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Demand and Supply of Exports in Pakistan – A Disequilibrium Model

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Introduction

Both single-equation models [Houthakar and Magee (1969), Naqvi *et al* (1983), Bahmani-Oskooee (1986)] and simultaneous equation models [Khan (1974), Goldstein and Khan (1978), Arize (1986), Balassa *et al* (1989), Anwar (1985) Khan and Saqib (1993) and Afzal (2001)] have been used to study export behavior in developed and underdeveloped countries. Goldstein and Khan [(1978)] have investigated the price responsiveness of export demand and export supply of eight industrial countries for the period 1955-70 using both equilibrium and disequilibrium models. The studies on the behavior of Pakistan's exports [Naqvi *et al* (1983), Anwar (1985), Khan and Saqib (1993) and Afzal (2001)] have not investigated the disequilibrium aspect of exports' response.

Pakistan embarked on vigorous trade liberalization and export promotion policies in the early 1990s following the example of the Asian Tigers and other developing countries to make the economy more efficient and competitive. Before this import substitution remained a dominant development strategy during the past decades. The purpose is to see how exports respond to the dynamics of demand and supply of exports. It may help to examine the behavior and performance of exports to get an insight for policy making.

This study is important and desirable in order to view the adjustment of not only aggregate exports but also of other categories of exports [Primary, Manufactured and Semi-Manufactured] because the importance of the composition of exports for economic growth has been emphasized in the literature [Kavoussi (1984), Dollar (1992), Khan and Saqib (1993), Afzal (2001)]. Kavoussi [(1984)] investigated how commodity composition of exports affects the relationship between exports and economic growth for a sample of 73 low and middle-income countries for the period 1960-78. He concluded that the level of development already

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achieved and the composition of exports significantly affects the relationship between exports and GDP. Afzal [(2001)] has concluded that since primary exports have negative world income elasticity vis-à-vis manufactured and semi- manufactured exports, a desirable strategy would be to promote manufactured and semi- manufactured exports.

The significance of the Disequilibrium model lies in the fact that it throws light on how the lagged year exports influence the current year exports because past behavior of exports may serve as a guide as well as incentive for the current period.

Therefore, following Goldstein and Khan [(1978)] the objective of this paper is to investigate the responsiveness of both export demand and export supply for aggregate exports, as well as Primary, Manufactured and Semi-manufactured exports of Pakistan for the period 1972 -2003. The rest of the paper is structured as follows. Section II describes the model and data sources. Section III briefly describes the economic classification of Primary, Semi-manufactured and Manufactured exports. Estimation results and discussion are given in Section IV and Section V is devoted to conclusions.

II. Model and Data Sources

The demand for exports depends on the world or important trade partners' income and also on the competition of domestic export prices with the world or important trade partners' export prices. Similarly, supply of exports is determined by the domestic price of exports, domestic price level and domestic income. Therefore, in log – linear form equations 1 and 2 are the demand (X_d) and supply (X_s) equations for exports. It is assumed that $X_d = X_s$. This is the Equilibrium model. The same equations also apply to the decomposition of exports into Primary [X_p], Manufactured [X_m], and Semi-manufactured [X_{sm}] exports.

$$LnX_d = \alpha_0 + \alpha_1 LnPU + \alpha_2 LnZW \quad [1]$$

$$LnX_s = \beta_0 + \beta_1 LnZZ + \beta_2 LnY \quad [2]$$

Since the equations are specified in logarithm, the coefficients are elasticities. The expected signs of the coefficients in the export demand equation are $\alpha_1<0$, and $\alpha_2>0$ and the expected signs of the coefficients in supply equation are: $\beta_1>0$, and $\beta_2>o$.

Where

X_d = real value of exports demanded

X_s = real value of export supply

X = total exports

X_p = real value of Primary exports

X_m = real value of Manufactured exports

X_{sm} = real value of Semi-manufactured exports

UVX_P = Unit value of exports of Pakistan in US dollars

UVX_w = Unit value of exports of world in US dollars

PU = $UVX_{P/}$ UVX_w

ZW = world real income

PX = Unit value of exports of Pakistan in domestic currency rupees [Rs]

WPI = Wholesale Price Index [WPI] of Pakistan

ZZ = PX / WPI

Y = real GDP of Pakistan

In the Disequilibrium model the exports demand and supply equations are as under:

Export Demand Equations

$$LnX_d = \gamma_0 + \gamma_1 \, LnPU + \gamma_2 \, LnZW + \gamma_3 \, LnX_{t-1} \qquad [1\text{-}A]$$

$\gamma_{1,}$ γ_2 and γ_3 are respectively relative price, real world income, and lagged exports [X_{t-1}] elasticities. The expected signs of the coefficients are: $\gamma_2 > 0$, $\gamma_3 > 0$, and $\gamma_1 < 0$. The inclusion of lagged dependent variables in the equation 1-A implies a partial adjustment process. That is the change in exports is related to the difference between the demand for exports in period t and actual exports in period t-1.

Therefore,

$$\Delta LnX_t = \lambda \, [LnX_t \, _- LnX_{t-1}] \qquad [1\text{-}B]$$

Where λ is the coefficient of adjustment [assumed positive] and Δ is the first difference operator, and $\Delta LnX_t = [LnX_t \, _- \, LnX_{t-1}]$. This applies to both demand and supply equations for exports in order to avoid repetition. The adjustment function [1-B] assumes that the quantity of exports adjusts to conditions of excess demand in the rest of the world and therefore, the price of exports is determined in the exporting country [Goldstein and Khan (1978), p.277].

Substitute 1-A in equation 1-B, we get

$$LnX_t = C_1 + C_2 LnPU + C_3 Ln ZW + C_4 LnX_{t-1} \quad [3]$$

Where

$C_1 = \lambda \gamma_0$; $C_2 = \lambda \gamma_1$; $C_3 = \lambda\gamma_3$; and $C_4 = 1-\lambda$

Based on the expected signs of the parameters in equation 1-A, we would expect that $C_2 <0$, $C_3> 0$, and $C_4> 0$. The average time lag in the adjustment of exports can be calculated from the parameters of the equation 3 as $(1- C_4)^{-1}$ or $1/(1-\lambda)$ and this applies to all equations that follow below.

Export Supply Equations

In the Disequilibrium model the following is the export supply function for Pakistan in terms of the traditional format:

$$LnXs = \Psi_0 + \Psi_1 LnZZ + \Psi_2 LnY + \Psi_3 lnXs_{t-1} \quad [2\text{-}A]$$

Ψ_1, Ψ_2 and Ψ_3; are respectively relative price for export supply, real GDP, and lagged export supply elasticities. The expected signs of the coefficients are: $\Psi_1> 0$; $\Psi_2 > 0$, and $\Psi_3> 0$. Like the export demand equation, we substitute equations 2-A in equation 1-B and get the following equation:

$$LnXs = d_0 + d_1 LnZZ + d_2 LnY + d_3 lnXs_{t-1} \quad [4]$$

Where

$Do = \lambda\Psi_0$ $d_1 = \lambda\Psi_1$, $d_2 = \lambda\Psi_2$, and $d_3 = 1-\lambda$

Based on the signs in equation 2-A the expected signs are:

$d_1 >0$, $d_2>0$, and $d_3>0$,

Problems in Time Series Data

Autocorrelation and Spurious Regression are the major problems in time series data. Granger and New Bold [(1974)] have suggested that *an R^2 > d is a good rule of thumb to suspect that the estimated regression suffers from spurious regression.* Since autocorrelation is generally found in time series data, where necessary autocorrelation has been corrected. Therefore, it is assumed that disturbances follow first order autoregressive [AR (1)] scheme. Autocorrelation has no universal cure. Different methods suggested in Econometrics literature have their own limitations [Gujarati (1995)]. The first order autoregressive process for the error terms in the modes is as follows:

$$\mu_t = \rho\mu_{t-1} + \varepsilon_t \qquad [3\text{-A}]$$

The parameter ρ is the first order serial correlation coefficient and $-1<\rho<1$. The AR (1) model incorporates the residual from the past observation into the regression model for the current observation. The ε_t is distributed as N $(0, \sigma^2_\varepsilon)$ and is independent of other errors over time as well as being independent of μ; and μ_t is distributed as N $(0, \sigma^2_\mu)$ but is not independent of other errors overtime. Several considerations in obtaining consistent estimates in the case of autocorrelation in TSLS are discussed in Fair [(1970)].

The Durbin-Watson d-statistic may not be used to detect first order serial correlation in autoregressive models because if we routinely compute the d-statistic for such models, there is a built-in bias against discovering the first order serial correlation. Despite this many researchers compute the d-value for want of anything better [Gujarati (1995), p. 605]. Therefore, we have used the d-statistic where lagged values have been used. Except equations 6 and 7 for semi-manufactured exports, other d-statistic is reasonably acceptable. Moreover in the Simultaneous equation model both R^2 and DW are less clear.

Cochrane-Orcutt iterative technique has been used to take care of the autocorrelation problem that is often used in practice [see Gujarati (1995), p.436]. DW suffers from some limitations. Therefore, the Q-statistic and the Breusch-Godfrey LM test are preferred in most applications. But these are applicable in large sample cases [50 or 60 observations at least]. But this is not the case in finite or small samples. Moreover, there are problems in selecting the appropriate lag length. Therefore, both statistics reported in this study are comfortable. More recent Cointegration and Error Correction techniques of time series econometrics have not been used as we are dealing with a Simultaneous equation model and these techniques have not been developed for this model.

The data on GDP, aggregate, Primary, Semi-manufactured and Manufactured exports have been taken from the *Pakistan Economic Survey* [various issues]. Real world Income data were obtained from World Tables [various issues]. The data regarding export unit value index for both Pakistan and the world in US$, world Wholesale Price Index [WPI], unit value of exports in domestic currency have been collected from *International Financial Statistics* yearbooks [various years]. The aggregate as well as the aforementioned categories of exports were deflated by unit value indices of exports [1990=100]. The period of the study is from 1972-2003.

III. Economic Classification of Exports

The changing composition of foreign trade of an economy reflects the structural changes that have taken place over the years. The share of primary commodity exports was 48% in 1974-75. After this year the declining trend of primary commodities exports is visible. It was as low as 20% in 1989-90,and 11% in 1996-97, 2001-02 and 2002-03 [Table1]. The share of semi-manufacture shows a mixed trend during the period under review. Its share was 27% in 1971-72 but fell to 11% in 1980-81 because some of the semi-manufactured goods were processed to higher stages of production and were exported as finished products and increased to 24% in 1989-90. During 1990s its share increased to 25% in 1994-95 but fell to 17% in 1997-98 and 11% in 2002-03. The manufacturing goods exports have exhibited an increasing trend. Its share increased from 29% in 1971-72 to 78% in 2002-03. This indicates a healthy trend in the composition of Pakistan's exports over the years. Growing importance of manufactured exports has been stressed in the literature as mentioned above.

Table-1: Economic Classification of Exports (%) [1972 - 2003]

Year	Exports		
	Primary commodity	Semi-manufacture	Manufacture
1971-72	45	27	29
1974-75	48	13	39
1978-79	32	21	50
1980-81	44	11	45
1983-84	30	14	57
1985-86	35	16	49
1989-90	20	24	56
1992-93	15	21	64
1996-97	11	21	68
1997-98	13	17	69
1998-99	12	18	70
2000-01	13	15	72
2001-02	11	14	75
2002-03	11	11	78

Source: *Pakistan Economic Survey* [1997-98 and 2002-04 (Statistical appendix)]

IV. Results and Discussion

TSLS [Two Stage Least Square] estimated all the said equations on aggregate as well other categories of exports. The estimation results for aggregate exports demand for ***Equilibrium*** and ***Disequilibrium*** models are as under:

Equilibrium Model

$$LnX_d = -18.21 \quad -1.14\ LnPU \quad +1.63\ LnZW \qquad [1]$$
$$(-1.80)^{**} \quad (-1.78)^{**} \quad (2.69)^{*}$$
$$R^2 = 0.96 \qquad D.W. = 1.55$$

Disequilibrium Model

$$LnX_d = -2.89 \quad -0.25\ LnPU \quad +0.28\ LnZW \quad +0.80\ LnX_{t-1} \qquad [3]$$
$$(-0.33) \quad (-0.62) \quad (0.49) \quad (5.58)^{*}$$
$$R^2 = 0.95 \qquad D.W = 1.67$$

Note: The number in parentheses in all the equations are t-statistics where * stands for 5 % and ** for 10% levels of significance respectively.

The signs of the relative price variable and the world income are correct and significant [Equation 1] for the aggregate exports demand. This is in agreement with Khan's [(1974)] results that also obtained significant price (-1.84) and world income (0.92) coefficients. Since the estimated price elasticity is greater than unity, this implies a fairly large response of exports to changes in relative prices. In six of the eight industrial countries, Goldstein and Khan [(1978)] obtained price elasticity greater than unity in the equilibrium model. The estimated short run demand function [equation 3] shows that the short run price and world income elasticities are not significant. The mean time lag is slightly greater than one year.

The short run price elasticity is smaller in absolute terms than the equilibrium model elasticity. Goldstein and Khan [(1978)] had similar results for eight industrial countries. But unlike them, short run world income elasticity [0.28] is smaller than the Equilibrium model income elasticity [1.63]. This result is according to expectations and the real world experience because LDCs face low-income elasticity for their exports as they generally export primary products, while the demand for the industrial countries does not suffer form this problem. This confirms the fact that the world demand conditions play a pivotal role in contributing to the promotion of exports. Trade optimists tend to ignore this fact.

For aggregate export demand the coefficient of adjustment λ is 0.20 implying that 20% of the discrepancy between the desired and actual demand for exports is eliminated in a year. The mean time lag in the adjustment of total exports is equal to λ^{-1} that can be calculated from the parameters of the equation. Since $C_3 = 1-\lambda$ and therefore, $\lambda^{-1} = (1-C_3)^{-1} = (1-0.80)^{-1} = 0.20$. Moreover, the mean time lag in the adjustment of exports to changes in independent variables is five years. This is rather a longer and unrealistic lag and shows the limitations of the partial adjustment model. Goldstein and Khan [(1978)] reported mean time lag that ranges from one quarter for USA and over five quarters for Germany as they used quarterly data. Lagged year exports [equation 3] have significant influence on the demand for current exports. Khan [(1974)] also got significant lagged year exports and not significant world income.

Aggregate export supply

Equilibrium Model

$$LnXs = -2.61 + 0.29\ LnZZ + 1.28\ LnY \qquad [2]$$
$$(-3.44) \quad (1.54) \quad (15.06)^*$$
$$R^2 = 0.95 \qquad D.W. = 1.80$$

Aggregate export supply function [Equation 2] is positively sloped though relative price is not significant. This means that Pakistan's export production is inelastic with respect to relative prices but highly elastic with respect to domestic production as the coefficient of the production conditions exceeds unity. Khan and Saqib [(1993)] also obtained positive but not significant coefficient (0.10). Eight industrial countries studied by Goldstein and Khan [(1978)], except Japan, the other seven countries had supply price elasticity greater than one and for Japan it was very high. The domestic income elasticity (1.28) in aggregate exports supply [Equation 2] is less than world income elasticity (1.63) for export demand [Equation 1] implying that Pakistan's exports are more dependent and influenced by foreign conditions than by the domestic economic situation.

Disequilibrium model

$$LnXs = -1.48 + 0.14\ LnZZ + 0.73\ LnY + 0.42\ LnXs_{t-1} \qquad [4]$$
$$(-2.32) \quad (1.14) \quad (3.40)^* \quad (2.25)^*$$
$$R^2 = 0.96 \qquad D.W. = 1.46$$

The estimation results show that in the disequilibrium model for aggregate exports supply, price and income elasticities are smaller than the equilibrium model [equation 2]. For export supply in the disequilibrium model, 1-λ = 0.42, and thus λ = 0.58. This means that 58% of the export supply adjusts within one year. Therefore, the adjustment of the total exports supply is better than total exports demand [20%].

Primary Exports Demand and Supply

Equilibrium Model

$$LnXp_d = 9.97 - 1.28\,LnPU - 0.27\,LnZW \quad [1]$$
$$(2.05)^* \quad (-4.16)^* \quad (-0.93)$$
$$R^2 = 0.63 \qquad D.W. = 1.55$$

Disequilibrium Model

$$LnXp_d = 1.56 - 0.34\,LnPU - 0.02\,LnZW + 0.54\,LnX_{pt-1} \quad [3]$$
$$(0.25) \quad (-0.63) \quad (-0.005) \quad (2.10)^*$$
$$R^2 = 0.52 \qquad D.W. = 2.14$$

For the demand equation [Equation 1] the relative price variable is significant and exceeds unity implying a fairly large response of primary exports to changes in relative prices. World income is not-significant but negative supporting LDCs complained of very low-income elasticity for their primary product exports. The coefficient of adjustment 1-λ = 0.54, so λ = 0.46 that is 46% Primary exports are adjusted in a year. In this model, like aggregate exports relative price and world income elasticities are smaller than the equilibrium model. The estimation results for ***Equilibrium and Disequilibrium Models*** for primary exports supply is:

Equilibrium Model - Xp supply

$$LnXps = 2.55 + 0.62\,LnZZ + 0.31\,LnY \quad [2]$$
$$(2.11)^* \quad (0.63) \quad (2.33)^*$$
$$R^2 = 0.39 \qquad D.W. = 1.80$$

Disequilibrium Model Xp supply

$$LnXps = 1.84 + 0.30\,LnZZ + 0.13\,LnY + 0.43LnXp_{t-1} \quad [4]$$
$$(1.45) \quad (0.36) \quad (1.06) \quad (2.32)^*$$
$$R^2 = 0.47 \qquad D.W. = 1.96$$

Xp supply function is positively sloped but not significant [equation 2]. The positive and not significant coefficient implies that Xp export prices do have a role in the supply of Xp but are not of much significance, because Pakistan does not enjoy a significant share in world exports.

Arize [(1986)] obtained positively sloped export supply functions in seven out of eight African countries. Khan and Saqib [(1993)] have reported positive but not significant coefficient for Xp supply. Moreover, domestic economic conditions represented by GDP have dominant influence on Xp supply. In the Disequilibrium model [equation 4], the results are according to expectations for Xp supply. The price and income elasticities are smaller compared to the Equilibrium model [equation 2] for Xp. The coefficient of adjustment is $1-\lambda = 0.43$ and thus $\lambda = 0.57$ that implies that 57% primary export supply is adjusted within a year.

Manufactured Exports Demand and Supply

Equilibrium Model

$$LnXm_d = \underset{(-5.88)^*}{-41.81} - \underset{(-1.23)}{0.62\, LnPU} + \underset{(6.83)^*}{2.89\, LnZW} \quad [1]$$

$$R^2 = 0.97 \quad D.W. = 1.92$$

Disequilibrium Model

$$LnXm_d = \underset{(-2.51)^*}{-8.06} - \underset{(-2.81)^*}{1.03\, LnPU} + \underset{(3.71)^*}{0.22\, LnZW} + \underset{(1.95)^{**}}{0.36\, LnX_{mt-1}} \quad [3]$$

$$R^2 = 0.92 \quad D.W. = 1.90$$

Relative price coefficient and world income have correct and expected signs for Xm demand [Equation 1]. Moreover, unlike X and Xp the relative price variable is not significant for Xm. Anwar [(1983)] also obtained negative and not significant coefficient (-1.38) for the relative price variable for X_m demand for the period 1960-80. For many developing countries relative prices do not seem to have a significant effect on the exports of these countries [Khan (1974), Arize (1986)]. In the Disequilibrium model for X_m, the coefficient of relative price and world income are significant while world income elasticity is smaller than the Equilibrium model. This means that when past year exports are taken into account relative price of Xm assumes greater importance and shows reasonably large response of X_m to prices. The coefficient of adjustment for X_m demand is $1-\lambda = 0.36$ and therefore, 74%-Manufactured exports are adjusted in one year.

Equilibrium Model - Xm supply

$$LnX_{m}s = -9.12 + 0.36\ LnZZ + 1.74\ LnY \quad [2]$$
$$(-11.20) \quad (0.42) \quad (19.12)^{*}$$
$$R^2 = 0.96 \quad D.W. = 1.82$$

Disequilibrium Model

$$LnX_{m}s = -7.36 + 0.20\ LnZZ + 1.40\ LnY + 0.20\ LnX_{mt-1} \quad [4]$$
$$(-2.28) \quad (0.75) \quad (2.37)^{*} \quad (0.57)$$
$$R^2 = 0.97 \quad D.W. = 1.62$$

The relative price coefficient is positive but not significant whereas the domestic income coefficient is positive and highly significant for X_m supply. Khan and Saqib [(1993)] obtained positive but not significant value for the price variable for X_m supply. A comparison of the two income elasticities for X_m [equation 1 and equation 2] suggests that manufactured exports are more dependent on world income rather than on GDP as a proxy for domestic economic activities.

Lagged X_m supply is not significant in the Disequilibrium model. But both price and income elasticities are smaller than the Equilibrium model. Mean time lag for X_m supply is 80%. That is 80% adjustment takes place in one year. Since the value of λ is closer to one, it means that adjustment in the X_m takes place sharply. The values of adjustment coefficients for Aggregate, Primary and Manufactured exports demand and supply throw adequate light on the adjustment of these exports. The comparison of adjustment coefficients indicates X_m performs fairly in terms of supply. And supports the emphasis on promoting X_m in the literature.

Equilibrium Model in Price Separation format for Xsm demand

We obtained statistically inferior, unexpected and unreliable results for demand and supply of Xsm in both the Equilibrium and Disequilibrium models [equations 1-4]. We, therefore, separated the relative price coefficient [PU] of export demand into Unit value of exports of Pakistan [UVXp] in US dollars and Unit value of Exports of the world [UVXw] in US dollars and similarly the relative price coefficient [ZZ] of export supply of Pakistan [PX] into domestic currency and the wholesale price index [WPI] in both models. We call it the Price Separation format. Therefore, the equilibrium model is:

$$LnX_{smd} = \theta_0 + \theta_1\ LnUVXp + \theta_2\ LnUVXw + \theta_3\ LnZW \quad [5]$$

$\theta_{1,}$ θ_2 and $\theta_{3,}$ are respectively export price index of Pakistan in US dollars, export price index of the world in US dollars and world real income elasticities. The expected signs of the coefficients in equation 5 are: $\theta_1<0$, $\theta_2>0$, and $\theta_3>0$.

The *Disequilibrium* model for Xsm demand is:

$$LnX_{smd} = \theta_0 + \theta_1 \, LnUVXp + \theta_2 \, LnUVXw + \theta_3 \, LnZW + \theta_4 X_{t-1} \qquad [1\text{-}G]$$

Like the export demand equation, we substitute equations 1-G in equation 1-B and get the following equations:

$$LnX_{sd} = g_0 + g_1 \, LnUVXp + g_2 \, LnUVXw + g_3 \, LnZW + g_4 X_{t-1} \qquad [6]$$

Where

$g_0 = \lambda\theta_0$, $g_1 = \lambda\theta_1$, $g_2 = \lambda\theta_2$, $g_3 = \lambda\theta_3$ and $g_4 = 1-\lambda$

The expected signs are:

$g_1 < 0$, $g_2>0$ $g_3>0$ and $g_4>0$.

The estimation results for the Equilibrium and Disequilibrium models are as under:

$$LnX_{sd} = \underset{(-1.14)}{-20.75} - \underset{(-2.23)^{*}}{3.85} \, LnUVXp + \underset{(1.52)}{1.89} \, LnUVXw + \underset{(1.88)^{**}}{2.10} LnZW \qquad [5]$$

$R^2 = 0.43$ DW =1.55

Disequilibrium Model

$$LnX_{sd} = \underset{(-0.11)}{-2.10} - \underset{(-1.20)}{1.92} \, LnUVXp + \underset{(0.79)}{0.85} \, LnUVXw + \underset{(0.37)}{0.52} \, LnZW + \underset{(1.98)^{*}}{0.68} X_{t-1} \qquad [6]$$

$R^2 = 0.60$ DW =1.34

Price separation format gives desirable results for Xsm demand. This suggests that price separation format is more suitable for Xsm demand than the traditional format. The merit of this form is that it shows the relative significance of the domestic and world export prices. The significant nature of the domestic export prices in equation 5 shows the importance of domestic export prices in semi-manufactured exports demand. The world real income has the correct and expected sign and is significant at the 10% level of significance. In the disequilibrium model [equation 6], the coefficients of domestic export prices, world export prices, and world real income are smaller than the equilibrium model such as aggregate and other classification of exports. The coefficient of adjustment for Xsm demand is 1-λ =0.68 and thus 32% semi-manufactured exports are adjusted in one year.

Equilibrium Model- Price Separation Format for Xsm Supply

Equilibrium Model of the Xsm Supply in Price Separation Format is as follows:

$$LnXs = \Psi_0 + \Psi_1 LnPX + \Psi_2 Ln WPI + \Psi_3 LnY \quad [7]$$

Ψ_1, Ψ_2, Ψ_3 and Ψ_4 are respectively export prices of Pakistan in domestic currency rupees [Rs]; WPI and real GDP elasticities. The expected signs of the coefficients for the export supply price and GDP are positive, while for the domestic level it is negative. The expected signs of the coefficients are: $\Psi_1 > 0$, $\Psi_3 > 0$ and $\Psi_2 < 0$. The Disequilibrium model in price separation format for Xsm supply is as under:

$$LnX_{ms} = \Psi_0 + \Psi_1 LnPX_{pak} + \Psi_2 Ln WP_{Ipak} + \Psi_3 LnYpak + \Psi_4 LnXs_{t-1} \quad [1\text{-}C]$$

Like the export demand equation, we substitute equations 1-C in equation 1-B and get the following equations:

$$LnX_{ms} = f_0 + f_1 LnPX_{pak} + f_2 Ln WPI_{pak} + f_3 LnY + f_4 LnXs_{t-1} \quad [7]$$

Where

$f_0 = \lambda\Psi_0$ $\quad f_{1=} \Psi_1,$ $\quad f_2 = \lambda\Psi_2,$ $\quad f_3 = \lambda\Psi_3$ and $\quad f_{4\,=}1\text{-}\lambda$

The expected signs are:

$f_1 > 0$, $f_2 < 0$, $f_3 > 0$ and $f_4 > 0$.

The estimation results of equation 7 and 8 are:

$$LnX_{ss} = \underset{(-2.44)^*}{-35.91} + \underset{(2.03)^{**}}{0.90\, LnPX} - \underset{(-2.20)^*}{3.92\, Ln\, WPI} + \underset{(2.60)^*}{6.18\, LnY} \quad [7]$$

$R^2 = 0.48$ $\qquad$ DW. =0.88

Disequilibrium Model

$$LnXs = \underset{(-3.42)}{-15.68} + \underset{(0.08)}{0.02\, LnPX} - \underset{(-2.02)^*}{1.13\, Ln\, WPI} + \underset{(3.45)^*}{2.69\, LnY} + \underset{(2.30)^*}{0.41\, LnXs_{t-1}} \quad [8]$$

$R^2 = 0.95$ $\qquad$ D.W. = 2.08

Like the demand equation, price separation format also gives agreeable results for Xsm supply. The signs of the coefficients are correct. Domestic production conditions represented by real GDP are positive and highly significant. The domestic price index is negative and significant suggesting that low inflation is expected to increase exports. The supply price of exports is positive but not significant implying the price-taking nature of Pakistan's economy. The coefficients of the Disequilibrium model are smaller like other categories of exports than the Equilibrium model. The coefficient of adjustment for Xsm supply is $1-\lambda = 0.41$ and thus 59% Xsm are adjusted within one year.

V. Conclusions

The estimated price elasticity for aggregate and primary exports demand in the Equilibrium model is greater than unity and implies a fairly large response of these exports to changes in relative prices, while for manufactured exports this response is inelastic. Pakistan's export supply is inelastic with respect to relative prices but highly elastic with respect to domestic production as the coefficient of the production conditions exceeds unity for aggregate as well as for other categories of exports.

Important results for the Disequilibrium model for Aggregate, Primary, Manufactured, and Semi-manufactured exports were obtained. We had different results for partial adjustment process for these kinds of exports. The coefficient of adjustment λ for Aggregate, Primary, Manufactured and Semi-manufactured exports demand and supply are: 0.20, and 0.58; 0.46 and 0.57; 0.74 and 0.80; and 0.32 and 0.80 respectively. These results show that of all the categories of exports, Manufactured exports perform well as the mean time lag is minimum. This highlights the crucial importance of Manufactured exports. This confirms the previous results [Afzal (2001)] that study of exports in disaggregated form throws sufficient light on the true behavior of aggregate as well as other groupings of exports. Concentration on the examination of total export behavior conceals a number of facts. Price separation format gives desirable results for Semi-manufactured exports demand and supply and this format is more suitable for Semi-manufactured exports.

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