Central Bank Review ISSN 1303-0701 print / 1305-8800 online

http://www.tcmb.gov.tr/research/review/

Exchange Rate Pass-Through and Exposure in the Turkish Economy*

Nazlı Toraganlı

The City University of New York, Graduate Center
365 5th Avenue, New York, NY 10016, USA

ntoraganli@gc.cuny.edu

Abstract

This paper examines the impact of exchange rate variations on the export prices and the profitability of the firms, at sectoral and at firm level respectively, in the Turkish manufacturing industry for the period 1995–2007. The data set consists of export unit values, bilateral exchange rates, total revenues, cost of goods sold, value of domestic and foreign sales, and Turkey's export trade partner's GDP's and CPI's. The results show that there is a tendency for local currency price stabilization. The average estimate of exchange rate pass-through to export prices is around 0.6. There is a mixed evidence on the relationship between exchange rate variations and profitability. It is found an apparent variation in the magnitude and direction of exposure across firms. However, these results are not robust to the specification used.

JEL Classification: F3, L1.
Keywords: Exchange rate, Exposure, Pass-through, Industry.

* The author would like to thank to the Research and Monetary Policy Department of the Central Bank of the Republic of Turkey for supporting this research. Additionally the author is grateful to M. Eray Yucel for his guidance throughout the research process as well as for suggestions from an anonymous referee, Pinar Ozbay, Ufuk Demiroglu and the participants of the seminar series at the Research and Monetary Policy Department of the Central Bank of the Republic of Turkey.

1. Introduction

The variations in exchange rates have important implications for (1) export prices; and (2) profitability of firms. There is no empirical work involving Turkish Economy examining the relation between exchange rates and export prices. On the other hand, the effect of exchange rate movements on firm's profitability has been studied extensively in the literature. These studies are based on reduced form regression models which are often criticized by their ignorance of firm's strategic pricing behavior. Motivated by this, the purpose of this research paper is to analyze these two phenomena together using a model based on the duopoly model of exporting firm.

A large body of literature is devoted to study the exchange rate exposure, defined as the responsiveness of profits to exchange rate variations. It is argued that exchange rate movements affect a firm's profitability because firms' activities are sensitive to exchange rates. Exporting companies' revenues will increase as a result of local currency depreciation. On the other hand, depreciation will increase production costs of companies that rely on imported inputs.

Exchange rate pass-through (ERPT) is an important factor in the analysis of exchange rate exposure since profitability and pass-through are closely related. Firms tend to adjust their profit margins by reducing their prices to protect their competitiveness in the market. The degree of adjustment in the profit margins determines the level of pass-through of exchange rates to prices.

This paper is organized as follows. Following this introduction, the next section describes briefly the existing literature on the exchange rate pass-through and exposure. The third section describes the model and methodology. The fourth section gives information on the data sources. The fifth section presents the results. The sixth section concludes.

2. Review of the Literature

Pass-through and profitability have been analyzed broadly in the literature but there are few studies examining them simultaneously. Bodnar, Dumas and Marston (hereafter BDM, 2002) present the first theoretical model of exporting firm that incorporates these two phenomena. In BDM, pass-through and exposure are both functions of product substitutability. Increased substitutability implies a more elastic demand for the exported good, which results in smaller price changes to

achieve the profit-maximizing level of exports. This implies a declining pass-through and increased exposure as a result of declining profits. BDM also present an empirical analysis using Japanese exporting industries, however their empirical results are mixed.[1] A recent study by Bartnam et al. (2009) extends BDM model by adding domestic market into their analysis. They show that pass-through is an important factor reducing the level of exchange rate exposure.

Most of the studies on ERPT are empirical and do not take into account firm's pricing behavior.[2] These studies document that prices of goods change by a smaller proportion than the real exchange rates between the trading countries. This situation is referred as "incomplete pass-through" and has been explained by the mark-up variability of firms, meaning that firms respond to home currency appreciations by decreasing the domestic currency prices of their exports in order to limit increases in the foreign currency prices of their products. This destination specific mark-up adjustment driven by exchange rate movements is called "Pricing to Market (PTM)" by Krugman (1987). Subsequent research has showed that the PTM is closely related to the convexity of the demand schedule (perceived by the exporters), which varies across industries based on the degree of competition, product substitutability, and the relative domestic and foreign shares in the market (Feenstra, 1989; Knetter, 1989; Marston, 1990 and Yang, 1997).

For the case of Turkey, ERPT studies have been focused mostly on import and domestic prices. Turkcan (2005) estimates the ERPT elasticities of imported intermediate and final goods following Goldberg and Campa's (2002) methodology. His results suggest that the short and long-run ERPT to import prices for final and intermediate goods are complete at both aggregated and disaggregated level. Moreover, the estimated pass-through elasticities significantly vary across countries and industries. Finally, intermediate goods have relatively higher pass-through rates than final goods. ERPT to domestic prices in Turkey has been analyzed extensively because imported inputs constitute an important percentage of the production costs; therefore they have a direct impact on domestic prices.[3] Arbatli (2005) uses a VAR framework to investigate the ERPT to domestic prices.

[1] Their pass-through values range from 0.15 for film to 0.81 for construction machinery. However the empirical results for exposure in the five out of eight sectors are either insignificant or are not within the theoretical limits (>1).

[2] For a more detailed information on this literature, see Goldberg and Knetter (1997).

[3] ERPT to domestic prices is defined as the change in domestic price levels arising from one percent change in the exchange rates.

Her results document that pass-through is lower during the periods of economic contractions, depreciations and lower inflation. Kara et al. (2007) investigates the evolution of ERPT to domestic prices with a special focus on the role of the monetary policy and exchange rate regime. Their results indicate that ERPT to domestic prices is higher in the pre-float period both in tradable and non-traded sectors. Additionally, the structural break tests show that there has been several breaks coinciding with major monetary and exchange rate regimes. This finding underlines the importance of the regime changes in the ERPT calculations.

Exchange rate exposure has been measured using Adler and Dumas' (1984) methodology or modified Capital Asset Pricing Model (CAPM). Adler and Dumas (1984) calculate exposure by regressing firm returns on the change in the trade weighted exchange rate index. On the other hand, modified CAPM consists of regressing firm returns on the change in the exchange rate and the return on the market portfolio. According to these models, firms exhibit exchange rate exposure if the coefficient of the exchange rate is significant. Nonetheless, these models do not take into account firm's pricing behavior or industry characteristics such as product substitutability, degree of competitiveness and market share; therefore they are sometimes criticized due to their misrepresentation of the firm's economic behavior.

The exchange rate exposure of US multinationals has been extensively analyzed (Jorion, 1990, and Bodnar and Gentry, 1993). A common pattern in many of these studies has been the tendency to observe few significant or extremely small exposure estimates. On the other hand, the studies of exposure in other countries such as Canada and Japan were more successful in finding a significant relationship between exchange rates and firm values (Bodnar and Gentry, 1993; He and Ng, 1998 and Dominguez and Tesar, 2006). For the case of Turkey, Kiymaz (2003) investigates the foreign exchange rate exposure of firms based on the sample of 109 firms traded on the Istanbul Stock Exchange during the period of 1991-1998. His findings document that Turkish firms are highly exposed to exchange rate risks and their profits (measured as stock values) are affected significantly by exchange rate variations (51 significant exposure elasticities in the sample of 109 firms). Particularly, textile, machinery, chemical and financial industries are subject to higher exposure elasticities. Additionally, exchange rate exposure is positively correlated with export and import involvement. Solakoglu (2005), investigates the relationship between exchange rate exposure and firm-specific factors such as firm

size, maturity, level of international activity (as measured by share of export revenue in total revenue and share of import expenditures in total costs) using a panel data analysis for the period 2001-2003 based on the sample of 137 firms. According to his results, firm size and level of export revenue has a negative effect on the elasticities of exchange rate exposure. Contrary to Kiymaz (2003), only 8% of the firms in 2003 had significant exposure estimates.

The studies mentioned so far have used stock prices as a proxy for profit. There are few studies which examine the relationship between profit and exchange rates with corporate profit data such as Clarida (1997) and Uctum (1998).[4] For example, Clarida (1997) found that during the strong (weak) dollar period 1980:3-1985:2 (1985:3-1989:2), the appreciation (depreciation) of the dollar reduced (boosted) real manufacturing profits by more than 20% (25%) in 1984 and 1985 (1987 and 1988). Clarida states that the impact of currency variations on profits are independent of the magnitude of exchange rate pass-through coefficients implying that currency appreciation (depreciation) always reduce (increase) profits.

In this paper, we will investigate the impact of exchange rate variations on the export prices and the profitability of the firms. The contribution of this paper to the literature is twofold. First, this study is the first to document the effect of exchange rates on the export prices in the Turkish manufacturing industry. A better understanding of this relationship will contribute to the understanding of the response of trade balance to exchange rate variations. Additionally, this analysis will identify which industries and products are more vulnerable to exchange rate fluctuations, which have a strategic importance for the foreign investment and foreign exchange rate risk management (Yang, 1997). Second, we will investigate the relationship between firm's profitability and exchange rates by using genuine measures of profit in contrary to the empirical research, which has used mostly stock price data as a proxy for corporate profits.

[4] Uctum (1998) uses aggregate indices of non-financial corporate gross operating surplus exclusive of non financial depreciation and taxes, while Clarida (1997) uses aggregates of domestic manufacturing profits with inventory valuation and capital consumption adjustments. However they do not incorporate pass-through directly into their analysis

3. Model and Methodology

The exchange rate pass-through and exposure elasticities will be calculated following BDM's methodology The BDM model is based on the strategic pricing behavior of an exporting firm that competes with a foreign firm in the export market.

3.1. Demand Side

The model assumes that pass-through and exposure are functions of substitutability between the exported goods and the goods produced locally in the foreign market. The consumers in the foreign market have the following utility function:

$$U(X_1, X_2) = \left[\alpha X_1^{\rho} + (1-\alpha) X_2^{\rho}\right]^{\frac{1}{\rho}} \tag{1}$$

where

$U(.) =$ the utility function of the consumers in the foreign market,

$X_1 =$ the quantity of the exporting firm's product sold in the foreign market,

$X_2 =$ the quantity of the foreign import-competing firm's product sold in the foreign market,

$\alpha =$ a preference weighting parameter, and

$\rho =$ a parameter measuring the substitutability between these products.

The demand functions for the two products are given as:

$$P_1 = D_1(X_1, X_2) = \frac{\alpha X_1^{(\rho-1)} Y}{\left[\alpha X_1^{\rho} + (1-\alpha) X_2^{\rho}\right]} \tag{2}$$

$$P_2 = D_2(X_1, X_2) = \frac{\alpha X_2^{(\rho-1)} Y}{\left[\alpha X_1^{\rho} + (1-\alpha) X_2^{\rho}\right]} \tag{3}$$

where Y is the total expenditures on the industry's products.

3.2. Firms' Profits

It is assumed that exporting firm's production is based in its home country, and import competing firm has sales only in the foreign market. Each firm's profit measured in its own currency. Exchange rate E is defined as the foreign currency value of domestic currency (an increase represents depreciation). The exporting firm produces its product using domestic as well as imported inputs. The profit of the exporting firm in its own currency is given as:

$$\Pi_1^* = EPX_1 - (C_1^* + EC_1)X_1 \quad (4)$$

where P is the export price, X_1 is quantity of the good exported, C_1^* is the unit cost of production based on domestic inputs and EC_1^* is the unit cost of production based on imported inputs.

The profit of the import competing firm denominated in its own currency is given as:

$$\Pi_2 = P_2 X_2 - C_2 X_2 \quad (5)$$

This firm has only domestic sales (X_2) and its production is based only on domestic inputs (C_2).

The duopoly model of exporting firm is solved under quantity competition. One important modification to the model is the inclusion of domestic market. The theoretical model assumes a pure exporting firm but empirical analysis may fail to identify these firms due to the lack of data.[5]

Based on the described model, pass-through and exposure will be estimated by using the following equations for price and profit:

The price equation is given as:

$$d\ln EP - d\ln P_i^D = \alpha_1 \times \left(d\ln E + d\ln C - d\ln P_i^D\right) \quad (6)$$

$$\hat{\eta} = (1 - \hat{\alpha}_1) \quad (7)$$

where C_2 is the marginal cost index in the foreign market (weighted average of the foreign consumer price indexes using export weights of firm's export markets), $\hat{\eta}$ is the pass-through coefficient, and P_d is the domestic price index (proxied by the wholesale price indexes).

The intuition behind the price equation is the following. The expression on the right hand is the percentage change in the ratio of the rest of the world's price index to the domestic price index, that is the real exchange rate. According to equation 6, the variation in the real exchange rate is related to the percentage change in the ratio of export prices to domestic prices through α_1 which gives us information on the

[5] In order to deal with this problem BDM use industry level measure for the percentage of foreign sales to total sales available for the year 1985, 1990 and 1994. In this paper, we will use firm level measure for the percentage of foreign sales to total sales averaged for the period 1995-2007.

degree of exchange rate pass-through behavior exhibited by a firm. Suppose $\hat{\alpha}_1 = 1$, this implies that if the real exchange rate depreciates by 1 percent, the firms adjust the ratio of export prices (denominated in producer currency, Turkish Lira in this case) to domestic prices so that it increases by the same amount. This situation indicates that pass-through is equal to zero.

The exposure elasticity of a pure exporter is calculated by using the following expression:

$$d \ln \Pi^{*}_{1jt} - d \ln E_t Y_t = \alpha_{2j} \times \left(d \ln E + d \ln C - d \ln P_i^{D} \right) \tag{8}$$

$$\hat{\delta}_j = (1-\gamma_i)\hat{\alpha}_{2j} + 1 \tag{9}$$

where Π is the profit, Y is the foreign expenditure index (weighted average of Turkey's trade partner's GDP's), γ is the fraction of imported inputs to total cost, and $\hat{\delta}$ is the exposure elasticity. The expression on the right hand side is the real exchange rate and the left hand expression is the differences between percentage changes in the profit and foreign expenditure index. The model requires that $\delta_j \succ 1$ which is satisfied when $\alpha \succ 0$. This implies that the real exchange rate and the differences between percentage changes in the profit and foreign expenditure index are positively related.

Note that the firms in our sample have also significant domestic markets; therefore the following modification has to be made. It will be assumed that, at the beginning of each period, the ratio of export profits in total profits is equal to θ and exchange rates affect only export profits.

$$\frac{\Pi^{EXPORT}}{\Pi^{TOTAL}} = \theta \tag{10}$$

After taking log differences of equation 10 and replacing into 8 will give us the following expression:

$$d \ln \Pi_{1j}^{EXPORT} - \theta_j d \ln SY = \alpha_{2j} \theta_j d \ln \left(\frac{SC}{P_D} \right) \tag{11}$$

The equations (6) and (11) will be estimated by using Generalized Least Square Estimation (GLS) procedure. The estimates of α_1 and α_{2j} will be replaced in equations (7) and (9) in order to calculate pass-through (η), and exposure (δ) elasticities.

The firms with negative profit values are not included while estimating Equation 11. This may bias our results therefore robustness check will be performed by creating a positive measure for profit using stock prices. The proxy for profits will be calculated based on the following expression:

$$d \ln \Pi = d \ln V - \beta_j d \ln V_{ISE100} \quad (12)$$

$\Pi =$ the proxy for profit
$V_j =$ the market value of firm j (in TL)
$V_{ISE00} =$ the market value of the ISE100 index, and
$\beta_j =$ the beta of firm j with the ISE100 index.[6]

As mentioned before, using the specification described in equation 11 is problematic because of the negative values of profit therefore an alternative specification, implied by the model, described in equation 13 will be used to test the relationship between exchange rates and the profitability of a firm.

$$\Delta GM_{1jt} = \phi_0 + \phi_{1j} \Delta \ln E_t + \varepsilon_{jt} \quad (13)$$

ΔGM_{jt} stands for gross margin percentage for firm j, E_t is the exchange rate, and ε_{jt} is the error term.

ϕ_{1j} represents the change in the gross margin percentage of a firm as a result of 1 percent change in the exchange rate. Positive (negative) values of ϕ_{1j} implies that depreciation of the currency has a positive (negative) impact on the profitability of the firms.

4. Data

The estimation of equations 8, 11 and 13 requires data on the export prices, exchange rates, imported input shares, share of export profits in total profits, domestic GDP and wholesale price indexes as well as GDP and wholesale price indexes of the Turkey's major trading partners.

The exposure estimates will be calculated at firm level and exchange rate pass-through estimates will be analyzed at sectoral level due to the lack of available data on export unit values at firm level. The data on export unit values, domestic wholesale price indexes and exchange rates is available through TURKSTAT.

[6] See Appendix 5 for the calculation of beta and the firms' betas.

Turkey's trade partners' GDP and wholesale price indexes is available through IMF's International Financial Statistics.

Gross margin is used as a proxy for profit and is calculated by subtracting cost of sales from total revenue. Firm level revenue and cost of sales is taken from firm's quarterly financial reports available through Istanbul Stock Exchange (ISE). Export sales in total sales is also taken from firm's quarterly financial reports. Average sectoral values of the shares of imported inputs in total production is given by Kiymaz (2003) at sectoral level for the period 1991-1998.

5. Estimation Results

Exchange rate pass-through to export prices are estimated at sectoral level using equation 6 for the period between 1995 and 2007. The estimation results are reported in Table 1.1. The exchange rate pass-through coefficients for 3 out of 6 industries are significantly positive and are within the range of 0 and 1. The average pass-through estimate for the period 1995-2007 is around 0.6. This means that one percent appreciation of Turkish Lira would decrease export prices denominated in producer currency (TL) by 0.60 percent. There is no apparent cross-industry variation in exchange rate pass-through estimates for the period 1995-2007. Incomplete exchange rate pass-through implies that Turkish exporters have sufficient market power which enables them to stabilize their local currency export prices by adjusting their profit margins to stay competitive in their export markets.

Note that our analysis investigates the exchange rate pass-through responses in the short-run. Long-run exchange rate pass-through responses may differ from short-run responses in a given industry. For example, Mallick and Marquez (2010), in their study based on Indian manufacturing industries for the period 1991-2006, find that the number of sectors with incomplete exchange rate pass-through considerable declines in the long-run. However, they also report an evidence for incomplete exchange rate pass-through in the long run in several industries. This implies that the notion of incomplete pass-through in the long-run is sector-specific. There are various factors which can cause exchange rate pass-through to be incomplete in the short-run but not in the long-run. According to the literature, among the most important factors are the menu costs, currency denomination of the trade contracts and the dynamics of demand response to price changes.[7]

[7] See Menon(1994) for a more detailed explanation.

The empirical results obtained using equation (11) do not support for the relation between exchange rates and corporate profits. Only 1 out of 51 firms in our sample document significant exchange rate exposure coefficients. The results still remain insignificant if non-negative measure for profit is used. However, the estimates calculated using equation (13) support the relationship between exchange rates and profitability of a firm. Table 2 presents the relationship between gross margin percentage and exchange rates. 18 out of 50 firms exhibit significant exposure estimates. One possible explanation to this puzzling behavior is the tendency of the firms to make use of hedging instruments (e.g., foreign debt) to protect themselves from unexpected movements of exchange rates (Allayannis and Ofek, 2001). Turkish firms are likely to hold foreign currency denominated assets due to a lack of trust in home currency and borrow foreign currency denominated debts in order to take advantage of the interest rate arbitrage. Given these facts, net foreign currency position plays an important role in the interpretation of exchange rate exposure because it is closely related with the investment decisions and therefore profitability of the firms (Gonenc et al., 2003). Besides, Turkish firms have tendency to issue foreign currency denominated debt which decrease the vulnerability of their revenues to fluctuations in the Turkish Lira. Consequently, the weak relationship between exchange rates and profits in Turkey can be explained by the use of financial hedging instruments.

Currency depreciation may affect exporters' profits through three channels. First channel is the volume channel where depreciation of the currency leads the exporting firm to lower its foreign currency price of exports. This increases export sales and therefore profits. Second channel is the valuation channel where domestic currency value of exports (which is equal to total profits) increases as currency depreciates. The last channel is the cost channel where domestic currency cost of imported input increases. Furthermore, foreign income may also affect the profits through direct demand channel. Higher (lower) foreign income raises demand for exports and improves (decreases) the profits. Depending on the magnitude of these channels, the relationship between exchange rates and profits can be positive, negative or zero.

The values of ϕ_{1j} vary between - 0.99 and 0.7. For example, if ϕ_{1j} is equal to 0.7, this means that 1 percent depreciation of the domestic currency, increases gross margin percentage by 0.7 percent. Only 2 firms in our sample, exhibit negative values for ϕ_{1j}, which imply that exchange rate depreciation has a negative impact

on the profitability of the firms. This finding can be explained by the use of imported inputs or the decrease in the foreign demand. There is an apparent variation in ϕ_{1j} across firms within the industry.

The period 1995-2007 will be divided into two subperiods to compare the exchange rate pass-through and exposure dynamics: 1) floating (after 2001) and 2) pre-floating exchange rate regime period. An important difference of the floating regime period is that periods of depreciation has been followed by the periods of appreciation. This behavior of exchange rates creates expectations about the persistence of exchange rate movements. Another difference documented in the floating exchange rate period is the increased volatility of exchange rates.

The estimates of exchange rate pass-through for the two periods are reported in Table 1.2 and 1.3. For the period before 2001, exchange rate pass-through coefficients for 3 out of 6 industries are significantly positive. The number of significant exchange rate pass-through coefficients drops to 1 for the period after 2002. All significant exchange rate pass-through estimates are within the range of 0 and 1.

There is an evidence for cross-industry variation in exchange rate pass-through coefficients for the period before 2001. For example, the pass-through estimates is equal to 0.18 for “Food Products and Beverages” and 0.5 for “Manufacture of Basic Metals”. This finding is consistent with the empirical literature which documents exchange rate pass-through responses vary across industries.

The estimates of ϕ_{1j} for the two periods are reported in Table 3 and 4. The number of significant ϕ_{1j} is much higher during the floating exchange rate period implying that exporters are more sensible to exchange rate variations in this period. Besides the magnitude of significant ϕ_{1j} are higher for all the manufacturing firms during the floating exchange rate period (See Figure 1).

Another finding is the positive relationship between the responsiveness of gross margin percentage to exchange rates, ϕ_{1j}, and the ratio of foreign sales to total sales, θ. This implies that the profitability of the export oriented firms are more sensible to exchange rate variations. Figure 2 demonstrates the relationship between ϕ_{1j} and θ more clearly.

6. Concluding Remarks

This paper examines the impact of exchange rate variations on the export prices and profitability of firms in the manufacturing industry. Using generalized least square estimation technique, it is found that Turkish exporters do price to market. The level of pricing to market varies across time and sectors.

We also found that exchange rate variations affect the profitability of firms in the manufacturing industry. The magnitude of this effect varies across firms within the industry. However these results are not robust to the specification used. Moreover, our results show that the profitability of export oriented firms are more likely to be affected from exchange rate variations.

Table 1.1. Exchange Rate Pass-through to Export Prices (1995-2007)

	Pass-Through($\hat{\eta}$)	z	Observations
Manufacture of Basic Metals	0.66		
Textiles	0.9	0.77	51
Paper and Paper Products	0.65	(2.06)*	51
Food Products and Beverages	0.59	(2.81)**	51
Chemicals and Chemical Products	0.99	0.11	51
Manufacture of Fabricated Metal Products (Excluding Machinery)	0.76	1.16	51

Table 1.2. Exchange Rate Pass-through to Export Prices (1995-2000)

	Pass-Through($\hat{\eta}$)	z	Observations
Manufacture of Basic Metals			
Textiles	0.28	(2.78)**	23
Paper and Paper Products	0.77	0.8	23
Food Products and Beverages	0.18	(2.26)*	23
Chemicals and Chemical Products	0.87	0.38	23
Manufacture of Fabricated Metal Products (Excluding Machinery)	0.74	0.61	23

Table 1.3. Exchange Rate Pass-through to Export Prices (2002-2007)

	Pass-Through($\hat{\eta}$)	z	Observations
Manufacture of Basic Metals			
Textiles	0.72	1.92	20
Paper and Paper Products	0.77	0.8	20
Food Products and Beverages	0.54	(2.36)*	20
Chemicals and Chemical Products	0.71	1.37	20
Manufacture of Fabricated Metal Products (Excluding Machinery)	0.56	1.65	20

Table 2

Estimates of ϕ_{1j} for the period 1995-2007

Stock	ϕ_{1j}	Z	Sector
AKSA	0.604	(4.32)**	Chemicals and Chemical Products
AYGAZ	0.056	0.76	Chemicals and Chemical Products
BAGFS	0.708	(2.77)**	Chemicals and Chemical Products
BRISA	0.382	(2.65)**	Chemicals and Chemical Products
DYBYO	0.032	0.2	Chemicals and Chemical Products
ECILC	-0.069	-0.87	Chemicals and Chemical Products
EGGUB	-0.045	-0.25	Chemicals and Chemical Products
GOODY	0.256	1.21	Chemicals and Chemical Products
GUBRF	0.643	(2.92)**	Chemicals and Chemical Products
HEKTS	0.07	0.38	Chemicals and Chemical Products
PETKM	0.342	1.16	Chemicals and Chemical Products
PIMAS	-0.249	-0.79	Chemicals and Chemical Products
PTOFS	0.025	0.66	Chemicals and Chemical Products
TUPRS	0.172	1.16	Chemicals and Chemical Products
BANVT	-0.101	-0.33	Food Products and Beverages
KENT	0.646	(2.49)**	Food Products and Beverages
KRVT	-0.45	(2.04)*	Food Products and Beverages
PINSU	-0.075	-0.44	Food Products and Beverages
PNSUT	0.098	1.11	Food Products and Beverages
TATKS	-0.04	-0.31	Food Products and Beverages
TBORG	-0.988	(3.59)**	Food Products and Beverages
TUKAS	0.235	0.99	Food Products and Beverages
BRSAN	0.248	1.31	Manufacture of Basic Metals
CELHA	0.614	(3.54)**	Basic Metals
CEMTS	0.008	0.03	Basic Metals
EREGL	0.428	1.39	Basic Metals
IZMDC	0.341	1.49	Basic Metals
SARKY	0.367	(2.44)**	Basic Metals
ALKAR	0.054	0.69	Fabricated Metal Products (excl. Machinery)
ARCLK	0.1	1.11	Fabricated Metal Products (excl. Machinery)
BFREN	-0.101	-0.44	Fabricated Metal Products (excl. Machinery)
EGEEN	0.491	(2.86)**	Fabricated Metal Products (excl. Machinery)
FMIZP	0.19	1	Fabricated Metal Products (excl. Machinery)
FROTO	-0.133	-0.56	Fabricated Metal Products (excl. Machinery)
MUTLU	-0.034	-0.21	Fabricated Metal Products (excl. Machinery)
PARSN	0.511	(2.25)*	Fabricated Metal Products (excl. Machinery)
PRKAB	0.408	(1.92)*	Fabricated Metal Products (excl. Machinery)
TOASO	0.116	0.86	Fabricated Metal Products (excl. Machinery)
TUDDF	0.148	0.83	Fabricated Metal Products (excl. Machinery)
VESTL	0.379	1.14	Fabricated Metal Products (excl. Machinery)
DURDO	-0.21	-0.59	Paper and Paper Products
HURGZ	0.173	1.01	Paper and Paper Products
KARTN	0.334	(2.09)*	Paper and Paper Products
TIRE	-0.068	-0.45	Paper and Paper Products
AKALT	0.58	(2.84)**	Textiles
AKIPD	0.59	(2.65)**	Textiles
ALTIN	0.367	(1.81)*	Textiles
DERIM	0.067	0.32	Textiles
KORDS	0.466	(2.59)**	Textiles
YUNSA	0.632	(2.33)**	Textiles

Table 3

Estimates of ϕ_{1j} for the period 1995-2000

Stock	ϕ_{1j}	Z	Sector
AKSA	0.235	1.03	Chemicals and Chemical Products
AYGAZ	0.34	1.52	Chemicals and Chemical Products
BAGFS	0.379	(2.06)*	Chemicals and Chemical Products
BRISA	-0.088	-0.93	Chemicals and Chemical Products
DYBYO	0.371	(1.76)*	Chemicals and Chemical Products
ECILC	0.341	(2.84)**	Chemicals and Chemical Products
EGGUB	0.253	(1.79)*	Chemicals and Chemical Products
GOODY	0.538	(1.80)*	Chemicals and Chemical Products
GUBRF	-0.408	-0.79	Chemicals and Chemical Products
HEKTS	-0.06	-0.25	Chemicals and Chemical Products
PETKM	0.198	1.23	Chemicals and Chemical Products
PIMAS	-0.076	-0.59	Chemicals and Chemical Products
PTOFS	0.524	(4.01)**	Chemicals and Chemical Products
TUPRS	-0.52	-1.08	Chemicals and Chemical Products
BANVT	-0.193	-0.68	Food Products and Beverages
KENT	-1.779	(5.05)**	Food Products and Beverages
KRVT	0.129	0.53	Food Products and Beverages
PINSU	0.041	0.47	Food Products and Beverages
PNSUT	0.145	0.6	Food Products and Beverages
TATKS	-0.169	-1.1	Food Products and Beverages
TBORG	-0.514	-1.54	Food Products and Beverages
TUKAS	0.003	0.01	Food Products and Beverages
BRSAN	0.204	1.21	Basic Metals
CELHA	0.127	0.44	Basic Metals
CEMTS	0.509	(4.64)**	Basic Metals
EREGL	-0.365	-1.58	Basic Metals
IZMDC	0.622	(2.96)**	Basic Metals
SARKY	0.12	0.77	Basic Metals
ALKAR	0.141	0.47	Fabricated Metal Products (excl. Machinery)
ARCLK	0.377	-1	Fabricated Metal Products (excl. Machinery)
BFREN	-0.292	-0.91	Fabricated Metal Products (excl. Machinery)
EGEEN	0.011	0.06	Fabricated Metal Products (excl. Machinery)
FMIZP	0.134	0.59	Fabricated Metal Products (excl. Machinery)
FROTO	0.334	1.24	Fabricated Metal Products (excl. Machinery)
MUTLU	-0.625	(2.59)**	Fabricated Metal Products (excl. Machinery)
PARSN	-0.547	-1.32	Fabricated Metal Products (excl. Machinery)
PRKAB	-0.338	-1.38	Fabricated Metal Products (excl. Machinery)
TOASO	0.147	1.01	Fabricated Metal Products (excl. Machinery)
TUDDF	0.292	(1.80)*	Fabricated Metal Products (excl. Machinery)
VESTL	-0.02	-0.26	Fabricated Metal Products (excl. Machinery)
DURDO	0.388	(2.33)**	Paper and Paper Products
HURGZ	-0.256	-1.45	Paper and Paper Products
KARTN	-1.260	(3.96)**	Paper and Paper Products
TIRE	-0.459	(1.87)*	Paper and Paper Products
AKALT	0.11	0.67	Textiles
AKIPD	0.198	0.99	Textiles
ALTIN	-0.073	-0.33	Textiles
DERIM	-0.124	-0.46	Textiles
KORDS	0.27	1.15	Textiles
YUNSA	0.108	0.55	Textiles

Table 4

Estimates of ϕ_{1j} for the period 2002-2007

Stock		z	Sector
AKSA	1.026	(1.87)*	Chemicals and Chemical Products
AYGAZ	1.437	(2.08)*	Chemicals and Chemical Products
BAGFS	0.999	(3.12)**	Chemicals and Chemical Products
BRISA	0.102	0.8	Chemicals and Chemical Products
DYBYO	0.907	1.51	Chemicals and Chemical Products
ECILC	-0.145	-0.99	Chemicals and Chemical Products
EGGUB	0.082	0.84	Chemicals and Chemical Products
GOODY	1.091	(2.09)*	Chemicals and Chemical Products
GUBRF	0.435	0.7	Chemicals and Chemical Products
HEKTS	0.233	0.34	Chemicals and Chemical Products
PETKM	0.694	1.5	Chemicals and Chemical Products
PIMAS	1.071	(1.79)*	Chemicals and Chemical Products
PTOFS	1.239	(2.64)**	Chemicals and Chemical Products
TUPRS	1.281	(5.09)**	Chemicals and Chemical Products
BANVT	0.733	(2.97)**	Food Products and Beverages
KENT	2.219	(2.75)**	Food Products and Beverages
KRVT	-0.592	(1.75)*	Food Products and Beverages
PINSU	-0.419	(1.80)*	Food Products and Beverages
PNSUT	0.756	(2.09)*	Food Products and Beverages
TATKS	0.322	(8.11)**	Food Products and Beverages
TBORG	2.769	(4.33)**	Food Products and Beverages
TUKAS	-0.014	-0.06	Food Products and Beverages
BRSAN	1.065	(2.27)*	Basic Metals
CELHA	0.371	-1.19	Basic Metals
CEMTS	1.116	(2.02)*	Basic Metals
EREGL	0.457	(7.40)**	Basic Metals
IZMDC	0.195	0.43	Basic Metals
SARKY	1.254	(1.66)*	Basic Metals
ALKAR	0.66	(3.10)**	Fabricated Metal Products (excl. Machinery)
ARCLK	1.660	(3.76)**	Fabricated Metal Products (excl. Machinery)
BFREN	-1.293	(4.43)**	Fabricated Metal Products (excl. Machinery)
EGEEN	1.459	(3.69)**	Fabricated Metal Products (excl. Machinery)
FMIZP	-0.338	(2.03)*	Fabricated Metal Products (excl. Machinery)
FROTO	1.287	(2.10)*	Fabricated Metal Products (excl. Machinery)
MUTLU	1.956	(3.16)**	Fabricated Metal Products (excl. Machinery)
PARSN	0.298	0.65	Fabricated Metal Products (excl. Machinery)
PRKAB	-0.082	-0.29	Fabricated Metal Products (excl. Machinery)
TOASO	-0.141	-0.69	Fabricated Metal Products (excl. Machinery)
TUDDF	1.096	(1.66)*	Fabricated Metal Products (excl. Machinery)
VESTL	0.024	0.42	Fabricated Metal Products (excl. Machinery)
DURDO	0.553	1.51	Paper and Paper Products
HURGZ	0.098	0.34	Paper and Paper Products
KARTN	-0.546	-0.75	Paper and Paper Products
TIRE	0.588	(1.90)*	Paper and Paper Products
AKALT	0.422	1.27	Textiles
AKIPD	0.703	(2.16)*	Textiles
ALTIN	0.941	(2.05)*	Textiles
DERIM	0.794	(3.61)**	Textiles
KORDS	1.205	1.38	Textiles
YUNSA	1.937	(2.11)*	Textiles

Figure 1. Comparison of ϕ_{1j} During the Periods 1995-2000 and 2002-2007

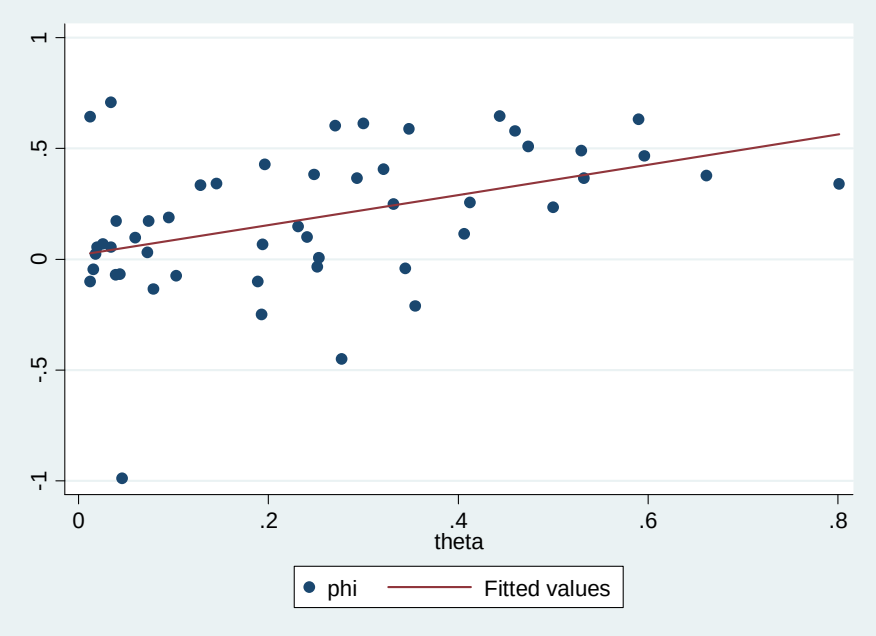
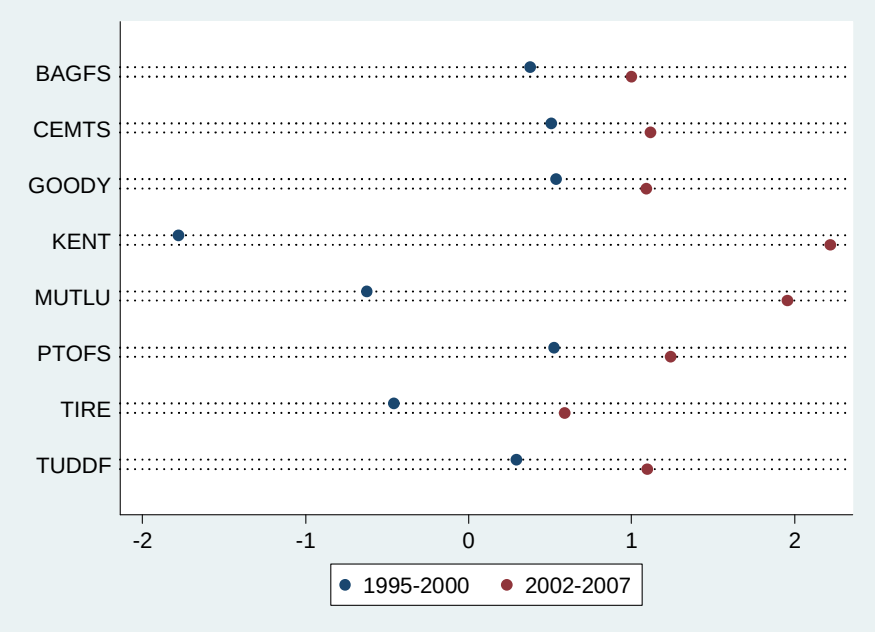


Figure 2. The Relationship between ϕ_{1j} and θ



References

Adler, M. and B. Dumas (1984) "Exposure to Currency Risk: Definition and Measurement." *Financial Management*, 13, 41-50.

Allayannis, G. and E. Ofek (2001) "Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives," *Journal of International Money and Finance*, 20(2), 273-296.

Arbatli, E.C. (2005) "Exchange Rate Pass-Through in Turkey: Looking for Asymmetries." *Central Bank Review*, 3(2).

Bartram, S.M., B.W. Gregory and M.A. Bernadette (2009) "Resolving the Exposure Puzzle: The Many Facets of Exchange Rate Exposure." EFA Ljubljana Meetings Paper.

Bodnar, G.M., B. Dumas and R.C. Marston (2002) "Pass-through and Exposure." *Journal of Finance*, 57(1), 199-231.

Bodnar, G.M., W.M. Gentry (1993) "Exchange rate exposure and industry characteristics: evidence from Canada, Japan, and the USA", *Journal of International Money and Finance*, 12:29-45.

Campa, J.M. and L.S. Goldberg (2006) "Distribution Margins, Imported Inputs, and the Sensitivity of the CPI to Exchange Rates." IESE Business School Working Paper 625.

——— (2002) "Exchange Rate Pass-Through to Import Prices: A Macro or Micro Phenomenon." Federal Reserve Bank Working Paper No:149.

——— (2006) "Distribution Margins, Imported Inputs, and the Sensitivity of the CPI to Exchange Rates." IESE Business School Working Paper 625.

Clarida, R.H. (1997) "The Real Exchange Rate and US Manufacturing Profits: A Theoretical Framework with some Empirical Support." *International Journal of Financial Economics*, 177-187.

Dominguez, K. and L.L. Tesar (2006) "Exchange Rate Exposure." *Journal of International Economics*, 68:188-218.

Feenstra, R., J. Gagnon and M. Knetter (1996) "Market Share and Exchange Rate Pass-Through in World Automobile Trade." *Journal of International Economics*, 40(1-2): 187-207.

Goldberg, P.K. and M. Knetter (1997) "Goods Prices and Exchange Rates: What Have We Learned?" *Journal of Economic Literature*, 35:1243-1272.

H. Gonenc, G.Z. Buyukkara and O. Koyuncu (2003) "Balance Sheet Exchange Rate Exposure, Investment and Firm Value : Evidence from Turkish Firms, *Central Bank Review*, 3(2):1-25.

He, Jia, Ng, and K. Lilian (1998) "Foreign Exchange Exposure of Japanese Multinational Corporations." *Journal of Finance* 53, 733-753.

Jorion, P. (1990) "The Exchange Rate Exposure of US Multinationals" *Journal of Business*, 63: 331-46.

Kara, H., H. Küçük-Tuğer, U. Özlale, B. Tuğer and E.M. Yücel (2007) "Exchange Rate Regimes and Pass-Through: Evidence from the Turkish Economy." *Contemporary Economic Policy*, 25 (2), 206–225.

Kiymaz, H. (2003) "Estimation of Foreign Exchange Exposure: An Emerging Market Application." *Journal of Multinational Financial Management*, 13: 71-84.

Knetter, M.M. (1989) "Price Discrimination by US and German Exporters." American Economic Review, 79(1): 198-210.

Krugman, P. (1987) "Pricing-to-market When the Exchange Rate Changes." In: Arndt, S.W. and Richardson, J.D., Editors, Real Financial Linkages Among Open Economies, MIT Press, Cambridge, 49-70.

Mallick, S. and H. Marques (2010) "Data Frequency and Exchange Rate Pass-through: Evidence from India'a Exports." *International Review of Economics and Finance*,19 (1):13-22.

Marston, R. (1994) "Pricing to Market in Japanese Manufacturing." *Journal of International Economics*, 29(2):17-36.

Menon, J. (1994) "Flexible Exchange Rates and Traded Good Prices: A Theory of the Short-run." Centre of Policy Studies, Monash University, General Paper No:108.

Solakoglu, N.M. (2005) "Exchange Rate Exposure and Firm-Specific Factors: Evidence from Turkey" *Journal of Economic and Social Research*, 7(2), 35-46.

Turkcan, K. (2005) "Exchange Rate Pass-Through in Final and Intermediate Goods: The Case of Turkey." *Yonetim ve Ekonomi*, 12(1).

Uctum, M. (1998) "Why Have Corporate Profits Declined? An International Comparison." *The Review of International Economics*, 6(2), 234-251.

Yang, J. (1997) "Exchange Rate Pass-Through in US Manufacturing Industries." *The Review of Economics and Statistics*, 79: 95-105.

Appendix 1. Foreign Expenditure Index

The table displays the major export trade partners and their corresponding trade weights. Expenditure index is equal to the trade weighted average of the CPI's of the given countries. Trade weights are based upon average bilateral trade flows for the period 1995-2007.

Composition of 14-Country Trade Weighted Foreign Expenditure Index	
Country	**Trade Weight (%)**
Germany	24.87
USA	11.48
United Kingdom	11.20
Italy	10.43
France	8.66
Russia	6.26
Iraq	5.09
Spain	4.87
Netherlands	4.79
Belgium	6.34
UAE	3.17
Romania	3.05
Israel	3.00
Greece	2.54
TOTAL	100.00

Appendix 2. The Ratio of Export Sales to Total Sales(θ)

Stock	θ	Stock	θ
AKALT	0.46	HURGZ	0.04
AKIPD	0.35	IZMDC	0.80
AKSA	0.27	KARTN	0.13
ALCAR	0.04	KENT	0.44
ALTIN	0.30	KERVT	0.27
ARCLK	0.24	KORDS	0.61
AYGAZ	0.02	MUTLU	0.24
BAGFS	0.03	PARSN	0.48
BANVT	0.01	PETKM	0.15
BFREN	0.19	PIMAS	0.19
BRISA	0.25	PINSU	0.10
BRSAN	0.32	PNSUT	0.06
CELHA	0.30	PRKAB	0.31
CEMTS	0.25	PTOFS	0.02
DERIM	0.20	SARKY	0.54
DURDO	0.35	TATKS	0.34
DYBYO	0.07	TBORG	0.05
ECILC	0.04	TIRE	0.04
EGEEN	0.53	TOASO	0.40
EGGUB	0.02	TUDDF	0.23
EREGL	0.19	TUKAS	0.49
FMIZP	0.10	TUPRS	0.07
FROTO	0.09	VESTL	0.66
GOODY	0.42	VKING	0.14
GUBRF	0.01	YUNSA	0.60
HEKTS	0.02		

Appendix 3. Share of Imported Inputs in Total Production Cost(γ)

Sector	γ
Food Products and Beverages	0.11
Textiles	0.32
Paper and Paper Products	0.21
Chemicals and Chemical Products	0.38
Manufacture of Basic Metals	0.40
Source: Kiymaz (2003)	

Appendix 4. List of Firms

FOOD PRODUCTS AND BEVERAGES	
Firm:	***Stock Name:***
BANVIT	BANVT
KENT GIDA	KENT
KEREVITAS GIDA	KRVT
PINAR SU	PINSU
PINAR SUT	PNSUT
TAT KONSERVE	TATKS
T.TBORG	TBORG
TUKAS	TUKAS
TEXTILES	
AKAL TEKSTIL	AKALT
AKSU IPLIK	AKIPD
ALTINYILDIZ	ALTIN
DERIMOD	DERIM
KORDSA	KORDS
YUNSA	YUNSA
PAPER AND PAPER PRODUCTS	
DURAN DOGAN BASIM	DURDO
HURRIYET GAZETECILIK	HURGZ
KARTONSAN	KARTN
TIRE KUTSAN	TIRE
CHEMICALS AND CHEMICAL PRODUCTS	
AKSA	AKSA
AYGAZ	AYGAZ
BAGFAS	BAGFS
BRISA	BRISA
DYO BOYA	DYBYO
ECZACIBASI ILAC	ECILC
EGE GUBRE	EGGUB
GOOD-YEAR	GOODY
GUBRE FABRIKALARI	GUBRF
HEKTAS	HEKTS
PETKIM	PETKM
PIMAS	PIMAS
PETROL OFISI	PTOFS
TUPRAS	TUPRS
MANUFACTURE OF BASIC METALS	
BORUSAN MANNESMANN	BRSAN
CELIK HALAT	CELHA
CEMTAS	CEMTS
EREGLI DEMIR CELIK	EREGL
IZMIR DEMIR CELIK	IZMDC
SARKUYSAN	SARKY
MANUFACTURE OF FABRICATED METAL PRODUCTS(EXCL. MACHINERY)	
ALARKO CARRIER	ALKAR
ARCELIK	ARCLK
BOSH FREN SISTEMLERI	BFREN
EGE ENDUSTRI	EGEEN
F-M IZMIT PISTON	FMIZP
FORD OTOSAN	FROTO
MUTLU AKU	MUTLU
PARSAN	PARSN
TURK PRYSMIAN KABLO	PRKAB
TOFAS OTO FABRIKASI	TOASO
T. DEMIR DOKUM	TUDDF
VESTEL BEYAZ ESYA	VESTL

Appendix 5. $\beta_j = \text{cov}(V_j, V_{ISE100}) / \text{var}(V_{ISE100})$

Stock	Beta
AKALT	1.036
AKIPD	1.145
AKSA	0.815
ALCAR	0.757
ALTIN	1.274
ARCLK	0.797
AYGAZ	1.194
BAGFS	0.978
BANVT	0.576
BFREN	0.727
BRISA	0.984
BRSAN	0.882
CELHA	0.894
CEMTS	0.762
DERIM	0.399
DURDO	0.816
DYBYO	0.952
ECILC	1.165
EGEEN	0.817
EGGUB	0.711
EREGL	0.804
FMIZP	0.659
FROTO	1.119
GOODY	1.066
GUBRF	1.006
HEKTS	1.744
HURGZ	0.88
IZMDC	1.095
KARTN	0.700
KENT	0.531
KERVT	0.916
KORDS	1.074
MUTLU	1.343
PARSN	0.867
PETKM	1.307
PIMAS	1.079
PINSU	0.601
PNSUT	1.235
PRKAB	1.039
PTOFS	0.720
SARKY	0.685
TATKS	1.089
TBORG	0.603
TIRE	0.652
TOASO	1.063
TUDDF	1.447
TUKAS	0.744
TUPRS	0.785
VESTL	0.864
VKING	0.653
YUNSA	1.014