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ESTIMATING MANUFACTURING TRADE STRUCTURES AND ELASTICITIES IN TURKEY: AN INDUCTIVE APPROACH

Mustafa Akal[1]

This study attempts to estimate the manufacturing export and import structures of traded goods valuing above two million American Dollars. Estimated models are found non linear with respect to manufacturing terms of trade adjusted United States Dollar exchange rate, but log linear with respect to the world prices, domestic manufacturing prices and outputs for the period of 1982-2000. The manufacturing export world output elasticity is found more elastic than the manufacturing import domestic output elasticity. An equivalent increase in world and domestic output improves trade balance, C*eteris Paribus,* and contributes to the economic growth. The manufacturing import world price elasticity was estimated less inelastic than the manufacturing export world price elasticity. A percentage increase in world prices is able to increase Turkey's manufacturing trade deficit, C*eteris Paribus*. Manufacturing export and import goods are found complementary implying intra-industry manufacturing trade.

1. Introduction

Manufacturing sector has been one of the most important sectors for the economy of Turkey in generating export receipts and contributing economic growth for recent two decades. Turkey's manufacturing import has increased in parallel to her manufacturing export and so the volume of manufacturing trade since 1980. Yükseler and Türkan (2006

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[1] Assoc. Prof. Dr., Sakarya University, Faculty of Economic and Administrative Sciences, Economics Department, Esentepe Kampusu, Adapazarı, 54187, Turkey. E-mail: akal@sakarya.edu.tr, Phone:90-264-2956341, Fax: 90-264-2956233.

p.43) accounted the ratio of manufacturing export about 89.67 % between 1996-2000 and 91.57 % between 1996-2005. They also accounted the use ratio of import goods in manufacturing production about 21.9 % based on 1998 input-output table. Today, the Turkish manufacturing sector is quite competitive internationally. The estimations of the manufacturing export and import demand structures and the estimation of the magnitudes of their price and output elasticities involve important policy implications. This study aims to outline the magnitude of elasticities for the policy conclusions and theoretical controversies in the area.

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 foreign income and relative prices are effective on foreign export demand from a country. They also assumed both domestic income and relative prices of countries effective on import demand. They attempted to explain both the export and import of a country with relative import price and income by log linear models based on Neo-Classical theory. They estimated both the relative price and income elasticities of both exports and imports of various countries. They came up with log linear simultaneous models under the assumption of the demand and supply equilibrium of exports without testing whether simultaneity and linearity exist or not in international trade. All of them are far away accounting most traded goods, which are main determinants of trade and the types of mostly traded goods vary highly over years. They choose aggregated exports receipts and imports expenditures as endogenous variables in their models. They all based their models on the assumption of economic theory, which assume export and imports substitutes for domestic goods or visa versa. Their approach is called “the traditional approach” in the literature. Tansel and Togan (1987) followed a similar approach for Turkey.

Guisan and Exposito (2004, p.7) found that the increase of imports of many complementary goods and services increases domestic production, implying the importance of import-led impact on the supply side on the productions in developing countries.

Özatay (2000) set up Turkish total 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 from Turkey. Senhadji and Montenegro (1999) emphasized that the higher export demand income elasticity means more powerful exports growth effect as an engine of growth. And the higher export price elasticity means more competition facing an exporting country at international market. This implies that devaluing domestic currency increases export revenues and help to reduce trade balance. On the other side, Arslan and van Wijnbergen (1993) concluded that the policies allowing real depreciation of the exchange rate were more effective than export incentives on Turkish export growth. Bahmani-Oskooee and Domac (1995) found a long-run equilibrium relationship between export growth and output growth in Turkey over the 1923-1990 period. Yiğidim and Köse (1997) found statistically insignificant export effect but a most significant import effect on the economic growth of Turkey. Özmen and Furtun (1998) found a bi-directional Granger causality between the export growth and output growth. Bahmani-Oskoode and Latifa (1992) estimated a significantly negative exchange rate coefficient on Turkish exports. Sivri and Usta (2001) found that the real exchange rate Granger causes neither exports nor imports by using the VAR model, and it can not be applied to improve trade balance. However, explaining trade in manufacturing sector was ignored up to now even manufacturing trade shares the highest portion in Turkey.

In international country studies, Marquez (2002) found contradictory results between data and theory in estimating trade elasticities. Hooper et al. (1998) found that the U.S. export and import cointegrated with relative prices and real effective exchange rates over the 1960-94 period. However, they obtained incorrect sign for the price elasticity for imports as consequence of using an effective exchange rate index. This would imply that a weaker domestic currency (U.S. Dollar) associates with greater imports. On the other hand, Rose and Yellen (1989) rejected the cointegration hypothesis by applying the Engle-Granger (1969) procedure in the estimated regression of the general form in trade balance for the monthly data over the 1960-85 period. Johnston and Chinn (1996) found the evidence of a long run relationship between U.S. trade flow, income and the real exchange rate over the 1973-93 period. From these findings, one may conclude that the estimates of different authors may differ because of the differences in sample periods and the overwhelming trade deficits; therefore, the magnitude of trade elasticities may differ in terms of sample period, country and trade balance status. For example, improvement in trade balance may require larger movement in the value of domestic currency under trade deficit. Hence, this would imply low import price elasticity. Turkey has faced large trade deficits for 1982-2000 period to have inelastic price elasticity. Furthermore, the estimated elasticities may contradict the theory depending on the periods and choosing traded goods according to worth variety of traded goods.

This study differs from earlier traditional general export and import studies (i) by following an inductive approach, (i) by using weighted exports and import quantity indexes which comprehend traded manufacturing goods worth above two millions U.S.D., (iii) by developing sectoral terms of trade (manufacturing TOT) adjusted U.S. Dollar exchange rate variable, (iv) by foreseeing a mathematical form based on data and causality between variables, (v) by testing whether the simultaneity exists between the endogenous variables which were assumed in some traditional models. Based on these differences we fit the most appropriate mathematical forms to the graphs between the manufacturing export, import and their causes to estimate the export and import structures and their elasticities by estimating direction of causations.

2. Data and Variables

Manufacturing export and import quantities and price indexes are obtained from *Statistical Indicators* 1923-2004 (Turkish Statistical Institution, 2005, www.tuik.gov.tr), and other variables are obtained from *International Financial Statistics Yearbook* (*1997,2001), IMF.* The Figure 1 indicated a cubic relationship between manufacturing export, import and manufacturing terms of trade adjusted exchange rate and domestic wholesale prices. The relation of the manufacturing export and relative export price, and between manufacturing import and relative import price are found natural log linear. The relation between manufacturing export and world gross domestic output, and between manufacturing import and Turkish gross domestic output are also found natural log linear. The SAS (2002-2003) software is used for data analysis. The Variables are symbolized as follows*:*

LQXM= Ln (Manufacturing export quantity indexes of Turkey), LPXM= Ln (Manufacturing export price indexes of Turkey),

LQMM=Ln (Manufacturing import quantity indexes of Turkey), LPMM=Ln (Manufacturing import price indexes of Turkey),

LMEXC=Ln ((Turkish liras per U.S. dollar)/(Manufacturing export price indexes /Manufacturing import price indexes),

LWPIM= Ln (Manufacturing wholesale price indexes of Turkey), LWWPI= Ln (Wholesale price indexes of the world), LWPI= Ln (Wholesale price indexes of Turkey),

LTGDP=Ln (Gross domestic product volume indexes of Turkey), LWGDP= Ln (Gross domestic product volume indexes of the world),

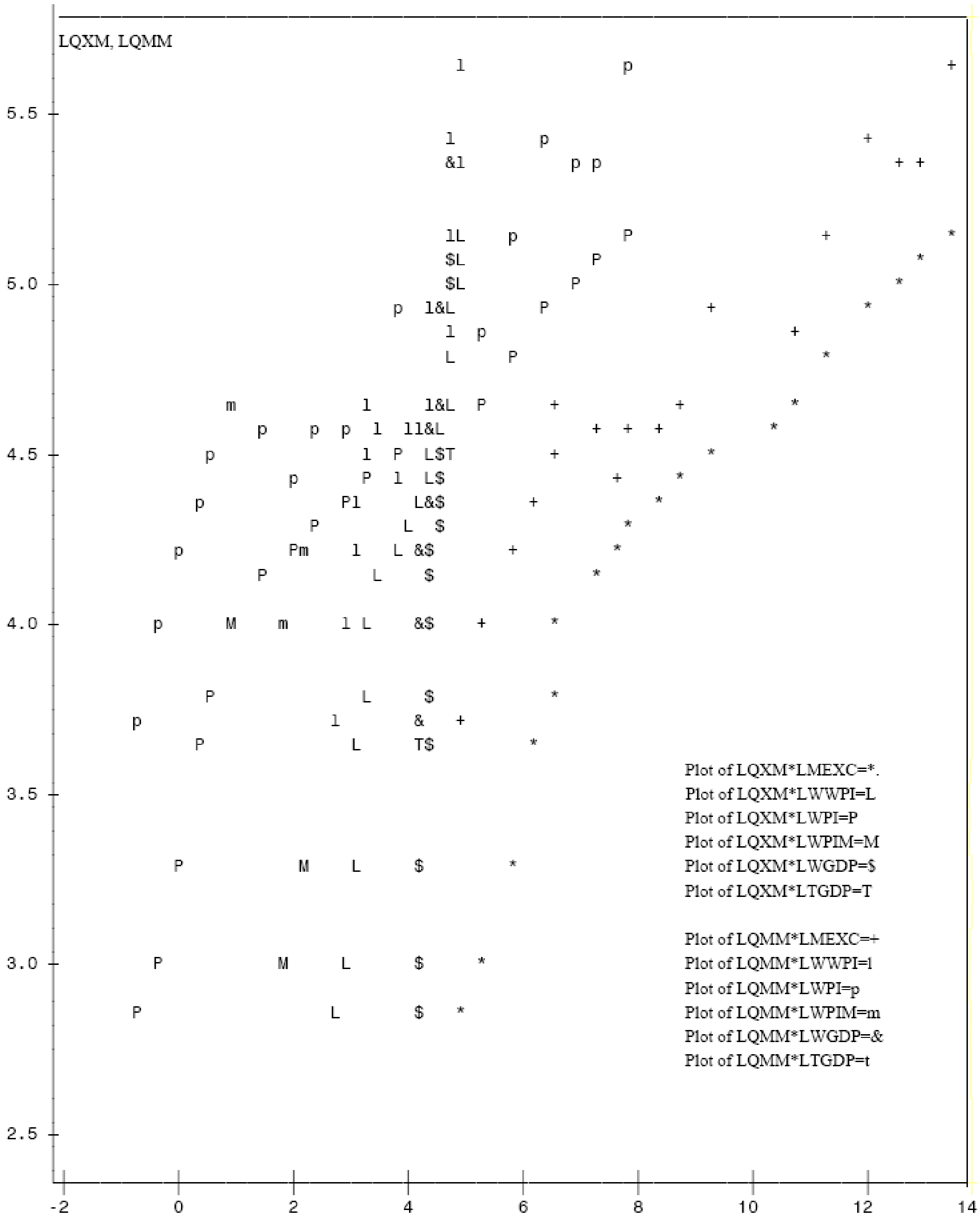
WWPX= Export price indexes of the world, WWPM= Import price indexes of the world,

Δ=the order of first differences operator.

All index series basis on 1994 principal year. All variables in the estimated models are in the forms of natural logarithms because this form is found more meaningful than absolute values as a result of graphics and linear correlation ratios.

After this point, we will be using symbols often for explanations to save place because there are many variables and many relations between variables to express explicitly.

Figure 1: Plot of Manufacturing Export and Import Versus Prices and Incomes



3. Correlation and Causation

To show the applicability of the variables one needs to research the degree of correlation between the manufacturing trade quantity variables and others. Since both the manufacturing terms of trade adjusted U.S. Dollar exchange rate and the domestic wholesale price showed cubic relationship with manufacturing export and import, and the world wholesale price and the manufacturing wholesale price showed somewhat cubic relation with the manufacturing export and import these variables were raised to the second and third upper power forms for estimations. The relationships between manufacturing export, import and related variables are found quite high and refer 0.0001 significance level as seen in Table 1.

Table 2 shows us the direction of the Granger causality (1969) between variables. The direction of causality is shown in the fifth column for export related variables and in the tenth column for import related variables in Table 2. There exists no causality between LQMM and LQXM as seen in the last raw of Table 2. Therefore, manufacturing export and import models (LQXM and LQMM models) can be set up independently. Furthermore, there exists one-sided causality between the prices and manufacturing export, and between the prices and manufacturing import that are from the prices (LMEXC, LWWPI, LWPIM, LWPI) to the export and to the imports as seen in the fifth and tenth columns respectively in Table 2. Table 2 also indicates unidirectional causality from LWGDP toward LQXM as seen in the ninth raw (the fifth column) and from LTGDP toward LQMM in the ninth raw (in the tenth column). All associates with the theoretical assumptions in direction of causality. Domestic output is found insignificant in explaining the manufacturing export during estimation process even there exists a one sided causality from domestic output toward the manufacturing export at lag one as seen in the eleventh raw (the column fifth) in Table 2. Indeed we may estimate structural patterns of manufacturing export and import and their output and price related elasticities.

Table 1: Estimates of Pearson Correlation Coefficients

Variable	Lqmm	Lmexc	Lmexc^2	Lmexc^3	Lwwpı	Lwwpı^2	Lwwpı^3	Lwpi	Lwpi^2	Lwpi^3	Lwgdp	Ltgdp	Lwpim	Lwpim^2	Lwpim^3
Lqxm	.937	.944	.904	.862	.963	.953	.941	.948	.830	.763	.975	.981	.863	.802	.753
Lqmm	1	.940	.931	.916	.889	.884	.897	.944	.905	.873	.947	.947	.892	.883	.864
Lmexc		1	.993	.974	.965	.976	.984	.981	.952	.906	.992	.968	.965	.947	.904
Lmexc^2			1	.994	.929	.948	.962	.972	.980	.949	.972	.937	.969	.978	.948
Lmexc^3				1	.886	.910	.931	.952	.992	.977	.944	.900	.959	.993	.977
Lwwpi					1	.998	.991	.952	.850	.772	.982	.983	.921	.842	.771
Lwwpı^2						1	.998	.961	.878	.805	.985	.980	.939	.872	.804
Lwwpı^3							1	.966	.902	.835	.985	.975	.952	.899	.835
Lwpı								1	.948	.891	.982	.971	.939	.920	.880
Lwpi^2									1	.987	.918	.875	.941	.991	.982
Lwpi^3										1	.862	.806	.904	.985	.998
Lwgdp											1	.989	.944	.905	.858
Ltgdp												1	.915	.855	.799
Lwpim													1	.958	.910
Lwpim^2														1	.988
Probability	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001

Table 2: Direction of Causality in Estimated Manufacturing Export and Import Models

LQXM					**LQMM**				
H_a versus H_o Hypothesis	Lag (t-m)	Comparison of Calculated and Critical F Ratios	Decision	Direction of Causality	H_a versus H_o Hypothesis	Lag (t-m)	Comparison of Calculated and Critical F Ratios	Decision	Direction of Causality
LMEXC→LQXM LQXM→LMEXC	t-2	$6.01>3.89=F_{2,12,.05}$ $.0765<2.81=F_{2,12,.10}$	Accept H_a Accept H_o	→	LMEXC→LQMM LQMM→LMEXC	t-1~2	$17.91>8.68=F_{1,15,.01}$ $.0165<3.07=F_{1,15,.10}$	Accept H_a Accept H_o	→
LWWPI→LQXM LQXM→LWWPI	t-3	$11.28>6.99=F_{3,9,.01}$ $5.88>3.86=F_{3,9,.10}$	Accept H_a Accept H_a	→	LWWPI→LQMM LQMM→LWWPI	t-2	$9.38>6.91=F_{2,12,.01}$ $1.174<2.81=F_{2,12,.10}$	Accept H_a Accept H_o	→
LWPI→LQXM LQXM→LWPI	t-2	$4.757>3.89=F_{2,12,.05}$ $1.11<2.81=F_{2,12,.10}$	Accept H_a Accept H_o	→	LWPI→LQMM LQMM→LWPI	t-2	$6.4>3.89=F_{2,12,.05}$ $.07<2.81=F_{2,12,.10}$	Accept H_a Accept H_o	→
LWPIM→LQXM LQXM→LWPIM	t-4	$8.57>4.53=F_{4,6,.05}$ $.35<3.18=F_{4,6,.10}$	Accept H_a Accept H_o	→	LWPIM→LQMM LQMM→LWPIM	t-4	$3.56>3.18=F_{4,6,.10}$ $.89<3.18=F_{4,6,.10}$	Accept H_a Accept H_o	→
LWGDP→LQXM LQXM→LWGDP	t-2	$7.6>6.93=F_{2,12,.01}$ $1.38<3.07=F_{2,12,.10}$	Accept H_a Accept H_o	→	LWGDP→LQMM LQMM→LWGDP	t-2	$2.26< 2.81= F_{2.12.10}$ $.00006< 2.81= F_{2.12,.10}$	Accept H_o Accept H_o	no no
LTGDP→LQXM LQXM→LTGDP	t-1	$7.47>4.54=F_{1,15,.05}$ $1.76<3.07=F_{1,15,.10}$	Accept H_a Accept H_o	→	LTGDP→LQMM LQMM→LTGDP	t-4	$3.83>3.18=F_{4,6,.10}$ $.79<3.18=F_{4,6,.10}$	Accept H_a Accept H_o	→
LQMM→LQXM	t-1~2	$.285<2.81=F_{2,12,.10}$	Accept H_o	no	LQXM→LQMM	t-1~2	$.257<2.81=F_{2,12,.10}$	Accept H_o	no

4. Functional Forms

This section needs to be discussed with the connection of Figure 1 and with the existing direction of causalities between manufacturing trade variables and their causation variables in parallel to economic theory.

a. Manufacturing Export

Traditionally foreign export demand is related to export prices relative to foreign prices and foreign income. And the import is related to import prices relative to domestic prices and domestic output. Based on estimated Granger-causes associating with the theory the manufacturing export function can be defined as

$LQXM_t = f\,(LMEXC_t, LWWPI_t, LWPI_t, LWPIM_t, LWGDP_t)$

to postulate and estimate models that might not include all of these variables under the consideration of econometric criteria.

Since Figure 1 indicates a cubic relationship between LQXM and LMEXC we expect

$\partial\, LQXM / \partial\, LMEXC > 0$, $\partial\, LQXM / \partial\, LMEXC^2 < 0$, $\partial\, LQXM / \partial\, LMEXC^3 > 0$.

The manufacturing export manufacturing terms of trade adjusted exchange rate elasticity varies according to a parabolic pattern. Therefore, one needs to estimate such pattern as the determinant of manufacturing export structure. This is the key variable that differs from the variables and assumptions of the traditional neoclassical estimation of foreign export price elasticities.

It is expected that

$\partial\, LQXM / \partial\, LWWPI > 0$ and $\partial\, LQXM / \partial\, LWPI < 0$, $\partial\, LQXM / \partial\, LWGDP > 0$.

However; one may expect that $\partial\, LQXM / \partial\, LTGDP > 0$ in view of export supply for the sample period as Turkey has followed an export lead industrial development strategy since 1980.

b. Manufacturing Import

Similar to the postulation of the manufacturing export function above, the manufacturing import function can be expressed as

$LQMM_t$=f ($LMEXC_t$, $LWWPI_t$, $LWPI_t$, $LWPIM_t$, $LTGDP_t$).

Since Figure 1 indicates a cubic relationship between LQMM and LMEXC we expect that

∂ LQMM / ∂ LMEXC > 0, ∂ LQMM / ∂ $LMEXC^2$ < 0, and ∂ LQMM / $\partial LMEXC^3$ > 0.

and it is expected that

∂ LQMM / ∂ LWWPI < 0, ∂ LQMM / ∂ LWPI and ∂ LQMM / ∂ LWPIM > 0, assuming that the domestic goods are substitutes for world export, *Ceteris paribus.* Otherwise they are complements.

For the income levels we expect that ∂ LQMM / ∂ LTGDP > 0.

From Table 1, we understand that all the trade related variables shows at least a significant natural log linear correlation with the manufacturing export and import quantities. However, one may not use all of them in the same equation not to cause multicollinearity, which causes biased regressors. In addition, various models need to be estimated to see partial or separate effect of each variable on the manufacturing export and import.

5. Estimated Manufacturing Export and Import Models and Trade Elasticities

Before estimating models, the direction of the causality tested by Granger Methodology above. Based on causality directions, models are set up unidirectionally as in Table 3. The Granger Causality test opposed the simultaneity assumption about export, import and their prices. An inductive approach is important to estimate mathematical structures of export and import equations and so to estimate the foreign trade price and income elasticities promptly for a country. There is no significantly estimated relation between the manufacturing export and manufacturing export unit price[2] as well as between the manufacturing export and the export unit price relative to the world wholesale price[3].

There are ten estimated export and import models in Table 3. The purpose of estimating different models is to show the significance of mathematical form between endogenous and exogenous variables exhibited on Figure 1 in addition to estimating separate effects of the price and income related variables on the manufacturing export and import.

The partial correlations between endogenous and exogenous variables in a model are also estimated and shown in Table 4 to show the contribution of each variable to the explanatory part of a model. For example, the partial correlation ratio between LQXM and LWGDP through Model LQXM 2-LQXM 4 ranged between .659 and .910. The higher ratio of partial correlation means the higher the effect of the related variable on the endogenous variable relative to the rest of the variables in a model's explanation in reality.

[2] The correlation ratio between QXM and PXM equals –0.3128, which is insignificant.
[3] As it is seen in Equation D1 at the end of Table 3. Similarly; there is no significantly estimated relation between the manufacturing import and its import unit price as well as between the manufacturing import and the import unit price relative to the domestic wholesale price as it is seen in Equation D2, and the import unit price relative to the domestic manufacturing wholesale price is not significant in Equation D4 import model. But the export unit price relative to the world export price is found significant in the estimated D5 export model at the end of Table 3.

Table 3: Estimates of Manufacturing Export and Import Quantity Models

	Manufacturing Export Models						Manufacturing Import Models			
Variable	LQXM 1	LQXM 2	LQXM 3	LQXM 4	LQXM 5	LQXM 6	LQMM 1	LQMM 2	LQMM 3	LQMM 4
COSTANT	-5.2 .83***	-16.86 4.2***	-19.35 3.57***	-26.62 3.27***	-4.8 2.7***	-4.29 .68***	-1.91 1.62	-8.73 1.68***	-10.7 1.82***	-8.77 1.77***
$LMEXC_t$	2.64 ..3***	1.41 .04***	.120 .36***	-0.21 .077***	2.48 .25***	2.45 .24***	2.03 .58***	1.018 .39***		0.13 .033***
$LMEXC_t^2$	-0.25 .03***	-0.125 .039***	-0.103 .035***		-0.22 .023***	-0.23 .026***	-0.21 .07***	-0.09 .04**		
$LMEXC_t^3$	.008 .001***	.003 .001***	.0028 .0013**		0.007 .001***	0.008 .001***	0.008 .002***	0.003 .002*		
$LWWPI_t$		-0.49 .156***	-0.44 .16***					-0.96 .24***	-0.94 .18***	-0.96 .16***
$LWPI_t$		0.051 .024**				0.088 .026***				
$LWPIM_t$			-0.043 .018***	-0.08 .033***	-0.07 .024***				-0.0695 .025***	
$LWGDP_t$		3.99 1.31***	6.69 1.138***	7.32 .86***						
LTGDP								2.92 .55***	4.2 .54***	3.59 .52***
R^2	.9899	.9972	.9973	.9871	.9934	.9944	.9307	.9809	.9651	.9732
Adj R^2	.9878	.9957	.9959	.9845	.9915	.9928	.9169	.9736	.9581	.9679
F	489	702	733	383	528	620	67	134	138	182
DW	1.68	2.65	2.788	.934	1.989	1.789	1.732	1.934	1.517	1.527
Lower, Upper, .01	.74, 1.41	2.037, 3.524	2.037, 3.524	.74, 1.41	.65,1.58	.65,1.58	.74, 1.41	.65,1.58	.74, 1.41	.74, 1.41
Lower, Upper, .025	.86, 1.55	1.908, 3.435	1.908, 3.435	.86, 1.55	.76,1.72	.76,1.72	.86, 1.55	.76,1.72	.86, 1.55	.86, 1.55
Lower, Upper, .05	.97,1.68	1.794,3.351	1.794,3.351	.97,1.68	.86,1.85	.86,1.85	.97,1.68	.86,1.85	.97,1.68	.97,1.68
Decision	No + aut.	inconclusive	inconclusive	inc. &+aut.	No+auto	No +&. inc	No + aut.	No+auto	No + & inc	No + & inc

Note: ***: 0-1%, **: 1-5%, *: 5-10% significance levels.
Estimated Traditional Manufacturing Disequilibria Models (Adapted from General Disequilibria Models):

$LQXM_t$= -5.25 - .312 Ln(PXM/WWPI) $_t$ + 2.15 Ln(WGDP) $_t$, R^2=.9533, Adj. R^2=.9474, F=163, DW=.396. (D1)
(6.08) (.32) (1.31)

$LQMM_t$= 0.29 - 0 .089 Ln(PMM/WPI) $_t$ + 1.003 Ln(TGDP) $_t$, R^2=.9112, Adj. R^2=.90, F=82, DW=1.09. (D2)
(2.84) (.056) (.613)

$LQXM_t$=-6.75 - 2.16 Ln(PXM/WWPM) $_t$ + 2.47 Ln(WGDP) $_t$, R^2=.9698, Adj. R^2=.9647, F=247, DW=1.399. (D3)
(1.59***) (.71***) (.34***)

$LQMM_t$= -2.56 +-0.036 Ln(PMM/WPIM) $_t$ + 1.62 Ln(TGDP) $_t$, R^2=.9024, Adj. R^2=.8902, F=74, DW=.688. (D4)
(1.79) (.03) (.386***)

$LQXM_t$=-5.54 - 1.9 Ln(PXM/WWPX) $_t$ + 2.21 Ln(WGDP) $_t$, R^2=.9712, Adj. R^2=.9677, F=270, DW=1.562. (D5)
(1.768***) (.56***) (.38***)

Note: The are other models estimated to show the significance of the patterns as follows

$LQXM\hat{}_t$=3.354 +. 595LWPI $_t$ - .111LWPI $_t^{2}$ + .0085LWPI $_t^{3}$, R=. 987, Adj R^2=. 968, F=183, DW=2.565 (D6)
(.05***) (.061***) (.023***) (.002***)

$LQXM\hat{}_t$= 2.127 + .408LWWPI $_t$ +. 45LWPI $_t$ - .112LWPI $_t^{2}$ +. 009LWPI $_t^{3}$, R=. 994, Adj R^2=. 984, F=281 (D7)
(.306***) (.001***) (.056***) (.016***) (.002***) DW=1.571

$LQMM\hat{}_t$= 4.157 + .338LWPI $_t$ - .008LWPI $_t^{2}$ + .0077LWPI $_t^{3}$, R=. 965, Adj R^2=. 918, F=68, DW=1.903 (D8)
(.059***) (.073***) (.028***) (.003***)

$LQMM\hat{}_t$= 4.072 + .028LWWPI $_t$ +. 328LWPI $_t$ - .08LWPI $_t^{2}$ +. 077LWPI $_t^{3}$, R=. 965, Adj R^2=. 912, F=48 (D9)
(.539***) (.178$^{\text{not sig}}$) (.099***) (.029***) (.003***) DW=1.85

$LQXM\hat{}_t$= .87 + .843LWWPI $_t$, Adj R^2=. 923, F=66, DW=. 365
(D10)
(.223***) (.057***)

$LQXM\hat{}_t$= 3.457 + .23LWPIM$_t$, Adj R^2=. 729, F=49.5, DW=. 50
(D11)
(.138***) (.033***)

$LQMM\hat{}_t$= 2.392 + .581LWWPI$_t$, Adj R^2=.778, F=64, DW=.682
(D12)
(.295***) (.073***)

$LQMM\hat{}_t$= 4.111 + .178LWPIM$_t$, Adj R^2=.783, F=68, DW=.93
(D13)
(.092***) (.022***)

Table 4: Estimates of Partial Correlation Coefficients of Manufacturing Export and Import Models

	Manufacturing Export Models						Manufacture Import Models			
Variable	LQXM 1	LQXM 2	LQXM 3	LQXM 4	LQXM 5	LQXM 6	LQMM 1	LQMM 2	LQMM 3	LQMM 4
$LMEXC_t$	.9161 .0001	.7191 .004	.6929 .006	-.5749 .016	.9375 .0001	.9405 .0001	.694 .003	.5829 .023		.7034 .002
$LMEXC_t^2$	-.8809 .0001	-.677 .008	-.6389 .014		-.8957 .0001*	-.9211 .0001	-.6385 .006	-.4946 .061		
$LMEXC_t^3$	.9166 .001	.5792 .032	.5257 .054		.8727 .0001	.9015 .0001	.6376 .006	.4553 .088		
$LWWPI_t$		-.6703 .009	-.6213 .018					-.7462 .001	-.8053 .0001	-.8471 .002
$LWPI_t$		.5252 .054				.6679 .005				
$LWPIM_t$			-.5503 .041	-.5327 .028	-.5911 .0001				-.5847 .014	
$LWGDP_t$		.659 .010	.7644 .0001	.9105 .0001						
LTGDP								.8264 .0001	.8946 .0001	.8731 .0001

6. Co-integration and Order of Integration

Whether a long-run relationship between the endogenous and exogenous variables in the estimated multiple regression models exists is discussed in this section. An appropriate Dickey-Fuller (1979) test equations is estimated for each estimated manufacturing export and import models. There exist various forms of DF test equations depending on the significance of trend and constant terms. Accordingly, the critical value varies depending on both the DF test equation and the number of observations for unit root, they also vary depending on the number of variables in cointegrating equation.

Table 5 presents us the integration test results of the individual variables. Table 6 presents us the co-integration test results of the export and import models. These tables also include Ljung-Box auto correlation test statistics for the randomness of estimated DF test equation following "estimated Dickey-Fuller τ_γ" raw in both tables. And Table 6 presents Ljung-Box χ^2 white noise check of residuals for estimated Manufacturing Models. Except for LQXM 2 model[4], all the estimated model indicated random error disturbances as seen in the fourth raw following Ljung-Box χ^2 white noise check of residuals for estimated Manufacturing Models in Table 6. All estimated DF models based on the first and second order differences of the errors of the co-integrating equations indicated no constant and trend case. Therefore, the ADF critical values are the case of "no constant, no trend" for the co-integrating equations. However, some of DF equations for the individuals variables exhibited either a constant or a trend. If the estimated "τ_γ " value is greater than the critical "τ_γ" a researcher must accept Alternative Hypothesis (H_a) of No Unit Root or Co-integration against Non Co-integration or Unit Root Null Hypothesis (H_0). For this, our H_0: $\gamma = 0$ and H_a: $\gamma < 0$ in an appropriately choice of one of the following:

$\{\Delta x_t = \gamma x_{t-1} + v_t\}$, $\Delta x_t = \alpha + \gamma x_{t-1} + v_t\}$,

$\{\Delta x_t = \gamma x_{t-1} + \sum_{j=1}^{p} \Delta x_{t-j} + v_t\}$ or $\{\Delta x_t = \alpha + \beta T + \gamma x_{t-1} + \sum_{j=1}^{p} \Delta x_{t-j} + v_t\}$

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[4] The DW autocorrelation test statistics of LQXM Model 2 fell in indicated inconclusive area.

Dickey-Fuller Test equations, where v_t is a randomly distributed error term, x_t is the series need to be tested whether exhibiting unit root or not. $\Sigma\Delta x_{t-j}$ is autoregressive part to satisfy randomness of v_t. T is time and α is constant terms. The test statistics is defined as $\tau_\gamma=\gamma/\sigma_\gamma$, where σ_γ is the standard error of γ.

According to the Ljung-Box test statistics for estimated DF test equations randomness is satisfied as they are seen in Table 5 and 6. The unit root test results in Table 5 indicated that individual variables are integrated at the level one as seen in the last raw, or their first differences are integrated at the level. According to D-F unit root cointegratability test, LQXM 2, 3 and LQMM 4 cointegrating equations indicated error disturbances integrating at the levels, $e_t \sim I(0)$ as seen in the last raw of the case of "Δ e_t" in Table 6, on the other hand, all the estimated models are found cointegrated at the first order differences; $e_t \sim I(1)$ as seen in the last raw in Table 6[5].

Considering Table 5 and 6 with Table 2, we understand that the direction of the long run relationships exhibits toward LQXM and LQMM from exogenous variables. There is no bidirectional causality between LQXM and its explanatory variables as well as between LQMM and its explanatory variables. Multiple regression models based on the existent causalities are found co-integrated either at the levels or at the first differences or both like in LQXM 2, 3 and LQMM 4 models.

Since all the estimated models indicated co-integrated series one may evaluate these models and the economic meanings of the estimated coefficients.

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[5] However, all of estimated models indicated cointegrated relationships based on DF critical values for individual series rather than ADF critical values. To increase sample size or degree of freedom may bring about cointegrating equations for other models at the level based on the ADF critical values.

Table 5: Estimated Dickey-Fuller τ_γ for Individual Variables, Unit root test

	LQXM	LQMM	LMEXC	LMEXC^2	LMEXC^3	LWWPI	LWPI	LWPIM	LWGDP	LTGDP
AR(1), γ	-.74	-.13	-.99	-1.11	-.91	-.87	-1.55	-.76	-.95	-1.3
τ (p,c,t)	-2.98 (0,c,0)	-4.01 (4,0,0)	-3.91 (0,c,0)	-4.2 (0,0,t)	-3.69 (0,0,t)	-3.42 (2,c,0)	-7.21 (0,c,0	-4.34 (0,0,0)	-3.53 (0,c,0)	-5.3 (0,c,0)
χ^2_{0-6} probability	3.65 (.72)	3.36 (.18)	2.33 (.89)	2.88 (.823)	2.21 (.899)	1.09 (.90)	2.97 (.81)	3.75 (.71)	2.05 (..92)	5.75 (.45)
χ^2_{6-12} probability	6.9 (.86)	5.04 (.75)	8.62 (.73)	9.57 (.634)	6.36 (.896)	9.2 (.53)	3.09 (.99)	4.76 (.97)	7.6 (.82)	9.36 (.67)
Distribution	random	random	random	random	random	random	random	random	random	random
τ critical	- 2.65(.1)	-2.7(.01)	- 3.83(.01)	- 3..83(.01)	- 3.03(.05)	-3.03(.05)	-3.83(.01)	-2.7(.01)	- 3.03(.05)	- 3.83(.01)
Integr. Level	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Note : t=trend inclusion, c=constant inclusion. Source for τ critical values: Watson, P. K. and Teelucksingh, S.S. (2002), Appendix 14.1: Critical Values for DF and ADF Tests for Unit Root Test, p.256.

Table 6 : Ljung-Box Stationarity and AEG (ADF) Co-integration Test Results for Manufacturing Models

	LQXM 1	LQXM 2	LQXM 3	LQXM 4	LQXM 5	LQXM 6	LQMM 1	LQMM 2	LQMM 3	LQMM 4
Ljung-Box χ^2 white noise check of residuals for estimated Manufacturing Models										
χ^2_{0-6} probability	7.84 .258	12.33 .055	10.19 .117	9.8 .133	3.58 .733	8.36 .213	3.34 .765	3.08 .799	4.72 .58	5.03 .54
χ^2_{6-12} probability	12.82 .382	15.08 .203	19.97 .068	14.68 .259	10.99 .530	12.5 .406	10.04 .612	7.35 .834	9.12 .692	6.08 .912
χ^2_{12-18} probability	18.12 .448	27.9 .064	21.25 .267	31.38 .626	12 .847	21.48 .256	12.33 .83	14.41 .702	26.31 .093	26 .10
Distribution	random	random	random	random	random	random	random	random	random	random
Errors' autocorrelation functions indicated stationary disturbances.										
Estimated Dickey-Fuller τ_γ, no constant, no trend cases for cointegration test (Δe_t)										
AR(1),γ	-.88	-1.37	-1.64	-.69	-1.001	-.95	-.889	-1.104	-.83	-.94
No constant, **τ** (p)	-3.82 (4)	-6.38 (0)	-7.13 (2)	-3.98 (0)	-4.1 (0)	-4.13 (0)	-3.76 (0)	-4.53 (0)	-3.44 (0)	-4.62 (0)
χ^2_{0-6} probability	6.63 .356	6.08 .414	5.71 .336	9.58 .144	3.48 .747	9.39 .153	2.59 .866	2.71 .844	3.28 .773	2.05 .915
χ^2_{6-12} probability	12.29 .423	9.07 .697	10.08 .524	15.79 .201	11.23 .509	15.28 .227	8.93 .709	6.57 .709	9.5 .885	4.12 .981
Distribution	random	random	random	random	random	random	random	random	random	random
ADF $_{CV}$	4.252*	6.135**	6.135**	4.252*	4.708*	4.708*	4.252*	5.164*	4.252*	4.252*
Decision	nonci	e_t~I(0)	e_t~I(0)	nonci	nonci	nonci	nonci	nonci	nonci	e_t~I(0)
The case of the second order differences DF test equation for errors ($\Delta^2 e_t$)										
AR(1),γ	-1.29	-1.43	-1.74	-.68	-1.35	-1.28	-1.302	-1.39	-1.22	-1.21
No constant, **τ** (p)	-5.91 (0)	-6.92 (0)	-10.31 (2)	-4.74 (2)	-5.76 (0)	-6.16 (0)	-5.49 (0)	-6.62 (0)	-5.02 (0)	-5.59 (0)
χ^2_{0-6} probability	2.69 .846	8.3 .217	3.41 .492	6 .20	4.53 .606	7.84 .25	3.74 .7112	5.38 .497	4.87 .561	4.89 .558
χ^2_{6-12} probability	7.07 .853	11.32 .501	11.29 .335	9.97 .443	11.53 .471	11.58 .479	8.33 .759	9.63 .649	11.68 .471	8.94 .708
Distribution	random	random	random	random	random	random	random	random	random	
ADF $_{CV}$	5.72***	6.135**	7.23***	4.725**	5.195**	5.195**	4.725**	5.66**	4.725**	4.725**
Decision	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)	e_t~I(1)

Source for ADF or AEG critical values: Watson, P. K. and Teelucksingh, S.S. (2002), Appendix 15.1: critical Values for ADF Tests of Cointegratability, pp. 279-280.

Note 1: Computations the DF test equations with constant (even constant terms are found insignificant) indicated integrated series for the case of $\Delta^2 e_t$ at the levels, or e~I(1).

7. Interpretation of the Results

All the Durbin-Watson test results of the manufacturing trade models indicated no autocorrelation problem except for LQXM 2 and LQXM 3 models of which D-W statistics ranged along inconclusive areas as seen in Table 3[6]. Therefore, all manufacturing models are reliable in view of autocorrelation. A possible multicollinearity among variables is avoided by eliminating either domestic wholesale price or domestic manufacturing wholesale price in estimated models as much as possible. We do not need to test structural change because the period is quite homogenous in policies and Figure 1 did not indicate a structural break.

Both the export and import models indicated significant log cubic relations with respect to the manufacturing TOT adjusted exchange rate, and natural log linear form with respect to the world wholesale prices, manufacturing domestic wholesale prices, domestic wholesale prices (excluding D6, D7, D8, D9 models), the world output and domestic output. However, the log linear or parabolic pattern of the manufacturing TOT adjusted exchange rate is also estimated in three models (LQXM 4, LQMM 3 and LQMM 4) as a result of the use of other price variables together in a model.

The estimated manufacturing export models are able to explain the variations in the manufacturing export between 98.45 % and 99.59 %. The estimated valid manufacturing import models are able to explain the variations in the manufacturing import between 91.69 % and 97.36 % as seen in Table 3, and all of them are significant at least 1 % level. This means that the manufacturing export of Turkey can be explained by the manufacturing terms of trade-adjusted exchange rate, the world price and income, and the domestic wholesale prices or manufacturing domestic wholesale prices. On the other hand, the manufacturing import of Turkey can be explained by the manufacturing terms of trade adjusted foreign exchange rate, the domestic wholesale prices or domestic manufacturing wholesale prices and income, and the world wholesale price level. The explanatory structural pattern may show differences from the traditional approach.

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[6] But LQXM 2 model indicated non-white disturbances based on Ljung-Box test, which detect high order autocorrelation.

The positively estimated foreign income elasticity of the manufacturing export demand and the domestic income elasticity of the manufacturing import demand satisfy our theoretical expectations. From Table 3 we understand that the manufacturing export demand income elasticity ranges between 3.99 and 7.32, and the manufacturing import demand income elasticity ranges between 2.92 and 4.2 in the estimated models[7]. As a result, the manufacturing export foreign income elasticity is found higher than the manufacturing import domestic income elasticity. Hence, one may reach the conclusion that both the manufacturing export and import are luxury goods oriented, and the manufacturing exports demand goods are more luxury than the manufacturing imports demand goods**.** Such results associates with the theory because manufacturing goods are mostly durable goods. Both elasticities are found higher than earlier studies' findings because the sample obtains trade concentrated goods worth above two millions U.S. Dollars.

Since the manufacturing export and import models indicated cubic function with respect to the manufacturing TOT adjusted U.S. Dollar exchange rate, hence; the manufacturing TOT adjusted elasticity of the export indicated parabolic function except for LQXM 4 model. Similarly; the manufacturing TOT adjusted elasticity of the import indicated parabolic function of the manufacturing TOT adjusted U.S. Dollar exchange rate in LQMM 1 and LQMM 2 models. Both imply varying elasticity over time.

The existence of cubic relations of both the manufacturing export and import with respect to domestic wholesale price indexes in graphical analysis are validated by the significantly estimated models as seen in equation D6-D9 at the end of Table 4. However, the wholesale price cubic effect existed as a linear form dominantly in the LQXM 2 and LQXM 6 models and it is found insignificant in LQMM 1 and LQMM 2, which additionally include the manufacturing TOT adjusted U.S. Dollar exchange rate. Instead, domestic manufacturing wholesale price is used in the LQMM 3 model and it is significant only in LQMM 3.

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[7] However, the manufacturing export demand world income elasticity is estimated under 2.5 in D.3 and D.4 of adapted disequilibria trade models at the end of Table 3, which are smaller than "3.99-7.32."

Foreign manufacturing export demand with respect to manufacturing wholesale price indicated a negatively constant natural log linear relation in LQXM 1 thorough LQXM 6 models as expected. Similarly, the manufacturing import is log linearly related to the domestic manufacturing wholesale price in LQMM 3 model. The existence of negative manufacturing export domestic manufacturing price elasticity and the world price elasticity implies that Turkish manufacturing export goods are complementary for the world's goods. Similarly; the manufacturing import demand world price and manufacturing domestic price elasticities are negative. Hence, one may conclude that manufacturing domestic goods and import goods are complementary. Both results imply intra-industry manufacturing trade. Both LQXM 3 and LQMM 3 models indicated that the world and domestic manufacturing goods are complements[8]. But LQXM 2 model indicated a positive domestic wholesale price and negative world price effect on foreign manufacturing export demand[9].

A percentage increase in the world prices yields around 0.96 percentage decrease in manufacturing import in LQMM 2 through LQMM 4 models. A percentage increase in domestic manufacturing prices decreases the manufacturing import by 0.0695 percentage in model LQMM 3 on the average[10].

The manufacturing import domestic manufacturing price elasticity is estimated less inelastic than the world price elasticity. And the manufacturing import world price elasticity is estimated less inelastic than the manufacturing export domestic wholesale price elasticity. On the other hand, the foreign manufacturing export demand is positively related to domestic wholesale price as it is seen in LQXM 2 and LQXM

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[8] Two goods are gross complements (substitutes) if a rise in the price of one good causes less (more) of the other good to be bought (Nicholson, 1989:165).

[9] However, one may think the dominance of manufacturing export supply over export demand or a Veblen effect on foreign manufacturing good demand from Turkey. Or there might be the imaginary export effect out of manufacturing trade resulting from export promotion policies during the period.

[10] However, the simple regression models indicated positive world and domestic manufacturing price effect on both manufacturing export and import in the models on the bottom of Table 4. Such sign inconsistency may exist because of the partial effects in the use of multiple regressions, assuming there is no extreme multicollinearity among the variables.

6 models[11]. The manufacturing TOT adjusted U.S. dollar elasticity of both the manufacturing export demand and import demand take different values depending on the LMEXC values over years[12].

Cosar (2002) estimated an inelastic general export demand real exchange rate elasticity and elastic income elasticity. As a result, the author interpreted that growth in trade partner countries may affect Turkey's export positively but the exchange rate policies may not be successful in promoting export growth**.** Here, the estimated income elasticity supports Cosar's conclusion to promote Turkish manufacturing export growth. However, since the manufacturing TOT adjusted exchange rate elasticity of manufacturing export is found as a parabolic form there existed variable exchange rate elasticity but it decreases as manufacturing TOT adjusted exchange rate increase from 1982 to 2000 years. However, there is a room to conclude that sectoral TOT adjusted exchange rate devaluations yield higher manufacturing export growth than manufacturing import growth in percentages before 1989[13]. Both

[11] However, a cubic manufacturing export model with respect to domestic wholesale price also existed as seen in equation D6 an D7 when domestic wholesale price is applied individually. Such structure would yield a parabolic manufacturing export domestic price elasticity as ". 595–0.222LWPI + 0.0255LWPI^{2}'' in D6 and "0.45–0.224LWPI+0.027LWPI^{2}'' in D7 models. A cubic manufacturing import model with respect to domestic wholesale price also existed as in model D8 when domestic wholesale price is applied individually. Then, one needs to estimate the manufacturing export domestic price elasticity based on "0.338–0.016LWPI + 0.231LWPI^{2}'' in D8 model. And both export and import domestic wholesale price elasticities may vary in sign from year to year. As a result point elasticity calculations the manufacturing import domestic wholesale price elasticity was found more elastic than the manufacturing export domestic wholesale price elasticity at higher domestic prices.

[12] For example, the manufacturing export demand manufacturing TOT adjusted U.S. Dollar exchange rate elasticity equals "2.64-0.5LMEXC+0.024LMEXC^{2}" in LQXM 1 model, and "0.120-0.206LMEXC+0.0084LMEXC^{2}" in LQXM 3 model. The manufacturing import demand manufacturing TOT adjusted U.S. Dollar elasticity equals "2.03-0.42LMEXC+0.024LMEXC^{2}" in LQMM 1 model, and "1.018-0.18LMEXC+0.009LMEXC^{2}" in LQMM 2 model. The absolute value of "2.64-0.50LMEXC+0.024LMEXC^{2}" is greater than the absolute value of "2.03-0.42LMEXC+0.024LMEXC^{2}" when the value of "0.61 - 0.08LMEXC" positive. In other words, the manufacturing export manufacturing TOT adjusted U.S. Dollar exchange rate elasticity is greater than the manufacturing import manufacturing TOT adjusted U.S. Dollar exchange rate elasticity for the LMEXC values under 7.625, where LMEXC ranged between 4.9 and 13.41, which is the case before 1989 and after.

[13] For example, LQXM 1 model yields 0.76552 sectoral TOT adjusted exchange rate elasticity of manufacturing export for LMEXC value equals 4.9 (for 1982 year) and 0.25236 for the LMEXC value equals 13.41 (for 2000 year). But the manufacturing import sectoral TOT adjusted exchange rate elasticity equals 0.54752 in year of 1982, and 0.71516 in year of 2000. This

manufacturing export and import sectoral TOT adjusted exchange rate elasticities are found inelastic. This implies a larger devaluation in manufacturing sectoral TOT adjusted foreign exchange rate to overcome a level of trade deficit through manufacturing export in the case of higher manufacturing export sectoral TOT adjusted exchange rate elasticity than import sectoral TOT adjusted exchange rate elasticity, *Ceteris Paribus*. This means a larger nominal exchange rate devaluation than manufacturing TOT improvement. It is impossible to overcome trade deficit in the case of lower manufacturing export sectoral TOT adjusted exchange rate elasticity than import sectoral TOT adjusted exchange rate elasticity. In such case, a larger reduction in sectoral TOT than exchange rate devaluation by government is required to overcome a level of trade deficit, C*eteris Paribus*.

The earlier estimates are related to the general export and import elasticities of the country. And different authors concentrated on estimation of the general export and import models for different periods. They are fully neoclassical approaches to the issue. Therefore, we can only compare the estimated manufacturing price and income elasticities with the general ones. 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 by –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. Compare with our findings, Manufacturing export

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implies a percentage devaluation in sectoral TOT adjusted exchange rate reduced trade balance in 1982 but increased trade balance in 1989, *Ceteris Paribus*.

and import output elasticities are found higher than the authors' general export and import output elasticities.

In addition to estimated different structural forms and different elasticities in manufacturing sector compared with general trade output and price elasticities, there may be changes in the trade elasticities depending on the policy periods. The export income and price elasticities were estimated higher over the 1960-83 period towards liberalization compared to the 1951-69 period, as well of the import income elasticity. However, our traditional models were found insignificant as they are seen in D1 and D2 models at the end of Table 3. We used the world unit import price indexes instead of the world wholesale price indexes in the modified D3 and D4 manufacturing export and import models. Manufacturing export relative price elasticity was found equals –2.16, on the other hand, manufacturing import relative price elasticity was found insignificant. Moreover; modified D5 traditional model yields higher relative price elasticity compared with D3 model. The manufacturing export demand relative domestic price (the domestic export prices/the world import price) elasticity was estimated as –2.16 which is lower than the manufacturing export demand relative domestic export price (the domestic export prices/the world export price) elasticity (-1.9) in comparing D3 model with D5 model. In these models, the export demand world output elasticity was found higher than the import demand domestic output elasticity as in proposed models in Table 3. And our estimated manufacturing models indicated higher income elasticities compared to Khan's and Tansel and Togan's "general" findings. This result implies that the manufacturing traded goods are more income elastic than general traded goods.

8. Conclusion

There existed a natural logarithmical cubic mathematical form between the manufacturing export, the import and the manufacturing terms of trade adjusted U.S. Dollar exchange rate. There also existed a cubic relation between the trade quantities and the domestic wholesale prices individually. There existed a natural logarithmical linear form both in the manufacturing export and import in relations to (i) the wholesale world price index (ii) the domestic manufacturing wholesale price index (iii) the domestic wholesale price index and (iv) between export and world output and (v) between the import and domestic output in multiple regressions.

The estimated manufacturing export models are able to explain the variations in manufacturing export between 98.45 % and 99.59 %. The estimated manufacturing import models are able to explain the variations in manufacturing import between 95.81 % and 97.36 %.

The manufacturing export and the import terms of trade adjusted U.S. Dollar exchange rate elasticities were found changeable and inelastic as a result of the parabolic elasticity function from year to year. The manufacturing TOT adjusted exchange rate devaluations yielded higher manufacturing export growth than manufacturing import growth and so an improvement in manufacturing trade balance before 1989. That means the foreign exchange policy was effective on reducing trade deficit before 1989.

Both the manufacturing export world wholesale price and import domestic manufacturing wholesale price elasticities are found inelastic and negative. The world's goods and Turkish manufacturing goods are found complementary rather than substitutes. This implies intra industry manufacturing trade between Turkey and Its trade partners. In addition, it is possible to experience higher trade price elasticities because of increases in variety of traded goods in neo-liberal trade period compared with trade protective period. The manufacturing import domestic manufacturing wholesale price elasticity is estimated less inelastic than the world wholesale price elasticity. And the manufacturing import world wholesale price elasticity is estimated less inelastic than the manufacturing export world wholesale price elasticity. An increase in the world wholesale price decreases manufacturing import more than manufacturing export and so improves trade deficit, *Ceteris Paribus*.

The positively estimated manufacturing export demand world income elasticity is estimated higher than the positively estimated manufacturing import demand domestic income elasticity. These results satisfy our theoretical expectations in sign and manufacturing goods to be durable and luxuries goods. The foreign manufacturing export demand world output elasticity ranges between 3.99 and 7.32, and the manufacturing import demand domestic output elasticity ranges between

2.92 and 4.2 along the estimated models. Our manufacturing export and import demand income elasticities are found higher than Tansel and Togans', and Khan's findings for the general export and import demand income elasticities. This is the result of the neo-liberal trade regime since 1980. An equivalent increase in world and domestic output improves trade balance by resulting higher manufacturing export than manufacturing import, C*eteris Paribus,* and contributes to the economic growth.

There is no a significant Granger causal simultaneity between the manufacturing export and its prices, between the manufacturing import and its prices. There is no causality between the manufacturing export and domestic output; between the manufacturing import and world output even the Pearson correlation coefficients between these variables were estimated high. Technically, manufacturing export does not Granger causes significantly the manufacturing import even there is implication of the complementary goods in trade, implying intra-industry manufacturing trade. However, working with larger sample may lead more definite conclusions on time series analysis.

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