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Full Length Research Paper

Does trade integration affect the asymmetric behavior of export prices? The case of manufacturing exports of Turkey

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This article attempts to analyze the effect of trade integration on the asymmetric behavior of export prices with respect to exchange rate changes using the experience of Turkey's trade integration and that of the European Union in 1996. In the course of this study, a fairly low exchange rate pass-through elasticity was found and the presence of asymmetry in the industries was considered. It was also found that neither the exchange rate pass-through elasticity nor the asymmetric response of export prices to appreciations and depreciations changed due to the trade integration.

Key words: Pass-through, trade integration, Turkey.

INTRODUCTION

The large fluctuations of exchange rates since the break-down of the Bretton-Woods system have led TO considerable discussions on the transmission of exchange rate changes to the pricing policies of international firms[1]. If exchange rate changes are not fully reflected in the prices of exporting firms, it is known as a pass-through relationship between exchange rates and prices. Considering the imperfect trade models, earlier studies on this topic have generally focused on large countries' experiences, such as those of the USA and Japan.

Many studies found that there has been a considerable decline in the exchange rate pass-through[2]. Gust et al. (2006) links this fall in the exchange rate pass-through to increased trade integration. They illustrated in a calibrated model that a significant portion of decline in the pass-through of the exchange rates into US import prices is due to increased trade integration of US with their trading partners. They predict that increased trade integration makes an industry (market) more competitive, thus exporters become more responsive to prices of their competitors which in turn lead to lower pass-through ratios.

One strand in this literature made an attempt to answer the question of whether or not foreign exporting firms behave the same way when their exchange rate is appreciated as compared to when it depreciates (the so-called "asymmetry" hypothesis). Some recent studies have offered reasons of why export price is not symmetric with the depreciation and appreciation of the home currency. It might emerge mainly due to strategies of exporters aiming at increasing market share in the foreign market, which is subject to constrains, such as trade restrictions, threat of damping practices or bottlenecks encountered when exporters have fixed marketing capacity (Knetter, 1994; Bugamelli and Tedeschi, 2008)[3].

The purpose of this study is in twofold. First, even though previous studies help to understand the asymmetric response of prices to exchange rate changes,

[1] The Bretton-Woods system was agreed upon in 1944 with the creation of the International Monetary Fund for the purposes of overseeing and monitoring the international monetary system. This was a pegged but adjustable exchange rates system. It collapsed in 1971 due mainly to the lack of an adequate adjustment mechanism.

[2] For example, studies by Otani, Shirutsuka and Shirota (2006) and Ihrig, Marazzi and Rothenberg (2006) find a decline in pass-through in Japan,and in G-7 economies, respectively.

[3] The other studies that investigate the asymmetry hypothesis include Marston (1990) and Yang (2007). Using Japanese export data, Marston (1990) provides weak evidence for the asymmetric exchange rate pass through finding that pricing to market elasticities are higher when the yen appreciates for 5 out of 17 products. Using US manufacturing data, Yang (2007) finds mixed evidence regarding the stability of exchange rate pass-through.

none has examined how asymmetries would change as a result of trade integration. This paper attempts to fill this gap to a certain extent by analyzing data on exports of Turkey to the European Union for 12 industrial groups at a two-digit level of industrial classification. Turkey's case is of interest because she joined the Customs Union and European Union (EU) in January 1996. With this Customs Union agreement, Turkey (EU countries) eliminated tariffs and levies on imports of manufactured products from European Union (Turkey) and Turkey adopted EU's common external tariff on imports from third parties. It is apparent that Turkey's experience provides an adequate setting to test specifically for changes in exchange rate pass-through elasticity and an asymmetric response of export prices due to trade integration.

The second goal of this paper is to explain whether the pass-through relationship has structurally changed due to trade integration. Although Gust et al. (2006) links the fall in exchange rate pass-through to an increased trade integration in a calibrated model, the formal empirical test for the validity of a fall in the exchange rate pass-through due to the trade integration is apparently lacking. This paper attempts to bridge this gap in this area.

This article is organized as follows: Subsequently, the existing literature on the exchange rate pass-through is briefly presented, after which the major events in the period considered in Turkey are summarized. The study goes further to describe an empirical model which shows determinants of an exporting firm's price behavior. This is followed by a description of the data set used in this study, after which the panel data estimations of export price adjustments were conducted in response to changes in Euro-Turkish Lira exchange rate, before finally concluding the study.

LITERATURE REVIEW

A large number of theoretical and empirical studies have examined the pricing policies of firms in response to changes in exchange rates since the publication of the seminal papers of Dornbusch (1987) and Krugman (1987). However, Menon and Goldberg (1995) and Knetter (1997) surveyed the related literature.

The first generation of studies generally followed the micro-based approach by investigating pricing behaviors of exporting firms in industrial countries, such as USA and Japan. For example, the paper by Marston (1990) examined the pricing to market behavior of Japanese manufacturing firms; Fisher (1989) investigated the exchange rate pass-through for the German and Japanese manufacturing firms; Feenstra (1989) examined the effect of tariffs and exchange rates on US prices of Japanese cars, trucks and motorcycles; and Khosla (1991) investigated the exchange rate pass-through relationship using Japanese data at a disaggregated level.

The second generation of studies have generally focused on the effects of exchange rate changes on export prices in small open economies. For example, the paper by Swift (1989) estimates the exchange rate pass-through for aggregate Australian exports and refutes the "small country" assumption. Athukorala (1991) investigates the pass-through relationship between exchange rates and prices of Korea's manufactured exports and he provides full support to the "small country" assumption. Lee (1995) shows that pricing to market is prevalent in the sixteen export industries of Korea.

The third generation of studies estimates the extent of pass-through elasticities and their determinants. For example, Kardasz and Stollery (2001) found that higher domestic cost of production, the elasticity of substitution between imports and domestic goods, and domestic advertising intensity led to higher exchange rate pass-through in thirty-one Canadian manufacturing industries. Campa and Goldberg (2005) provided evidence on the extent of the exchange rate pass-through into import prices of 23 OECD countries and found the minor role of macroeconomic variables in the evolution of pass-through elasticities. Barhoumi (2006) shows that most of the differences in the long run exchange rate pass-through into import prices in a sample of 24 developing countries are due to three macroeconomic determinants: the exchange rate regimes, trade barriers and inflation regimes.

More recent empirical studies investigated different aspects of the pass-through relationship. For example, Mallick and Marques (2010) studied the pricing behavior of Indian exporters using both annual and monthly data to reveal the role of data frequency in determining variation in the degree of short and long run exchange rate pass-through. Similar to the study of Bugamelli and Tedeschi (2008), they find that estimates of the exchange rate pass-through differ with the frequency of the data used.

Yoshida (2010) considers the extent of the bias in estimations of exchange rate pass-through due to the aggregation found within the product category. Using the most finely disaggregated data sets for five Japanese ports, he finds that export prices are set at different levels across local ports; and as such, export prices corresponded differently to exchange rate variations. Toraganli (2010) investigates the effect of exchange rates' fluctuations on export prices and profitability of firms in the Turkish manufacturing industry, and finds that pricing to market exists for the Turkish exporters and its level varies across time and sectors.

OVERVIEW OF THE TURKISH ECONOMY IN THE LAST TWO DECADES

Turkey's economy in the 1990s was remembered with high inflation and economic crises. In 1989, the capital account was fully liberalized and the full convertibility of Turkish Lira was recognized. Following the capital account liberalization, a massive inflow of short term

capital was experienced and the real interest rates were kept very high to secure these inflows. In addition, inflation rates were high and the government ran very large budget deficits. Open capital account, high interest and inflation rates, together with unstable political environment, led to the 1994 economic crisis. After the crisis, Turkey continued to follow the "managed float" exchange rate policy and signed a new stabilization program with the IMF in April, 1994. After the failure of this program in stabilizing the economy and reducing inflation, Turkey designed another stabilization program with the cooperation of the IMF in July, 1998. Even though the stabilization program helped restore the economy, very high interest rates on government debt instruments attracted foreign capital inflows and the Turkish Lira continued to be appreciated. However, capital inflows were reversed due to the economic crisis in Russia in August 1998, which in turn raised the real interest rates of the central bank to halt the capital outflows. Increase in interest rates negatively affected the banking sector through increasing their past-due loans. Due to lack of supervision and regulation of the banking sector, banks resorted to practicing risky businesses, in which case eight banks were taken over by the State Deposit Insurance Fund after they became insolvent.

In December 1999, Turkey signed a three year stand program with the IMF to stabilize the economy. The program was framed around a crawling peg. However, the exchange rate was still overvalued, and the interest rates could not be lowered and the economy was still vulnerable to capital outflows. Increased political tensions, coupled with rumors about financial problems of commercial banks, and massive capital outflows were observed in the month of November, 2000. Consequently, the banking system fell into a severe liquidity crunch; as such, interest rates soared, the official reserves were enormously depleted, the stock market experienced a massive decline and Turkish Lira substantially depreciated. Finally, the crawling peg system was abandoned and a floating exchange rate system was launched on 22 February, 2001.

Turkey signed the so-called Transition to the Strong Economy Program announced in May 2001 with the IMF. The new program was a continuation of the old program backed by a series of structural reforms. Due to the failure of this program, another program was launched in 2002 and completed successfully in 2005.

EMPIRICAL MODEL

Here, this study briefly outlines a framework which describes the degree of exchange rate pass-through similar to the previous literature (Hooper and Mann, 1989; Barhoumi, 2006; Campa and Goldberg, 2005). It is assumed that a typical Turkish firm sets the price of its exports to the EU countries in its own currency (PX_{TL}) at a markup (λ) over its marginal cost of production (C_{TL}), that is:

$$PX_{TL} = \lambda C_{TL} \quad (1)$$

In a frictionless world, the law of one price requires that:

$$PX_{TL} = P_{€} / E_{€/TL} \quad (2)$$

where $E_{€/TL}$ is the nominal exchange rate quoted in units of the importer's currency per unit of the exporter's currency and $P_{€}$ is the price charged in the EU countries in the importer's currency (Euro). Equation 1 shows that the price charged in each sector is the product of the marginal cost and a mark-up term which is assumed to depend on demand pressure at home and on competitive pressure in the importing country. Based on Equations 1 and 2, an ad hoc pass-through equation can be specified as follows (Khosla, 1991; Knetter, 1994):

$$\Delta \ln PX_{i,t} = \lambda_i + \beta \Delta \ln E_t + \delta \Delta \ln C_{i,t} + u_{it} \quad (3)$$

where $PX_{i,t}$ is a home denominated export price for industry i, E is an exchange rate quoted in units of the importer's currency per unit of the exporter's currency, $C_{i,t}$ is the sector-specific production prices which is a proxy for marginal cost of exporters, λ_i are sector specific fixed effects which capture mark up differences across sectors, and the β coefficients measure adjustments of export prices denominated in the exporter's currency in response to the exchange rate changes. Full pass-through is obtained when β is equal to zero meaning that changes in the exchange rates fully passed through the importer's prices. Thus, $1-\beta$ defines the degree of pass through into the import price.

The following specification estimates whether or not the pass-through relationship changes due to the customs union:

$$\Delta \ln PX_{i,t} = \lambda_i + \beta_i \Delta \ln E_t + \phi \Delta \ln d_{i,t} E_t + \delta \Delta \ln C_{i,t} + u_{it} \quad (4)$$

where d_{it} is a January 1996. The value and statistical significance of ϕ denotes whether or not the exchange rate pass-through has a structural change due to the customs union agreement.

In order to test the asymmetry hypothesis, we extended Knetter (1994)'s specification, in which appreciations of the exporter's currency ($\Delta E>0$), denoted by ΔlnE_1 in the logarithmic form, were separated from depreciations of the exporter's currency ($\Delta E<0$), denoted by ΔlnE_2. As such, Equation 4 is amended as follows:

$$\Delta \ln PX_{i,t} = \lambda_i + \beta_1 \Delta \ln E_{1,t} + \beta_2 \Delta \ln E_{2,t} + \delta \Delta \ln C_{i,t} + u_{it} \quad (5)$$

where $\Delta lnE_{1,t}$ is the change in the log of the exchange rate in the case of positive variation (zero otherwise), that is, when the exporting country's currency is appreciated; and $\Delta lnE_{2,t}$ is the change in the log of the exchange rate when it decreases (zero otherwise), that is, when the exporting country's currency depreciates. Statistically, significant differences between coefficients β_1 and β_2 should provide an evidence for the asymmetry hypothesis.

The last specification estimates the marginal effect of trade integration on the asymmetries found in the exchange rate pass through and is thus shown:

$$\Delta \ln PX_{i,t} = \lambda_i + \beta_1 \Delta \ln E_{1,t} + \beta_2 \Delta \ln E_{2,t} + \alpha_1 \Delta \ln d_{it} E_{1,t} + \alpha_2 \Delta \ln d_{it} E_{2,t} + \delta \Delta \ln C_{i,t} + u_{it} \quad (6)$$

From the equation, it is observed that statistically significant α_1 and α_2 coefficients provide an evidence ofa structural change in the asymmetries because of the trade integration.

Table 1. Summary statistics of variables for the sectors.

Variable	Exchange rate		Wholesale prices		Price of exports	
Sector	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Basic Metal Industry	0.517	1.352	3.630	1.586	3.691	1.519
Food Prod. and Bev.	0.517	1.352	3.525	1.522	3.706	1.372
Wearing Apparel	0.517	1.352	3.426	1.538	3.619	1.367
Chemicals	0.517	1.352	3.541	1.419	3.680	1.368
Coke and Ref. Petroleum	0.517	1.352	3.444	1.868	3.548	1.836
Machinery and Equipment	0.517	1.352	3.468	1.472	3.682	1.356
Non-metallic Products	0.517	1.352	3.590	1.512	3.684	1.341
Metal Products	0.517	1.352	3.659	1.411	3.748	1.386
Motor Vehicles, Trailers	0.517	1.352	3.468	1.449	3.573	1.400
Rubber and Plastic Prod.	0.517	1.352	3.591	1.427	3.676	1.349
Radio, TV, communication	0.517	1.352	3.590	1.205	3.560	1.112
Textile Products	0.517	1.352	3.546	1.398	3.640	1.323
Average	0.517	1.352	3.540	1.484	3.651	1.394

DATA AND RESULTS

The data utilized in this study were obtained from the online database of both TURKSTAT (Turkish Statistical Institute, www.tuik.gov.tr) and the Central Bank of the Republic of Turkey (www.tcmb.gov.tr). Our database comprises the monthly data that were collected over the period of 1994:01 to 2009:12 for a sample of the 12 two-digit manufacturing sectors in ISIC Rev.3[4]., based on the 1994 export price series and the 1994 based wholesale price indexes (which is a proxy for marginal cost of exporters) that were converted to the base of 2003=100. Since the Euro was introduced as an accounting currency on 1 January, 1999 and was replaced by the former European Currency Unit (ECU) at a ratio of 1:1, the ECU-Turkish Lira rates were used for the Euro-Turkish bilateral exchange rates for the dates before January, 1999.

Before doing estimations, it will be helpful to provide information about the dataset utilized in the analyses. Table 1 reports the average values and standard deviations of the variables in the natural logarithm form for each sector over the period of 1994:01 to 2009:12.

Table 1 demonstrates that with respect to the mean of the variables, there is no one on one relationship between marginal cost of exporters and export prices of each sector. As such, higher marginal costs do not necessarily lead to higher prices, although the correlation between means of wholesale prices and export prices is 0.56 which is not very high. In addition, the export prices with the smaller standard deviation are less dispersed than the wholesale prices with higher standard deviation. This means that sectors absorb part of their marginal cost changes and do not fully pass their marginal cost changes to their prices. The series are used in their first difference forms to eliminate possible spurious relationship between exchange rates and export prices and solve the stationary issues which are very likely to occur in the levels of the series. In addition, splitting positive and negative variations to test the asymmetry hypothesis is readily obtained by the first differenced exchange rates.

The regression equations are estimated by pooling data over all industries. Table 2 represents the results of the exporter's production cost on export price measured in units of the exporter's currency and is statistically significant with the expected positive sign. Pass-through of domestic costs into export prices is rather incomplete in Equations 3 and 4, but it is close to completion in Equations 5 and 6. The negative and statistically significant values of β in Equations 3 and 4 imply that, on average, in response to the 10% appreciation (depreciation) of Turkish Lira against the Euro, the Turkish exporter would reduce (increase) his markup by 8.0%, and assuming constant costs, the price paid in Euros would rise (fall) by only 2.0%. This very low pass-through ratio implies that the markup to the European Union is almost unresponsive to fluctuations in the value of Turkish Lira and it proves the "small countries' assumption" of Turkish firms as price takers in the European markets. The statistically insignificant coefficient □ in Equation 4 implies that the trade integration with European Union does not lead to structural change in the pass-through relationship.

The asymmetry hypothesis is tested using Equations

[4] The sectors included are: 1- Food products and beverages, 2- Textile products, 3- Wearing apparel, 4- Coke and refined petroleum, 5- Chemicals, 6- Rubber and plastic products, 7- Non-metallic products, 8- Basic metal industry, 9- Metal products, except machinery, 10- Machinery and equipment, n.e.c, 11- Radio, tv, communication eq. and app., 12- Motor vehicles, trailers and half trailers.

[5] The fixed effects estimator is consistent as long as the individual effects can be assumed to be correlated with the other right hand side variables. In case this assumption is violated, the random effects model, which assumes that individual effects and other variables are uncorrelated, is also estimated. Since the results of the random effects model were almost same with the results of the fixed effects model, it is not reported here. But, it is available upon the request from the author.

Table 2. Results of estimations using the fixed effects' model.

Coefficients	Equation 3	Equation 4	Equation 5	Equation 6
B	-0.79 (0.04)*	-0.82 (0.05)*		
Δ	0.28 (0.07)*	0.28 (0.07)*	0.89 (0.14)*	0.88 (0.15)*
ϕ		0.04 (0.05)		
β_1			0.02 (0.01)**	0.32 (0.25)
β_2			-0.27 (0.07)*	-0.24 (0.08)*
α_1				-0.30 (0.26)
α_2				-0.06 (0.11)
Number of observations: 2292				
Adj.R^2	0.53	0.53	0.32	0.32
DW	2.40	2.40	2.33	2.34
Wald			$P > \chi^2 = 0.04$	

Notes: Standard errors in parentheses are robust to heteroscedasticity. The *Wald* statistics tests the restriction of hypothesis H_0: $\beta_1 = \beta_2$. * indicates significance at 1% statistical level, ** identifies significance at 10% statistical level.

5 and 6, which allow two separate coefficients for the exchange rates. In the fourth column, an almost complete exchange rate pass-through into the import price was found after the appreciation of the Turkish Lira (98%), while an incomplete pass-through elasticity (73%) was found after depreciation. In addition, the Wald test rejects the restriction that the two slopes are equal. This finding suggests that asymmetries exist in the response of export prices to exchange rate changes in Turkey's exports to the European Union. In the last column, the coefficient of the pass-through elasticity for the appreciations was not statistically significant, while the coefficient for the depreciations was statistically significant, thereby denoting an incomplete exchange rate pass-through. Nevertheless, the estimated coefficients for the structural change variables in asymmetries due to the trade integration are not statistically significant, meaning that there has been no change in the asymmetries due to the trade integration.

Conclusions

In this study, an analysis was done on whether or not the exchange rate pass-through and asymmetric export price adjustments, with respect to currency fluctuations, changed due to trade integration. Using Turkey's experience, we found that the exchange rate pass-through into the import price was fairly low and the exchange rate pass-through behavior was not symmetric between appreciation and depreciation of home currency. We also found that neither exchange rate pass-through elasticity nor the asymmetric response of export prices to currency fluctuations changed due to the trade integration.

The conclusions confirm that Turkey is a small country in the EU market. While the share of European Union in Turkey's exports is more than 50%, the share of Turkish exports in the imports of the EU is about 3%. In addition, it implies that Turkish and European firms may belong to separate market segments, and therefore trade integration might cause insignificant change in competition among firms and might not have much effect on pricing behaviors of Turkish firms. Such information can be used for successful management of the international trade policy, especially to alleviate Turkey's persistent current account problem.

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