Bilateral Trade Elasticities of Turkey

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Abstract This paper investigates the long-run bilateral trade elasticities of Turkey and its major trading countries. In the long run, Turkish bilateral trade is inelastic (with varying sign). Thus, the devaluation or revaluation of the Turkish Lira should be expected to have only a limited impact on Turkey's trade balance. On the other hand, Turkish trade is income elastic in the long run but income inelastic in the short run. Nevertheless, the Marshall-Lerner condition is satisfied only for Canada, South Korea and the US. Furthermore, switching to the euro has reduced Turkish imports from the EU members and emerging market crises tend to increase Turkish imports.

Keywords: Bilateral income elasticity, bilateral price elasticity, Marshall-Lerner condition, cointegration

JEL Classification: F11, F14

1. Introduction

In 2005, the industrial sector in Turkey constituted 29%, agriculture constituted only 11% and services constituted 60% of aggregate production. The annual growth rates in the industrial sector were generally closer to aggregate growth rates. In 2004, the industrial sector grew 9.4% (where the aggregate growth rate was 8.9%), but in 2005, it decreased to 6.6% (where the aggregate growth rate was 7.4%). Agriculture grew only 5.7% and services grew 10.2% in the same year. On the other hand, 90% of imports were industrial and agricultural goods and only 10% were services. The trade balance gave a deficit of \$43.3 billion in 2005 and rose to \$62.8 billion in 2007. Therefore, the trade behaviour becomes a major concern in countries with high deficits. Measuring the determinants of trade provide useful information on shaping trade policy.

Trade elasticities have major macro-economic policy implications for any country. The major determinants of international trade are the gross domestic product (GDP) of a country, the foreign GDP, the price of export and import, the foreign price and the exchange rate. Since shifts in the trade balances are regarded widely as a function of changes in exchange rates, the relationship between trade and these determinants are examined by a robust model of the export and import demand functions (Haynes et al. 1996).

This study differs from earlier work by including real trade values and real exchange rates. This reduces the possibility of bias caused by omitting a potentially relevant variable from the estimation. This study also differs from earlier work by examining trade elasticities on a bilateral basis (including Turkey's major trading partners, such as Canada, China, France, Germany, Italy, Japan, South Korea, the Netherlands, Russia, Spain, Switzerland, the UK, and the US), rather than aggregated trade and price data. This eliminates many of the problems associated with defining and using aggregate variables. Additionally, following Togan and Berument (2007), the prices of exports and imports are used in calculating the real import and export functions, alongside the real exchange rates. Five different cointegration techniques are used in order to offset the disadvantages of each technique and maintain robust results. Furthermore, the implication of trade function allows for testing whether the ML condition holds for bilateral trade in Turkey in the long run.

The empirical findings of this paper support the findings of Neyapti et al. (2007). In the long run, exports are sensitive to the real exchange rate only in Canada and the US. On the other hand, imports are sensitive to the real exchange rate only in Korea. Furthermore, foreign demand is sensitive to exports and domestic demand is sensitive to imports. However, in the short run, only imports from Russia are sensitive to the real exchange rate. Nevertheless, we found no evidence that trade is income elastic in the short run.
Finally, the study is structured as follows, section 2 gives the literature review, section 3 outlines the major historical developments in Turkish trade for the selected period. Secion 4 gives the theoretical framework, section 5 explains the methodology section 6 gives the unit root and cointegration test results. In section 7, data and the empirical findings are explained. Finally, section 8 makes the conclusion.

2. Literature Review

A number of studies have followed the traditional approach and have estimated import and export demand elasticities to determine whether the Marshall-Lerner (ML thereafter) condition holds. See for example Kreinin (1967), Houthakker and Magee (1969), Khan (1974, 1975), Goldstein and Khan (1976, 1978), Wilson and Takacs (1979), Haynes and Stone (1983), Warner and Krein (1983), and Bahmani-Oskooee (1986). The ML condition states that as long as the sum of price elasticity of export and import demand functions exceed unity, devaluation will improve the trade balance. Additionally, there have been studies on estimating trade elasticities for developing countries. Bahmani-Oskooee and Niroomand (1998) tested long run price elasticities and Marshall-Lerner condition for thirty developed and developing countries. Lal and Lowinger (2002) confirmed the existence of both short-run and long-run relationships between nominal exchange rate and trade balances for South Asia countries.

One of the criticisms of these studies has been the use of aggregate trade data. The problem, so-called "aggregation bias," is that a significant price elasticity with one trading partner could be more than offset by an insignificant elasticity (see Bahmani-Oskooee and Goswami, 2004). Therefore, this opens a new research area for the study of trade elasticities on a bilateral basis.

Some studies include bilateral trade between selected developed countries and different regions such as that of Marquez (1990). There have been studies on the bilateral trade between the US and one or more of its trading partners, for example, Cushman (1990), Haynes et al. (1996), Bahmani-Oskooee and Brooks (1999), and Nadenichek (2000). However, there also have been studies on the bilateral trade of one country other than the US; for example, studies of bilateral trade in Canada by Bahmani-Oskooee et al. (2005), or bilateral trade in Sweden by Hatemi-J and

Irandoust (2005), Irandaust et al. (2006) and of the bilateral trade of manufacturing goods in Japan by Harriigan and Vanjani (2003). Nevertheless, even fewer studies have been conducted for the analysis of bilateral trade in developing countries, beside the studies by Wang and Ji (2006) for bilateral trade in China and Liu et al. (2007) for bilateral trade in Hong Kong. This study aims to fill this gap and study bilateral trade elasticity between Turkey and its major trading partners.

There have been studies on the trade elasticity of merchandise imports and exports for the Turkish economy. The relation between Turkey's export and exchange rate is controversial. For example, Neyapti et al. (2007) examined the effects of the Customs Union Agreement between Turkey and the EU on the behaviour of Turkey's export and import demands. In other studies, Celasun and Rodrik (1989) found little support for establishing a relationship between export and exchange rate policy, where Arslan and Wijnbergen (1993) found a positive relationship between exports and domestic depreciation of the currency. Nevertheless, there are studies showing that the Marshall–Lerner condition holds as the absolute values of estimated price elasticities for the import and export of goods add up to more than unity (Simsek and Kadilar, 2004; Togan and Berument, 2007).

For the income elasticity of merchandise exports, Aydin et al. (2004) found a positive relation between elastic income in the long run and inelastic income in the short run. Özkale and Karaman (2006) showed that Turkey's import demand is income elastic and price inelastic. However, Özkale et al. (2006) found inelastic income elasticity for the period after the establishment of the Customs Union between Turkey and the EU (for the period between 1996 and 2004), with a negative sign for the income elasticity coefficient. Simsek and Kadilar (2004) found that there is a long-run relationship between the export or import of goods and price and income. Aydin et al (2004) and another recent study by Togan and Berument (2007) found elastic foreign demand for the export of goods with a positive sign.

3. Overview of the Turkish Trade

1980 was a turning point in Turkey's economy and foreign trade policies. Prior to 1980, the main feature of the Turkish trade policy had been the inward-oriented development strategy, so-called "import substitution" industrialization. Towards the end of the 1970s, Turkey had been faced with the problem of high trade and a current account deficit. The heavy balance of payment inequilibria together with slow growth rates and high inflation rates forced the government to take measures.

Parallel to the deteriorating conditions in the world economy after the oil crisis, some problems began to appear necessitating tight measures. On January 1980, a package of economic stability measures known as the January 24 Decisions was adopted to restore the deteriorated macroeconomic balances. It was supported by multilateral organizations, including the IMF, the World Bank, and by the bilateral creditors, the major OECD countries. The main aims of the programme were the establishment of a free market economy and integration with the world economy. With this program, Turkey abandoned the import substitution policy and adopted export promotion as an industrialization strategy base. Other important objectives were to realize financial liberalization, take measures towards improving capital markets and in the long term, liberalize foreign capital movements. A further objective was a reduction in the inflation rate.

During this period, bureaucratic obstacles to trade were eliminated to a great extent. For example, Decree No. 30, regarding the protection of the Turkish lira's value, did not allow the inflow of foreign exchange. With the January 24 Decisions, the lira was devaluated by 49% against the US dollar, which limited domestic demand with the aim of accelerating exports. During the 1980s, the fixed exchange rate policy was abandoned and a flexible exchange rate policy was adopted. Exports were encouraged with several incentive instruments.

In 1987, Turkish Eximbank was established to increase the international competitiveness of Turkish companies and to support Turkey's export-led strategy. Following these developments, the total export volume increased dramatically. While exports earnings were USD 2.3 billion in 1979, they increased to USD 12.9 billion in 1990. Moreover, the composition of exports changed. While industrial goods constituted 36% of total exports in 1980, their share rose to 80% in 1990.

The decade of the 1990s had dynamics quite different from those of the previous period. The global economic conditions had changed and problems such as economic stagnation were experienced in the world economy, the Gulf War, and chronic problems like high inflation rates, budget deficits, and rising debt stock deteriorated Turkey's economy. The macroeconomic instabilities accelerated the foreign currency demand and were compounded by a widened current account deficit led to a severe crisis in the financial sector in the first quarter of 1994. To cope with the crises a stability package known as the April 5 Decisions was adopted. These changing global conditions reduced the increasing rate of Turkey's exports. The Turkish lira depreciated by 135% against the dollar in the first nine months of 1994. By the end of 1994, wholesale inflation reached 121% on average, the interest rates of government securities rose to 190% and the GNP declined by 26% in USD terms. The current account gave surplus while capital outflow amounted to USD 4 billion.

Turkey became a member of the World Trade Organization in 1995 and the Customs Union with the European Union was completed in 1996, eliminating all types of trade restrictions for industrial goods. The EU and Turkey enjoy a deep trade relationship. Indeed, the EU ranks by far as number one in both Turkey's imports and exports while Turkey ranks 7th in the EU's top import and 5th in export markets. Nevertheless, the impact of the customs union agreement goes beyond exports and imports. The approximation of law includes the introduction of not only the competition policy, but also the other policies supporting the protection of industrial, intellectual and property rights for promoting trade between Turkey and the EU.

In the second half of 1997, an economic crisis in the South East Asian economies had spillover effects to the rest of the world economy. This had negative effects, especially on emerging markets such as Turkey. Nevertheless, the Russian crisis in 1998 had greater impact on the Turkish economy, since Russia was one of the main partners in Turkish foreign trade. Turkey's economy deteriorated, its export increase rate declined and growth rate decreased. In 1998, the economy grew by only 2.7%.

The Turkish economy has witnessed a boom and bust cycle in the last decade. The "home grown" economic crisis of 2001, which had devastating repercussions for the economy, was followed by a prolonged period of growth and stability (Akyuz, 2009). Following the economic crisis in 2001, Turkey's exports recorded a 12.8% increase and reached USD 31.3 billion. Strong pace of growth in exports continued in 2002 and 2003 respectively by 14.1% and 31%. In 2003, total exports reached USD 47.3 billion and Turkey became the 24th largest economy among the leading exporting economies. The main reasons behind this strong export growth in 2003 were the continuous expansion of the production though weak domestic demand, a decrease in real labor costs, rising productivity, improving finance opportunities, higher prices of export goods and positive development in euro/dollar parity.

The honeymoon, unfortunately, did not last long. It appears that the Turkish economy is headed toward another period of slow growth; this time, as a result of the global financial crisis ignited by the mortgage crisis in the US (Akyuz, 2009). For the past few years, the leading motif of the Turkish economy has been recovery, restructuring, privatization and preparation for ascension to the European Union. Today, though privatization and the EU remain key, economic expansion and business development are now salient.

4. Theoretical Framework

The effect of income and the real exchange rate on international trade is well recognized in the literature. To examine to what extent movements in the balance of trade of services are explained by change in relative prices, income and exchange rate we employ an imperfect substitute model (Goldstein and Khan, 1985) for the export and import demand function, where we assume that foreign and domestic products are imperfect substitutes.

$$X_{it} = \mathrm{f}(P_{xt}, P_{it}^*, Y_{it}^*) \tag{1}$$

Where t denotes the time period of estimation, X_{it} is the value of the export of goods to ith country, P_x is the export price in New Turkish Lira (domestic GDP deflator is taken as a proxy), P_i^* denotes the foreign price deflator (GDP deflator is used as a proxy) in New Turkish Lira, and Y_i^* is foreign real GDP. If we divide the right-hand side of the equation (1) by foreign prices P_{it}^*, due to the linearity of demand functions the export demand is not going to change (Goldstein and Khan, 1985). Therefore the logarithmic form of the export demand function is as follows:

$$\ln \mathrm{RX}_{\mathrm{it}} = \alpha_0 + \alpha_1 \ln q_{it} + \alpha_2 \ln Y_{it}^* + D1 + D2 + D3 + \varepsilon_{\mathrm{t}} \tag{2}$$

Error! Bookmark not defined.where $\ln \mathrm{RX}_{\mathrm{it}}$ is the natural log of real export value calculated by export from the ith country deflated by price of exports. $\ln q_{it}$ is the natural log of real exchange rate calculated by $\ln(P_{it}^* e/P_t)$, where P_{it}^* is foreign price, e is nominal exchange rate and P_t is domestic price level and $\ln Y_{it}^*$ is the natural log of the foreign real income. D1 is the dummy variable associated with switching to euro for euro zone countries, D2 is the dummy variable associated with the Asian and Russian crises and D3 is the dummy variable associated with the financial crises in Turkey.[2] Finally ε_{t} is the error term.

We expect a coefficient of relative price (real exchange rate) α_1 in equation 2 to be positively related to export because an increase in the real exchange rate, a depreciation of the Turkish Lira (TL) promotes Turkish competitiveness and thus its exports. It is difficult to define the sign of income elasticity α_2 as it can have a different sign. From one side increase in the foreign income can raise demand for Turkish exports. However, if foreign goods are highly competitive with Turkish exports foreign income in this case can have negative effect on the export volume from Turkey.

The standard form of the import demand function can be expressed by the following equation:

$$M_{it} = \mathrm{f}(P_{mt}, P_t, Y_t) \tag{3}$$

Where M_{it} is the value of import from the ith country, P_{mit} denotes the import price of the traded goods in New Turkish Lira (foreign GDP deflator is taken as a proxy), P_t denotes a domestic price deflator (domestic GDP deflator is used as a proxy) and Y_t is domestic real GDP. Following the analysis made in export demand function extraction we can divide the right-hand side of equation (3) by domestic prices P_t. As a result, the estimated import demand function is as follows:

$$\mathrm{lnRM}_{\mathrm{it}} = \beta_0 + \beta_1 \ln q_{it} + \beta_2 \ln Y_t + D1 + D2 + D3 + \upsilon_{\mathrm{t}} \tag{4}$$

where $\mathrm{lnRM}_{\mathrm{it}}$ is the natural log of real import quantity deflated by the price of imports and $\ln q_{it}$ is the natural log of the real exchange rate. β_1 is expected to have a negative sign because real depreciation is expected to reduce Turkish imports. $\ln Y_t$ is the natural log of the domestic real income. If the income elasticity of β_2 is positive, this implies that Turkish income leads to an increase in Turkish imports. D1, D2 and D3 are dummy variables explained in export demand function. Finally υ_t is the error term.

We assume that the relative import prices coefficients β_1 will be negatively related to the import quantity as according to the demand theory an increase in the import price will reduce the import demand while an increase in domestic prices will raise demand for import. However, income coefficient β_2 can have a positive as well as negative effect on import demand. If there are no any alternatives for imported goods in the domestic production, income will have a positive effect on the import volume. However, the opposite effect was also found in some studies. Thus Sinha (2001) found that income has a negative effect on import demand in India and Sri Lanka. Therefore, there is no certain expected sign for income elasticity.

5. Methodology

Several of the variables used for testing trade elasticities were non-stationary, making the use of standard econometric procedure such as ordinary least squares inappropriate. Therefore, cointegration analysis will be used for testing long-run relationship in export and import demand functions. It is common in the literature to use various cointegration techniques to offset the disadvantages of each technique (see, for example, Chinn, 2005; Narayan and Narayan, 2005; Makin and Narayan, 2008; Uz and Ketenci, 2008)

For estimating a long-run (cointegrating) relationship between the variables, five different methods were considered. These are the ordinary least squares (OLS), the fully-modified OLS (FMOLS) estimator by Pedroni (2000), the dynamic OLS (DOLS) estimator by Kao and Chiang

(2000), the autoregressive-distributed lag (ARDL), and Johansen's (1988) multivariate maximum-likelihood procedure (JOH-ML) and additionally the vector error correction (VEC) framework that studies the short-run behaviour of trade demand functions. Each method has different advantages and disadvantages. So, the aim is to minimise the drawbacks as the number of techniques is increased.

Kao and Chen (1995) demonstrated that the OLS estimator is asymptotically normal, but at the same time it is asymptotically biased. They proposed to correct bias in the OLS; however, results showed that this correction did not performed well in small samples. The problem facing the standard OLS regression applied to a non-stationary time series is that there may give rise to misleading results and erroneous inferences, which is called the "spurious regression" problem (Irandoust et al., 2006, p.171). The FMOLS estimator takes into account the presence of a constant term and the possible correlation between the error term and the first differences of the regressors. However, it does not produce better results than the OLS test. Kao and Chiang (2000) show that both the OLS and the FMOLS estimators exhibit small-sample bias and that the DOLS estimator appears to outperform both estimators. In order to obtain an unbiased estimator of the long-run parameters the DOLS estimator uses parametric adjustment to the errors by augmenting the static regression with the leads, lags, and contemporaneous values of the regressors in first differences.

Long-run parameters may be estimated consistently using the traditional autoregressive-distributed lag (ARDL) approach. In the ARDL, we decided the appropriate autoregressive order by using the Akaike Information Criterion (AIC) and the Schwarz criterion (SC).[3] The problem with the JOH-ML technique is that this method depends on the asymptotic theory and therefore requires large number of observations. Equations 2 and 4 are used for these different techniques both in the cointegration test and long-run cointegration coefficients.

The deviation from long-run equilibrium corrected in real export and real import is tested for real exchange rate and income. A vector error correction model is applied to Johansen's approach.

$$\Delta\omega_t = \sum_{j=1}^{k-1}\Gamma_j \Delta\omega_{t-j} + \Pi\omega_{t-k} + u_t \tag{5}$$

where ω_t is (nx1) vector, Γ_j and Π are (nxn) matrices of parameters representing short-term and long-run impacts, respectively. $\Pi = \alpha\beta'$, where α reflects the speed of adjustment toward equilibrium, while β is a matrix of long-run coefficients.

The short-run relationship in the export and import demand function is analysed by the vector error correction model. For export demand function, the equation becomes as follows:

$$\begin{aligned}
\Delta \ln \mathrm{RX}_t &= \mu_1 + \sum_{i=1}^{p}\delta_{1i}\Delta\ln \mathrm{RX}_{t-i} + \sum_{i=1}^{p}\gamma_{1i}\Delta\ln q_{t-i} + \sum_{i=1}^{p}\kappa_{1i}\Delta\ln Y^*_{t-i} + \lambda_1\,\Omega + \omega_{1t}\\
\Delta\ln\ln q_t &= \mu_2 + \sum_{i=1}^{p}\delta_{2i}\Delta\ln \mathrm{RX}_{t-i} + \sum_{i=1}^{p}\gamma_{2i}\Delta\ln q_{t-i} + \sum_{i=1}^{p}\kappa_{2i}\Delta\ln Y^*_{t-i} + \lambda_2\,\Omega + \omega_{2t}\\
\Delta\ln Y^*_t &= \mu_3 + \sum_{i=1}^{p}\delta_{3i}\Delta\ln \mathrm{RX}_{t-i} + \sum_{i=1}^{p}\gamma_{3i}\Delta\ln q_{t-i} + \sum_{i=1}^{p}\kappa_{3i}\Delta\ln Y^*_{t-i} + \lambda_3\,\Omega + \omega_{3t}
\end{aligned} \tag{6}$$

where, Ω is the equilibrium relations that $\Omega = (\ln RX_{t-1} - \ln q_{t-1} - \ln Y^{*}_{t-1})$, λ_1, λ_2 and λ_3 reflect the speed of adjustment toward the equilibrium.

For the import demand function, the equation becomes;

$$\Delta \ln RM_t = \chi_1 + \sum_{i=1}^{p} \phi_{1i} \Delta \ln RM_{t-i} + \sum_{i=1}^{p} \xi_{1i} \Delta \ln q_{t-i} + \sum_{i=1}^{p} \theta_{1i} \Delta \ln Y_{t-i} + \eta_1 \Lambda + \omega_{1t}$$

$$\Delta \ln q_t = \chi_2 + \sum_{i=1}^{p} \phi_{2i} \Delta \ln RM_{t-i} + \sum_{i=1}^{p} \xi_{2i} \Delta \ln q_{t-i} + \sum_{i=1}^{p} \theta_{2i} \Delta \ln Y_{t-i} + \eta_2 \Lambda + \omega_{1t}$$

$$\Delta \ln Y_t = \chi_3 + \sum_{i=1}^{p} \phi_{3i} \Delta \ln RM_{t-i} + \sum_{i=1}^{p} \xi_{3i} \Delta \ln q_{t-i} + \sum_{i=1}^{p} \theta_{3i} \Delta \ln Y_{t-i} + \eta_3 \Lambda + \omega_{1t} \quad (7)$$

where, Λ is the equilibrium relations that $\Lambda = (\ln RM_{t-1} - \ln q_{t-1} - \ln Y_{t-1})$, η_1, η_2 and η_3 reflect the speed of adjustment toward the equilibrium.

6. Unit Root and Cointegration Tests

First we need to investigate the integration properties of the variables necessary for the estimation of the export and import demand models. The variables investigated for the unit root are real export, real import, real exchange rate and real GDP for Turkey's major trading partners, Canada, China, France, Germany, Italy, Japan, Korea, the Netherlands, Russia, Spain, Switzerland, the UK, and the US.

The most controversial issue in selecting variables for cointegration is the identification of the values with unit root. A cointegration test is employed using variables with unit root. Therefore, in order to the test integration properties of variables we used the Dickey and Fuller (1979), the Augmented Dickey-Fuller (ADF) test, Phillips-Perron (1988) test (PP), and the Kwiatkowski, Phillips, Schmidt, and Shin's (1992) KPSS test. The ADF test constructs a parametric correction for higher-order correlation. The lag length for the ADF tests was selected to ensure that the residuals are white noise. Testing for the integration properties of variables the Phillips-Perron test proposes a nonparametric method of controlling for serial correlation. This method estimates the non-augmented Dickey-Fuller test. The main difference of the KPSS test from the other tests described above is that the series are assumed to be stationary (no unit root) under the null hypothesis, while the null hypothesis of the tests described above assume the non-stationarity of series.

Tests for the individual time series are presented in the appendix whereas the empirical results for their first differences are not presented here due to out of space consideration.[4] Every test includes the results of estimations with constant or with constant and trend together. Stationarity columns (S) show the level of integration of series, where *I*(0) denotes the stationarity of a variable or absence of the unit root, and *I*(1) indicates the non-stationarity of a variable or existence of the unit root. The unit root test results provide evidence to assume that all variables other than real exports to China and Korea, real imports from Canada and real exchange rate for Japan represent a non-stationary process (unit root) when they are in levels. So, we exclude stationary variables in our cointegration analysis.

The next step is to identify whether there is a cointegration relationship between the real trade values and their determinants such as real exchange rate and income. Five different techniques are used to establish whether the dependent and independent variables in each model are cointegrated. The null of no cointegration is tested for these techniques. For the DOLS, two lags and leads are used. In the JOH-ML estimates, one important thing is the selection of lag order. We focus mainly on the selection criteria that are commonly used in the literature, the Schwarz criterion (SC).[5] We used a maximum lag order of five.

Table 1 shows the cointegration test results for the export demand function. The estimation results provide enough evidence to assume that the dependent and independent variables in the export demand function in all countries other than Japan and Russia are cointegrated. Therefore, long run and short-run coefficients are not reported for Japan and Russia. Table 1 also shows the cointegration test results for the import demand function. For the Netherlands and the US, only two out of five techniques give statistically significant results. So, there is enough evidence to assume that the dependent and the independent variables are cointegrated for countries other than the Netherlands and the US.

7. Empirical Findings

This section tries to estimate the long run and short-run coefficients of trade models between Turkey and its main trading partners. First presented are the long-run exchange rate elasticities and the income elasticities for both export and import demand functions, respectively. Then, the short-run relations are reported to see whether these variables behave differently.

Results of the long-run real exchange rate elasticities for the trade functions are reported in Table 2. These results confirm the controversies of different sign and magnitudes in the literature. In general, the real exchange rate coefficients in the export demand function are slightly greater that the coefficients in the import demand function, which is similar to the results of Neyapti et al. (2001). Table 2 shows that the real exchange rates are statistically significant in all counties other than Italy and Spain. Nevertheless, the exports are price inelastic for all countries other than Canada and the US. The bilateral price elasticities are of the expected sign for countries other than France, Spain, Switzerland, and the UK. Least square estimations and the JOH-ML mostly give opposite signs.[6] Table 2 also shows that the real exchange rates statistically significant for countries other than Italy and Switzerland. The import is price elastic only in Korea. There are expected sign only in China, France, Russia and Switzerland. Finally, it can be concluded that the ML condition is satisfied only for Canada, Korea and the US.

Table 3 shows the long-run income elasticities for export and import demand functions, respectively. The results confirm Aydin et al. (2004), Simsek and Kadilar (2004) and Togan and Berument (2007) with positive sign for both trade demand functions, which is also consistent with the trade demand theories. All income elasticities in both export and import demand functions are statistically significant and elastic. Findings in this study shows that the income elasticities of both exports and imports are much greater than one. Additionally, the income elasticities of Turkish exports exceed that of imports, which is similar to the findings of Hatemi-J and Irandaust (2005). The study allows including six countries (France, Germany, Italy, the Netherlands, Spain, Switzerland and the UK) where both export and import estimates are carried out for the same country. All these countries other than Switzerland gave higher income elasticities of exports than of imports. This shows that Turkish exports are more sensitive to foreign demand; therefore, Turkey is more likely to be responsive to the economic growth in foreign countries.

The long-run relationship between Turkish trade and its determinants allows us to test whether dummies have a significant role in Turkish trade.[7] The effect of switching to the euro is found statistically significant in France and Italy (with positive sign) and the Netherlands and Germany (with negative sign) for the export demand function. Additionally, it is also found statistically significant (with negative sign) in Germany, Italy and Spain for the import demand function. In general, switching to the euro has significant but negative effect on Turkish trade. The Asian and the Russian crises are found statistically significant in Canada for the export demand function and significant in Germany, Japan, Russia, Spain and the UK for the import demand function. Finally, the financial crisis of 2000-2001 is statistically significant only in Spain for the export demand function and significant in Russia, Spain, Switzerland and the UK for import the demand function. Generally, the effects of dummies are greater for the import demand function than for the export demand function.[8]

The error correction coefficients λ and η show the short-run behaviours of the trade variables to long-run disequilibrium. The error correction coefficients are λ_1 and η_1 for exports and imports in equations 6 and 7, respectively. They are both negative and significant statistically in all countries other than Canada, suggesting that both imports and exports respond to disequilibria in the long-run relationship, but with exports adjusting to disequilibria faster than imports. The error correction coefficients λ_2 and η_2 show how the relative exchange rates correct long-run disequilibrium. They are significant for countries other than France, Germany, the Netherlands and the UK for the export demand and they are significant in France, Russia, Spain and the UK for import demand function. Income elasticities, unlike long-run relationship, have no effect in the adjustment of the long-run disequilibrium.

8. Conclusion

The results of the price elasticities show that, in the long run, prices are significant determinants of trade. However, export demand is price elastic only in the US and Canada. It is inelastic for European countries. The import demand is price elastic only in Korea. This shows the important role of the US dollar in Turkish trade, even though more than 50% of trade is between Turkey and European countries. Also, geographical distance is not considered an important factor in shaping the price elasticity of trade demand.

On the other hand, income is an important determinant of Turkish trade in the long run. The bilateral income elasticities are much higher than the bilateral price elasticities (real exchange rate elasticities). Both Turkish exports and imports are income elastic. Furthermore, Turkish exports are more sensitive to the foreign demand, thus more responsive to foreign economic growth.

Finally, this study shows that switching to the euro has affected the Turkish trade with euro zone countries. This effect is negative for the import demand function. Together with the analysis of the price elasticity of Turkish trade being more sensitive to dollars, it is important to mention the effect of devaluation of the US dollars against the euro and its effect on Turkish trade. The economic crises in developing countries are also important determinants for Turkish imports. Emerging market crises, whether domestic or foreign, tend to increase Turkish imports, especially from EU countries. One possible explanation is that during the period of crises, speculations affect the future expectations negatively, so this might increase the demand for imports.

Nevertheless, this study tests the classical trade demand models for the long run. There are also other important variables that are excluded from these models. For example, the effect of customs union between Turkey and the European Union or the other characteristics of Turkish trade. One plays a role of outsourcing, where the important share of imports is Turkish exports. These might be included in further studies of Turkish trade on a bilateral basis.

Endnotes

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2. See the appendix for further details of the dummy variables.

3. We followed the traditional method and used the AIC and SC to determine the appropriate autoregressive lag order in cointegration tests (to see whether the residuals are stationary).

4. All variables were found stationary at their first differences.

5. Lütkepohl (1985) shows that the criterion preferred in small samples is the SC, hence, this is the test used here.

6. One explanation is related to the common criticism of the Johansen's technique related to the number of observations. According to some studies, like that by Toda (1995), less than 100 observations can lead to misleading results. In this study, the JOH-ML is carried out for not less than 100 observations, except for Russia and Switzerland. However, this might still be an insufficient number of observations for determining the cointegration relations among the trade demand variables.

7. Dummies are not reported for saving space but available upon request.

8. Further interpretation of dummies together with the estimation results will be made in the conclusion.

9. Three currencies, the Korean Won, the Chinese yuan and the Russian ruble, are calculated from cross rates (via US dollars).

References

Akyuz, A. 2009. "Political Economy of Turkey: İn Search of Stability Amid Domestic and Global Crises," *Center on the United States and Europe at Brookings,* US-Europe Analysis Series; March.

Arslan, I. and S. Van Wijnbergen. 1993. "Export Incentives, Exchange Rate Policy and Export Growth in Turkey," *Review of Economics and Statistics*, 75, 128-133.

Aydın, M. F., U. Cıplak, and M. E. Yücel. 2004. "Export Supply and Import Demand Models for the Turkish Economy," *The Central Bank of the Republic of Turkey Research Department Working Paper,* 04/09.

Bahmani-Oskooee M. 1986. "Determinants of International Trade Flows, The Case of Developing Countries," *Journal of Development Economics*, 20, 107-123.

Bahmani-Oskooee M and T. J. Brooks. 1999. "Bilateral J-Curve between US and Her Trading Partners," *Weltwirtschaftliches Archives*, 135, 156-165.

Bahmani-Oskooee M and G. G. Goswami. 2004. "Exchange Rate Sensitivity of Japan's Bilateral Trade Flows," *Japan and the World Economy,* 16, 1-15.

Bahmani-Oskooee M, G. G. Goswami, and B. K. Talukdar. 2005. "Exchange Rate Sensitivity of the Canadian Bilateral Inpayments and Outpayments," *Economic Modelling*, 22, 745-757.

Bahmani-Oskooee M. and F.Niroomand. 1998. "Long-Run Price Elasticities and the Marshall-Lerner Condition Revisited," *Economics Letters*, 61, 101-109.

Celasun, M. and D. Rodrik. 1988. "Some Policy Dilemmas in Turkish Macroeconomic Management," *Kedendy School of Government Discussion Paper* 173D, Harward University.

Chinn, M. D. 2005. "Supply Capacity, Vertical Specialization and Tariff Rates: The Implications for Aggregate US Trade Flow Equations," National Bureau of Economic Research. *NBER Working Paper No W11719*, October.

Cushman, D. O. 1990. "US Bilateral Trade Equations, Forecasts and Structural Stability," *Applied Economics*, 22, 1093-1102.

Goldstein, M. and M. Khan. 1976. "Large Versus Small Price Changes and the Demand For Imports," *IMF Staff Papers*, 23, 200-225.

Goldstein M. and M. Khan. 1978. "The Supply and Demand for Exports: A Simultaneous Approach," *Review of Economics and Statistics*, 60, 275-286.

Harrigan, J. and R. Vanjani. 2003. "Is Japan's Trade (Still) Different?" *Journal of the Japanese and International Economies*, 17, 507-519.

Hatemi-J, A. and M. Irandoust. 2005. “Bilateral Trade Elasticities, Sweden versus Her Trade Partners,” *American Review of Political Economy*, 3, 38-50.

Haynes, S. E, M. M. Hutchison, and R. F. Mikesell. 1996. “US-Japanese Bilateral Trade and the Yen-Dollar Exchange Rate: An Empirical Analysis,” *Southern Economic Journal*, 52, 923-932.

Haynes, S. E. and J. A. Stone. 1983. “Secular and Cyclical Responses of the US Trade to Income: An Evaluation of Traditional Models,” *Review of Economics and Statistics*, 65, 87-95.

Houthakker, H. S. and S. Magee. 1969. “Income and Price Elasticities in the World Trade,” *Review of Economics and Statistics*, 51, 111-125.

Irandoust, M., K. Ekblad, and J. Parmler. 2006. “Bilateral Trade Flows and Exchange Rate Sensitivity: Evidence from Likelihood Based Panel Cointegration,” *Economic Systems*, 30, 170-183.

Johansen, S. 1988. “Statistical Analysis of Cointegration Vectors,” *Journal of Economic Dynamics and Control*, 12, 231-54.

Kao, C. and B. Chen. 1995. “On the Estimation and Inference of a Cointegrated Regression in Panel Data When the Cross-Section and Time-Series dDmensions are Comparable in Magnitude,” *Working paper*, Department of Economics, Syracuse University.

Kao, C. and M. Chiang. 2000. “On The Estimation and Inference of a Cointegrated Regression in Panel Data, Nonstationary Panels, Panel Cointegration, and Dynamic Panels,” In *Advances in Econometrics*, ed. B. Baltagi, Elsevier, Amsterdam; New York and Tokyo 179–222.

Khan, M. S. 1974. “Import and Export Demand in Developing Countries,” *IMF Staff Papers*, 21, 678-693.

Khan, M. S. 1975. “The Structure and Behaviour of Imports of Venezuela,” *Review of Economics and Statistics*, 57, 221-224.

Kreinin, M. E. 1967. “Spurious Regression and Residual-Based Tests for Cointegration in Panel Data,” *Journal of Econometric*, 90, 510-516.

Lal, A. K. and T. C. Lowinger. 2002. “Nominal Effective Exchange Rate and Trade Balance Adjustment in South Asia Countries,” *Journal of Asian* Economics, 13, 371-383.

Liu, L., K. Fan, and J. Shek. 2007. “Hong Kong’s Trade Patterns and Trade Elasticities,” *Hong Kong Monetary Authority Quarterly Bulletin*, March, 21-31.

Lütkepohl, H. 1985. “Comparison of Criteria for Estimating the Order of a Vector Autoregressive Process,” *Journal of Time Series Analysis*, 6, 35-52.

MacKinnon, J. 1991. “Critical Values for Co-integration Tests,” In *Long-Run Economic Relationships,* eds. R.F. Engle and C.W.J. Granger Oxford University press, 267-76.

Makin, A. J. and P. K. Narayan. 2008. "Have US External Imbalances been Determined at Home or Abroad?" *Economic Modelling*, 25, 520-531.

Marquez, J. 1990. "Bilateral Trade Elasticities," *The Review of Economics and Statistics* February, 70-77.

Nadenichek, J. 2000. "The Japan-US Trade Imbalance: A Real Business Cycle Perspective," *Japan and the World Economy*, 12, 255-271.

Narayan, P. K. and S. Narayan. 2005. "Estimationg income and price elasticities of imports for Fiji in a cointegration framework," *Economic Modelling*, 22, no.3, 423-438.

Neyapti, B., F. Taskin, and M. Ungor. 2007. "Has European Customs Union Agreement really affected Turkey's trade?" *Applied Economics*, 39, 2121-2132.

Pedroni, P. 2000. "Fully-modified OLS for heterogeneous cointegrated panels," In *Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Advances in Econometrics,* Ed. B. Baltagi, Elsevier Science, Amsterdam; New York and Tokyo, 93–130.

Simsek, M. and C. Kadilar. 2004. "The Cointegration Analysis of Turkey's Import Demand Function with Bounds Test, 1970-2002," (in Turkish) *Dogus University Journal*, 5, 27-34.

Özkale, L. and F. N. Karaman. 2006. "Static Effects of the EU-Turkey Customs Union," (in Turkish) *International Economics and Foreign Trade Policies*. Undersecretariat of the Prime Ministry for Foreign Trade.

Togan, S. and H. Berument. 2007. "The Turkish Current Account, Real Exchange Rate and Sustainability, a Methodological Framework," *The Journal of International Trade and Diplomacy*, 1, 155-192.

Uz, İ. And N. Ketenci. 2008. "Panel Analysis of the Monetary Approach to Exchange Rates: Evidence from Ten EU Members and Turkey," *Emerging Markets Review*, 9, 57-69

Wang, J. and A. G. Ji. 2006. "Exchange Rate Sensitivity of China's Bilateral Trade Flows," *BOFIT Discussion Papers* 19.

Warner, D. and M. E. Kreinin. 1983. "Determinants of International Trade Flows," *Review of Economics and Statistics*, 65, 96-104.

Wilson, J. F. and W. E. Takacs. 1979. "Differential Responses to Price and Exchange Rate Influences in The Foreign Trade of Selected Industrial Countries," *Review of Economics and statistics*, 61, 267-279.

Appendix

The time period for Switzerland is 1983Q1-2007Q4, for Russia 1990Q1-2007Q4 and for all other countries 1982Q2-2007Q4. *RX* is Turkish real exports to country *i*, where nominal export values are deflated from the Turkish export price index (2003=100) obtained from the Turkish Statistical Institute (TURKSTAT). *RM* is Turkish real imports from country *i*, where nominal export values are deflated from the Turkish import price index (2003=100) obtained from TURKSTAT. *Y* is the real GDP in country *i* in dollars, at fixed purchasing power parity based on OECD reference year and seasonally adjusted. Data for GDP in Russia is obtained from Goskomstat and the period 1991-95 is calculated from annual growth rates obtained from the United Nations.

q is the real bilateral exchange rate between Turkey and country *i*. The variable is defined as $(P_{it}^{*}e/P_t)$, where P^* is country *i*'s Consumer price index (CPI) (2000=100) is obtained from the OECD for all countries other than China where it is obtained from the National Bureau of Statistics of China. *e* is the nominal bilateral exchange rate defined as the number of Turkish lira (TL) per number of country *i*'s currency, obtained from the Central Bank of Turkey and *P* is the Turkish CPI.[9]

The first dummy (D1) is associated with switching to the euro for euro zone countries, where national currency is included in the analysis for the bilateral exchange rate for the period between 1982Q1-2002Q2 and the euro included for 2002Q3-2007Q4. Therefore D1 is zero for the period of national currency and 1 for the euro. Second dummy (D2) is associated with Asian and Russian crises and designed in the following way: 1 for 1997Q2-1998:Q3 and 0 otherwise. D3 is associated with financial crises in Turkey and designed in the following way: 1 for 2000Q4-2001Q2 and 0 otherwise.

Unit Root Test Results

	REAL EXPORTS						REAL IMPORTS					
	ADF(a)		PP(a)		KPSS(b)		ADF(a)		PP(a)		KPSS(b)	
	C	c,t	c	c,t	c	c,t	c	c,t	c	C,t	c	c,t
Canada	-2.44	-1.919	-1.93	-5.50	1.15	0.11	-3.57	-6.77	-4.18	-6.72	0.96	0.10
S	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)
China	-3.48	-4.537	-3.35	-4.71	0.69	0.08	-2.10	-4.26	-2.23	-4.02	1.18	0.14
S	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
UK	-0.69	-5.908	-0.89	-6.08	1.25	0.17	-1.39	-4.51	-1.59	-4.65	1.21	0.24
S	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)
France	-1.14	-3.062	-1.07	-6.55	1.12	0.11	-1.33	-2.54	-1.84	-4.56	1.18	0.25
S	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
Germany	-3.83	-2.64	-3.20	-4.03	1.22	0.27	-1.55	-2.94	-1.58	-4.25	1.20	0.24
S	I(0)	I(1)	I(0)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
Italy	-0.49	-1.83	-1.77	-5.81	1.20	0.17	-2.13	-2.28	-1.42	-3.89	1.21	0.27
S	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
Japan	-2.96	-1.85	-4.46	-5.66	0.55	0.20	-1.66	-3.65	-2.61	-6.15	1.13	0.19
S	I(0)	I(1)	I(0)	I(0)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)
Korea	-5.46	-6.77	-5.39	-7.14	0.77	0.22	-1.98	-2.52	-2.45	-2.30	1.15	0.27
S	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Netherlands	-0.75	-4.82	-1.69	-7.37	1.24	0.14	-2.21	-1.34	-1.73	-2.69	1.17	0.30
S	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Russia	-1.09	-3.93	-1.30	-3.98	1.12	0.13	-0.83	-4.08	-1.72	-8.59	1.25	0.16
S	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)
Spain	-0.96	-2.89	-0.89	-8.41	1.24	0.11	-1.15	-4.54	-1.51	-4.58	1.23	0.08
S	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
Switzerland	-1.68	-2.91	-4.45	-6.10	0.76	0.23	-0.16	-5.53	-0.97	-5.71	1.18	0.09
S	I(1)	I(1)	I(0)	I(0)	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
USA	-2.60	-2.22	-1.92	-6.67	1.19	0.13	-1.70	-2.85	-2.11	-4.52	1.11	0.28
S	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
	REAL EXCHANGE RATE						INCOME					
Canada	-1.80	-4.01	-2.452	-4.082	0.61	0.20	-0.113	-2.40	0.28	-2.188	1.20	0.14
S	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
China	-0.872	-2.54	-0.825	-2.69	1.00	0.14	0.95	-1.587	-6.382	-16.52	1.23	0.08
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(0)	I(0)	I(1)	I(0)
UK	-2.042	-3.461	-2.713	-3.026	0.36	0.24	0.25	-2.70	0.6944	-3.039	1.21	0.09
S	I(1)	I(0)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
France	-1.367	-2.10	-1.443	-2.068	0.42	0.24	-0.679	-2.576	-0.10	-2.251	1.21	0.08
S	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
Germany	-2.33	-2.76	-2.37	-2.908	0.72	0.07	-0.478	-1.265	-0.488	-1.546	1.20	0.23
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Italy	-0.82	-1.99	-0.80	-2.00	0.72	0.21	-1.16	-1.19	-1.26	-1.22	1.18	0.22
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Japan	-9.43	-9.45	-9.50	-9.51	0.32	0.27	-3.30	-1.06	-2.51	-1.18	1.14	0.29
S	I(0)	I(0)	I(0)	I(0)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)
Korea	-1.70	-3.39	-2.23	-3.00	0.52	0.22	-2.29	-1.03	-2.15	-0.72	1.21	0.30
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Netherlands	-1.85	-2.47	-1.92	-2.63	0.67	0.11	1.11	-3.52	1.06	-3.52	1.22	0.12
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
Russia	-2.71	-2.58	-2.76	-2.11	0.56	0.20	-0.68	-2.32	-2.22	-2.11	0.41	0.28
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)
Spain	-0.74	-1.74	-0.76	-1.75	0.58	0.26	0.45	-2.58	1.39	-2.25	1.21	0.12
S	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
Switzerland	-2.13	-2.10	-2.13	-2.09	0.22	0.21	0.41	-1.82	0.45	-1.83	1.19	0.12
S	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
USA	-1.76	-2.59	-1.92	-2.43	0.24	0.15	-0.91	-2.63	-0.07	-2.68	1.22	0.08
S	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)
Turkey	-	-	-	-	-	-	-0.80	-3.86	-1.01	-3.77	1.20	0.18
S							I(1)	I(0)	I(1)	I(0)	I(1)	I(1)

c- intercept includes constant and ct- constant with trend. (a) Null of non-stationarity (unit root), (b) Null of stationarity. Integration: The level of integration I(0) - stationary series (no unit root), I(1) nonstationary series (unit root). Decisions are based on 5 percent critical values used from MacKinnon (1996) one-sided p-values.

Table 1. Cointegration test Results

	OLS	FM-OLS	DOLS	ARDLS	JOH
Export Demand Function					
Canada	-0.43 *	-0.64 ***	-0.57 **	-1.33 ***	51.75 ***
France	-0.55 **	-0.54 **	-0.91 ***	-1.09 ***	70.62 ***
Germany	-0.49 ***	-0.45 ***	-0.45 ***	-1.24 ***	51.22 ***
Italy	-0.32	-0.31	-0.64 ***	-0.99 ***	38.98 ***
Japan	-0.19	-0.19	-0.28	-1.09 ***	17.75 **
Netherlands	-0.60 ***	-0.69 ***	-0.72 **	-1.01 ***	59.66 ***
Russia	-0.36	-0.37	-0.37	-0.81	39.06 ***
Spain	-1.06 ***	-1.00 ***	-1.30 ***	-0.97 ***	60.10 ***
Switzerland	-0.80 ***	-0.67 ***	-0.79 ***	-0.82 ***	26.96 ***
UK	-0.69 ***	-0.78 ***	-0.80 ***	-0.96 ***	56.61 ***
US	-0.48	-1.01 ***	-0.61 *	-1.15 ***	58.27 ***
Import Demand Function					
China	-0.31 *	-0.31	-0.30 *	-0.86 ***	23.93
France	-0.50 ***	-0.57 ***	-0.57 ***	-0.56 ***	32.04 **
Germany	-0.56 ***	-0.63 ***	-0.63 ***	-0.59 ***	28.02 *
Italy	-0.44 **	-0.46 **	-0.55 **	-0.99 ***	24.16
Japan	-0.49 **	-0.49 **	-0.46 *	-1.01 ***	18.29 **
Korea	-0.18 *	-0.07	-0.20	-1.48 ***	29.52 *
Netherlands	-0.42 *	-0.42	-0.34	-0.89 ***	25.39
Russia	-0.84 ***	0.05	-0.72 ***	-0.95 ***	51.62 ***
Spain	-0.31 **	-0.26 *	-0.35 **	-1.15 ***	17.40
Switzerland	-0.34 **	-0.04	-0.33	-1.01 ***	27.26 *
UK	-0.38 *	-0.49 **	-0.37	-0.99 ***	21.54
US	-0.24	-0.26	-0.21	-1.20 ***	28.56 *

*, **, *** indicate significance at 10, 5 and 1percent levels, respectively;

[a] OLS, FM-OLS, DOLS and ARDL tests of H_0: No cointegration, significance based on MacKinnon (1991)

[b] Trace statistics are given for Johansen one-sided upper-tail test of H_0: No cointegration.

Table 2. Long-run Exchange Rate Elasticities

	OLS		FM-OLS		DOLS		ARDLS		JOH-ML	
Export Demand Function										
Canada	1.27	***	1.54	***	1.95	***	0.10		-2.54	***
France	-0.18	***	-0.45	***	-0.24	***	-0.02		0.21	***
Germany	0.45	***	0.54	***	0.65	***	0.14	**	-0.60	***
Italy	0.11	*	-0.01		0.17		0.02		-0.33	
Netherlands	0.43	***	0.59	***	0.78	***	0.08		-0.70	***
Spain	-0.04		-0.23	***	-0.03		-0.02		0.04	
Switzerland	-0.51	***	-0.33	**	-0.41	**	0.03		0.25	
UK	-0.23	*	0.02		-0.54	***	-0.12		0.72	***
US	0.96	***	1.39	***	1.13	***	0.72	***	-1.06	***
Import Demand Function										
China	-0.83	**	-0.77	**	-0.88	*	-1.08	***	1.12	
France	-0.19	**	-0.47	***	-0.34	***	-0.12		0.43	***
Germany	0.27	***	0.36	***	0.22	*	0.14		-0.46	**
Italy	0.07	*	-0.03		0.11		-0.02		-0.15	
Korea	1.18	***	1.46	***	1.61	***	-0.56	***	-0.83	
Russia	-0.03	**	-0.02	**	-0.06	***	-0.03	***	0.05	***
Spain	0.13	***	0.01		0.28	***	0.04		-0.34	*
Switzerland	-0.10		0.06		-0.02		0.18		0.01	
UK	0.27	**	0.45	***	0.38	**	0.08		-1.73	***

*, **, *** indicate significance at 10, 5 and 1 percent levels, respectively.

Table 3. Long-run Income Elasticities

	OLS		FM-OLS		DOLS		ARDLS		JOH-ML	
Export Demand Function										
Canada	5.45	***	5.48	***	5.83	***	3.88	***	-6.23	***
France	5.45	***	4.60	***	5.11	***	5.58	***	-5.28	***
Germany	4.14	***	4.11	***	4.08	***	3.62	***	-3.91	***
Italy	4.24	***	4.21	***	4.21	***	6.54	***	-3.68	***
Netherlands	3.77	***	3.73	***	3.57	***	3.16	***	-3.55	***
Spain	6.41	***	5.58	***	6.41	***	6.24	***	-6.36	***
Switzerland	2.42	***	2.44	***	2.40	***	3.44	***	-2.59	***
UK	5.06	***	5.07	***	5.01	***	5.06	***	-4.89	***
US	4.27	***	4.23	***	4.36	***	3.88	***	-4.11	***
Import Demand Function										
	OLS		FM-OLS		DOLS		ARDLS		JOH-ML	
China	6.15	***	6.18	***	6.14	***	4.40	***	-5.32	***
France	3.51	***	3.11	***	3.50	***	3.41	***	-3.50	***
Germany	2.76	***	2.72	***	2.84	***	2.77	***	-2.78	***
Italy	3.10	***	3.11	***	3.20	***	2.61	***	-3.12	***
Japan	1.97	***	1.95	***	1.98	***	1.88	***	-1.87	***
Korea	6.05	***	6.10	***	6.27	***	3.36	***	-4.91	***
Russia	4.56	***	4.27	***	4.49	***	4.57	***	-4.57	***
Spain	3.19	***	2.84	***	3.31	***	3.17	***	-3.19	***
Switzerland	3.02	***	3.01	***	3.08	***	3.30	***	-3.26	***
UK	2.52	***	2.53	***	2.59	***	2.50	***	-2.84	***

*, **, *** indicate significance at 10, 5 and 1 percent levels, respectively.

Table 4. Vector Error Correction Coefficients.

Export Demand Function							Import Demand Function						
	λ_1		λ_2		λ_3			η_1		η_2		η_3	
Canada	-0.04		0.04	***	0.00	***	China	-0.28	***	-0.01		0.00	
France	-0.54	***	0.13		0.01	**	France	-0.40	***	-0.14	*	0.02	*
Germany	-0.46	***	-0.08		0.00		Germany	-0.42	***	0.07		0.01	
Italy	-0.27	**	0.69	***	0.01	***	Italy	-0.37	***	0.05		0.01	
Netherlands	-1.36	***	-0.11		0.01		Japan	-0.56	***	-		-0.02	*
Spain	-0.93	***	-0.81	*	0.01		Korea	-0.18	***	0.01		0.00	
Switzerland	-1.02	***	-0.36	***	0.01		Russia	-0.47	***	-1.28	**	0.04	**
UK	-0.77	***	-0.06		0.00		Spain	-0.22	***	0.24	*	0.00	
US	-0.92	***	0.26	***	-0.01		Switzerland	-0.33	***	-0.03		0.02	**
							UK	-0.23	***	0.11	***	-0.01	

*, **, *** indicate significance at 10, 5 and 1 percent levels, respectively.
In export demand function all countries are in lag 1 except Canada in lag 2. In import demand function all countries are in lag 1 except Japan and the UK, they are both in lag 2.