğilim ve ithalat bağımlılığı kanallarının göreli büyüklüğüne bağlı olacaktır. İhracat oranı yüksek ve ithal-girdi oranı düşük olan Tekstil ve Giyim Eşyası sektörleri için rekabet etkisinin baskın olup bu sektörlerdeki üretim artışı reel kur azalışlarından olumlu olarak etkilenecektir. Bunun yanında, Ana Metal, Elektrikli Makine, Radto, TV ve İletişim Araçları, Tıbbi, Hassas ve Optik Aletler, Motorlu Kara Taşıtları ve Diğer Ulaşım Araçları gibi hem ihracat oranı hem de ithal-girdi oranı yüksek olan yüksek ve orta-yüksek teknolojili sektörler içinse ithalat bağımlılığının etkisi baskın olup reel kur değer kayıplarından olumsuz olarak etkilenmektedirler.

Çalışmada son olarak, sektörel ihracat ve ithalatın reel kur esneklikleri, standart ihracat ve ithalat denklemleri kullanılarak tahmin edilmiştir. İhracat denklemine, yerli gelir ve dünya geliri değişkenleri yanında ithalat değişkeni de eklenmiştir. Elde edilen sonuçlara göre, düşük ve orta-düşük teknolojili sektörlerin ihracatı reel kurdaki değer kayıplarından pozitif olarak etkilenirken, yüksek ve orta-yüksek teknolojili sektörlerin ihracatı ise reel kur değişmeleri karşısında duyarsızdır. Yüksek ve orta-yüksek teknolojili sektörlerin ihracatının reel kura karşı duyarsız olması, bu sektörler için ihracat eğilimi ve ithal-girdi kullanımı kanallarının yerli paradaki değer kaybı karşısında ters yönlü çalışmasının bir sonucudur. Diğer yandan, düşük ve orta-düşük teknolojili sektörlerin düşük ihracat oranı ve düşük endüstri-içi ticaret oranları ile tutarlı olarak, bu sektörlerde reel kur azalışlarının etkisi standart Mundell-fleming modelinin önermesi ile tutarlıdır. İhracat denklemindeki ithalat değişkeninin etkisi ise yüksek ve orta-yüksek teknolojili sektörler için, bu sektörlerin yüksek ithal-girdi oranları ile tutarlı olarak pozitiftir. Düşük ve orta-düşük teknolojili sektörlerin ihracatı ise ithalattan sadece yerli ithalat talebi kanalıyla etkilendiğinden, ithalat artışından negatif olarak etkilendiği bulunmuştur. Son olarak, ithalat denklemlerinin tahmin sonuçları da beklentilerle uyumludur. Elde edilen bulgulara göre, hem yüksek ve orta-yüksek teknolojili sektörler hem de düşük ve orta-düşük teknolojili sektörler için sektörel ithalat reel kurdaki değer kayıplarından olumsuz olarak etkilenmektedir.

APPENDIX G

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

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

YAZARIN

Soyadı : Yolcu Karadam
Adı : Duygu
Bölümü : İktisat

TEZİN ADI (İngilizce) : The Real Exchange Rate and Economic Growth

TEZİN TÜRÜ : Yüksek Lisans [ ] Doktora [x]

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. [ ]
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. [ ]
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. [x]

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: