Exchange Rate Pass-Through Elasticities in Final and Intermediate Goods: The Case of Turkey

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ÖZET

Mevcut küreselleşme sürecinin en önemli özelliklerinden biri üretim sürecinin parçalanmasıdır. Son zamanlarda ulaşım ve haberleşme teknolojilerinde ortaya çıkan gelişmeler ara mal ticaretinde önemli artışlara yol açmıştır. Buna karşın, ara malları ithalatındaki döviz kuru yansıması hakkında yapılan ampirik çalışmalar az sayıdadır. Bu çalışmada ithalat birim değerleri kullanılarak, ülke ve endüstri seviyesinde Türkiye'nin nihai ve ara mal ithalat fiyatlarının döviz kuru yansıması 1989.q1 ve 1996.q4 dönemi için incelenmiştir. İnceleme sonucunda, Türkiye'deki döviz kuru yansımasının bu dönemde oldukça hızlı olduğu gözlemlenmektedir. Nihai ve ara malların kısa ve uzun dönem esneklikleri döviz kuru yansımasının hem ülke hem de endüstri seviyesinde tam olduğunu göstermektedir. Ek olarak, tahmin edilen yansıma esnekliklerinin ülkeler ve endüstriler arasında değişkenlik gösterdiği anlaşılmaktadır. Son olarak da, ara mallardaki döviz kuru yansıması nihai mallara oranla göre daha yüksek olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: *Döviz Yansıması, Nihai Mallar, Ara Malları, Türkiye*

Nihai ve Ara Mallarda Döviz Kuru Yansima Esneklikleri : Türkiye Örneği

ABSTRACT

A distinctive feature of present globalization is fragmentation of production. The recent developments in transportation and communication technologies led to a surge in intermediate goods trade. However, intermediate goods trade is often neglected in the empirical studies of the exchange rate pass-through. Using import unit values, this study examines the pass-through of exchange rate changes into both aggregated and disaggregated imported final and intermediate goods prices of Turkey for the period of 1989.q1 to 1996.q4. Empirically, Turkey's pass-through is quite rapid. The short-run and long-run elasticities for both final and intermediate goods suggest that complete pass-through is more relevant for Turkey at both aggregated and disaggregated level. In addition, the estimated pass-through elasticities considerably vary across countries and industries. Finally, intermediate goods have relatively higher pass-through rates than final goods.

Key Words*: Exchange Rate Pass-Through, Final Goods, Intermediate Goods, Turkey.*

I. INTRODUCTION

As the Bretton Woods system of fixed exchange rates began to show signs of strain in the late 1960s, many industrialized countries adopted floating exchange rates early in 1973. Since the breakdown of the Bretton Woods system, exchange rates fluctuated sharply in both developed and developing countries. In the absence of changes in real economy, such as changes in productivity growth or labor costs, one might expect that any changes in exchange rates should be fully transmitted into import prices of traded goods. Yet it has been recorded that import prices have not fully reflected movements in the exchange rate, a phenomenon often labeled as incomplete pass-through of exchange rates into import prices.

Exchange rate pass-through (ERPT) is defined as the percentage change in local currency import prices resulting from a one percent change in the exchange rate between the exporting and importing country. The incomplete pass-through occurs whenever the foreign firms did not completely adjust their prices to the changes in exchange rates in order to maintain their market shares in the local markets. In the literature, the phenomenon of foreign firms stabilizing their import prices in the local currency is defined as pricing-to-market (PTM) by Krugman (1986). If the foreign firms can decide to set their price in the buyers' currency to maintain their market shares, then this specific variety of PTM is labeled as local-currency price stability (LCPS). On the other hand, if the foreign firms can decide to set their price in their own currency (i.e., pass-through is one-for-one), then this phenomenon is called as producer currency pricing (PCP).

Since the collapse of the Bretton Woods system, numerous studies have analyzed the relationship between the exchange rate movements and prices of imported goods and domestic goods, commonly known as ERPT. These studies can be divided into three groups. The first group focuses on the pass-through into aggregate import prices (for example, Campa and Goldberg (2002), Parsley (2003), and Campa and Minguez (2002)). The second group of studies focuses on the pass-through into import prices of specific industry or products. These include Knetter (1993), Menon (1993), Feenstra, et al. (1996), Stanley and Stollery (1998, 2001), Yang (1997), Olivei (2002), and Pollard and Coughlin (2003). The last group is the studies that analyze the effects of exchange rate fluctuations on the domestic prices, specifically Consumer Price Index (CPI) and Wholesale Price Index (WPI) (for example, Leigh and Rossi (2002)).

To the best of our knowledge, with the exception of Athukorala and Menon (1994), Campa and Goldberg (1995), and Campa and Minquez (2002), intermediate goods trade is often neglected in the both theoretical and empirical studies of the ERPT into import and domestic prices. A distinctive feature of present economic globalization is product fragmentation or outsourcing. As the World markets have become increasingly integrated in the last few decades due to developments in transportation and communication technologies, fragmentation of production occurs not only across regions within a country but also across countries. Overall, these advances ultimately led to a surge in the intermediate goods trade.[1]

Empirical results in Athukorala and Menon (1994) suggest that input costs significantly determine the degree of pass-through and PTM for Japanese exporters. In addition, Campa and Goldberg (1995) empirically show that inputs trade has a significant effect on the responsiveness of firms' investment decisions to exchange rate changes. Using monthly import unit values data and the input-output tables, Campa and Minquez (2002) estimated the pass-through elasticities

[1] A number of empirical studies have recorded the growing importance of trade in intermediate goods despite the fact that these studies all used different data sources and methods to measure the degree of fragmentation. See Feenstra (1998), Campa and Goldberg (1997), Hummels et al., (1998), Yeats (2001), and Türkcan (2003), for example.

to CPI and the costs of intermediate consumption for 12 European Union countries' (EU) trade with 12 non-EU countries. Their empirical results indicate that the calculated pass-through elasticities for final goods consumption are significantly lower than that for intermediate goods consumption.

None of above studies, however, explicitly analyzes the pass-through elasticities into imported final goods prices and imported intermediate goods prices. The goal of this study is to compare the ERPT in Turkish imports of final goods with the ERPT in Turkish imports of intermediate goods at both aggregated and disaggregated level. The goal of this study is then twofold. The first one is to estimate ERPT into both aggregated and disaggregated imported final and intermediate goods prices of Turkey. Building on the model developed by Campa and Goldberg (2002), short-run and long-run pass-through rates are estimated using quarterly data from 1989 to 1996 for imported final and intermediate goods prices of Turkey's trade with 12 OECD countries. The second goal of this study is then to compare the ERPT in Turkish imports of final goods with the ERPT in Turkish imports of intermediate goods at both aggregated and disaggregated level. Following Campa and Goldberg (2002), the pass-through elasticities at aggregated and disaggregated level are estimated using the Ordinary Least Squares (OLS) method.

The rest of the paper is organized as follows. Section 2 briefly summarizes the model developed by Campa and Goldberg (2002). Section 3 provides empirical framework and the data. Section 4 presents and discusses empirical results. The final section summarizes main conclusions of the study.

II. THE MODEL

This study follows Campa and Goldberg's (2002) approach, where a markup model was used to estimate pass through effects. We begin by assuming that there is a representative foreign firm that has market power over the price of its goods in importing countries. Further we assume that this representative firm sets its export to country j in its own currency $\left(PX_t^j\right)$ as a markup $\left(\pi_t^j\right)$ over its marginal cost of production $\left(C_t^*\right)$:

$$PX_t^j = \pi_t^j C_t^* \qquad (1)$$

where the asterisks refer to variables measured in foreign currency. To obtain the import price in the importing currency $\left(PM_t^j\right)$, equation (1) is multiplied by the local currency price of foreign exchange, E_t^j (i.e., defined in terms of domestic currency per units of foreign currency). Hence, domestic currency import price is given by:

$$PM_t^j = \left(PX_t^j\right)E_t^j = \left(\pi_t^j\right)E_t^j C_t^* \qquad (2)$$

Markup rates $\left(\pi_t^j\right)$ vary if the ERPT is less than complete. Markup rates depend on competitive pressure in the foreign market, demand pressure in the domestic

market $\left(Y_t^*\right)$, and the exchange rate. The difference between the price of import-competing products and the exporter's production costs provides a measure of competitive pressure. The demand pressure, on the other hand, would be captured by the exporting country's industrial production index. The exchange rate can be an important cost factor in the representative foreign firm's cost function if this representative firm heavily relies on the imported intermediate goods. The profit markup is thus modeled as:

$$\pi_t^j = \left(\frac{P_t^j}{E_t^j C_t^*}\right)^{\alpha} \left(Y_t^*\right)^{\beta} \tag{3}$$

Substituting equation (3) into equation (2), we obtain:

$$PM_{it}^h = \left(E_t^j C_t^*\right)^{1-\alpha} \left(P_t^j\right)^{\alpha} \left(Y_t^*\right)^{\beta} \tag{4}$$

Taking the logarithms of the variables, and after some manipulation we have:

$$pm_t = (1-\alpha)e_t + (1-\alpha)c_t^* + \alpha p_t + \beta y_t^* \tag{5}$$

In equation (5), the ERPT is defined as the elasticity of foreign currency with respect to the exchange rate (i.e., $1-\alpha$).[2] The import price is thus specified as a function of exchange rate e_t, foreign exporter's marginal cost c_t^*, competitive pressure p_t, and the demand pressure y_t^*. Pass-through is said to be complete when $\alpha = 0$, whereas it is incomplete when α is between 0 and 1. In sum, the model sets that the elasticity of the ERPT is positive and less than one. Moreover, the coefficients for the exporter's cost variable, the competitive pressure, and the demand pressure are expected to be positive.

III. ECONOMETRIC PROCEDURE AND DATA

Before we proceed in the estimation of equation (5), we must assess the problems of stationarity of the variables, cointegration, and structural breaks. To confront these problems, we first apply the Augmented Dickey-Fuller (ADF) test to log series of import prices, exchange rate, foreign costs, foreign country's industrial production index, and home country's producer price index. The ADF tests indicate that with a very few exceptions logarithmic forms of all time series with time trend contain unit roots.[3] After first differencing, the null hypothesis of unit root with very few exceptions is easily been rejected for all series tested. As a consequence, the first differences of the time series are used in the regressions.

In addition to stationarity of the time series, we employ the Engle-Granger procedure to determine whether these individual time series are integrated of order one or $I(1)$. Following Campa and Goldberg (2002), the Engle-Granger procedure involves the estimating the following equation:

[2] From now, we drop the country index j for simplicity reason.

[3] The results of the ADF tests are not reported in this study to save space.

$$pm_t = \alpha + \gamma e_t + \beta c_t^* + \varepsilon_t \quad (6)$$

The first step in the Engle-Granger procedure requires the estimation of equation (6) by OLS and testing the estimated residuals $\varepsilon_t = \rho\varepsilon_{t-1} + \upsilon_t$ for stationarity to determine whether the regression equation might represent a cointegrating relationship between the variables. The findings of the Engle-Granger cointegration test presented in Table 1 indicate that with very few exceptions the hypothesis of no cointegration can not be rejected. As a result, an error correction model (ECM) is not used in the regressions.

Furthermore, we must analyze whether time series data used in this study include any periods of violent change. Turkey employed the managed floating regime as the exchange rate system in the 1990s. The sample period that was covered in our study includes the violent currency crises in 1994. As a result of Turkey's currency crisis, output fell 6 percent, inflation rose to 3-digit levels, the Turkish Central Bank lost half of its reserves, and the exchange rate (against the US dollar) depreciated by more than half in the first three months following crisis. Hence, it is necessary to address this issue more carefully. There are several methods of testing for the presence of structural breaks in the data. A tool that is particularly useful in this regard is the Chow test, where disturbance term is assumed to be the same in both periods. To perform Chow test, a number of breakpoints, corresponding the periods 1994.q1-1994.q4, are selected. Despite the fact that the sample period had severe currency crisis, the Chow test for all individual time series is not significant for all four periods. Thus, the evidence suggests that splitting the time series into two periods are not appropriate.

Table 1: Results of Engle-Granger Cointegration Test

Country	Total Goods		Final Goods		Intermediate Goods	
	ADF	Critical	ADF	Critical	ADF	Critical
Austria	-2.64	-3.45	-2.80	-3.45	-2.30	-3.45
Belgium	-3.16	-3.45	-2.33	-3.45	-2.73	-3.45
Switzerland	-2.78	-3.45	-2.37	-3.45	-2.77	-3.45
Germany	-2.25	-3.45	-2.74	-3.45	-2.57	-3.45
Spain	-2.75	-3.45	-3.02	-3.45	-3.28	-3.45
France	-2.64	-3.45	-2.59	-3.45	-2.92	-3.45
The UK	-2.21	-3.45	-2.56	-3.45	-1.63	-3.45
Italy	-5.91*	-3.45	-2.77	-3.45	-3.67*	-3.45
Japan	-3.01	-3.45	-3.65*	-3.45	-3.05	-3.45
Netherlands	-2.76	-3.45	-3.00	-3.45	-3.43	-3.45
Sweden	-2.01	-3.45	-2.59	-3.45	-2.86	-3.45
USA	-3.26	-3.45	-2.89	-3.45	-3.05	-3.45

Note: The null hypothesis is no cointegration. The rejection of null hypothesis for ADF test is based on the Mackinnon critical values. * indicates the rejection of the null hypothesis at 1 % significance levels.

For the regressions, following Campa and Goldberg (2002), we use a log linear specification for equation (5):

$$\Delta pm_t = \alpha + \sum_{i=0}^{-4} a_i \Delta e_{t-i} + b_i \Delta c^*_{t-i} + c_i \Delta p_{t-i} + d_i \Delta y^*_{t-i} + \nu_t \qquad (7)$$

Prior to estimation of equation (7) by OLS, all variables are expressed in first differences and four lags of exchange rate series are also included in the estimation to allow import prices to respond to any changes in exchange rate over time.[4] The short-run pass through elasticity is thus given by the estimated coefficient a_i, whereas the long-run elasticities are provided by $\sum_{i=0}^{-4} a_i$. According to the model, the short-run elasticity of ERPT, a_i, is expected to be positive and less than unity. Moreover, the signs of b_i, c_i, and d_i are presumed to be positive.

The data used in this study is formed in three dimensions: one dimension is the partner country of Turkey, another is the industry, and the third is time dimension. The regressions are themselves composed of two parts: cross-country pass-through elasticities and cross-industry pass-through elasticities. For the estimation of the ERPT across countries, the data is aggregated across industries. In other words, the aggregate analysis (country by country) consists of the sum of the individual International Standard Industry Classification (ISIC) industries. As a result, two dimensions (country and time) are used in the estimation of the ERPT across countries. However, for the estimation of the ERPT across industries, the data are averaged across countries. Thus, the regression in this case does have industry and time dimension.[5]

The dependent variable in the regression is the quarterly import unit values at the 3-digit level of ISIC of Turkish manufactured imports from 12 OECD countries. The series constructed for Turkish import unit values for Turkish imports from 12 OECD countries were based on the OECD's International Trade Commodity Statistics (ITCS) database (1988-1996). The data are classified by the Harmonized System (HS) Revision 1. This database provides detailed annual bilateral trade data for commodity exports and imports in quantity and value (in thousands of $US at current prices) between Turkey and its trading partners. There are about 5403 items at the 6-digit level of the HS. For this study the top 12 import partners were chosen. The purpose of this is to minimize the number of missing observations considering the fact that the constructing of the import values at the 6-digit level of HS requires not only import values but

[4] Given the fact that the time series in our sample are quarterly, using four lags of exchange rate in the estimation of the equation (7) is empirically appropriate.

[5] The manufacturing industries used in this study are shown in Table 7 as ISIC (313, 314, 322, 324, 353, 354, 371, and 372) industries were excluded from the estimations for the sake of improving the accuracy of the unit-value data across industries.

quantity information.[6] As seen in Table 2, roughly 75% of Turkey's manufactured imports come from these 12 OECD countries during the sample period.

In order to analyze whether the ERPT differ across final goods and intermediate goods, we should first select intermediate goods in the bilateral trade data. Following Hummels, et al. (1999), we employ the United Nations (UN) Broad Economic Categories classification (BEC) to distinguish intermediate goods from final goods. The BEC includes 19 basic categories, which are listed in Table 6. Categories (41 and 521) are classified as capital goods, categories (112, 122, 51, 522, and 6) are classified as consumption goods, and categories (111, 121, 2, 3, 42, and 53) are classified as intermediate goods. The BEC scheme has a major disadvantage. Some of the categories such as food products (112, 122), fuel goods (321), and capital goods (41, 51) could be consumed directly by consumers, or used as intermediates in the related industry. In this paper, fuel (3), will not be considered as an intermediate good and is omitted from the estimations. The final selection of the intermediate goods thus includes the categories (111, 121, 21, 22, 42, and 53). The final selection of final goods includes the categories (112, 122, 51, 522, and 6).

In order to select the intermediate goods from trade data, we concord from the BEC to Standard International Trade Classification (SITC Rev.3) using a mapping developed by the UN, and then match the SITC to the HS codes using a correspondence table published by the UN.[7] As a result, about 2807 items are selected out of 5403 items from the 6-digit level of HS are considered as intermediate goods and 1036 items are considered as final goods.[8] Once, we selected the intermediate goods and final goods, we obtained the unit value at the 6-digit product level of HS products for each type of goods. Unit values at the 6-digit product level of HS are constructed as the value of imports of the product divided by the quantity imported. To obtain the unit values at industry level, the calculated unit values are weighted by their value-share in the each industry. Industry, in this study, is defined as the 3-digit International Standard Industrial Classification (ISIC Rev.2). There are 28 manufacturing industries at the 3-digit level of aggregation of ISIC Rev. 2. The weights in each of ISIC industries are hence based on Turkey's imports in that industry with the corresponding partner country. Finally, the weighted unit values are summed over all 6-digit HS

[6] These are Austria, Belgium-Luxembourg, France, Germany, Italy, Netherlands, Sweden, Switzerland, the United Kingdom, the United States, Japan, and Spain. Note that Belgium and Luxemburg are treated as a single country due to data availability.

[7] The concordances table from SITC Rev.3 to HS (Rev.1) is acquired from the UN publication: "Standard International Trade Classification Revision 3" Series M, No.34/Rev.3. The BEC table is obtained from the UN publication: "Classification by Broad Economic Categories: defined in terms of SITC Rev.3". Series M, No.53, Rev.3.

[8] The number of intermediates goods and consumption goods used in calculations, however, varies across countries due to missing quantity observations and trade flows. For instance, USA has 719 intermediate goods and 1536 consumption goods while Germany has 157 and 929, respectively.

products comprising a particular industry using a concordance table from HS to ISIC.[9]

Since, the trade data is recorded annually, we have employed the following method to transform the unit value data into quarterly data using foreign country's export price index:

$$MUV_{i,t}^{q} = MUV_{i,t}^{y} \times \left[\frac{XUV_{i,t}^{q}}{\left(\sum_{s=1}^{4} XUV_{i,t}^{q} \right) \Big/ 4} \right] \tag{8}$$

where $MUV_{i,t}^{q}$ refers to quarterly import unit value index for Turkish imports from its trading partners, $MUV_{i,t}^{y}$ refers to annual import index for Turkish imports from its trading partner, XUV_{t}^{q} refers to Turkey's trading partner quarterly export unit value index at aggregate level, and i refers the 3-digit ISIC (Rev.2). Foreign country's export price index at aggregate level is obtained from the International Financial Statistics (IFS) CD-ROM. The data is quarterly and its base year is 1995=100. Once, we obtain the quarterly bilateral unit values at the industry level, we have converted them into Turkish Lira (TL) using the quarterly bilateral exchange rate between Turkey and its trading partner.

The nominal exchange rate is defined in terms of domestic currency (TL) per units of foreign currency. The data is quarterly and obtained from Central Bank of Turkey's web page: www.tcmb.gov.tr. For the estimation of the ERPT across countries, bilateral nominal exchange rates are used. For the estimation of the ERPT across industries, however, we employed nominal effective exchange rate index, which is calculated as a weighted geometric average of the exchange rates, expressed in the form of an index. First, weights are calculated in terms of trade share in Turkey's trade with 12 OECD countries. Then, Turkey's nominal effective exchange rate is calculated as,

$$E_j = \prod_{i=1}^{12} N_i^{w_i} \tag{9}$$

where E_j is Turkey's nominal effective exchange rate , N_i is the bilateral exchange rate between Turkey and its trading partner i, and w_i is the weight of country i in relation to Turkey.

The prices for Turkish substitute goods, p_t, and the foreign exporter's marginal costs, c_t^*, were proxied by the producer price indexes (PPI) and taken from the OECD's "Indicators of Industrial Activity" database. This index is based

[9] The concordances table from HS (Rev.1) to ISIC (Rev. 2) is obtained from World Bank "Trade and Production database" CD-ROM.

on the ISIC (Rev. 2) classification. Data is quarterly and its base year is 1990=100. The demand pressure, y_t^*, was proxied by the foreign industrial production index (IPI), which were obtained from the International Financial Statistics (IFS) CD-ROM.

IV. EMPIRICAL RESULTS

As stated earlier, the pass-through of exchange rate changes into imported final and intermediate goods prices are estimated by OLS for Turkish trade with 12 OECD countries. Our data set covers the period from 1989.q1 to 1996.q4 for 20 Turkish ISIC manufacturing industries at the 3-digit level of aggregation. Before discussing empirical results, we first look at Turkish trade data at both country and industry level. The trade data reveal a couple of important empirical facts. First, as seen in Table 2, the significant portion of Turkey's manufactured trade occurred with 12 OECD countries, about 75 percent. Germany is the country with the largest import share in Turkey's total manufactured goods trade, about 21 percent. Second, Table 2 indicates that Turkey's intermediate goods trade with OECD (9) is consistently lower than Turkey's final goods trade with OECD (9) during the period of 1985-2000. In addition, Turkey's intermediate goods trade share with OECD (9) slightly dropped from 70 percent to 69 percent over the period 1989 to 1996. Hence, the degree of fragmentation has not been increased much over this period despite the fact that other important studies indicate otherwise.

The results of the regressions for Turkey's each trading partner and ISIC industries for each of the product groupings (all imported manufactured goods, imported final goods, and imported intermediate goods) are reported in Table 3 and Table 4, respectively.[10] For the goal of the present study, we will focus only on the short-run and long-run pass-through elasticities for final goods and intermediate goods.

Beginning with the pass-through estimates of the final goods, unweighted average pass-through across countries is 0.89 per cent in the short-run while it is 1.18 per cent in the long-run. The average pass-through elasticity for the intermediate goods is 1.016 in the short-run and 1.019 in the long-run. For the final goods, long-run estimates of the pass-through elasticity generally tend to be higher than their short-run counterparts among statistically significant cases but one instance (Spain). Also, the results show that countries such as Italy and Sweden have relatively higher pass-through elasticities than other countries. Turning now to the intermediate goods, pass-through estimates in the short-run are generally lower than their long-run counterparts. In addition, Italy and Austria have relatively higher pass-through than other countries.

[10] All estimations are performed in SAS 8.2. This study focuses on the estimated value of the short-run and long-run exchange rate pass-through elasticities. Hence, the estimated coefficients for the other explanatory variables will not be reported though the results are in line with the theory.

Turning to our estimates of pass-through for 22 ISIC industries reported in Table 4, we find that average short-run exchange rate pass-through elasticity is 0.72 for final goods and 1.12 for intermediate goods. In the-long-run, we find that average pass-through elasticity is 0.93 for final goods and 1.43 for intermediate goods. First of all, the results indicate that the estimated pass-through elasticities considerably vary across industries. This finding is clearly in line with the results of Knetter (1993). In the short-run, industries belonging to ISIC (311, 331, 361, and 342) have relatively higher pass-through into final goods than other industries. Indeed, pass-through tends to be complete in the short-run for these industries. On the other hand, the pass-through elasticities into final goods in ISIC (369, 382, 383, and 384) industries are relatively lower than other industries. For final goods in the long-run, ISIC (323, 351, 342, and 355) industries show high pass-through elasticities while ISIC (361, 362, 382, 384, and 385) have relatively low pass-through elasticities.

Table 2: The Relative Importance of Individual Countries' Imports in the Turkey's Total Imports from World,1989-1996

All Manufacturing Goods				
	1990	1992	1994	1996
OECD (12)	0.7593	0.7703	0.7327	0.7585
Austria	0.0133	0.0155	0.0115	0.0157
Belgium	0.0305	0.0288	0.0252	0.0290
Switzerland	0.0329	0.0383	0.0256	0.0289
Germany	0.2144	0.2056	0.1885	0.2182
Spain	0.0202	0.0179	0.0208	0.0296
France	0.0727	0.0740	0.0800	0.0770
The UK	0.0607	0.0634	0.0599	0.0679
Italy	0.1061	0.1076	0.1111	0.1225
Japan	0.0691	0.0628	0.0540	0.0411
Netherlands	0.0301	0.0301	0.0291	0.0320
Sweden	0.0129	0.0125	0.0146	0.0184
USA	0.0964	0.1139	0.1124	0.0781
Final Goods				
OECD (12)	0.8171	0.7951	0.7594	0.7607
Austria	0.0055	0.0122	0.0126	0.0088
Belgium	0.0441	0.0277	0.0163	0.0228
Switzerland	0.0295	0.0455	0.0593	0.0439
Germany	0.1269	0.1443	0.1870	0.1607
Spain	0.0132	0.0136	0.0153	0.0194
France	0.1121	0.0679	0.0933	0.1238
The UK	0.0558	0.0669	0.0933	0.0920
Italy	0.0635	0.0868	0.1047	0.1438
Japan	0.0407	0.0423	0.0299	0.0271
Netherlands	0.0334	0.0242	0.0309	0.0352
Sweden	0.0152	0.0090	0.0119	0.0091
USA	0.2772	0.2546	0.1049	0.0742

	Intermediate Goods			
OECD (12)	0.7045	0.7149	0.6557	0.6974
Austria	0.0162	0.0192	0.0124	0.0172
Belgium	0.0335	0.0303	0.0316	0.0331
Switzerland	0.0250	0.0344	0.0205	0.0214
Germany	0.2054	0.1991	0.1801	0.1916
Spain	0.0249	0.0209	0.0239	0.0327
France	0.0720	0.0890	0.0808	0.0733
The UK	0.0643	0.0635	0.0551	0.0646
Italy	0.1022	0.1030	0.0974	0.1111
Japan	0.0420	0.0345	0.0321	0.0250
Netherlands	0.0355	0.0349	0.0336	0.0346
Sweden	0.0127	0.0116	0.0103	0.0117
USA	0.0708	0.0745	0.0775	0.0811

Note: We obtained the total trade at the 6-digit level of HS product level for all products, and thereafter summed over all products compromising a particular industry. The economy-wide measure of total trade for each country is then obtained by aggregation of all ISIC (Rev.2) industries. Individual countries' all manufactures trade is then divided by the Turkey's total trade with world. Total trade is defined as sum of export and import values. The process was repeated for final goods and the intermediate goods.
Source: Author own calculations from OECD's Database ITCS, Harmonized System (HS), Rev.1, 1988-96

For intermediate goods in the short-run, ISIC (384, 331, 385, 381, and 382) show relatively higher pass-through whereas ISIC (356, 390, 361, and 369) demonstrate lower pass-through. For intermediate goods in the long-run, ISIC (331, 384, 381 and 385) have relatively higher pass-through whereas ISIC (356, 390, and 341) show lower pass-through. Also, it is worth noting that contrary to our expectations, the calculated pass-through rates are found to be negative though not significant for some industries, such as ISIC (369,382, and 384) for final goods and ISIC (356 and 390) for intermediate goods.

Table 3: Country-Specific Exchange Rate Pass-Through into Import Prices

Country	Total Goods		Final Goods		Intermediate Goods	
	Short-Run	Long-Run	Short-Run	Long-run	Short-Run	Long-Run
Austria	1.144*	1.197	0.861	1.190	1.545*	1.644*
Belgium	0.985	0.485	0.197	1.177	0.800	0.520
Switzerland	0.847*	1.066*	0.990*	1.457*	1.278*	1.037
Germany	0.948	1.123	0.885	0.680	0.519	0.918
Spain	0.973*	1.195*	1.058*	0.732*	0.905*	1.213*
France	0.752*	0.984*	0.471	0.379	1.059*	1.431*
The UK	0.399	-0.247	1.356*	1.731*	0.454	-0.031
Italy	1.471*	1.303	1.694*	2.352	1.701*	1.732
Japan	0.730*	0.840*	0.860*	1.176*	0.369*	0.883+
Netherlands	1.043*	0.941*	0.712	0.219	1.472*	0.985
Sweden	1.516*	1.717*	1.687*	2.173*	1.083	0.880
USA	0.664*	1.132*	-0.071+	0.906	1.007*	1.022*
Average	0.956	0.978	0.892	1.181	1.016	1.019

Note: */+: Based on the F-tests (P values) at 5 percent level, it can be statistically rejected that the pass-through rate is zero/one.

Three important facts emerge from the cross-country and cross-industry regressions. First, empirical results suggest that the pass-through from the exchange rate to imported final and intermediate goods prices in Turkey is quite rapid. Pass-through across countries or industries is relatively complete after the first year following a change in the nominal exchange. The results confirm findings by Leigh and Rossi (2002) that pass-through from the exchange rate to prices in Turkey is over in about a year, but mostly in the first four months. Leigh and Rossi (2002) claim that the estimated pass-through in Turkey is both shorter and larger than that estimated in other key emerging market countries. In that study, a high level of currency substitution and oligopolistic industrial structure in Turkey are given as possible reasons behind the high level ERPT into Turkey's domestic prices. Due to the persistence high inflation, currency substitution was common in Turkey with prices, contracts, and wages indexed formally or informally to the TL/$ until the early 2000s. As a result, firms rapidly pass through their own prices due to exchange rate changes. In addition, Turkey's oligopolistic wholesalers are able to pass exchange rate changes rapidly on to retailers. This has resulted in a significant increment in exchange rate elasticities in Turkey.

Table 4: Industry-Specific Exchange Rate Pass-Through into Import Prices

Industry	Total Goods		Final Goods		Intermediate Goods	
	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run
311	1.396*	1.556	1.569*	0.918	1.459	2.020
321	1.229*	1.222	0.656	1.010	1.282*	1.361*
323	1.196*	2.105*	0.881*	2.039*	1.267*	1.713
331	2.350	3.711	1.367	1.624	2.271	3.943
332	0.633*	0.604	0.991*	0.811	1.059*	0.942
341	0.548	0.349	0.892*	1.101	0.537	0.255
342	1.011*	1.145	1.169*	1.215*	0.667	0.934
351	1.223*	1.279	0.802*	1.217*	1.221*	1.303
352	0.947*	1.013*	0.712	0.985	0.813*	0.870*
355	1.045	1.281	0.857*	1.166	1.509*	1.569
356	-0.108*+	0.165*	0.670	0.932	-0.647	-0.424
361	0.709	1.017*	1.182*	0.474	0.340	1.134*
362	1.304*	1.118	0.711*	0.310	1.279*	1.057
369	-0.172	1.413	-0.083	1.321	0.363	0.943
381	2.437*	3.465*	0.816	1.095	1.796*	2.698*
382	0.629	0.781	-0.524	-0.618	1.728*	1.528*
383	0.989*	1.012*	0.507	0.717	1.022*	0.779
384	1.245	1.569	-0.118	0.268	2.699	3.848
385	1.713*+	1.937*	0.756*	0.508	1.879*	2.497*
390	0.769	1.108	0.767	1.311	-0.077	-0.185
Average	1.055	1.393	0.729	0.920	1.123	1.439

Note: */+: Based on the F-tests (P values) at 5 percent level, it can be statistically rejected that the pass-through rate is zero/one.

Second, PCP is more relevant for Turkey than LCP for the two product groupings: final goods and intermediate goods. Following Campa and Goldberg (2002), we explore whether PCP or LCP is relevant for Turkey. Recall that PCP refers to a null hypothesis of zero pass-through while LCP refers to a null hypothesis of pass-through of unity (complete pass-through). Table 5 summarizes the tests results across countries and industries for all three different product groupings. Beginning with final goods, we reject zero pass-through (LCP) for 6 countries out of 12 countries in the short-run while 5 out of 12 in the long-run. In the short-run, pass-through elasticities into final goods are significantly different from one for 1 out of 12 countries. In the long-run, we fail to reject complete pass-through hypothesis for all countries. Turning now to the intermediate goods in the short-run, pass-through elasticities are significantly different from zero in 8 out of 12 countries while we fail to reject complete pass-through hypothesis for all countries. In the long-run, pass-through elasticities into intermediate goods are significantly different from zero in 4 out of 12 countries while we fail to reject complete pass-through hypothesis in 1 out of 12 countries.

The short-run and long-run elasticities for the two product groupings suggest that PCP (complete pass-through) is more relevant for Turkey though it is still rejected for two countries. Only for USA and Japan's pass-through into Turkey we do find evidence that long-run pass-through might be less than one. Athukorala and Menon (1994) found that incomplete pass-through is better characterization in Japanese exports. In that sense, the result is consistent with Athukorala and Menon's (1994) finding. Knetter (1989) found that country-specific adjustment export prices in conjunction with exchange rate fluctuations is much more pronounced in the German export industries than in the USA. Given the fact that USA's pass-through into Turkey is incomplete for final goods, the results here are in contrast with Knetter's (1989) findings.

As evident in Table 5, for final goods, a zero short-run pass-through can be rejected for the half of the ISIC industries (10 out of 20) whereas a zero long-run pass-through can be rejected in 3 industries out of 20 industries. For intermediate goods, a zero short-run pass-through can be rejected for 11 industries out of 20 industries while a zero long-run pass-through could be rejected in 6 industries out of 20 industries. In the short-run and long-run, a null hypothesis of complete pass-through (PCP) could not be rejected for any of the ISIC industries included in the estimations for both product groupings. Likewise across countries, the evidence indicates that complete pass-through across industries is more relevant for both final goods and intermediate goods.

Third, as seen in Table 3 and 4, pass-through rates to intermediate goods are much higher than to final goods. A possible explanation behind this result may be based on the heavy reliance on imported intermediates across all Turkish manufacturing industries in domestic production. According to World Trade Production Database, about 21 per cent of used intermediates in the Turkish manufacturing industry is imported. Turkish final goods producers can buy the intermediate goods either from their own domestic producers or through

importing. The Turkish inputs market is not well developed to satisfy the increased demand coming from its own final goods producers. Like many developing countries, Turkey has employed protectionist trade policies to encourage its domestic industry until the 1980s. Developing countries typically began by protecting final stages of industry, such as food processing and automobile assembly. Once the possibilities for replacing consumer goods imports had been exhausted, these countries turned to protection of intermediate goods, such as automobile parts, steel, and petrochemicals. As a result of these trade policies, final goods industries were relatively well developed while the intermediate industries were not. With the shortage of competitive pressure from the Turkish input producers, foreign inputs producers would, thus, not need to adjust their price in the Turkish inputs market to protect their market shares. In other words, the PTM incentives for foreign intermediate goods producers less pronounced. By contrast, the foreign final goods exporters are much more willing to undertake price adjustments in response to a depreciation of the TL to protect their market shares given the fact that the final goods market are relatively well established in Turkey. As a consequence, the short-run pass-through rates in final goods for Turkey are expected to be less than one. As seen in the Table 4, the estimates of the ERPT support our intuition. This result is clearly in line with the findings of Campa and Minguez (2002).

Table 5: Rejection of LCP or PCP for Import Prices

	Total Goods		Final Goods		Intermediate Goods	
	Country	Industry	Country	Industry	Country	Industry
Short-Run Reject=0	9	12	6	10	8	11
Reject=1		2	1			
Average Elasticity	0.956	1.055	0.892	0.729	1.016	1.123
Long-Run Reject=0	7	7	5	3	4	6
Reject=1					1	
Average Elasticity	0.978	1.393	1.181	0.920	1.019	1.439

Note: Total number of countries and ISIC industries used in the estimations is 12 and 20, respectively. Entries in table show number of countries and industries for which hypothesis is rejected. LCP refers to a null hypothesis of zero pass-through (Reject=0) while PCP refers to a complete pass-through (Reject=1).

We now explore whether there is a relationship between the higher rate of pass-through in intermediate goods in some industries and the percentage of imported intermediate goods utilized by an ISIC industry. As noted earlier, a higher percentage of imported intermediate goods utilized by an ISIC industry is

supposed to indicate a higher pass-through elasticities in that industry. The results in Table 5 show only weak support of this prediction.

Finally, it is worth noting that the degree of variation in pass-through estimates across industries is relatively higher than across countries for both product groupings. These results suggest that exchange rate pass-through estimates for countries are more stable than the exchange rate pass-through for ISIC industries. This finding contradicts the recent findings of Campa and Goldberg (2002) where they found that pass-through rates for disaggregated import prices are more stable than the ERPT for aggregated import prices.

V. CONCLUDING REMARKS

This study has focused on the pass-through of exchange rate changes into both aggregated and disaggregated imported final and intermediate good prices of Turkey. Following Campa and Goldberg (2002), short-run and long-run pass-through rates are estimated using quarterly data from 1989 to 1996 for imported final and intermediate goods prices of Turkey's trade with 12 OECD countries. We have used a three-dimensional panel of very disaggregated (6-digit HS level) import unit values from Turkey's top 12 trade partners for the period of 1989.q1 to 1996q4. Our econometric results lead to the following conclusions. First, empirically, Turkey's import pass-through is quite rapid especially in intermediate goods. For final goods, unweighted average pass-through across countries is 0.89 per cent in the short-run while it is 1.18 per cent in the long-run. The average pass-through elasticity for the intermediate goods is 1.016 in the short-run and 1.019 in the long-run. Second, there is a considerable degree of variation in pass-through across countries. Third, PCP is more relevant for Turkey than LCP for the two product groupings: final goods and intermediate goods. The short-run and long-run pass-through into aggregated import prices at aggregated level for the two product groupings suggest that PCP is more relevant for Turkey though it is still rejected for two countries. Fourth, intermediate goods have relatively higher pass-through rates in the short-run than final goods.

Turning to our estimates of pass-through for 22 ISIC industries, we find that average short-run exchange rate pass-through elasticity is 0.72 and 1.12, for final goods and for intermediate goods, respectively while average long-run exchange rate pass-through elasticity is 0.92 and 1.43. First of all, the results indicate that the estimated pass-through elasticities considerably vary across industries. Second, pass-through rates to intermediate goods are much higher than those for final goods. Third, the evidence indicates that PCP is more relevant for both final goods and intermediate goods.

The findings in this paper suggest a number of policy implications. Estimates of exchange rate elasticities are very high for Turkey, indicating more or less full pass-through of exchange rate changes into inflation. Campa and Goldberg (2002) proved that there is a strong relationship between volatile inflation and the degree of the for the OECD countries. It is, therefore, necessary for Turkey to reduce inflation volatility using tight monetary policies.

Furthermore, structural reforms such as in Turkish wholesale industries could make it difficult for foreign firms to pass on the price increases resulting from currency depreciation. As a result, these reforms may reduce the negative impacts of external factors on Turkish economy as a whole.

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APPENDIX

Table 6: Broad Economic Categories Classification Scheme (BEC,1986)

Commodity Categories	End-Use Classes
1. Food categories	
11. Primary	
111. Mainly for industry	Intermediate goods
112. Mainly for household consumption	Consumption goods
12. Processed	
121. Mainly for industry	Intermediate goods
122. Mainly for household consumption	Consumption goods
2. Industrial supplies not elsewhere specified	
21. Primary	Intermediate goods
22. Processed	Intermediate goods
3. Fuels and lubricants	
31. Primary	Intermediate goods
32. Processed	Intermediate goods
321. Motor Spirit	Intermediate and consumption goods
322. Other	Intermediate goods
4. Capital goods (except transport equipment), and parts and accessories thereof	
41. Capital goods (except transport equipment)	Capital goods
42. Parts and accessories	Intermediate goods
5. Transport equipment and parts and accessories thereof	
51. Passenger motor cars	Intermediate and consumption goods
52. Other	
521. Industrial	Capital goods
522. Non-industrial	Consumption goods
53. Parts and accessories	Intermediate goods
6. Consumer goods not elsewhere specified	
61. Durable	Consumption goods
62. Semi-durable	Consumption goods
63 Non-durable	Consumption goods
7. Goods not elsewhere specified	

Source: the United Nations

Table 7: International Standard Industrial Classification (ISIC, Revision 2)

Code	Industry
311	Manufacture of food products
313	Manufacture of beverages
314	Manufacture of tobacco
321	Manufacture of textiles
322	Manufacture of wearing apparel, except footwear
323	Manufacture of leather products
324	Manufacture of footwear, except rubber or plastic
331	Manufacture of wood products, except furniture
332	Manufacture of furniture, except metal
341	Manufacture of paper and products
342	Manufacture of printing and publishing
351	Manufacture of industrial chemicals
352	Manufacture of other chemicals
353	Manufacture of petroleum refineries
354	Manufacture of miscellaneous petroleum and coal products
355	Manufacture of rubber products
356	Manufacture of plastic products
361	Manufacture of pottery, china, earthenware
362	Manufacture of glass and products
369	Manufacture of other non-metallic mineral products
371	Manufacture of iron and steel
372	Manufacture of non-ferrous metals
381	Manufacture of fabricated metal products
382	Manufacture of machinery, except electrical
383	Manufacture of machinery, electric
384	Manufacture of transport equipment
385	Manufacture of professional and scientific equipment
390	Manufacture of other manufactured products