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# Explaining and Testing Structural Break of Relative Trade of Turkey with European Union Countries

*Mustafa Akal**

***Abstract:*** This study explains and tests structural break of Turkey's relative trade with the European Union countries for the period of 1982-2007. As a result, the data indicated the evidence of structural break and alternating elasticities' signs in estimations based upon error component model. After (Before) Turkey being the member of the ECU a percentage increase in all the relative foreign income, Turkish TOT, real exchange simultaneously and a unit increase in trend is found improving (decreasing) the relative trade about 0.135 (0.78) percentage in total. However, the dynamic fixed effect model did not validate the evidence of structural break. This implies individual differences matter in relative trade not to face structural break.

***Keywords:*** relative trade, elasticity, Turkey and EU, panel data, testing structural break

***JEL Classification:*** F1, F13, O24, C23, F41, C51

## Introduction

This study explains relative trade of Turkey with the 14 EU countries for period of 1982-2007, prior to the period of Turkey's being a member of the ECU and after, and it aims to predict whether structural break exists or not between two periods by employing an error component and a dynamic fixed effect model in the estimated relative income and price elasticities of the relative trade during the period[1]. Based on the importance of foreign exchange rate, relative trade prices, relative Turkish terms of trades (TOT), relative output models are developed to explain bilateral relative trade of Turkey with European countries.

After Turkey being a member of the ECU, tariffs and levies on especially industrial products imports were eliminated between Turkey and EU member countries. After then, Turkey's comparative advantages in bilateral trade with the EU countries was started to be determined mainly by domestic conditions such as

* Mustafa Akal is at Sakarya University, Faculty of Economic and Administrative Sciences, Economics Department, Esentepe Kampusu, Adapazari, Turkey.

production cost, exchange rate, inflation, investment and partially economic policies. Determination of the bilateral trade advantages were hidden and restricted by import duties and other restrictions on imports before Turkey's membership to the ECU, January 1, 1996. After then, Turkey reduced tariff rates on imports from out of EU member countries under the obligations of the European Union's common external tariff. These changes are considered that Turkey's external trade become more EU oriented and cause changes in the magnitudes and the signs of parameters in determining comparative trade advantages of Turkey's bilateral trade with respect to EU countries.

The earlier studies by Khan (1974), Murray and Ginman (1976), Goldstein and Khan (1978), Haynes and Stone (1983), and Arize (1987), etc., all assumed both income and relative prices are effective on both export and import among countries. They all assumed exported and imported goods are substitutes in modeling. Their approach is called 'the traditional approach' in the literature. Tansel and Togan (1987) followed a similar approach for Turkey. However, a general relative trade model has not been found in the literature in regardless to Turkey's trade with European Union countries up to this study.

Marquez (1990:76) points out the role of bilateral trade elasticities in designing trade policies and predicting how the direction of international trade responds to changes in income and relative prices. Bahmani-Oskooee and Brooks (1999) consider the impact of the magnitudes of bilateral export and import elasticities in pulling out trade partners out of recessions or contributing economic development of trade partners. Montenegro (1999) emphasized that the higher export demand income elasticity means more powerful exports growth effect as an engine of growth for exporting country.

Bahmani-Oskooee and Brooks (1999:120-124) employed incomes of US trade partners in export demand model for American goods, and the US income in import demand model of America for the goods of the American's trade partners, and they employed real exchange rate in both the US export and import bilateral trade models, in which choosing bilateral data avoids aggregation bias in estimations. Bahmani-Oskooee and Brooks' (1999:124) findings associate with theoretical expectations in all bilateral country cases, and they estimated income elasticity of US import demand ranging between 2.32-4.67 and income elasticity of US export demand ranging between 0.06-2.02 across trade partners. Their conclusion is that having relatively lower income elasticity of US export than the income elasticity of US import suggests that the impact of US economy on pulling other economies out of a recession is larger than the impact of economy of a US trade partners on pulling US economy out of recession. However, none of these studies consider relative trade but separate export and impor models. In relative trade model, estimating relative income elasticity above unity implies larger contribution of EU member countries to the

export and thus the economic growth of Turkey than Turkey's contribution to the EU member countries' economies. Weinhold and Rauch (1997:15) found the evidence of openness accelerating industrial output growth.

Karaman and Ozkale (2009) found Turkish income elasticities equal 3.62 and 4.48 and real exchange rate elasticities equal -0.003 and 0.019 for import demands for the EU goods and non European Union countries respectively by utilizing random effect model in aggregation. Ozatay (2000) sets up Turkish export as a function of foreign income and real exchange rate. He estimated a significantly inelastic real exchange rate but insignificant foreign income elasticity effect on foreign export demand for Turkish export. Tansel and Togan (1987, p. 532) found the best export demand price elasticity equals -2.53, and that of foreign income 2.18 in simultaneity of the general export demand and supply equilibrium. They estimated the best import price elasticity equals –0.56 and income price elasticity about 1.65. They also estimated the export demand and the import structural equations in disequilibria. They estimated the export demand relative price elasticity about –0.93, and the export demand income elasticity about 1.51. The import demand relative price elasticity was estimated as –0.47, and the income elasticity was estimated as 1.42 over the period of 1960-1983, largely for the import substitution period. Khan (1974, pp. 687-689) found the general export price and the income elasticities as –1.41 and 1.619 respectively in equilibrium, and –0.743 and 0.056 in disequilibria. He found the Turkish import price and income elasticities equal –2.175 and 0.554 respectively in equilibrium, and –2.293 and 0.501 in disequilibria over the period of 1951-1969. These elasticities are constants based on the log linear equations and separate export and import models. There is no relative trade model studied in literature for Turkey to compara with our study.

Dielman (1983:111) points out that the importance of pooled data is that they obtain the information to deal with both intertemporal dynamics and the individuality of the entities being investigated. Hsiao (2003:3) considers greater capacity for capturing the complexity of human behavior, reductions in multicollinearity among explanatory variables and increases efficiency and degree of freedom of econometric estimates as advantages of panel data compared to a single cross-section or a time series data. Madsen (1998:624) argues that trade among OECD countries outcomes depending on economies of specialization rather than comparative advantages. Similar arguments can be considered more strongly in trade among EU member countries.

In our case, since panel OLS estimates indicated the first order autoregressive error structure with contemporaneous correlation among cross sections for each EU member country Parks method (1967) is employed in model estimation which has advantageous of transforming data within time associating with Madsen's argument (1998:624) that within time transformation of data all exports, imports, incomes and

trade unit prices are jointly determined across OECD (or EU member) countries under the integration of world market, similar scale economies and cyclical movements, similar composition of manufacturing and quality improvements of export and import goods across OECD countries not to have measurement errors. In addition, having autocorrelation problem leads us to apply a dynamic part in fixed effect model regarding to whether individual country differences matters in relative trade of Turkey with the 14 EU member countries.

## Model Structure and Variables

Two models are estimated to induce the effects of the relative foreign income, Turkish TOT, relative price and real exchange rate and trend as percentage based on the theoretical statements, reality of the economy of Turkey and model specification criterions.

Since the panel OLS estimates showed the first order autoregressive error structure with contemporaneous correlation among cross sections, Parks method (1967) is followed for consistent and asymptotically efficient errors covariance matrixes and unbiased regressors estimations of the models for panel data. The estimated model by employing Parks method is presented as

$$\text{Ln}\,(X/M)_{it} \quad {}_1 + \ {}_2\text{Ln}\,(Y_f/Y_d)_{it} + \ {}_3\text{Ln}\,(TOT)_{it} + \ {}_4\text{Ln}\,(REXC)_{it} + \ {}_5\text{TREND}_i + u_{it}$$

where $i \quad 1,.....,N, t \quad 1,.....,T$ and $u_{it}$ specifies random error structure, which depends on the particular model. The total number of observations equals $M \quad N \quad T$, which accounts the 14 EU member countries for the periods of 1982-1995, 1996-2007 and 1982-2007. Parks (1967:502-503) points out that the estimation with the error disturbances exhibiting both contemporaneous and serial correlation requires more general error covariance specification matrix of error disturbances for estimating more efficient regressors than Zellner (1962)'s estimations. Hence, Parks (1967: 500) presents the errors structure as $u_{it} \quad {}_i u_{i,t\ 1}, i \quad 1,....,14, t \quad 2,....,26$ in which the random errors are heteroschesdastic

$$E(u_{it}^2) \quad {}_{ii}$$

and contemporaneously correlated

$$E(u_{it}u_{jt}) \quad {}_{ij}$$

and

$$E(\ _{i\,t}\ )\quad 0, E(u_{i,\,t-1}\ ,\ _{j\,t}\ )\quad 0, E(\ _{i\,t}\ ,\ _{j\,t}\ )\quad\ _{ij}\ , E(\ _{i\,t}\ ,\ _{js}\ )\quad 0(s\quad j),$$

$$E(u_{i\,0}\ )\quad 0, E(u_{i\,0}, u_{j\,0}\ )\quad\ _{ij}\quad \frac{\ _{ij}}{(1\quad\ _{i}\ _{j})}$$

The Parks method assumes a first-order autoregressive error structure with contemporaneous correlation between cross sections and deals with both cross section heteroschedasticy and autocorrelation problems for consistent, efficient and unbiased estimations. In addition, Parks method implicitly assumes the unobservable country (cross section) and time series heterogeneities to be random. Parks (1967) firstly estimates the covariance matrix for the vector of random errors 'u' by using OLS residuals, then obtains a consistent estimator of the first-order autoregressive parameter for each cross section ( $_{i}$), and then removes autoregressive characteristic of the data by taking usual weighted differences of variables over time and estimates consistent error covariance matrix, which also overcomes measurement problems within time transformation as mentioned by Madsen (1998:624) above. Finally $_{i}$s is estimated by generalized least squares (EGLS).

A dynamic cross section fixed effect model can be estimated to have an idea about the significances of countries' unobservable and heterogeneous effects. By assuming the unobservable and heterogeneities fixed on each country a cross section dynamic fixed effect model is run by taking lag values of relative trade variable out of autocorrelation. In the dynamic fixed effect model different constant terms ( $_{i1}$) is assumed for each bilateral trade partner of Turkey. The fixed effect model with dynamic part can be presented as

$$\begin{aligned}\text{Ln}\,(X/M)_{i\,t}\quad\ _{i1} + \ _{2}\text{Ln}\,(Y_f/Y_d)_{i\,t} + \ _{3}\text{Ln}\,(P_X/P_f)_{i\,t} + \ _{4}\text{Ln}\,(P_M/P_d)_{i\,t} + \ _{5}\text{Ln}\,(REXC)_{i\,t}\\ + \ _{6}\text{TREND}_i + \ _{7}\text{Ln}\,(X/M)_{i,\,t-1} + \ _{i\,t}\end{aligned}$$

where $i\ \ 1,.....,N, t\ \ 1,.....,T$ where $_{it}$ exhibits random disturbances and approaches normal distribution at large observation, where $_{k}\ /(1\quad\ _{7})$, k = 2, 3, 4, 5 give long run cross section and time invariant fixed effect elasticities $_{6}\ /(1\quad\ _{7})$, gives long run growth rate in relative trade. $_{i1}\ /(1\quad\ _{7})$ gives long run individual country time invariant fixed effect intercept term. In the one-way fixed-effects model, 'the data is transformed by removing the cross-sectional means from the dependent and independent variables' (SAS/ETS, 2008:1284)[2].

The variables used in models are characterized as follows:

Ln (X/M) = Ln (i$^{th}$ country's import from Turkey in USD /Turkey's import from i$^{th}$ country in USD), the bilateral relative trade of Turkey with i$^{th}$ country (relative trade) in terms of USD.

Ln ($Y_f$ /$Y_d$) = Ln (Gross domestic product purchasing power per capita of $i^{th}$ country / Gross domestic product purchasing power per capita of Turkey), the bilateral relative foreign income in terms of USD.

Ln (REXC) = Ln (Real exchange rate) = Ln (nominal exchange rate * $i^{th}$ country's deflator / deflator of Turkey), the bilateral real price of USD in terms of TL, which is measured in a way such that an increase reflects a real appreciation of the USD versus TL.

Ln (TOT) = Ln (Terms of trade of Turkey with $i^{th}$ country) = Ln ((Turkish export unit price in USD/$i^{th}$ country's export unit price in USD)*100), Ln (($P_X$/ $P_M$)*100), the bilateral Turkish terms of trade.

Ln ($P_X$/$P_f$) = Ln ($i^{th}$ country's relative import price with Turkey) = Ln (Turkish export unit price in USD / $i^{th}$ country's deflator), the bilateral relative export price of Turkey.

Ln ($P_M$/$P_d$) = Ln (relative import price of Turkey with $i^{th}$ country) = Ln ($i^{th}$ country's export unit price in USD / deflator of Turkey), the bilateral relative import price of Turkey.

TREND = Time variable.

D9607 = Dummy variable for the Turkey's being a member to the European customs union, for the period of 1996-2007.

Data are obtained from the OECD, IMF, and TURKSTAT data bases[3].

Theoretical expectations are as follows:

$$\frac{\text{Ln (X/M)}}{\text{Ln (}Y_f/Y_d\text{)}} \quad 0, \frac{\text{Ln (X/M)}}{\text{Ln (TOT)}} \quad 0, \frac{\text{Ln (X/M)}}{\text{Ln (}P_X/P_f\text{)}} \quad 0, \frac{\text{Ln (X/M)}}{\text{Ln (}P_M/P_d\text{)}} \quad 0, \frac{\text{Ln (X/M)}}{\text{Ln (REXC)}} \quad 0, \frac{\text{Ln (X/M)}}{\text{TREND}} \quad ; \quad 0.$$

**Estimation and Interpretation**

Donoval (2006:15) points out that the improvement in terms of trade implies an advantage for exporter country in foreign trade; implying that more import is asked for unit export by the TOT improved country, which is supposed to improve country's export-import ratio. However, the situation depends on elasticities of offer curves of the countries. The TOT elasticity of relative trade is estimated about -0.29 for the 1996-2007 which opposes Donoval's argument, however, it alternated to 0.1 for the period of 1982-1995 which matches Donoval's argument. In evaluating the model estimated by Park method, a one percentage increase in Turkish TOT reduces relative trade about 0.29 percentage, a one percentage increase in the relative foreign income increases relative trade about 0.215 percentage, a one percentage increase in the real exchange rate increases relative trade about 0.15 percentage on the average

during Turkey's membership to ECU period. It is the evidence that being a member of ECU has improved the relative trade about 0.06 percentage. On the other hand, time influenced Turkey's relative trade with the 14 EU countries negatively between 1982-1995 and positively between 1996-2007. Overall, a percentage increase in all countries' relative foreign incomes, Turkish TOT, real exchange and a unit increase in trend is found improving the export-import ratio about 0.135 percentage as indicated by the model in the second column of Table 1 for the period of the 1996-2007, on the other hand, a percentage increase in all countries' relative foreign incomes, Turkish TOT, real exchange and a unit increase in trend is found deteriorating the export-import ratio about 0.77 percentage as indicated by the model in the third column of Table 1 for the period of the 1982-1995. All the regressors alternated in sign from the 1982-1995 period to the 1996-2007 period in model estimated by Parks method.

The test for no fixed effect for the dynamic cross section fixed effect models indicated the acceptance of the fixed effect hypothesis, which implies individual unobservable differences matter in explaining relative trade, for all periods. However, since the dynamic fixed effect model did not exhibit structural break the model covering the whole period can be interpreted for both periods or for the entire period, where both the relative export and relative import price variables are specified under the neoclassical assumption that the export and import goods are substitutes for domestic goods. Both the relative export and relative import price variables are found significant in the dynamic fixed effect model (Model 7). A percentage increase in the relative export price and the relative import price increases export performance of Turkey about 2.37 percentage with respect to the import performance from EU member countries in the long run, Ceteris Paribus, as the last column (Model 7') indicates in Table 1. The long run relative income elasticity is estimated as 1.3, and the long run real exchange rate elasticity is estimated as 2.13, the growth rate in export-import ratio is estimated as 0.17 percent per year on the average, Ceteris Paribus, during for the period of 1982-2007. The relation between the relative trade and the relative import prices matches theoretical expectations. The estimating sign of the positively estimated relative export price opposes to theoretical sign.

Assuming TOT as indicator of competition, deterioration in Turkish bilateral TOT as a consequence of technical improvement and technological development or as a consequence of other factors improves relative trade of Turkey with EU member countries after being a member to the ECU. Dummy is found statistically insignificant in reducing relative trade during Turkey's membership to the ECU in both models, implying not a significant change in Turkey's competitiveness in trade with the EU countries as a result of eliminating tariff on import from EU member countries after 1996 against arguments that ECU harms Turkish economy.

Table 1: Estimated Models

| | Error Component Models | | | | Individual Specific Intercept Models | | | | 1982-07 |
|---|---|---|---|---|---|---|---|---|---|
| | 1996-07 | 1982-95 | 1982-07 | 1982-07 | 1996-07 | 1982-95 | 1982-07 | 1982-07 | Long Run Elasticity |
| VARIABLE | Ln(X/M) 1 | Ln(X/M) 2 | Ln(X/M) 3 | Ln(X/M) 4 | Ln(X/M) 5 | Ln(X/M) 6 | Ln(X/M) 7 | Ln(X/M) 8 | Ln(X/M) 7' |
| CONSTANT | 129 (.3.29***) | 48.5 (2.26***) | -7.3 (9.2) | -19.4 (14.2) | -138.7 (39***) | -266 (112**) | -182 (37***) | -179 (37***) | |
| Ln ($Y_f/Y_d$) | 0.215 (.02***) | -0.57 (.05***) | -0.14 (.19) | -0.11 (.19) | 0.03 (.25) | 1.5 (.54***) | 0.6 (.17***) | 0.59 (.18***) | 1.3 |
| Ln TOT | -.29 (.17***) | 0.1 (.009***) | 0.27 (.09***) | 0.26 (.09***) | | | | | |
| Ln ($P_X/P_f$) | | | | | 1.66 (.03***) | 0.76 (.32**) | 0.97 (.21***) | 0.99 (.21***) | 2.11 |
| Ln ($P_M/P_d$) | | | | | -0.076 (.05) | 0.25 (.11**) | 0.12 (.03***) | 0.11 (.04***) | 0.26 |
| Ln (REXC) | 0.15 (.006***) | -0.29 (.005***) | -0.04 (.03) | -0.03 (.03) | 1.64 (.29***) | 0.64 (.31**) | 0.98 (.21***) | 1.001 (.21***) | 2.13 |
| TREND | 0.06 (.002***) | -0.02 (.001***) | 0.003 (.004) | 0.009 (.007) | 0.06 (.02***) | 0.13 (.05**) | 0.08 (.02***) | 0.08 (.02***) | 0.17 |
| $Ln(X/M)_{i,t-1}$ | | | | | 0.54 (.06***) | 0.4 (.07***) | 0.54 (.04***) | 0.54 (.04***) | |
| D9607 | | | | -0.10 (.09) | | | | -0.04 (.08) | |
| SSE | 139.5 | 187.04 | 359.87 | 359.7 | 5.88 | 25.35 | 34.84 | 35.82 | |
| DFE | 163 | 191 | 359 | 358 | 148 | 175 | 344 | 342 | |
| Technique | Parks | Parks | Parks | Parks | CS Fixed effect | CS Fixed effect | CS Fixed effect | CS Fixed effect | |
| $R^2$ | .9856 | .9676 | .0369 | .0351 | .9134 | .7257 | .7765 | .7767 | |
| Correlations range among regressors | -.91 & .42 | -.43 &.28 | -.11&.33 | -.75&. 24 | - . 37 &.98 | .004 &.95 | - . 22 & .97 | - . 20 &.97 | |
| F test for no fixed effect | - | - | - | - | 3.32*** | 5.27*** | 6.56*** | 6.43*** | |
| **OLS estimate of average of** $_i$ | 0.805 | 0.698 | 0.769 | 0.769 | 0.032 | -0.127 | -0.12 | -0.12 | |
| F test for no Structural Break | $\frac{SEE \quad (SEE_1 \quad SEE_2) / k}{SEE_1 \quad SEE_2 / (NT \quad 2k)}$ 7.23<br>7.23>2.82.8=F5,359..01<br>Accept Ha: Structural break exists | | | | $\frac{SEE \quad (SEE_1 \quad SEE_2) / (N \quad k \quad 1)}{SEE_1 \quad SEE_2 / (NT \quad N \quad 2k \quad 1)}$ 1.79<br>1.79<1.88=F21,344,.01<br>Accept H0: No structural break exists | | | | |

Note 1: *** significant at the 1 % level, ** significant at the 5 % level, * significant at the 10 % level.

Note 2: Individual country intercept values are not presented here, hovewer, they are available at request from the author.

Fagerberg (1996:12) found a significantly positive impact of both direct R&D and R&D acquired indirectly through purchases of capital goods on competitiveness, and indirect R&D from domestic sources contribute more to competitiveness than indirect R&D from abroad, which implies that reliance on domestically created technology brings about a competitive advantage internationally. Fagerberg (1996:3) also mentions that a larger country is more advantageous to gain a competitive advantage in R&D intensive activities including 'technological spillovers' effect in scope economies than a small country. Gustavsson etc. (1999) point out that the R&D activity of the representative firm, the total R&D in the domestic industry, the economy wide stocks of knowledge, the factor prices, the resource endowments, the external and internal scale economies, the economies of scale in R&D internal to the firm, the degree of openness for the capacity to utilize global spillovers, the degree of investment for introduction of embodied technical progress have impact on the competitiveness, and a higher impact of the R&D on competitiveness in high- and medium- than in low-tech industries. Bojnecand and Fertő (2009) found that trade balance affect more influenceable than the influence of export-import unit values, and they found the evidence of the R&D expenditures improve competition based on quality (quality competition) increase but reduce price competition, foreign direct investment reduces unsuccessful price competition and increases unsuccessful quality competition, the size of the economy improves price competition and reduces quality competition, the consumer demands associated with higher level of income per capita increase unsuccessful price and quality competition on agro-food trade competition between the five Central European Countries in a study classifying competition into four categories. Angelos and George (2003:240) mention the evidence of Turkish industrial production concentration on food, textile, petroleum refineries, iron and steel, transportation equipment, electrical machinery, chemical product and largely industrial product oriented Turkish export. Recently, Turkey start to move high- and medium tech industrial production from low-tech industrial production and agglomeration economies in regions, which improves product quality and competitiveness as Gustavsson etc. (1999), Bojnecand and Fertő (2009) and Fagerberg (1996:12) consider, as Turkey start to increase its capital goods share in export. However, Turkey is a technology transformer country in competitiveness even being one of the largest countries among ECU member countries to gain competitive advantage in R&D intensive activities. For the reasons mentioned above Turkey has potential to improve bilateral relative trade or reduce trade deficit facing with EU member countries the most of whose population is less than Turkey.

## Conclusion

The estimated model by using Parks method which overcomes consequences of the autocorrelation and heterescadasticity problems indicated structural break and alternating signs of regressors from the period of 1982-1995 to the period of 1996-2007. Turkish bilateral TOT, relative foreign income, foreign exchange rate and trend are found explanatory around 98% in explaining the relative trade for the period of the 1996-2007. A percentage deterioration (improvement) in the Turkish terms of trade improves (reduces) Turkey's relative export by 0.29 percentage on the average for the period of 1996-2007. The dummy variable to measure the effect of Turkey's membership to the ECU is found insignificant on Turkish export deterioration relative to import to the 14 EU countries. The Relative export is significantly positively correlated with real exchange rate, time and relative income for the second period. Freeing trade by eliminating custom taxes improved Turkey's relative export with the 14 EU countries about 0.915 (0.135+0.78) percentage, assuming a percentage increase in each of relative income, Turkish TOT, real exchange rate and a unit increase in trend would had been for both periods.

The estimated dynamic fixed effect (intercept) model did not indicate structural break and found explanatory around 73 % and implies that individual country differences matters in explaining relative trade of Turkey with the 14 EU countries for the entire period. Based on the dynamic fixed effect model, a percentage increases in relative foreign income improves relative trade by 1.3 percentage, a percentage increase exchange rate improves relative trade by 2.13 percentage on the averages, Ceteris Paribus, for the period of 1982-2007. A percentage decrease (increase) in each of bilateral relative foreign income, relative export price, relative import price and real exchange rate and a unit increase in trend, all in total reduces (improves) relative trade of Turkey with the 14 EU member countries by 5.97 percentage on the average in the long run.

## NOTES

[1] The 14 EU member countries are France, Belgium-Luxembourg, Netherlands, Germany, Italy, England, Ireland, Denmark, Greece, Portugal, Spain, Sweden, Finland, Austria.

[2] The error term in cross section fixed effect model can be specified as $_{it}$ $_{il}$ $v_{it}$, when constant $_{il}$ excluded or NOINT option is used in model specification, where $_{il}$s are nonrandom parameters to be estimated. If NOINT option is not specified in TSCSREG panele model procedure in SAS, after the slope estimates are handled, the estimation of an intercept or the cross-sectional fixed effects is handled as $_{i}$ $\bar{y}_i$ $\tilde{}_s\bar{x}_i$ for $i$ = 1, ...., N.

[3] GDP Deflators export and import unit prices are obtained from IMF Financial Statistics Yearbook 2008. Gross domestic product purchasing power per capita in USD at Current Prices are obtained from OECD National Accounts (www.oecd.org, 27 May 2009). Exchange rate; TL per USD, export and import, Turkish GDP Deflator are obtained from TURKSTAT: Main Economic Indicators (www.turkstat.gov.tr, accessed 12 May 2009).

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