TRENDS, CYCLES, AND VOLATILITY IN EXPORT PRICES: THE CASE OF TURKEY

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I. INTRODUCTION

Since the early 1980s, the export dependence of the Turkish economy has been continuously increasing. Although, the share of primary commodities in the total exports of Turkey has been declining recently, primary commodities still account for the bulk of exports. The recent trend in primary commodity prices has been unfavorable for the major exporters of primary commodities. During the last few years real primary commodity prices have been continuously declining. Furthermore the volatility of primary commodity prices appears to have increased. At the same time, Turkey made considerable efforts to increase the share of manufactured goods in total exports. The most convincing evidence of this orientation is the switch to an export oriented economy from an import substituting economy in 1980. This has considerably increased the dependence of the Turkish economy on export earnings and made export prices an important factor in determining movements of key economic variables of the domestic economy. Yet, increased dependence of the Turkish economy on exports has made exports a source of economic destabilization. Consequently, the characteristics of the export prices have become very important in implementing appropriate stabilization policies and develop hedging strategies.

The purpose of this study is to examine the behavior of export prices of 32 SITC (Standard International Trade Classification) two digit divisions of the Turkish primary commodity and manufacturing sectors. Among these sectors 15 are in the primary commodities group and 17 are in the manufactured commodities group. The total export price series, which includes all other sectors in addition to the 32 sectors, is also examined here. These 33 monthly export price indexes were examined for 1969:1-1995:12 period. The use of disaggregated data avoids possible aggregation and interpretation problems associated with the use of aggregate data. While previous research emphasized the primary commodity prices, the present study focuses both on the primary and manufactured commodities export prices.

The study concentrates on the following major points. First, we determine whether export prices are nonstationary. If a time series contain a unit root, it can be classified as nonstationary. Shocks have permanent effects, if the time series is nonstationary. Determining whether the export prices series are nonstationary is a prerequisite for the further analysis of these series. The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and the Augmented Dickey-Fuller (ADF) unit root tests were used to determine whether the export price series were nonstationarity. As noted by Perron (1989), existence of structural changes seriously distorts the results obtained from unit root tests. Thus, we take into account the structural breaks and use unit root tests of Banerjee, Lumsdaine, and Stock (1992). These tests determine the date of structural changes endogenously, hence, they are preferable to the unit root tests of Perron (1989). We obtained strong evidence from the unit root tests that the majority of export price series are nonstationary.

Second, even if unit root tests point out to the existence of a permanent component, this does not deny the existence of a temporary component. A time series is said to be persistent, if the effects of shocks last more than a single period. Persistence of shocks has little to do with nonstationarity. A nonstationary series will show little persistence, if the size of the permanent component is small compared to the size of temporary or cyclical component. The effects of supply shocks are probably more persistent than those due to demand shocks. Therefore, the export price series may show little persistence, if demand shocks are relatively larger. This indicates that the temporary component is relatively larger in size than the permanent component. However, if much of the change in export prices is caused by supply shocks, then the permanent component may be relatively larger compared to the temporary component and the series will show strong persistence. A nonparametric method developed by Campbell and Mankiw (1987) and Cochrane (1988) were used determine the size of persistence in export prices. It was found that almost all export price series show little persistence. This shows that the permanent component in export prices implied by unit root tests is relatively unimportant. Therefore, it was concluded that most movements in export prices are temporary movements probably caused by demand shocks.

Third, the data used was sufficiently disaggregated so as to capture important sector specific characteristics. Many studies examining international prices use aggregate data. Aggregate data may hide much of the short-run fluctuations that are present in individual price series. Therefore, aggregate data may overstate the persistence and understate the size of the cyclical component. Among the purposes of this study are the estimation of the size of persistence and the relative importance of the cyclical and permanent components, which is best accomplished by the use of disaggregated data.

Fourth, it is generally argued that a switch to a floating exchange rate system in many countries during the late 1970s and early 1980s increased the volatility of many trade variables including export prices. On the other hand, many countries including Turkey tried to diversify their exports on the product and market bases. If the diversification efforts were successful, then this would reduce the volatility of export prices. Another aspect of the export prices this study investigates is the changing volatility. To address the issue of changing volatility of export prices tests for ARCH effects in export prices were used. Furthermore, Breusch-Pagan and White's tests of heteroskedastic disturbances were also employed. Descriptive statistics for different subsamples provide further evidence about the volatility of export prices. It was found that export prices showed a significant heteroskedasticity. Furthermore, the volatility was higher during 1970s than 1980s. It was also discovered that volatility of export prices showed some fluctuations and a significantly declining trend over the sample period 1969-1995.

The plan of this paper is as follows. Section II describes the data in details. In Section III, several unit root tests were used to estimate the size of persistence in export prices. Section IV examines the existence of heteroskedastic disturbances. The volatility characteristics of the export prices and evolution of the volatility over time were also examined in Section IV. Section V concludes the paper.

II. THE DATA

The export price series used in this study were monthly indexes covering the period 1969:1-1995:1. The price indexes were computed from the U.S. dollar denominated unit values. This is unpublished data was collected by the Prime Ministry Undersecretariat of Foreign Trade (UFT). The raw data was obtained directly from the databank of the UFT. Price data related to foreign trade is collected by three different institutions in Turkey. These are the State Statistical Institute (SSI), the Central Bank of Turkey, and the UFT.

We prefer to use the UFT export price series data for the following reasons: (1) the UFT allowed us to obtain data according to SITC classification directly from its database system and (2) we were able to obtain sufficient information about the computational methods used by the UFT, the representativeness of exports, and the choice of the base year. For instance, the UFT uses a correction rule that essentially smooths out the export price series. We were not able to obtain any information as to whether the Central Bank and SSI use such rules.

According to the UFT, the correction rules they use minimizes the errors in statistical records. The rules it uses essentially smooth out the prices. The UFT used the following rule prior to 1989. Let P_0 and P_n be the price in the base year and the price in the current year, respectively. If $P_n>2P_0$, then the UFT sets $P_n = 2P_0$. However, the UFT changed the rule after 1989. The rule after 1989 sets $P_n = 10P_0$, if $P_n > 10P_0$. Unfortunately, this introduces an inconsistency to the export price series used in this study. The rule before 1989 is particularly damaging for the purpose of this study. This rule may distort the results by artificially reducing the effects of shocks. We were not able to completely correct the effects of these arbitrary rules. However, a partial correction was feasible. The data was corrected applying the same rule used after 1989 to the data before 1989, i.e., data before 1989 was reconstructed using the rule $P_n = 10P_0$, if $P_n > 10P_0$.

Not all sectors under the SITC headings have usable data. Some sectors have many missing values. It was decided to use data on 32 two digit (SITC divisions) sectors. The SITC codes together with a brief description of these sectors are given in Appendix 1. The selection of these sectors was based on whether the sector was continuously subject to international trade and had a significant share in total exports. The share of these 32 sectors in total exports was approximately 89 percent after 1992. The total export price series, which includes all other sectors in addition to 32 sectors listed in Appendix 1, was also examined. The data for all series cover the period 1969:1-1995:12. This was the longest time span for which the data was available. The period covered includes two oil price shocks, the large shocks of political instability in Turkey during late 1970s, and an important structural change following the Economic Stabilization Decisions in 1980.

Since the data used had a monthly frequency one may suspect seasonal effects. Autocorrelation functions of logged first differences indicate some insignificant seasonality in some series. Although, the seasonal effects are insignificant an X-11 filter to all series was applied and the sensitivity of our results to seasonality was examined. The results obtained using X-11 filtered data were almost identical to the results obtained using unfiltered data. Therefore, it was assumed no seasonality and all results presented in the following sections were obtained using the seasonally unadjusted data.

III. UNIT ROOT EXPORT PRICES AND PERSISTENCE

To assess the importance of permanent shocks in explaining variability of export prices, first it was determined whether a unit root component existed. If it is found that a shock affects the level of series in far future the series contains a unit root. On the other hand, if the effect of a shock on the level of series in the far future is zero, then the series is stationary and does not contain a unit root. Time series that can be represented as a function of a linear time trend are called trend stationary. Deviations of these series from the trend show mean reversion while a unit root time series does not. The ADF tests of Dickey and Fuller (1979, 1981) and the KPSS tests developed by Kwiatkowski, Phillips, Schmidt, and Shin (1992) were used to investigate whether the export price series contain a unit root. The alternative hypothesis of trend stationarity in the ADF and KPSS tests does not allow for structural changes. As shown by Perron (1989), if the effect of structural changes is not taken into account unit root tests will often fail to reject the incorrect hypothesis of a unit root. Therefore, the unit root tests of Banerjee, Lumsdaine, and Stock (1992) (BLS), which allow for a structural change at an endogenously determined date under the alternative hypothesis, were used. If the null hypothesis of a unit root is rejected the series is stationary and all shocks have a temporary effect. If the null hypothesis is not rejected the series contains a unit root or permanent component.

Unit root tests give no information about the size of unit root component. Existence of a unit root component does not mean high persistence. Time series will show little persistence, if the size of the unit root component is small. Therefore, the second step was to asses the size of unit root component. The methodology developed by Campbell and Mankiw (1988) and Cochrane (1988) was used to determine the size of unit root component.

The procedure suggested by Doledo, Jenkinson, and Sosvilla-Rivero (1990) was followed to perform the ADF tests. The selection of the appropriate lag-length k is very important in the applications of the ADF tests. If the lag-length is not sufficient, the ADF tests may have serious size distortions. We follow a fairly general procedure to determine the optimal lag-length. We start from $k = 24$ and sequentially reduce k until a significant t-statistic is found on the Δy_{t-k}, where y_t is the log of series. The ADF tests are performed using three models. The most general model is Model A and contains a constant and a linear trend term as deterministic regressors, Model B contains a constant, and Model C has no deterministic regressor.

Results of the ADF tests for models A, B, and C are given in Table 1. The table also reports selected lag lengths and the Ljung-Box tests. The Ljung-Box tests show that selected lag lengths are sufficiently large so that no autocorrelations remain in residuals. Test results for Model A show that the null of a unit root is not rejected for SITC 42, 55, 68, and 78 at the 5 percent level. Furthermore, the joint restriction of a unit root and no linear trend is rejected for SITC 29 and 84 using the f_3 test. Using the critical values from the normal distribution unit root null is also rejected for these series. For the remaining 27 series the null hypothesis of a unit root cannot be rejected at the 5 percent level. The test results for Model B show that among the 27 series for which the null of f_3 is not rejected, 9 series seem to be stationary at the 5 percent level. For the series that the results for Model B indicate a unit root we further test for the joint restriction of a unit root and no constant term using the f_1 test. Whenever this restriction is not rejected we use the estimates for Model C to test for a unit root. Results for model C indicate that all series contain a unit root.

Table 1. Unit Root Tests

	KPSS Tests		Augmented Dickey-Fuller Tests†			
			Model A			
SITC	h_m	h_t	t_t	f_3	k	$Q(24)$
00	3.04	0.29	-2.07	2.29	21	5.02
01	2.25	0.40	-3.1	5.15	23	13.05
03	3.52	0.47	-2.6	3.90	21	3.90
04	2.66	0.75	-2.5	4.73	24	26.18
05	3.09	0.63	-2.2	2.52	13	7.67
06	2.53	0.62	-3.0	5.92	7	34.46
07	2.23	0.77	-2.3	4.79	20	8.46
09	3.45	0.52	-1.9	2.23	14	17.27
11	3.74	0.23	-2.2	2.67	23	7.48
12	2.69	0.58	-1.7	2.44	16	12.72
22	2.79	0.43	-2.0	2.41	10	12.12
27	3.59	0.91	-0.6	3.36	21	4.11
28	2.36	0.63	-2.4	2.99	3	19.66
29	2.67	0.63	-3.2	7.69*	9	9.26
42	2.96	0.20	-3.6*	6.29	2	18.34
52	3.33	0.84	-1.9	2.14	2	24.30
53	3.88	0.74	-1.6	2.52	9	23.95
55	3.52	0.15**	-4.2*	9.38*	18	10.39
65	3.45	0.66	-2.0	2.70	16	15.46
66	3.63	0.72	-2.4	4.68	23	9.10
67	3.78	0.28	-1.9	2.23	22	17.40
68	3.34	0.22	-3.6*	6.57*	22	31.82
69	3.39	0.54	-1.9	3.44	24	9.51
72	3.92	0.25	-3.2	5.41	17	10.81
74	3.87	0.19	-2.9	4.36	22	17.86
77	3.76	0.13**	-2.6	3.47	19	10.02
78	3.36	0.54	-4.1*	10.87*	23	22.09
81	3.77	0.36	-2.5	3.87	23	9.03
83	3.49	0.50	-2.5	3.98	12	13.65
84	3.72	0.62	-3.0	6.47*	19	33.87
85	3.71	0.15**	-3.4	5.92	11	12.35
89	3.53	0.49	-1.5	2.13	21	18.94
TOT	3.69	0.82	-2.1	5.04	19	11.87

† In addition to *k*-lagged differences of the series Model A includes a constant and a linear trend term, Model B includes a constant, and Model C has no deterministic regressors.

* Significant at the 5 percent level.

** Not significant at the five percent level.

The ADF tests are in general shown to be low powered. The Monte Carlo investigations by Schwert (1989) showed that the ADF tests have low power and are sensitive to the choice of lag-length. The KPSS tests, on the other hand, have good power properties. Results of the KPSS tests are given Table 1. Test results given for h_m show that none of the series are mean stationary at the 5 percent level. However, the results given for h_t indicate that SITC 55, 77, and 85 are trend stationary. In all series the ADF tests indicate stationarity, the KPSS tests confirm this only for SITC 55. Thus, it was concluded that there is strong evidence that the SITC 55 series is stationary. For most of the other series, both the ADF and KPSS tests support the hypothesis of nonstationarity. Therefore, there is strong evidence that 18 out of 33 export price series are nonstationary and there is weak evidence that 14 of the remaining 15 series are also nonstationary. Summarizing, the ADF and KPSS tests indicate that 32 out of 33 series contain a unit root component.

Export prices are often subject to large shocks, which may have effects lasting for many years. These large shocks are mostly associated with structural changes. Structural changes display their effects on time series in the form of a change in the mean of the series (level shift), a change in the growth rate of the series (trend shift), or both. Perron (1989) showed that unit root tests have little power to distinguish between a nonstationary series and a stationary series that has undergone structural changes. Perron corrects the ADF tests to take account of structural changes. There is a serious disadvantage of Perron’s tests, which makes them favor the alternative hypothesis of stationarity around a changing mean or growth rate. That is, one has to exogenously determine the date of structural change to implement Perron's tests. Chiristiano (1992) showed that the exogenous determination of the date of structural change makes Perron's tests favor the alternative hypothesis of stationarity under a structural change. Banerjee, Lumsdaine, and Stock (1992) and Zivot and Andrews (1992) propose test statistics that determine the time of structural change endogenously.

Several of the BLS tests that have good power and size properties were used. The null hypothesis is nonstationarity against the alternative hypothesis of stationarity around a shift in the trend or level of the series for all of the BLS tests. Results of the BLS tests are given in Table 2. Out of 10 tests given in Table 2 only one test, rolling $t_{DF}^{\min}(k/T)$, indicates that several export price series are stationary around a shift in the trend or level of the series. Other tests support the stationarity hypothesis at most for 6 series. Furthermore, there is no uniform agreement about the stationarity of a series by all tests. It is important to notice that sequential tests indicate most series had a shift in the trend or level either around 1974 or around 1980. The first date corresponds to the first oil price shock and second to the Economic Stabilization Decisions of 1980. Structural changes around these two dates are, of course, the most likely ones, and are supported by the test results. Considering the disagreement among the majority of the BLS tests, it was concluded that evidence about the stationarity of these series is weak even after taking into account the effects of structural changes. However, we point out that test results indicate occurrence of large shocks around 1974 and 1980.

Table 2. Structural Change Unit Root Tests

SITC	Recursive Tests[a] t_{DF}^{max}	t_{DF}^{min}	Rolling Tests[b] t_{DF}^{max}	t_{DF}^{min}
00	-3.34*	-2.54	0.79	-3.51
01	-0.03	-3.11	-0.16	-7.47*
03	-0.96	-2.86	-0.20	-3.81
04	-0.83	-2.29	0.21	-4.35
05	-1.13	-3.31	-0.85	-3.41
06	0.26	-2.11	-0.16	-3.53
07	0.08	-2.09	-0.41	-4.71
09	-1.35	-2.12	-0.63	-8.26*
11	0.37	-2.44	0.20	-4.68
12	-1.32	-2.64	-0.04	-3.33
22	-0.01	-2.81	0.39	-3.05
27	0.61	-3.02	0.30	-5.06*
28	-0.52	-2.53	-0.87	-5.26*
29	0.81	-2.83	0.82	-3.95
42	-0.71	-2.63	-0.39	-5.70*
52	-0.67	-2.63	-1.08	-4.95*
53	-0.60	-2.25	-1.20	-5.82*
55	-1.23	-2.93	-1.02	-5.21*
65	-1.02	-3.87	0.26	-4.91*
66	-1.11	-3.12	-0.38	-4.24
67	-0.73	-2.42	-0.36	-3.64
68	-1.51	-2.47	-1.03	-6.24*
69	-2.09*	-4.46*	0.78	-4.10
72	-2.42*	-3.47	-0.67	-4.92*
74	-0.78	-2.34	-1.16	-3.15
77	-1.12	-3.27	-0.67	-4.08
78	-1.92*	-2.84	-1.19	-4.48
81	0.09	-2.68	0.24	-3.52
83	-0.18	-3.55	-0.44	-6.06*
84	-1.20	-3.07	-0.19	-3.38
85	-1.51	-3.22	-1.03	-4.07
89	-1.36	-3.33	-0.73	-6.07*
TOT	-0.48	-2.93	0.47	-4.19

[a]25 percent of the observations are trimmed from the beginning and end of the sample,
[b]Test statistics are computed using 1/3 of the observations.
* Significant at the 5 percent level

Table 2. Structural Change Unit Root Tests (continued)

	Sequential Tests: Level Shift[c]					
SITC	$F^{\max}$	Shift Date	DF	Shift Date	$t_{DF}^{\min}$	Shift Date
00	1.13	80:05	-2.89	80:05	-2.89	80:05
01	5.40	74:05	-3.39	74:05	-3.39	74:05
03	5.03	77:01	-3.66	77:01	-3.66	77:01
04	9.85	77:07	-3.99	77:07	-3.10	77:06
05	12.27	78:11	-4.22	78:11	-4.22	78:11
06	1.69	84:05	-1.60	84:05	-2.58	84:05
07	17.70*	74:05	-4.74*	74:05	-4.74*	74:05
09	5.56	83:02	-2.92	83:02	-2.93	83:12
11	7.38	75:11	-3.17	75:11	-3.19	76:03
12	15.61	75.03	-4.18	75.03	-4.27	76:01
22	11.76	75:06	-4.28	75:06	-4.28	75:06
27	21.05*	81:01	-4.40*	81:01	-4.42*	81:04
28	9.86	77:02	-3.99	77:02	-3.99	77:02
29	5.80	75:05	-3.39	75:05	-3.40	75:04
42	2.49	74:05	-3.13	74:05	-3.13	74:05
52	16.60*	75:01	-3.72	75:01	-4.06	80:06
53	9.13	82:08	-3.12	82:08	-3.13	82:10
55	1.78	90:07	-3.48	90:07	-4.48	90:07
65	19.46*	74:05	-4.86*	74:05	-4.86*	74:05
66	12.19	80:12	-3.74	80:12	-3.74	80:12
67	2.78	89:09	-2.77	89:09	-2.77	89:09
68	1.90	88:08	-2.96	88:08	-2.97	88:06
69	8.42	81:10	-4.90*	81:10	-4.10	81:10
72	9.05	89:10	-4.05	89:10	-4.05	89:10
74	4.61	91:09	-2.80	91:09	-2.81	91:10
77	1.22	75:12	-2.68	75:12	-2.69	76:12
78	21.08*	75:03	-5.66*	75:03	-5.66*	75:03
81	2.18	74:05	-2.31	74:05	-2.31	74:05
83	9.78	95:02	-4.02	75:02	-4.02	75:02
84	9.15	74:05	-4.23	74:05	-4.23	74:05
85	2.67	90:06	-3.39	90:06	-3.40	91:02
89	21.63*	74:11	-4.82*	74:11	-4.84*	75:01
TOT	11.67	74:05	-3.81	74:05	-3.81	74:05

[c] 15 percent of the observations are trimmed from the beginning and end of the sample.
* Significant at the 5 percent level

Table 2. Structural Change Unit Root Tests (continued)

SITC	Sequential Tests: Trend Shift[c]					
	$F^{\max}$	Shift Date	DF	Shift Date	$t_{DF}^{\min}$	Shift Date
00	11.57	84:06	-4.29	84:06	-4.29	84:06
01	5.12	82:09	-3.27	82:09	-3.32	82:09
03	12.49	75:01	-4.58	75:01	-4.58	75:01
04	5.49	74:09	-3.52	74:09	-3.52	74:09
05	8.08	76:09	-3.61	76:09	-3.61	76:09
06	12.29	81:03	-3.40	81:03	-3.78	82:11
07	5.07	88:11	-0.66	88:11	-2.85	83:10
09	23.77*	80:08	-4.88*	80:08	-4.88*	80:08
11	10.17	74:09	-3.59	74:09	-3.59	74:09
12	9.93	74:05	-3.58	74:05	-3.58	74:05
22	8.60	74:08	-3.90	74:08	-3.90	74:08
27	23.87*	74:07	-3.71	74:07	-3.71	74:07
28	16.31	75:02	-4.77*	75:02	-4.77*	75:02
29	3.97	82:04	-3.30	82:04	-3.32	82:06
42	8.19	80:12	-3.51	80:12	-3.80	82:02
52	16.19	74:05	-4.02	74:05	-4.02	74:05
53	11.95	75:10	-2.70	75:10	-3.07	76:11
55	7.35	79:12	-4.09	79:12	-4.09	79.12
65	2.92	76.03	-2.64	76:03	-2.64	76:03
66	8.67	78:08	-2.98	78:08	-2.98	78:08
67	15.48	80:05	-4.29	80:05	-4.29	80:05
68	4.32	74:12	-3.01	74:12	-3.22	79:11
69	6.06	76:06	-3.78	76:06	-3.78	76:06
72	12.73	80:08	-4.21	80:08	-4.27	83:01
74	8.27	80:03	-3.02	80:03	-3.02	80:03
77	9.47	81:12	-3.80	81:12	-3.99	82:08
78	8.28	74:09	-4.46	74:09	-4.46	74:09
81	8.27	86:05	-0.01	86:05	-2.58	82:11
83	5.95	74:05	-3.51	74:05	-3.51	74:05
84	3.69	85:11	-3.60	85:11	-3.60	85:11
85	13.33	84:10	-4.78*	84.10	-4.78*	84:10
89	13.40	74:06	-4.04	74:06	-4.04	74:06
TOT	3.34	81:03	-1.51	81:03	-2.24	91:03

[c]15 percent of the observations are trimmed from the beginning and end of the sample.
* Significant at the 5 percent level

Unit root tests provide evidence about the existence of a permanent component in export prices, but are silent on the size of the permanent component. A time series can be decomposed into permanent and cyclical components. Persistence depends on the relative size of the permanent component. If the variance of the permanent component is small in comparison to the variance of cyclical component the time series will have little persistence. Persistence measures developed by Campbell and Mankiw (1988) and Cochrane (1988) were employed to examine the relative importance of permanent components.

Let the logarithm of the export prices follow an integrated moving average process with drift. Let $A(L)$ be the lag polynomial in the moving average representation of the first differences of the export price series. Then, $A(1)$ provides a measure of persistence. In practice, one needs to estimate ARIMA models to obtain $A(1)$. In most cases, this is undesirable because of issues related to identification and estimation of ARIMA models. Cochrane (1988) suggests a nonparametric measure of persistence closely related to $A(1)$. Define V^k as the ratio of $1/k$ times the variance of *k*-differences to the variance of first differences. Cochrane (1988) shows that a consistent nonparametric estimator of V^k is the Barlett estimator. Campbell and Mankiw (1988) show that a nonparametric estimator of $A(1)$, denoted $A^k(1)$, at window size *k* can be obtained using V^k.

Main results for the persistence measures V^k and $A^k(1)$ are given in Table 3 for values of *k* ranging from 1 to 20 years. In examining these results, it was noticed that for the series that have a large permanent component and high persistence supply side shocks such as technological changes play an important role. However, if most shocks are demand side shocks resulting from the conditions in the world markets, we should find an important temporary component. Neverthless, since many events in the world markets last for many years existence of a significant temporary component may still be associated with high persistence. Estimates in Table 3 show that the majority, 23 sectors, of the export price series have little persistence. For many sectors estimates of $A^k(1)$ are below 0.35 even at the four year horizon. This means that for these sectors 65 percent of the effect of a shock is undone in four years. At the 20 year horizon many of the estimates of $A^k(1)$ are even blow 0.20. For these same sectors estimates of V^k show that temporary shocks explain much of the variance in export prices. Out of 33 export price series examined, only for 2 sectors, SITC 04 and 05, are the estimates of V^k above 0.25 at the one year horizon. However, at the 20 year horizon 5 export price series have estimates of V^k above 0.25. Therefore, it was concluded that much of the variability in export prices facing the Turkish export industries are due to temporary shocks abroad. Although, the existence of permanent components that are mostly related to supply side conditions cannot be denied, they explain very little of the variability in export prices.

Table 3. Estimates of Persistence

k (years)		1			2			4			8	
SITC	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$
00	0.12	0.03	0.40	0.09	0.03	0.34	0.07	0.03	0.30	0.03	0.02	0.21
01	0.13	0.03	0.44	0.09	0.03	0.37	0.06	0.03	0.31	0.04	0.03	0.26
03	0.17	0.04	0.43	0.13	0.04	0.39	0.07	0.03	0.29	0.06	0.04	0.25
04	0.50	0.12	0.77	0.47	0.15	0.74	0.52	0.23	0.78	0.71	0.45	0.92
05	0.65	0.15	0.82	0.76	0.24	0.88	0.64	0.29	0.81	0.69	0.43	0.84
06	0.16	0.04	0.48	0.15	0.05	0.46	0.17	0.08	0.50	0.25	0.16	0.60
07	0.11	0.03	0.36	0.09	0.03	0.32	0.08	0.04	0.31	0.08	0.05	0.31
09	0.13	0.03	0.39	0.08	0.03	0.31	0.05	0.02	0.25	0.03	0.02	0.20
11	0.09	0.02	0.34	0.06	0.02	0.28	0.05	0.02	0.24	0.02	0.01	0.17
12	0.12	0.03	0.37	0.10	0.03	0.34	0.09	0.04	0.33	0.05	0.03	0.25
22	0.16	0.04	0.43	0.12	0.04	0.37	0.08	0.04	0.31	0.05	0.03	0.25
27	0.14	0.03	0.46	0.11	0.04	0.40	0.13	0.06	0.42	0.15	0.10	0.46
28	0.19	0.04	0.50	0.17	0.05	0.47	0.12	0.06	0.40	0.11	0.07	0.37
29	0.12	0.03	0.39	0.09	0.03	0.33	0.08	0.03	0.31	0.06	0.04	0.27
42	0.20	0.04	0.49	0.16	0.05	0.44	0.10	0.04	0.35	0.09	0.06	0.34
52	0.21	0.05	0.51	0.16	0.05	0.44	0.15	0.07	0.73	0.17	0.11	0.46
53	0.11	0.02	0.36	0.07	0.02	0.29	0.04	0.02	0.23	0.04	0.03	0.23
55	0.08	0.02	0.03	0.05	0.02	0.26	0.04	0.02	0.22	0.03	0.02	0.20
65	0.22	0.05	0.51	0.18	0.06	0.46	0.17	0.08	0.44	0.18	0.12	0.46
66	0.16	0.03	0.44	0.11	0.04	0.37	0.09	0.04	0.33	0.11	0.07	0.36
67	0.07	0.02	0.31	0.05	0.02	0.26	0.03	0.01	0.21	0.01	0.01	0.13
68	0.15	0.03	0.48	0.10	0.03	0.39	0.05	0.02	0.29	0.05	0.03	0.29
69	0.12	0.03	0.40	0.09	0.03	0.35	0.09	0.04	0.34	0.11	0.07	0.38
72	0.10	0.02	0.33	0.05	0.02	0.24	0.03	0.01	0.19	0.02	0.01	0.16
74	0.09	0.02	0.36	0.05	0.02	0.27	0.03	0.02	0.20	0.02	0.01	0.16
77	0.11	0.03	0.39	0.06	0.02	0.29	0.04	0.02	0.24	0.03	0.02	0.20
78	0.08	0.02	0.34	0.05	0.02	0.26	0.04	0.02	0.23	0.04	0.03	0.24
81	0.09	0.02	0.34	0.06	0.02	0.28	0.04	0.02	0.24	0.02	0.01	0.15
83	0.09	0.02	0.32	0.06	0.02	0.26	0.04	0.02	0.23	0.05	0.03	0.25
84	0.13	0.03	0.40	0.09	0.03	0.34	0.08	0.04	0.32	0.08	0.05	0.31
85	0.09	0.02	0.35	0.05	0.02	0.27	0.03	0.01	0.21	0.02	0.01	0.17
89	0.13	0.03	0.42	0.06	0.02	0.29	0.05	0.02	0.26	0.06	0.04	0.28
TOT	0.25	0.06	0.55	0.25	0.08	0.54	0.31	0.14	0.60	0.44	0.28	0.72

Table 3. Estimates of Persistence (continued)

k (years)		10			15			20	
SITC	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$	$\hat{V}_k$	s.e.	$\hat{A}^k(1)$
00	0.03	0.02	0.19	0.03	0.03	0.18	0.02	0.02	0.14
01	0.05	0.03	0.26	0.03	0.03	0.22	0.02	0.02	0.19
03	0.03	0.02	0.19	0.04	0.04	0.22	0.03	0.03	0.19
04	0.83	0.59	0.99	1.16	1.00	1.17	1.46	1.45	1.31
05	0.68	0.48	0.83	0.70	0.61	0.85	0.74	0.74	0.87
06	0.29	0.21	0.64	0.40	0.35	0.76	0.47	0.47	0.82
07	0.09	0.06	0.33	0.09	0.08	0.33	0.12	0.12	0.37
09	0.03	0.02	0.20	0.02	0.02	0.17	0.01	0.01	0.13
11	0.02	0.01	0.15	0.01	0.01	0.09	0.02	0.02	0.16
12	0.05	0.04	0.25	0.04	0.03	0.21	0.07	0.07	0.29
22	0.06	0.04	0.26	0.04	0.03	0.21	0.02	0.02	0.14
27	0.16	0.12	0.48	0.16	0.14	0.48	0.13	0.13	0.42
28	0.11	0.08	0.37	0.14	0.12	0.42	0.05	0.05	0.27
29	0.05	0.03	0.25	0.03	0.03	0.20	0.01	0.01	0.13
42	0.08	0.06	0.31	0.06	0.05	0.27	0.04	0.04	0.23
52	0.20	0.14	0.49	0.24	0.21	0.54	0.24	0.24	0.54
53	0.04	0.03	0.23	0.05	0.05	0.25	0.05	0.05	0.24
55	0.03	0.02	0.19	0.04	0.03	0.22	0.05	0.05	0.26
65	0.21	0.15	0.50	0.26	0.23	0.55	0.37	0.37	0.66
66	0.12	0.09	0.39	0.20	0.18	0.50	0.27	0.27	0.57
67	0.01	0.01	0.13	0.01	0.01	0.12	0.01	0.01	0.12
68	0.05	0.04	0.29	0.05	0.04	0.28	0.05	0.05	0.27
69	0.12	0.08	0.40	0.17	0.15	0.48	0.24	0.24	0.57
72	0.02	0.01	0.15	0.02	0.02	0.14	0.02	0.02	0.15
74	0.02	0.01	0.16	0.02	0.02	0.16	0.01	0.01	0.10
77	0.02	0.01	0.16	0.01	0.01	0.13	0.02	0.02	0.16
78	0.05	0.03	0.25	0.06	0.05	0.29	0.08	0.08	0.33
81	0.02	0.01	0.15	0.01	0.01	0.09	0.02	0.02	0.16
83	0.05	0.04	0.25	0.07	0.06	0.29	0.11	0.11	0.37
84	0.09	0.06	0.33	0.12	0.10	0.39	0.17	0.17	0.47
85	0.02	0.01	0.16	0.02	0.02	0.18	0.02	0.02	0.16
89	0.06	0.05	0.29	0.09	0.07	0.09	0.13	0.13	0.42
TOT	0.52	0.37	0.79	0.73	0.63	0.92	0.98	0.97	1.07

A second aspect of the estimates is the dissimilarity of the persistence estimates across sectors. This indicates that most shocks are sector specific. Thus, the effects of aggregate shocks that are mostly due to business cycle conditions in dominant economies, such as the US economy, are small on the export prices faced by the Turkish industries. One reason for the dissimilarity of persistence across sectors may be that different sectors sell to different markets. Turkish exporters sell to diversified markets. Therefore, various demand shocks in these different markets will make the behavior of export prices dissimilar.

A third aspect of the persistence estimates we would like to point out is the behavior of the leading export sectors and the total export price index. A close examination of the estimates in Table 3 reveals that the persistence in the total export price series is large and the permanent component explains more than 50 percent of the variance. The estimate of V^k for the total index at the 20 year horizon is 0.98. Furthermore, the standard error of V^k is large and increasing quickly with the window size for the total export price series. There may be two explanations for the high persistence in the total export price series. First, aggregation will affect the behavior of the total index. Temporary shocks across sectors may cancel out when added and this leaves the unit root component as the dominant source of variability in the total index. Second, a few large sectors, SITC 04, 05, 27, 65, and 84, behave similar to the total index. Like the total index, these sectors show high persistence. Since the share of these sectors is large in total exports, they will have a dominant role on the behavior of the total index.

The last aspect of the persistence estimates is the similar behavior of the primary and manufactured commodities. Many of the persistence measures are small in both groups. There are 3 sectors, SITC 04, 05, and 06, in the primary commodities group and 4 sectors, SITC 52, 65, 66, and 69, in the manufactured commodities group with high persistence. Other sectors in both groups show low persistence and have small permanent components. The reason for this similar behavior is probably the dominant role of sector specific shocks in both groups. Both of these groups may not have significant permanent components that vary across the primary and manufactured commodities groups.

IV. DECLINING VOLATILITY OF EXPORT PRICES

In the previous section, existence of a permanent component and the relative size of persistence in export prices faced by the Turkish export sectors were examined. It was found that a permanent component exists in all export price series, but the size of permanent component is small and most sectors show little persistence. In this section, another aspect of the export prices was examined. It is argued that a switch to a floating rate system in the late 1970s and the early 1980s increased the volatility of export prices. In this section, the sample moments of export price series was examined in order to see whether market and product diversification in Turkish exports, which has taken place in the last two decades, reduced volatility of export prices.

To examine the volatility properties of the export prices, we tested for heteroskedastic disturbances in the log differences of the export price series. For this purpose, we employed White and Breusch-Pagan heteroskedasticity tests in addition to the LM tests for ARCH(1) and ARCH(4) disturbances. Results of these tests are given in Table 4. The null hypothesis of no heteroskedastic disturbances is only not rejected for SITC 05, 28, and 65 using the White test and only for SITC 05 using the Breusch-Pagan test. Furthermore, the hypothesis of no ARCH(1) disturbances is not rejected for seven series including total export price series while the hypothesis of no ARCH(4) disturbances is not rejected only for SITC 03. These findings clearly indicate that shocks to the export prices are not identically distributed and times of high volatility or large shocks exist.

The results of heteroskedasticity and ARCH tests show us the existence of times of high volatility, but give no information about the evolution of volatility over time. To examine whether volatility has risen or fallen in recent years we calculate descriptive statistics of export prices for the 1969:01-1995:12 full sample and 1969:01-1973:10, 1973:11-1979:12, and 1980:01-1995:12 subsamples. Descriptive statistics for these sample periods are given in Table 5. There are several features of the results in Table 5 that are worth mentioning. First, average prices were higher in all sectors in recent years. This indicates a rising trend in export prices. Second, variance of the export prices has sharply fallen over time. This can clearly be seen from the estimates of the coefficient of variation. The coefficients of variation were lower in the 1973:11-1979:12 period compared to the 1969:01-1973:10 period and were still lower in the 1980:01-1995:12 period. Therefore, export prices become less volatile around a rising mean. For instance, the coefficient of variation for the total export price series was 6.10 for the 1969:01-1973:10 sample, 3.64 for the 1973:11-1979:12 sample, and 3.59 for the 1980:01-1995:12 sample. This indicates volatility has been continuously falling for the majority of the export sectors. There are, however, a few sectors that had higher volatility during 1973:11-1979:12 period possibly due to the first oil price shock.

Table 4. Tests for Heteroskedastic Disturbances

SITC	White's Test[a]	Breusch-Pagan Test[a]	ARCH(1)[b]	ARCH(4)[c]
00	19.93	99.1	12.3	33.1
01	86.86	487	50.6	69.8
03	16.14	19.5	7.8	8.3
04	83.62	996	8.9	45.9
05	7.70*	10.1*	3.7	18.6
06	162.6	777	87.4	126
07	15.03	44.1	6.6	60.5
09	25.56	122	19.2	42.2
11	27.60	72.1	1.3*	26.1
12	20.70	49	16.6	18.4
22	19.42	119	15.7	16.6
27	36.52	63.6	1.2*	14.5
28	7.42*	20	0.6*	12.3
29	22.62	92.2	15.6	16.1
42	45.98	100.2	8.2	29.7
52	35.49	119	26.1	34.7
53	25.13	63.3	12.3	15.9
55	20.1	69.5	6.5	12.9
65	4.7*	22.6	0.8*	37.4
66	93.3	426	12.6	38.9
67	32.7	163	15.9	32.2
68	59.5	277	34.8	75.2
69	132	601	90.9	85.9
72	19	61.4	8.1	16.8
74	40.7	140	1.7*	43.5
77	45.9	137.6	24.3	41.4
78	50.6	198	30.6	66.6
81	25.5	62.5	9.9	45.7
83	32.6	71.1	20.8	34.1
84	39.9	173.3	13.7	49.8
85	14.5	58.5	3.3*	10.4
89	45.4	123.7	16.2	36.6
TOT	25.6	54.9	2.2*	48.3

[a] $\chi^2(5)$, [b] $\chi^2(1)$, [c] $\chi^2(4)$

* not significant at the 5 percent level.

Table 5. Descriptive Statistics for Various Sample Periods

SITC	Mean	Variance	Coefficient of Variation	Kurtosis	Skewness
Sample period 1969:01-1995:12					
00	4.486	0.437	14.741	-0.634	-0.416
01	4.679	0.238	10.420	2.919	-1.325
03	4.116	0.428	15.902	-0.414	-0.671
04	4.251	0.352	13.963	9.656	-2.419
05	4.367	0.169	9.414	-0.234	-0.920
06	4.372	0.287	12.263	4.942	-1.785
07	4.448	0.342	13.143	1.609	-1.649
09	3.812	1.008	26.345	-1.059	-0.633
11	3.943	0.756	22.046	-0.827	-0.397
12	4.125	0.247	12.059	0.545	-1.086
22	4.339	0.195	10.182	0.139	-0.498
27	4.084	0.458	16.576	-0.765	-0.860
28	3.827	0.225	12.382	-0.365	-0.767
29	4.395	0.286	12.161	1.427	-1.350
42	4.272	0.163	9.441	-0.437	-0.374
52	4.047	0.596	19.069	-0.393	-1.046
53	3.707	1.143	28.846	-1.125	-0.581
55	4.115	0.470	16.666	3.886	-1.725
65	4.171	0.305	13.247	0.422	-1.091
66	4.246	0.263	12.087	-0.182	-0.914
67	3.351	1.231	33.108	1.358	-1.121
68	3.813	0.540	19.266	0.326	-1.026
69	4.081	0.480	16.983	5.256	-1.775
72	3.474	1.353	33.488	-1.078	-0.505
74	3.655	1.155	29.407	0.189	-0.723
77	4.018	0.532	18.152	-0.806	-0.171
78	4.180	0.694	19.928	3.123	-1.775
81	3.689	1.060	27.905	-0.173	-0.658
83	3.772	1.231	29.415	1.191	-1.222
84	4.173	0.351	14.189	-0.005	-0.871
85	3.443	1.195	31.845	-0.194	-0.575
89	3.824	0.767	22.900	0.766	-1.153
TOT	4.161	0.271	12.500	-0.325	-0.875

Table 5. Descriptive Statistics for Various Sample Periods (continued)

SITC	Mean	Variance	Coefficient of Variation	Kurtosis	Skewness
			Sample period 1969:01-1973:10		
00	3.591	0.074	7.598	-0.521	0.695
01	3.919	0.166	10.384	8.562	-2.298
03	3.077	0.119	11.212	-0.717	0.186
04	3.283	0.505	21.647	7.154	-1.878
05	3.628	0.029	4.698	0.684	0.812
06	3.464	0.273	15.075	5.412	-1.833
07	3.374	0.261	15.150	0.517	0.898
09	2.506	0.595	30.790	0.332	0.945
11	2.620	0.149	14.740	3.217	1.167
12	3.213	0.059	7.566	2.358	-1.343
22	3.580	0.029	4.717	0.687	0.916
27	2.907	0.024	5.356	-0.245	0.205
28	3.005	0.021	4.849	0.152	0.048
29	3.439	0.155	11.437	-0.353	-0.369
42	3.684	0.054	6.285	-0.882	-0.462
52	2.621	0.025	6.066	15.097	-3.243
53	2.123	0.182	20.113	2.861	0.933
55	3.419	0.732	25.025	1.631	-1.366
65	3.178	0.106	10.246	-0.588	0.240
66	3.399	0.086	8.609	0.425	-0.401
67	1.916	0.889	49.194	1.902	-1.427
68	2.961	0.832	30.807	-0.905	0.667
69	2.996	0.524	24.159	4.973	-1.954
72	2.026	0.542	36.356	-0.766	0.651
74	2.378	0.847	39.207	0.980	-0.745
77	3.037	0.084	9.524	0.335	0.077
78	2.970	1.177	36.537	-1.064	-0.097
81	2.107	0.370	28.873	-0.061	-0.526
83	2.062	0.948	47.202	0.563	-0.525
84	3.168	0.115	10.691	-0.209	-0.182
85	2.222	0.659	36.520	0.895	0.961
89	2.389	0.499	29.551	0.572	0.116
TOT	3.231	0.039	6.101	-0.304	0.512

Table 5. Descriptive Statistics for Various Sample Periods (continued)

SITC	Mean	Variance	Coefficient of Variation	Kurtosis	Skewness
			Sample period 1973:11-1979:12		
00	4.130	0.289	13.007	-1.356	-0.451
01	4.674	0.163	8.642	0.005	-1.012
03	3.870	0.145	9.835	-0.197	-0.808
04	4.188	0.064	6.038	-0.027	-0.677
05	4.273	0.040	4.678	-0.200	0.801
06	4.381	0.081	6.495	-0.590	0.132
07	4.577	0.099	6.877	3.622	-1.741
09	2.957	0.177	14.241	6.182	1.766
11	3.658	0.276	14.354	-0.692	-0.350
12	4.174	0.066	6.148	-0.063	-0.924
22	4.317	0.057	5.509	0.085	-0.183
27	3.753	0.122	9.314	-0.079	-0.640
28	3.853	0.118	8.933	0.106	-1.202
29	4.450	0.058	5.421	3.669	-1.462
42	4.200	0.062	5.917	-0.860	0.163
52	3.810	0.159	10.477	0.405	-0.765
53	2.924	0.329	19.637	-0.273	-0.025
55	3.737	0.354	15.914	-0.075	-0.647
65	4.019	0.026	4.039	-0.666	-0.654
66	3.974	0.057	6.037	-0.208	0.457
67	2.521	0.457	26.822	6.913	-2.476
68	3.303	0.170	12.500	5.583	-1.830
69	3.830	0.061	6.476	-0.644	0.021
72	2.616	0.533	27.909	-0.888	-0.061
74	2.850	0.316	19.720	0.893	-0.455
77	3.587	0.167	11.380	3.527	-1.243
78	3.988	0.205	11.356	-0.070	-0.551
81	3.232	0.327	17.700	0.687	-0.827
83	3.475	0.565	21.633	-0.043	-0.482
84	3.897	0.017	3.311	-0.719	0.268
85	2.836	0.408	22.537	0.182	0.285
89	3.564	0.201	12.567	1.384	-1.020
TOT	3.952	0.021	3.639	-0.277	0.402

Table 5. Descriptive Statistics for Various Sample Periods (continued)

SITC	Mean	Variance	Coefficient of Variation	Kurtosis	Skewness
		Sample period 1980:01-1995:12			
00	4.894	0.147	7.830	3.300	-0.270
01	4.910	0.061	5.030	-0.880	0.231
03	4.524	0.115	7.484	-0.558	-0.343
04	4.567	0.034	4.047	-0.259	0.176
05	4.626	0.025	3.439	-0.468	-0.498
06	4.643	0.049	4.787	-0.297	-0.019
07	4.723	0.030	3.650	0.375	-0.382
09	4.535	0.133	8.042	8.723	-2.807
11	4.453	0.303	12.367	-0.998	-0.336
12	4.382	0.056	5.394	-0.497	0.111
22	4.576	0.068	5.704	2.560	1.071
27	4.568	0.023	3.341	6.086	-1.413
28	4.067	0.065	6.259	0.778	0.143
29	4.662	0.064	5.442	3.166	-0.586
42	4.477	0.086	6.548	-0.653	-0.276
52	4.569	0.025	3.469	7.004	-1.688
53	4.487	0.142	8.401	2.327	-1.453
55	4.470	0.112	7.501	6.856	-1.902
65	4.530	0.036	4.217	-1.239	0.242
66	4.606	0.021	3.122	-0.656	-0.506
67	4.104	0.179	10.321	1.562	-1.107
68	4.267	0.071	6.247	-0.435	0.011
69	4.505	0.069	5.830	5.547	-1.318
72	4.242	0.408	15.061	2.413	-1.564
74	4.360	0.310	12.779	0.897	-0.911
77	4.481	0.232	10.745	-0.753	-0.257
78	4.620	0.090	6.491	-0.808	-0.397
81	4.344	0.285	12.287	-1.240	-0.130
83	4.404	0.261	11.597	1.253	-1.252
84	4.584	0.046	4.691	-0.868	-0.300
85	4.029	0.728	21.179	7.818	-2.176
89	4.358	0.134	8.396	-0.403	-0.878
TOT	4.523	0.026	3.587	-1.444	0.247

Figure 1. Change in Volatility of Export Prices

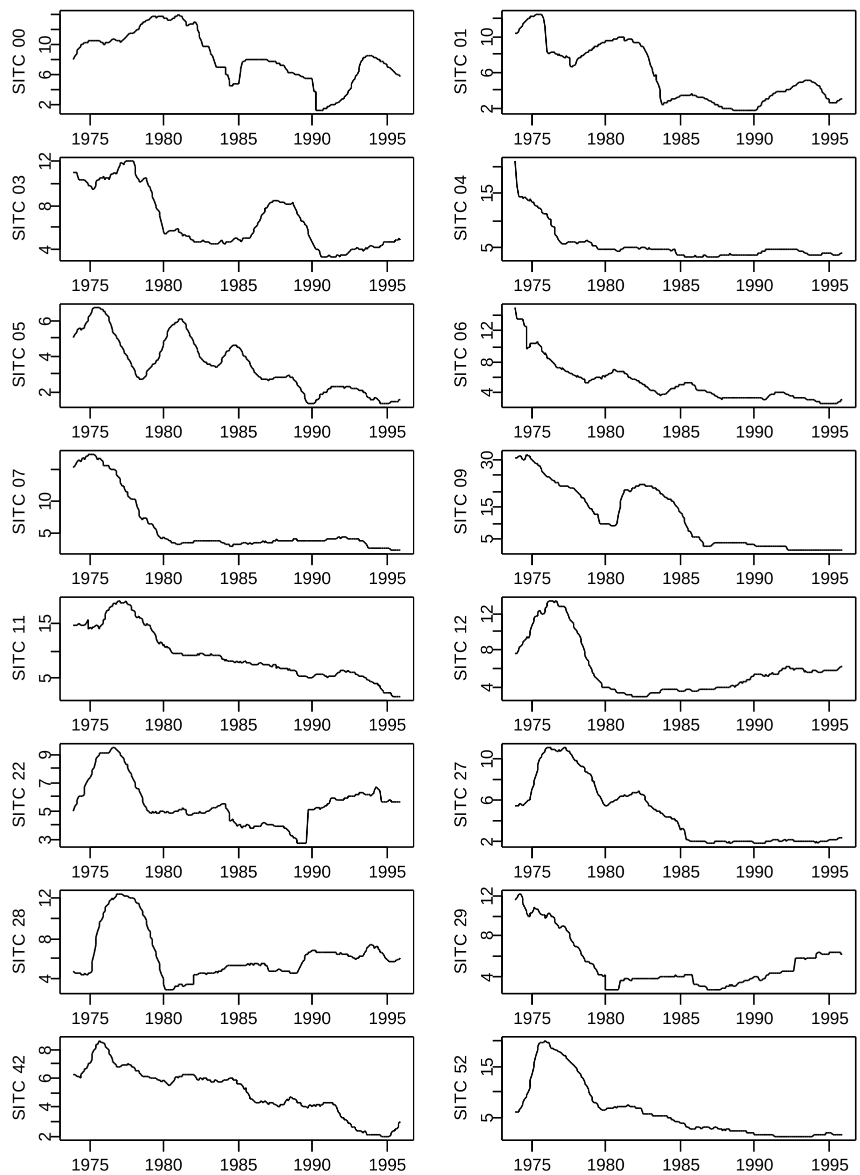


Figure 1. Change in Volatility of Export Prices (continued)

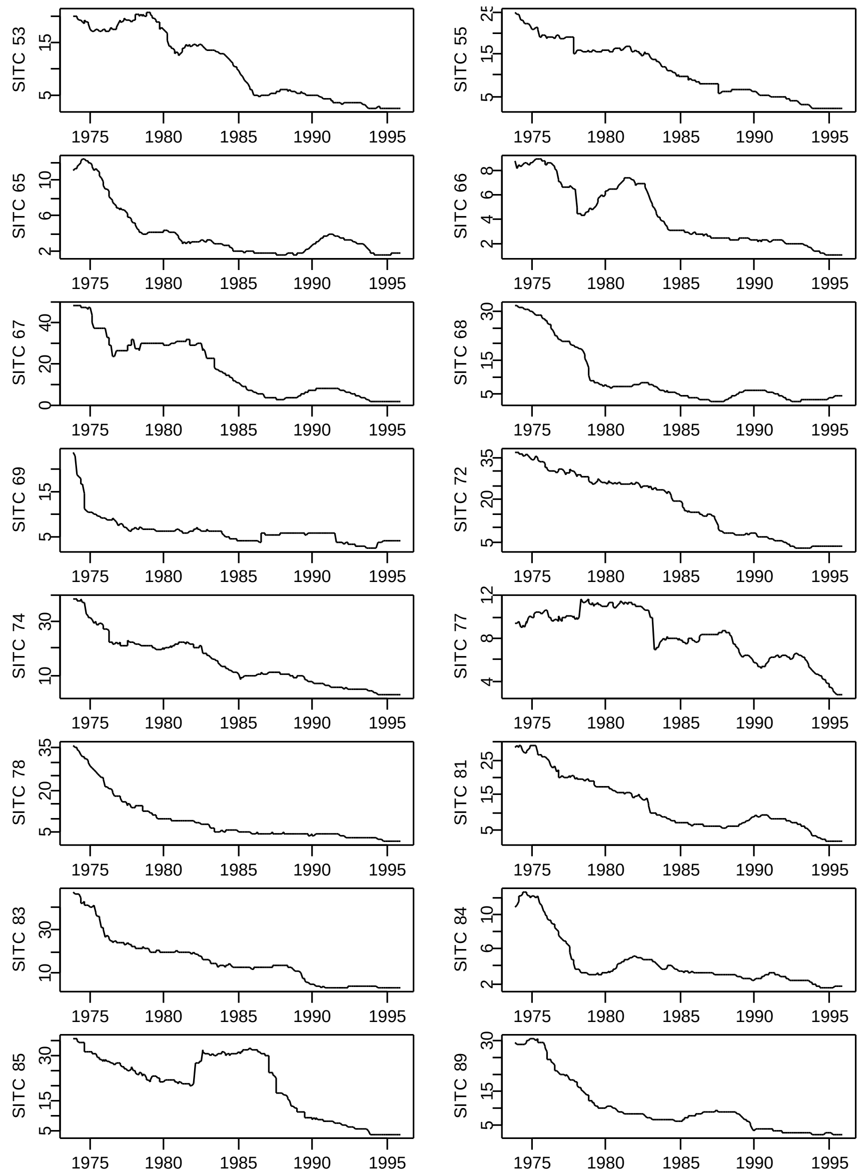
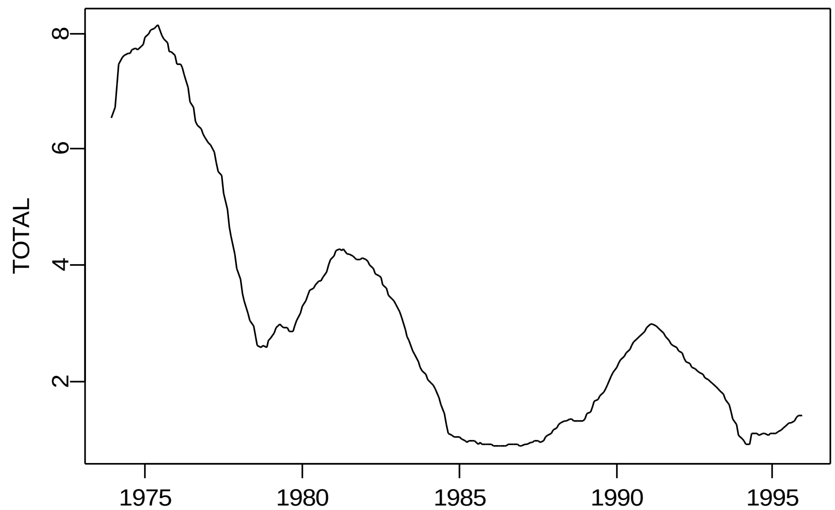


Figure 1. Change in Volatility of Export Prices (continued)



To better examine the changing volatility over time Figure 1 gives 5-year moving average coefficient of variations for all sectors. These plots show that volatility had a falling trend for all sectors. However, the volatility of export prices had increased around 1973 for all sectors and around 1989 for the majority. The first rise in the volatility is due to the first oil price shock. Third, volatility across sectors varies largely. This shows that there are important sector specific factors which determine the volatility in a given sector. This does not mean that there are no common factors that affect the volatility in all sectors. Although, common factors made volatility in all sectors decline over time, sector specific factors or shocks make one sector always more or less volatile than the others. Fourth, manufactured commodities were always more volatile than primary commodities. In general, manufactured commodities have a larger coefficient of variation estimates than primary commodities in all three subsamples and in the full sample. Thirwall and Bergevin (1985) found that primary commodity prices are generally more volatile than manufactured commodities prices. This is obviously not true for the export prices facing the Turkish industries. Fifth, estimates of excess Kurtosis show that the distribution of export prices had fatter tails during the 1969:01-1973:10 period compared to the later periods. Therefore, probability of large shocks has declined in recent years.

V. SUMMARY AND CONCLUSION

Exports gained a high significance in the Turkish economy following the abolishment of the import substitution policy in 1980. Dependence of the Turkish economy on export earnings has been continuously increasing since then. Turkey placed a great significance in increasing the share of manufactured commodities in exports. However, primary commodities still account for the bulk of total exports. Prices of primary commodities relative to manufactured commodities have been continuously declining since early 1980s. Worldwide abolishment of the fixed exchange rate system and switch to flexible exchange rate system has increased the volatility of international prices. These developments together with increased dependence of the Turkish economy on exports made the movements in export prices a potential destabilizing force. This study examined the characteristics of export price series of 32 individual sectors. We obtained significant information about the export prices series using time series techniques.

One of the issues investigated in this study is the existence and importance of the role played by permanent shocks. We show that most export price series are nonstationary and subject to permanent shocks. We further examined the size of permanent component relative to temporary component. We estimated measures of persistence that show the relative importance of permanent and temporary components. We found that most export price series show little persistence and the size of permanent component is relatively small.

We also examined the volatility of export prices. We found that all export prices are subject to heteroskedastic disturbances. However, volatility of all export price series was continuously declining after early 1980s. We are not sure about the precise sources of declining volatility of export prices facing the Turkish exporters. However, market and product diversification can explain the declining volatility. Volatility across sectors varies largely. This shows that there are significant sector specific factors. We discovered that the sectors in the manufactured commodites group are more volatile than the sectors in primary commodities group.

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Appendix 1. Description of the Export Sectors Used in the Study (SITC,Rev.3)

SITC Code	Description
00	Live Animals other than Animals of division 03
01	Meat and Meat Preparations
03	Fish, Crustaceans, Molluscs, and Aquatic Invertebrates, and Preparations thereof
04	Cereals and Cereal Preparations
05	Fruits and Vegetables
06	Sugars, Sugar Preparations, and Honey
07	Coffee, Tea, Cocoa, Spices, and Manufactures thereof
09	Feeding Stuff for Animals (not including unmilled cereals)
11	Beverages
12	Tobacco and Tobacco Manufactures
22	Oil Seeds and Oleaginous Fruits
27	Crude Fertilizer and Ores (excluding coal, petroleum, and precious stones)
28	Metalliferous Ores and Metal Scrap
29	Crude Animal and Vegetable Materials, n.e.s.
42	Fixed Vegetable Fats and Oils; Crude, Rafined or Fractionated
52	Inorganic Chemicals
53	Dyeing, Tanning, and Coloring Materials
55	Essential Oils, Resinoids, and Perfume Materials; Toilet, Polishing, and Cleaning Preparation
65	Textile Yarn, Fabric, Made-up Articles, n.e.s. and Related Products
66	Non-metallic Mineral Manufactures, n.e.s.
67	Iron and Steel
68	Non-ferrous Metals
69	Manufactures of Metals, n.e.s.
72	Machinery Specialized for Particular Industries
74	General Industrial Machinery and Equipment, n.e.s. and Machine Parts, n.e.s.
77	Electrical Machinery, Apparatus, and Appliances, n.e.s. and Electrical Parts thereof
78	Road Vehicles (including air-cushion vehicles)
81	Prefabricated Buildings; Sanitary, Plumbing, Heating, and Fitting
83	Travel Goods, Handbags, and Similar Containers
84	Articles of Apparel and Clothing Accessories
85	Footwear
89	Miscellaneous Manufactured Articles, n.e.s.
TOT	General Total, includes all other sectors in addition to 32 listed above