

**AN EMPIRICAL EXAMINATION OF THE STRUCTURAL
STABILITY OF EXPORT FUNCTION: THE CASE OF
TURKEY**

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ABSTRACT

The persistence of the foreign trade deficit in Turkey has challenged both policy makers and model builders. In this respect, the question of whether estimates from traditionally specified trade equations can still be relied upon is an important issue to be discussed. This paper reports the results of a project to estimate export supply and demand functions for Turkey. Our primary goal is to analyze the extent to which historical experience, as incorporated in these estimated equations, can be used as a reliable guide to future trends in exports. In this context, this paper estimates and tests the stability properties of conventional equations concerning real exports for Turkey. The estimation results indicate that in analyzing exports for the period after 1994, traditional export equations are not sufficient for forecasting and policy simulations. Variables such as uncertainty indicators or investment have crucial roles in explaining exports. However, estimated elasticities are stable enough to perform adequately. Recent evidence and the estimation results support these arguments.

I. INTRODUCTION

The persistence of the foreign trade deficit in Turkey has challenged both policy makers and model builders. In this respect, the question of whether estimates from traditionally specified trade equations can still be relied upon is an important issue to be discussed. This paper reports the results of a project to estimate export supply and demand functions for Turkey. Our primary goal is to analyze the extent to which historical experience, as incorporated in these estimated equations, can be used as a reliable guide to future trends in exports. A similar study for import demand function has been done in Kotan and Saygılı (1999).

Our analysis follows partly in the tradition of Hooper *et al.* (1998) which estimates and tests the stability properties of conventional equations concerning real imports and exports of goods and services for the G-7 countries. Following the same procedure, this study estimates real export demand and supply functions for Turkey and assesses parameter constancy tests. The plan of the paper is as follows: In Section II, Turkish export performance during the last two-decade period is summarized briefly. In Section III, a short summary on previous empirical work is provided. The following

chapter, Section IV, specifies the model, database and the sample period. In addition, short-run and long-run estimation results are reported and discussed. Section V contains the results of the parameter stability tests. Finally, the last section concludes .

II. EXPORT PERFORMANCE IN TURKEY: A BRIEF SUMMARY

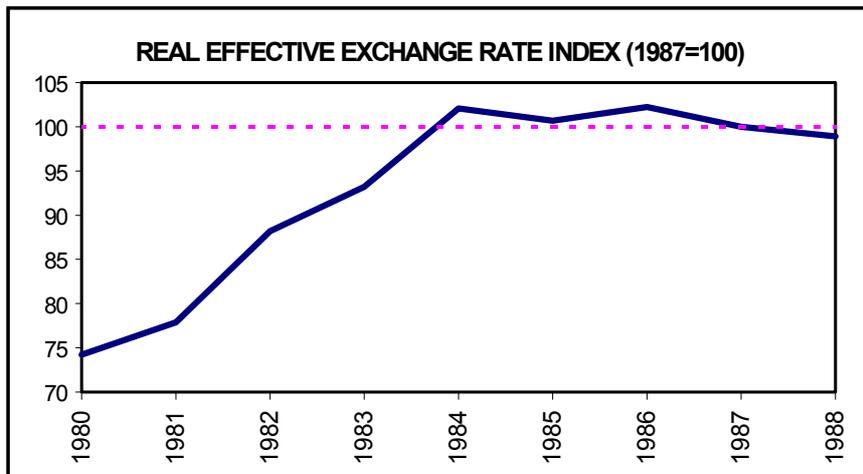
II.1. First Episode: 1980-1988

From early 1930s to 1980s, Turkey followed an inward oriented development strategy called import substitution industrialization. In particular, this strategy was dominant during the planned economy period between 1960 and 1977. This inward oriented industrialization strategy was carried out successfully in its first phase and substitution of consumer goods was achieved. However, the 1970s witnessed a more difficult phase of this strategy. Substitution of intermediate and capital goods was aimed at in this phase. However, the economy experienced several external and internal shocks. In particular, the first and second petroleum shocks in 1970s raised the import bill considerably. As a result of these developments, trade and current account deficits reached an all time high at the end of the 1970s. External debt increased sharply and the economy faced a heavy balance of payment crisis. At the same time, economic growth slowed and realized in the negative in 1979 while the inflation rate accelerated.

The measurements taken against economic crisis in the 1978-1980 period failed and finally the government put into practice a stabilization and adjustment program in January 1980. This program, called "January 24 Decisions", was supported by multilateral organizations, including IMF and the World Bank, and by bilateral creditors, the major OECD countries. The most important objectives

of the program were to reduce the share of the public sector in the economy and to provide free market mechanism conditions. In this respect, the promotion of exports and the liberalization of imports were set as essential targets. Other important objectives were to realize financial liberalization, take measures towards improving capital markets and in the long term, liberalize foreign capital movements. Furthermore, a reduction in the inflation rate was aimed at.

GRAPH I

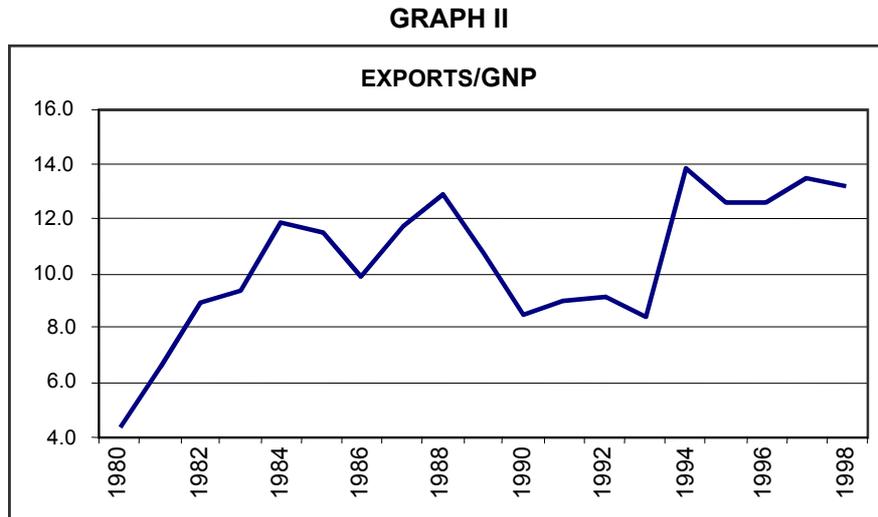


In the implementation of this policy, the correction of the misalignment in prices and the elimination of the disequilibria in certain markets were the initial steps. Secondly, an export-promotion policy through export incentives, especially devaluations, was pursued in this period. In this respect, multiple exchange rates were eliminated and a uniform rate was established with a large devaluation at a rate of 100 percent. In May 1981, the Central Bank was authorized to make daily adjustments in the exchange rate. With continuous adjustments, the Turkish lira depreciated in real terms and the real effective exchange rate increased markedly until 1988

(Graph I). Import liberalization was more gradual and cautious due to balance of payment problems. The major change in this context started in 1983 with the removal of quantitative restrictions on a large proportion of import items along with reductions in tariff rates. Changes in the direction of domestic financial liberalization started in July 1980 and removed controls on interest rates. As a consequence of this development, interest rates increased sharply. In December 1983, residents were allowed to open foreign exchange deposits in commercial banks. The most important result of the stabilization program was the reduction in domestic demand. In the context of this program, real wages were controlled by the government and declined considerably. At the same time, agriculture trade terms decreased in this period as compared to the 1970s, which led to further contraction in domestic demand. The contraction of the domestic demand caused two important results. Firstly, the inflation, which had accelerated at the end of 1970s, was controlled considerably in 1981-1983 period. Secondly, the contraction of domestic demand promoted exports. In addition, the decline in real wages and large devaluations improved competitiveness in international trade. At the same time, export incentives, such as tax rebate schemes, payment of cash premiums, and export credit affected exports in increasing terms (Graph II).

The Turkish economy had export-led growth during the 1981-1988 period. In other words, export growth until 1988 was the most important achievement of the adjustment program. During this period, both the growth and the change in the composition of exports showed impressive progress. In fact, exports more than tripled, and the share of manufacturing goods in total exports increased significantly (Uygur, 1997). However, this growth was not based on investment. Export performance was achieved by the utilization of the existing capacity in

the manufacturing, industry which had been created largely in 1970s at higher rates, as well as the other factors mentioned above. However, the sustainability of this export oriented growth process depended crucially on investment growth. Therefore, it is more appropriate to assess this policy as export-promoting rather than export-oriented.

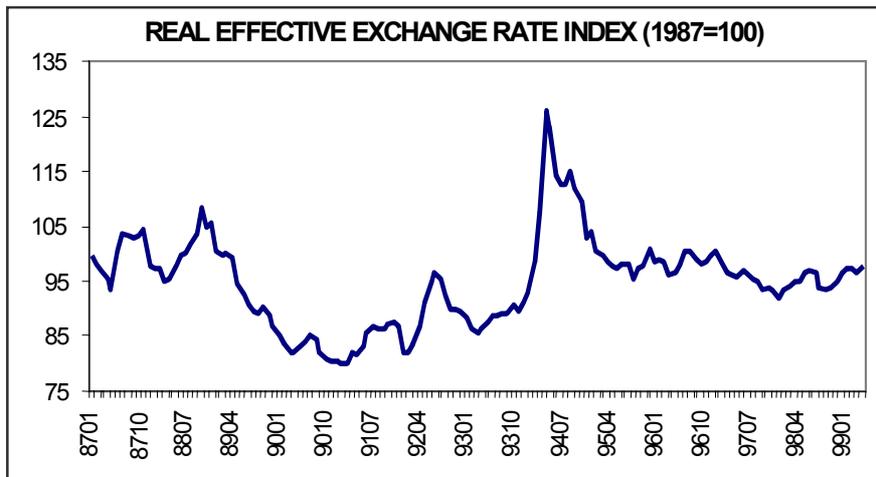


II.2. Second Episode: 1989-1993

1989 can be assessed as a turning point for the Turkish economy. Firstly, the controls on foreign capital movements were removed and major changes were introduced. Turkish securities as well as foreign securities could be traded freely; Turkish banks could extend foreign currency credit to foreign trade companies; all barriers on the foreign borrowing of domestic firms were removed and foreigners could open Turkish lira accounts convertible to foreign exchange. Secondly, economic policies became expansionary at the close of the 1980s. Real wages in the manufacturing industry increased sharply and agricultural subsidies accelerated. These developments made it easier for Turkish corporations to borrow

abroad and for foreign capital to benefit from the arbitrage opportunities caused by interest rate differentials. As a consequence of the speculative capital inflows, the Turkish lira appreciated in real terms during the 1989-1993 period (Graph III). On the other hand, expansionary policies, especially increasing real wages, caused a considerable rise in domestic demand. During the 1989-1993 period, export performance slowed significantly due to domestic demand expansion and real appreciation of the Turkish lira, and the share of the exports in GNP decreased to the levels of the early 1980s. At the same time, export incentives, which had had a strong impact on export performance, were removed to a large extent by the end of 1988 because of budgetary constraints. As a consequence of these developments, trade and current account deficits increased. Then, international rating institutions decreased the credit rates of Turkey. To circumvent panic and keep the exchange rate within certain limits, the Central Bank intervened in the foreign exchange market at the cost of decreasing reserves. However, the demand for foreign exchange continued resulting a substantial amount of capital outflow. This financial crisis affected the real sector to a large extent leading to negative growth rates in the GNP and the GDP in 1994. These developments caused sharp rises in inflation and interest rates, whereas real wages declined significantly.

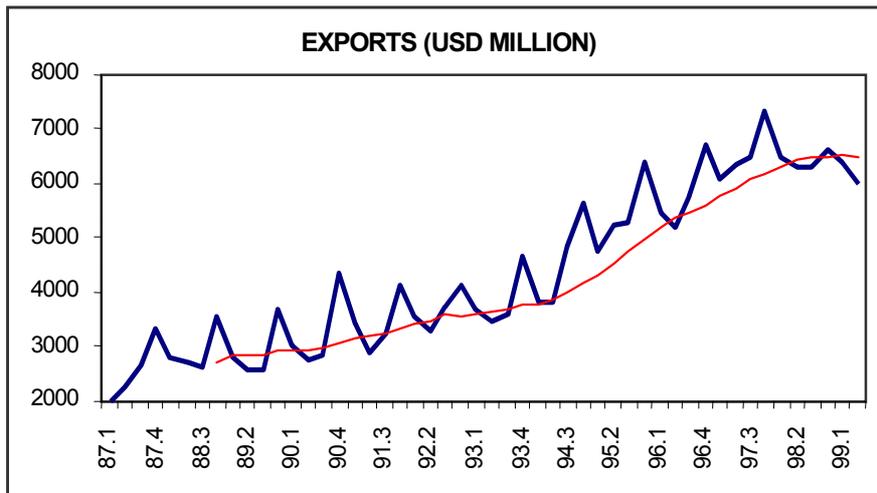
GRAPH III



II.3. Third Episode: 1994-present

A stabilization program was announced by the government on April 5, 1994. Similar to the January 24 Decisions, this stabilization program was intended to reduce the domestic demand and increase exports via the real depreciation of the Turkish lira. Therefore, exports expanded substantially in 1994. This policy continued until the end of 1994 and expansionary measures were pursued with an expansion in domestic activity in 1995, and especially in 1996-1997 period. Moreover, a real exchange rate policy which aimed at maintaining a constant real value for an exchange rate basket was followed by the Central Bank. These developments resulted in a sharp increase in imports. The share of exports in the GNP increased in this period as compared to 1981-1988 and 1989-1993 periods (Graph I). Furthermore, export subsidies, which had had a strong effect on export performance during the 1981-1988 period, could not be raised due to GATT Uruguay provisions, the scheduled customs union with the European Union and constraints imposed by large budget deficits (Uygur, 1997).

GRAPH IV



Thus, the increase in exports achieved in 1980-1989 can be attributed to the policies summarized as devaluations of Turkish lira, export incentive schemes and reduction in domestic demand. This episode ended by reverse trends in the mentioned policies and a sharp reduction in exports was realized between 1989 and 1993. After the financial crisis occurred in early 1994, the share of exports in the GNP expanded notably relative to the previous episodes in spite of the persistence of the real foreign exchange rate policy and the considerable increase in domestic demand. This contradictory development in exports after 1993 may imply a structural change relating alterations in the sensitivity of exports to the foreign exchange rate and domestic demand policies (Graph IV).

III. PREVIOUS EMPIRICAL WORK

There is substantial empirical literature on the estimation of income and price elasticities in international trade and much of it focused on US trade with special emphasis on the import demand function. Recently, conventional equations concerning imports and exports of G-7 countries have been estimated and stability properties

tested in Hooper *et al.* (1998). They conclude that conventional trade equations and elasticities are stable enough, in most cases, to perform adequately in forecasting and policy simulations. Income elasticities of US trade have not been shifting in a direction that will tend to ease the trend toward deterioration in the US trade position, and finally price channel is found to be weak in the case of continental European countries. Deyak *et al.* (1989) studies the structural stability of disaggregated US import demand and suggests that the trends in the price and income elasticities are not smoothly continuous over time and that the values can vary considerably from one period to the next. Similarly, Ceglowski (1997) investigates the stability of Japanese import and export equations using both Chow tests and recursive estimation techniques and found significant evidence of instability in both during the mid-1980s. Zietz and Pemberton (1993) examines parameter stability in aggregate US import demand functions for the time period 1972-90 and suggests that parameter stability depends on the definition of the relative price term employed in the model. It also finds that the most stable models generate the best out-of-sample forecasts. In a different aspect, Marquez (1990) estimates income and price elasticities for bilateral world trade. This paper finds that bilateral trade elasticities exhibit enough of a dispersion to suggest that the direction of trade is sensitive to changes in income and prices. Marquez (1994) also assembles a simultaneous model explaining bilateral US import volume and prices. According to the evidence, treating trade elasticities as autonomous parameters and ignoring the statistical implications of simultaneity and optimization biases the structural estimates and undermines the effectiveness in addressing questions relevant to economic interactions among nations.

In country specific analyses, import and export functions for the case of Turkey are mostly analyzed in the context of macroeconometric models. Özatay (1997), for example, aims to construct a quarterly macroeconometric model that describes the functioning of the Turkish economy. In the balance of payments block of the model, total exports are considered to be demand determined and described as a function of real exchange rate and foreign income. Similarly, the Turkish State Planning Organization (1995) describes the main features of the macroeconometric model (DPTMAKRO) that forms the basis of development plans. DPTMAKRO follows the conventional treatment by estimating the sectoral trade flows as functions of income and certain price variables. A similar approach is followed in Uygur (1987).

Other studies also focus on export modeling. Uygur (1997) evaluates export policies pursued in Turkey during the period from the late 1970s to the mid 1990s. The paper attempts to differentiate the long-term and short-term effects of export policies, and estimates an export supply function by using an error-correction estimation procedure. The estimation results indicate that real exchange rate, investment, excess demand and export subsidies contribute significantly to the explanation of export supply with correct signs; however, in the long-run export subsidies turn out to have a negative impact due to uncertainties in policies. Another recent study, Saygılı *et al.* (1998), analyzes various exchange rate indicators that are readily available and tests their performance in predicting trade flows. In this study, the nominal value of exports in US dollar terms is estimated by using short-run error-correction models, and exports are considered as a function of foreign income and real exchange rate. From a different aspect, Erlat and Erlat (1997) estimates a long-run

equilibrium relationship between trade balance and the terms of trade. This estimation is based on Johansen's approach in obtaining cointegration vectors and takes into account the possibility of structural instability in the long-run relationship analyzed. The findings indicate that there exists a steady long-run relation between trade balance and terms of trade in the post-1980 period, as opposed to the pre-1980 period. As Turkey's export composition changed towards a higher share of manufactured goods, prices started becoming important for export supply decisions, leading to an increase in exports and thereby an improvement in the trade balance.

It can be generalized that studies on estimating trade flows for the case of Turkey are mostly held in the context of macroeconometric models in which the trade flows are usually treated as a function of income and certain types of price variables. Parameter stability tests have not been performed in most of these studies.

IV. ESTIMATION: MODEL, DATA, AND RESULTS

IV.1. Model

In this study, both export demand and supply functions are estimated. Real export supply (rx_s) is considered as a function of real domestic income (ryd) and real effective exchange rate ($reer$) while real export demand (rx_d) is considered as a function of real foreign income (ryf) and real effective exchange rates. Letting lower-case letters denote logarithmic values, Turkey's export supply and demand functions are modeled as follows:

$$rx_{s,t} = \alpha + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \psi t + \delta reer_t + \gamma ryd_t + \varepsilon_t \quad 1)$$

$$rx_{d,t} = \lambda + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \vartheta t + \lambda reer_t + \delta ryf_t + \eta_t \quad 2)$$

where d_1, d_2, d_3 denote seasonal dummy variables, and t denotes the time trend.

These equations are used to obtain cointegrating vectors (or long-run relationships) for real export supply and demand by following the Engle and Granger two-step estimation procedure¹. These equations constrain the long-run elasticities to be the cointegrating vectors and allow for a more complete specification of short-run income and price elasticities. For export supply, the formulation is:

$$\Delta r x_{s,t} = \phi + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \zeta + \sum_{j=1}^n \rho_j \Delta reer_{t-j} + \sum_{j=1}^n \theta_j \Delta ryd_{t-j} + \sum_{j=1}^n \pi_j \Delta r x_{s,t-j} + \nu ECM_{s,t-1} \quad 3)$$

where ECM_s is the difference between actual exports and their long-run value as predicted by the cointegrating relationship between rx_s , ryd and $reer$ from equation 1 above. The error-correction coefficient " ν " indicates the proportion of ECM_s that is closed in the current period. Similarly, for real export demand, the formulation is:

$$\Delta r x_{d,t} = \tau + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \omega + \sum_{j=1}^n \psi_j \Delta reer_{t-j} + \sum_{j=1}^n \kappa_j \Delta ryf_{t-j} + \sum_{j=1}^n \vartheta_j \Delta r x_{d,t-j} + \alpha ECM_{d,t-1} \quad 4)$$

where ECM_d is the difference between actual exports and their long-run value as predicted by the cointegrating relationship between rx_d , ryf and $reer$ from equation 2 above. The error-correction coefficient " ω " indicates the proportion of ECM_d that is closed in the current period.

¹ Engle and Granger (1987).

IV.2. Data

The model estimations are based on quarterly data covering the period 1987q1-1998q1-q3. Quarterly data related to the home country's figures such as exports, price of exports, GDP and real effective exchange rate are obtained from the database of the Central Bank of Turkey. Exports are deflated by export prices. The nominal GDP figure is constructed in US dollars and deflated by the US wholesale price index. The real effective exchange rate index, *reer*, is based on the wholesale price indices of US, Germany and Turkey. The data on foreign countries are weighted by "1,5" for Germany and by "1" for US. The base year is 1987.

Quarterly data related to foreign countries were obtained from International Financial Statistics. Turkey's exports to G-7 countries constitute approximately 40 percent of the total and the real foreign demand, *ryf*, is proxied by the simple sum of the GDP figures of G-7 countries, as each is in US dollar terms and the sum is deflated by the US wholesale price index.

IV.3. Results

In this section, time series properties of the data are specified. Test results of the unit root and cointegration tests are provided. Lastly, short-term error-correction models specified in equations 3 and 4 above are estimated and test results are discussed.

IV.3.a. Testing for Unit Roots in the Data

The stationarity of the series is tested by using the Augmented Dickey-Fuller (ADF) test procedure. Tests are performed both in level and first difference forms. The ADF test statistics are presented in Table I. Test results suggest that the unit root null can not be rejected at 5 percent significance level for the level of all variables in the

analysis. In contrast to level forms, the unit root null is strongly rejected at 5 percent significance for the first difference forms. In other words, all variables appear to be integrated of order 1.

**TABLE I
AUGMENTED DICKEY-FULLER TEST RESULTS FOR LEVELS¹**

$$\Delta Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \sum_{j=1}^n \alpha_j \Delta Y_{t-j} + \sigma_t$$

Critical	τ	$\tau_{\beta\tau}$	τ_{μ}	$\tau_{\alpha\mu}$	τ	result	Integration
Values	(-3.50)	(2.81)	(-2.93)	(2.56)	(-1.95)		of order
Variables							
$rx_{s,d}$	-1.96(0)	1.99	-0.34(0)	1.93	8.36(0)	UR	I(1)
ryf	-1.29(0)	0.10	-1.03(3)	1.17	1.45(3)	UR	I(1)
ryd	-2.57(1)	1.79	-1.84(1)	-5.19		UR; C	I(1)
$reer$	-2.52(1)	0.49	-2.49(1)	2.49	-0.34(2)	UR	I(1)

¹The 5 percent asymptotic critical values for the ADF tests are calculated from Table 8.5.2 in Fuller (1976, p. 373). The figures in parentheses with t-values denote lag lengths.

**AUGMENTED DICKEY-FULLER TEST FOR RESULTS FOR FIRST
DIFFERENCE FORMS¹**

$$\Delta \Delta Y_t = \beta_3 + \beta_4 t + \beta_5 \Delta Y_{t-1} + \sum_{j=1}^n \gamma_j \Delta \Delta Y_{t-j} + \eta_t$$

Critical	τ	$\tau_{\beta\tau}$	τ_{μ}	$\tau_{\alpha\mu}$	τ	result	Integration
Values	(-3.50)	(2.81)	(-2.93)	(2.56)	(-1.95)		of order
Variables							
$rx_{s,d}$	-6.01(1)					N; C	I(0)
Ryf	-12.75(2)					N; C	I(0)
Ryd	-4.86(0)					N; C	I(0)
$Reer$	-5.25(1)					N	I(0)

¹The 5 percent asymptotic critical values for the ADF tests are calculated from Table 8.5.2 in Fuller (1976, p. 373). The figures in parentheses with t-values denote lag lengths.

IV.3.b. Testing for Cointegration

As mentioned in Section IV.1, the Engle and Granger two-step estimation procedure is followed in testing for cointegration relationships between rx_s , ryd and $reer$, and rx_d , ryf and $reer$. In the first step, equations 1 and 2 are estimated by OLS and test results are summarized in Table II. In the export supply model, the estimation results indicate that real domestic economic activity affects real exports negatively and the real effective exchange rate has a positive impact on the supply of exports. On the demand side, real foreign demand and real effective exchange rates are estimated to be positively related with real export demand. Related coefficients have expected signs.

TABLE II
Cointegration Test Results I

$$rx_{s,t} = \alpha + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \psi t + \delta reer_t + \gamma ryd_t + \varepsilon_t$$

	coefficient	t-statistic
<i>constant</i>	2.65	2.11
d_1	-0.28	3.15
d_2	-0.29	-3.74
d_3	-0.14	-6.10
t	0.01	-2.17
<i>reer</i>	0.06	0.16
<i>ryd</i>	-0.30	-1.26

TABLE II (continued)
Cointegration Test Results I

$$rx_{d,t} = \lambda + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \vartheta t + \lambda reer_t + \delta r y f_t + \eta_t$$

	coefficient	t-statistic
<i>constant</i>	0.97	1.54
<i>d₁</i>	-0.17	-4.78
<i>d₂</i>	-0.20	-4.62
<i>d₃</i>	-0.17	-4.00
<i>t</i>	0.01	4.16
<i>reer</i>	0.43	3.34
<i>ryf</i>	0.10	1.18

In the second step, the stationarity properties of the residuals of the equation 1 (RESIDEQ1) and equation 2 (RESIDEQ2) are tested. Related results are presented in Table III. RESIDEQ1 and RESIDEQ2 are estimated to be stationary concluding that equation 1 and equation 2 can be used to obtain cointegrating vectors or long-run relationships for real export supply and demand, respectively.

TABLE III
Cointegration Test Results II¹

$$\Delta Y_t = \beta Y_{t-1} + \sum_{j=1}^n \alpha_j \Delta Y_{t-j} + \sigma_t$$

	ADF test statistic
RESIDEQ1	-5.33
RESIDEQ2	-4.53

¹The 5 percent asymptotic critical values for the ADF tests are calculated from Table 2 in Engle and Yoo (1987, p. 157). For the cointegration relations of 3 variables and the sample sizes of 50, the critical value is -4.11.

Estimated cointegration relationships indicate that long-run elasticity of export supply with respect to income is 0.3 and related

price elasticity is 0.06. For the case of real export demand, the long-run income elasticity is estimated to be 0.1 and price elasticity is estimated to be 0.4².

IV.3.c. Testing Short-run Error-correction Models

Having specified the time series properties of the data and error-correction terms of the export supply and demand equations, equation 3 and equation 4 formulated above are estimated in this section. Estimation results are summarized in Tables IV and V.

**TABLE IV
EXPORT SUPPLY FUNCTION FOR TURKEY: ESTIMATION RESULTS**

$$\Delta x_{s,t} = \phi + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \xi + \sum_{j=1}^n \phi_j \Delta reer_{t-j} + \sum_{j=1}^n \theta_j \Delta ryd_{t-j} + \sum_{j=1}^n \pi_j \Delta x_{s,t-j} + \nu ECM_{s,t-1}$$

	coefficient	t-statistic
<i>constant</i>	0.18	6.60
<i>d</i> ₁	-0.39	-16.21
<i>d</i> ₂	-0.14	-3.50
<i>d</i> ₃	-0.06	-0.82
$\Delta reer_{t-1}$	0.59	3.39
Δryd	-0.18	-1.73
$ECM_{s,t-1}$	-0.85	-6.18
<i>R-squared</i>	0.91	
<i>Adj. R-squar.</i>	0.89	
<i>DW</i>	2.03	
<i>F-statistic</i>	60.62	

² The estimated elasticities differ according to the estimation procedure used in the analysis. In a recent study, Saygılı *et al.* (1998) tests empirically the ability of alternative real effective exchange rate indices in predicting trade flows. The data is not deflated and is in US dollar terms. The cointegration properties of the time series are analyzed by using the Johansen Maximum Likelihood estimation procedure. In this study, long-run elasticity of exports with respect to income is estimated to be around 0.9 and related price elasticity is estimated to be around 0.2 at the highest.

For the case of export supply function, estimation results indicate that domestic demand proxied by gross domestic income affects real export supply negatively, but it is insignificant at the 5 percentage significance level. The real effective exchange rate index has a one period lag effect on real exports. The ECM_s term in the model has the expected negative sign implying that any deviation from the long-run equilibrium is partially adjusted in each period. This adjustment speed is 0.9. The short-run elasticity of export supply with respect to income is estimated to be 0.2 whereas the short-run elasticity of exports with respect to the real effective exchange rate index is 0.6.

TABLE V
EXPORT DEMAND FUNCTION FOR TURKEY: ESTIMATION RESULTS

$$\Delta x_{it} = \tau + \beta_1 d_1 + \beta_2 d_2 + \beta_3 d_3 + \alpha + \sum_{j=1}^n \psi_j \Delta reer_{t-j} + \sum_{j=1}^n \kappa_j \Delta ryf_{t-j} + \sum_{j=1}^n \vartheta_j \Delta x_{it-j} + \alpha ECM_{d,t-1}$$

	Coefficient	t-statistic
<i>constant</i>	0.17	6.82
d_1	-0.29	-7.41
d_2	-1.17	-4.93
d_3	-0.12	-4.01
$\Delta reer$	0.50	2.70
Δryf	0.17	3.33
$ECM_{d,t-1}$	-0.70	-4.93
<i>R-squared</i>	0.89	
<i>Adj. R-squar.</i>	0.87	
<i>DW</i>	1.99	
<i>F-statistic</i>	50.91	

The estimation results for the short-run error-correction model of the real export demand function suggest that real effective exchange rates and foreign demand have significant and positive

impact on real exports at current levels. The adjustment term, ECM_d , has the expected negative sign and is significant at an estimated value of 0.7. The short-run elasticities for the real export demand function are estimated to be 0.2 for income and 0.5 for the real effective exchange rate index³.

Consequently, both price and income elasticities are estimated to be lower than 1 for real export demand and supply functions referring to inelastic components. The income elasticity of the real export demand function is estimated to be lower than the price elasticity. This conclusion is also verified for both long-run and short-run functions. However, the real export supply function is estimated to have higher income elasticity than price elasticity in the long-run, while income elasticity is lower than price elasticity in the short-run. In other words, it is possible to generalize that Turkish exports are dominantly explained by real exchange rate changes from the demand side and supply side in the short-run. Conversely, the main determinant is the change in domestic demand in the long-run from the supply side.

V. PARAMETER CONSTANCY

In this section, the parameter stability of income and price elasticities of export supply and demand equations are analyzed by using Chow tests. The Chow breakpoint test is based on a comparison of the sum of squared residuals obtained by fitting a single equation to the entire sample with the sum of squared residuals obtained when separate equations are fit to each sub-sample of the data.

³ Saygılı *et al.* (1998) estimates the short-run elasticities of the export function between 0.7-0.9 for income and 0.03 for the real effective exchange rate index.

In our analysis, the Chow breakpoint test strategy is implemented in three steps. First, the sample was split in 1994 and the first sub-sample used to obtain initial elasticity estimates. Second, the coefficients were re-estimated with the second sub-sample. Third, it was tested whether the coefficients differ in the second sub-sample by constructing F-statistics. The parameter stability tests were used for long-run elasticities of real export supply and demand equations (equations 1 and 2) as well as short-run elasticities of the related equations (equations 3 and 4). The calculated F-statistics are reported in Table VI.

TABLE VI
CHOW BREAKPOINT TEST RESULTS¹

	long-run elasticities	short-run elasticities
	equation 1	equation 3
<i>Real export supply</i>	F stat.= 1.36	F stat. = 2.09
	equation 2	equation 4
<i>Real export demand</i>	F stat.= 2.23	F stat. = 1.74

¹ The null hypothesis indicates no structural shift between the two sub-samples. The critical value at 5 percent significance level is $F_{30}^7 = 2.33$.

An inspection of Chow breakpoint test results reveals that the null hypothesis is accepted for all equations at the five percentage significance level, which indicates that both long-run and short-run elasticities appear to be stable during the sample period. In other words, the estimated elasticities can be considered stable enough to perform adequately in forecasting and policy simulations.

VI. CONCLUSION

The primary goal of this paper is to analyze the extent to which historical experience, as incorporated in these estimated equations, can be used as a reliable guide to future trends in exports. In this context, real export supply and demand equations are estimated.

The export performance that Turkey has experienced during the last two decades can be summarized in three episodes. The expansion in exports achieved in 1980-1988 can be attributed to the policies generalized as devaluations of the Turkish lira, export incentive schemes and reduction in domestic demand. This episode ended with reverse trends in the mentioned policies and a sharp reduction in exports was occurred between 1989-1993. Following the financial crisis that occurred in early 1994, the share of exports in the GNP expanded notably relative to previous episodes in spite of the persistence of real foreign exchange rate policy and the considerable increase in domestic demand. This contradictory development in exports after 1993 may imply a structural change referring to alterations in the sensitivity of exports to the foreign exchange rate and domestic demand policies. However, inspection of the error-correction model estimation results and the related Chow breakpoint tests reveals that both long-run and short-run elasticities appear to be stable during the sample period 1987-1998. In other words, in analyzing exports for the period after 1994, traditional export equations are not sufficient for forecasting and policy simulations. Variables such as uncertainty indicators or investment have crucial roles in explaining exports. Nevertheless, estimated elasticities are stable enough to perform adequately. Recent evidence and the estimation results support these arguments.

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