Implications of Liberalization of Trade on Economic Welfare of Producers and Consumers of *Basmati* Rice

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Abstract: This paper examines the welfare effects of trade liberalization on *Basmati* rice within Pakistan's economy. Welfare gains (or losses) in terms of consumer and producer were estimated for the pre- and post-WTO periods. Welfare gains associated with the then existing protection policies were compared with those when these policies were removed, if trade were fully liberalized for both periods. The analysis reveals that there has been a significant difference between domestic and foreign prices, suggesting tax on producers of *Basmati* rice in both pre- and post-WTO periods. However, the quantum of difference was comparatively less during the post-WTO period. Welfare analysis estimated higher losses for producers compared to gains to the consumers during both pre- and post-WTO periods. However, losses in the producers' surplus were comparatively less during the post-WTO period, suggesting that certain measures were adopted by government in line with the WTO regime. Similarly simulation results demonstrate greater gains to producers than losses to consumers in the case of world market being liberalized. It is recommended that government needs to curtail tariff related interventions and, besides improving the pace of trade liberalization at domestic level, it should pursue WTO's negotiations for early implementation of WTO's trade liberalization on the international level.

Keywords: agriculture in trade liberalization, agricultural policy, *Basmati* rice, government policy

JEL classifications: Q17, Q18, Q28

1. Introduction

Rice is one of Pakistan's most important crops, in second position as a staple food after wheat (Akhtar, 1999) while *Basmati* rice is an important export commodity (GoP, 2008). *Basmati* rice is the third largest crop in terms of

occupying area under cultivation (Zulfiqar, 2008). Due to the importance of *Basmati* rice to the Pakistani economy, this research has been conducted with the objectives of (i) identifying price and tariff related protection policies and interventions made in relation to *Basmati* rice economy in Pakistan, (ii) estimating welfare effects associated with existing price and tariff policies and interventions; and, (iii) estimating implications of WTO's trade liberalization in domestic and global markets of *Basmati* rice.

Production of various crops including *Basmati* rice has been privately owned. However, marketing and trade of most commodities have mainly been regulated or managed by government in one way or another. The major policy intervention by Pakistan's Government has been in the form of "support prices", currently abandoned to comply with World Trade Organization (WTO) agreements. The announcement of "support or procurement prices" and size of stocks procured thereby have affected production and trade of the commodities. Secondly, State Trading Enterprises (STEs) had been playing a major role in trading of some major agricultural commodities including *Basmati* rice. Although lately Pakistan has taken certain measures to liberalize trade, according to the Trading Corporation of Pakistan (2006) it is, *inter alia*, still involved in the inspection of rice for export. Thirdly, import tariffs and export duty have been important interventions. According to Scott *et al*. (1990) and Scott (1988), imposition of export duties on *Basmati* rice has been a common feature. Reference to such policies in the *Basmati* rice economy are also found in studies like Cornelisse and Kuijpers (1987), Ahmad and Chaudary (1987), Hamid *et al*. (1987), Alderman (1988), Chishti (1994), Ackerman and Dixit (1999), Ashfaq *et al*. (2001) and Arifullah (2007).

The adverse impact of tariff related protections on the mass population welfare is described in a number of studies. Taylor *et al*. (2010) using a disaggregated rural economy-wide model nesting a series of agricultural household models, found that reduced tariffs decreased nominal incomes for rural household groups in El Salvador, Guatemala, Honduras and Nicaragua. At the same time, it also lowered consumption costs. The net effect has been improved welfare in most cases. This implies that pre-CAFTA agricultural protection policies were harmful for most rural household groups. Mahmood *et al*. (2010), concluding the review of a number of studies stated that an increase in international rice prices would result in welfare gain for Pakistan. Tsheko (2006) found that cheaper imports resulting from agricultural trade liberalization would have welfare gain for rural households of small countries in the African Custom Union such as Botswana, Namibia, Lesotho and Swaziland. Zulfiqar *et al*. (2009) while studying implications of state interventions in Pakistan's cotton crop price and tariff have argued that as a result of trade liberalization, there would have been a net welfare gain when changes in producers' and consumers' surpluses are compared.

For this current article, the types of interventions that Pakistan's Government has adopted to regulate its *Basmati* rice economy from 1985 to 2005 have been determined through reviewing Pakistan's *Basmati* rice domestic wholesale price, export price and world trade price. An examination of the data on prices (Table 1) reflects that Pakistan's domestic wholesale price (P_d) has remained, on average, at US$374.89 (Pak Rs.13777.29) per M. ton while the average world trade price (P_w) remained at US$332.97 (Rs.12236.59) per M. ton. However, Pakistan's average export price (P_e) was US$514.23 (Rs.18897.74), signifying export tax amounting to US$139.34 (Rs.5120.71) per M. ton during the 1985-2005 study period. *Basmati* is special quality rice

Table 1: Pakistan's *Basmati* Rice Prices for 1985-2005 (Prices per M. Ton)

Year	Pakistan's Domestic Wholesale Price		World Price	Pakistan's Export Price
	Pak Rs.	US$	(US$)	(US$)
1985-1986	6300.75	390.40	268.23	655.87
1986-1987	6625.75	385.68	280.56	697.68
1987-1988	6843.75	388.86	347.59	713.10
1988-1989	6625.25	344.79	351.99	677.51
1989-1990	7326.00	341.61	356.24	671.57
1990-1991	8314.50	370.81	368.93	466.23
1991-1992	9338.25	375.87	358.03	407.07
1992-1993	10323.00	397.65	332.35	424.34
1993-1994	10650.50	353.09	374.17	405.56
1994-1995	10275.25	333.05	348.97	400.45
1995-1996	14316.75	426.49	403.33	406.71
1996-1997	14729.25	377.74	390.74	440.67
1997-1998	17683.25	409.37	351.67	452.41
1998-1999	20570.75	439.64	329.25	508.14
1999-2000	15902.00	307.16	295.98	501.71
2000-2001	18140.25	310.42	268.52	463.95
2001-2002	21000.50	341.88	252.40	461.93
2002-2003	23327.75	398.77	276.89	494.78
2003-2004	22636.25	393.16	325.24	508.54
2004-2005	24616.00	411.43	378.35	526.34
Average	13777.29	374.89	332.97	514.23

Sources: FAO (2005) Statistical databases; *Agricultural Statistics of Pakistan* (various issues).

and its export cannot be evaluated on the basis of the world average rice price given in Table 1. Therefore, the free trade export price has been estimated using the domestic price of *Basmati* rice to establish whether Pakistan has supported its *Basmati* rice in the domestic market. For this purpose, the export supply (E_s) and export demand (E_d) functions were adopted from Zulfiqar (2008: 73) and solved for *Basmati* rice free trade export price (P_{ef}). So obtained, the free trade export price along with Pakistan's domestic *Basmati* rice price is reflected in Table 2. A comparison of the two prices (P_d and P_{ef}) indicates *Basmati* rice remained under the "price tax-cum-export tax" regime.

Table 2: Pakistan's *Basmati* Rice Domestic and Estimated Free Trade Prices for 1985-2005 (Prices per M. Ton)

Year	Pakistan's Domestic Wholesale Price (US$)	*Basmati* Rice Estimated Free Export Trade Price (US$)
1985-1986	390.40	441.09
1986-1987	385.68	442.30
1987-1988	388.86	446.55
1988-1989	344.79	399.83
1989-1990	341.61	391.38
1990-1991	370.81	384.66
1991-1992	375.87	380.02
1992-1993	397.65	401.07
1993-1994	353.09	358.97
1994-1995	333.05	340.46
1995-1996	426.49	424.48
1996-1997	377.74	383.34
1997-1998	409.37	412.86
1998-1999	439.64	444.79
1999-2000	307.16	320.49
2000-2001	310.42	319.81
2001-2002	341.88	348.89
2002-2003	398.77	404.64
2003-2004	393.16	400.32
2004-2005	411.43	418.31
Average	374.89	393.21

Source: *Agricultural Statistics of Pakistan* (various issues).

1.1 Analytical Framework

The objective set for this research required a three-step methodology, namely first, analysis of prices using time series data from 1985 to 2005 and identification of government interventions by means of calculating mean price values for the study period. The second methodological step involves computation of associated welfare effects in terms of changes in producer and consumer surpluses (ΔPS & ΔCS) using the following approach:

$$\Delta PS = +/- \int_{P_d/P_{df}}^{P_d/P_{df}} S(P)dp$$

or

$$\Delta CS = +/- \int_{P_{df}/P_d}^{P_{df}/P_d} D(P)dp$$

This means that if actual domestic price (P_d) is higher than estimated free trade price (P_{df}) then producers were gaining as shown by the (+) sign and vice versa. Conversely, if estimated free trade price (P_{df}) is higher than actual domestic price (P_d) then consumers were gaining shown by the (+) sign and vice versa.

The third methodological step involves analyzing implications of the implementation of WTO agreements, particularly the Agreement on Agriculture, in relation to the difference between domestic and world prices. For estimating welfare effects of existing policy regimes, we compared those with the free trade situation. If no government interventions related to price/tariff existed, the free trade price P_{df} would have prevailed instead of the existing domestic price P_d. Hence, the effects of implementation of free trade at domestic level have been estimated using a free trade scenario. However, at international level, these estimates have been developed using an increase in the prices on the international market, based on empirical results of a number of studies such as FAO (2005), Anderson *et al*. (2006) and Akhtar (1998). The functional details of these methodologies are given in their respective sections below.

2. Identification of Government Interventions

To achieve our objectives, the study period (1985-2005) was divided into two sub-periods: pre-WTO (1985-1995) and post-WTO (1995-2005). The aim of taking pre- and post-WTO periods was to judge as to whether any progress

was made in meeting WTO obligations particularly related to the Agreement on Agriculture and in such a case, what are the implications for the welfare of producers and consumers of Basmati rice. The mean values of prices for the two sub-periods were computed as follows, using Tables 1 and 2.

	Pre-WTO period (1985-1995)	*Post-WTO period* (1995-2005)
Pakistan's wholesale price (P_d)	US$368.18 (Rs.8262.30)	US$381.61 (Rs.19292.28)
Estimated free trade price (P_{df})	US$398.63 (Rs.8945.57)	US$387.79 (Rs.19604.86)
Pakistan's trade price (P_e)	US$551.94 (Rs.12385.92)	US$476.52 (Rs.24090.51)

Average P_d lingered at US$368.18 per M. ton against average P_e at US$551.94 and average P_{df} at US$398.63 during the pre-WTO period, reflecting the "price tax-cum-export tax" regime as shown in Figure 1.
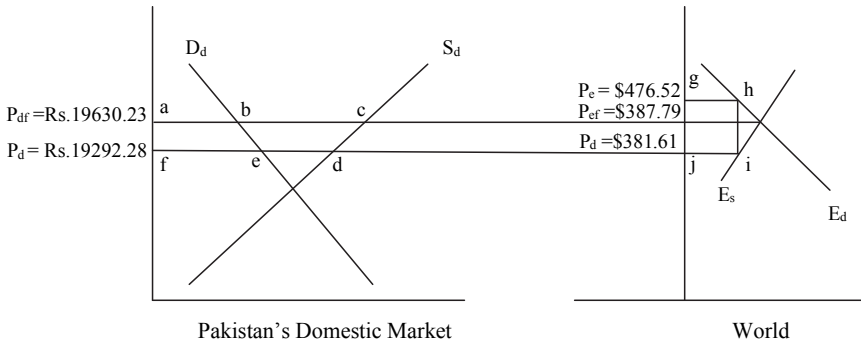
Figure 1: Price Tax-cum-export Tax Regime during 10 Years Pre-WTO
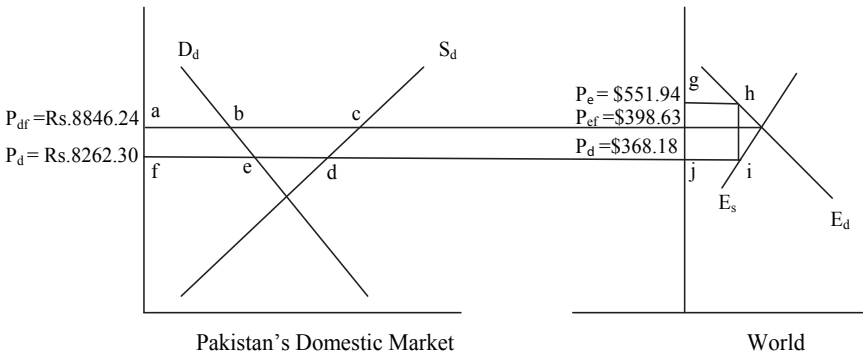
Source: WTO (2008).

The post-WTO study period witnessed averages of P_d (US$381.61), Pe (US$476.52) and P_{df} (US$387.79), again reflecting the "price tax-cum-export tax" regime as shown in Figure 2.

Figure 2: Price Tax-cum-export Tax Regime during 10 Years Post-WTO

Source: WTO (2008).

This leads us to our second methodological step of computing associated welfare effects in terms of changes in producer and consumer surpluses.

3. Computation of Welfare Effects

Welfare effects of (pre- and post-WTO) scenarios were estimated using simple welfare analysis. To conduct welfare analysis, producer and consumer surpluses (ΔPS & ΔCS) were determined along with computed export tax (ET) based on demand, supply and price linkage equations. The net welfare gain or cost (NWG/C) to the society was estimated by adding up all the three components i.e. ΔPS, ΔCS and ET. To estimate producer and consumer surplus and to estimate these equations, time series data from 1985 to 2005 was used.

3.1 Pre-WTO Situation

The welfare effects of "price tax-cum-export tax" regime of pre-WTO period are represented as in Figure 1. The associated welfare effects were captured using the following model:

$$\Delta PS = -\,(\text{acdf}) = -\int_{P_d}^{P_{df}} S(P)\,dp \tag{1}$$

$$\Delta CS = +\,(\text{abef}) = +\int_{P_d}^{P_{df}} D(P)\,dp \tag{2}$$

$$ET = (ghij) = (P_e - P_d)E_s \; (E_s = \text{export supplies}) \tag{3}$$

$$NWG/L = \Delta PS + \Delta CS + E_s \tag{4}$$

Specification and Estimation of Supply and Demand Functions

Supply and demand functions of *Basmati* rice crops were econometrically estimated. In general, the following model of supply and demand was originally tried and subsequently adjusted according to the nature of the crop behaviour of the variables involved.

$$A \;=\; \alpha_0 + \alpha_1 A_{t-1} + \alpha_2 P_d \tag{a}$$

$$S_d \;=\; \beta_0 + \beta_1 \hat{A} + \beta_2 FNT + \beta_3 PPT + \beta_4 WAT \tag{b}$$

$$D_d \;=\; \gamma_0 - \gamma_1 P_d + \gamma_2 GDPP + \gamma_3 POPP \tag{c}$$

$$E_s \;=\; S_d - D_d \tag{d}$$

$$E_d \;=\; \theta_0 - \theta_1 P_e + \theta_2 P_w + \theta_3 GDPW + \theta_4 POPW \tag{e}$$

Where A = area under *Basmati* rice in '000 hectares

   A_{t-1} = lagged area under *Basmati* rice in '000 hectares

   $\hat{A}$ = area predicted (in equation 3.1a) under *Basmati* rice in '000 hectares

   S_d = domestic supply of *Basmati* rice in Pakistan in '000 M. tons

   D_d = domestic demand of *Basmati* rice in '000 M. tons

   E_s = net export supply in '000 M. tons

   E_d = net export demand in '000 M. tons

   P_d = Pakistan's domestic wholesale price in Pak. Rupees per M. ton

   P_e = export price per M. ton in US$

   P_w = world trade price per M. ton in US$

   FNT = total nutrient-fertilizers in '000 M. tons used

   PPT = total pesticides used in '000 M. tons

   WAT = availability of water in million acre feet

   POPP = population of Pakistan in millions

   POPW = World population

   GDPP = GDP of Pakistan

   GDPW = GDP of world

The aforementioned model of supply and demand is a simultaneous-equations recursive model (Gujarati, 2003; Maddala, 2002), wherein area sown (A) under crop is assumed to be determined by lagged area (A_{t-1}) and domestic price (P_d). The so determined area (A), along with nutrient-fertilizers used, plant protection measures (PPT) applied and water availability (WAT), further determines commodity supply (S_d).

The domestic demand (D_d) is assumed to be influenced by commodities' own price (P_d), Pakistan's national income (GDPP) and size of Pakistan's population (POPP). Export supply (E_s) is equal to $S_d - D_d$.

Export demand (E_d) is assumed to be determined by Pakistan's export price (P_e), world trade price of the commodity involved (P_w), world GDP (GDPW) and world population (POPW).

A number of specifications were used and a final estimated model was selected on the basis of economic theory and statistical/econometric diagnostics using R^2, F-test, t-test, the Jarque-Bera (JB) Normality, DW and Durban h tests. This estimated model needed to go through, at least, three more major modifications to come up to a final useable form. First, the equations (a) and (b) are autoregressive functions, which yield short-run results. These needed to be converted to long-run versions. Second, equation (b) contains a predicted value of area (Â), which is already estimated in equation (a). Hence, Â in equation (b) would have to be replaced with its estimated value. Third, the model contains an export demand function (E_d) but does not have the export supply function (E_s), which would have been computed using $E_s = S_d - D_d$. The equation (a) includes lagged dependent variables (A_{t-1}), used as one of the explanatory variables. Hence this equation provides short-run effects. To convert this equation into long-run, we first computed a coefficient of adjustment (λ), and then adjusted the short-run equation to its long run version. For computation of (λ), we know that the coefficient of lagged variable is equal to "$1 - λ$" (Gujarati, 2003). Hence in equation (a), $α_1$ is:

$$1 - λ = α_1$$

Solving for λ

$$λ = 1 - α_1$$

To convert equation (a) into its long-run version, we divided all coefficients with explanatory variables attached (with the exception of lagged variable) and constant, by the value of (λ) and omitted the lagged variable from the equation. By doing so we got the long-run version of the equation.

Based on the above explanation, the following model of supply and demand functions of *Basmati* rice has turned out with reasonably good results relative to other options tried.

$$A = 201.95 + 0.7375A_{t-1} + 0.0085P_d$$
$$(1.831) \quad (4.854) \quad\quad (1.865)$$
$$(0.080) \quad (0.000) \quad\quad (0.075)$$
$$R^2 = 0.9127 \quad\quad F = 120.236 \quad\quad DW = 2.0581$$
$$\text{Durbin H} = -0.3560 \quad\quad N = 26$$

$$S_d = -848.18 + 1.6226\hat{A} + 0.3761FNT - 21.1720TR$$
$$(-2.038) \quad (2.692) \quad\quad (1.195) \quad\quad (-0.7234)$$
$$(0.054) \quad (0.013) \quad\quad (0.245) \quad\quad (0.477)$$
$$R^2 = 0.8801 \quad\quad F = 53.812 \quad\quad DW = 1.1255 \quad\quad N = 26$$

$$D_d = 565.31 - 0.0084P_d + 0.0117PWIR + 0.2002GDPPR$$
$$(7.653) \quad (-0.4186) \quad\quad (0.3680) \quad\quad\quad (2.763)$$
$$(0.000) \quad (0.680) \quad\quad\quad (0.716) \quad\quad\quad (0.011)$$
$$R2 = 0.8409 \quad\quad F = 38.760 \quad\quad DW = 1.5681 \quad\quad N = 26$$

$$E_d = -526.29 - 0.23247P_e + 1.1063P_w + 0.028086GDPWD$$
$$(-1.635) \quad (-0.9639) \quad\quad (2.424) \quad\quad\quad (5.448)$$
$$(0.116) \quad (0.346) \quad\quad\quad (0.024) \quad\quad\quad (0.000)$$
$$R2 = 0.7514 \quad\quad F = 22.169 \quad\quad DW = 1.5985 \quad\quad N = 26$$

After conducting various operations as mentioned earlier, the shortened version of the model obtained is as follows:

$$S_d = 750.5248 + 0.052582P_d$$
$$D_d = 1043.901 - 0.008451P_d$$
$$E_s = -293.3762 + 0.061033P_d$$
$$E_d = 574.5015 - 0.23247P_e$$
$$E_d = 121.1217 + 1.1063P_w$$

The model was estimated using data for years 1979-1980 to 2004-2005 and therefore, is valid only for average values of the related variables for the period 1980-2005. For all other periods, we would need to adjust intercept values, using average values of the dependent variables and respective explanatory variables. Our pre-WTO study period relates to the period 1985-1995. We therefore used mean values of dependent and explanatory variables for 1985-1995 to re-adjust intercept values as follows (see Zulfiqar, 2008 for further explanation).

$$S_d = 676.9517 + 0.052582P_d \tag{5}$$

$$D_d = 840.7971 - 0.008451P_d \tag{6}$$

$$E_s = -163.845 + 0.061033P_d \tag{7}$$

$$E_d = 468.7365 - 0.23247P_e \tag{8}$$

$$E_d = 1.360216 + 1.1063P_w \tag{9}$$

Basmati is a high quality rice and its export cannot be evaluated on the basis of the world average rice price. We have therefore, estimated a free trade export price on the basis of the domestic price of *Basmati* and established whether Pakistan has supported its *Basmati* rice in the domestic market. To do so we used export supply (E_s) and export demand (E_d) functions already estimated in the model. We equated required equations after adjusting for every year of the study period (1985-2005) and solved for *Basmati* rice free trade export price (P_{ef}), as given in Table 2.

For arriving at a free market price (P_{ef}), the export supply (E_s) and export demand (E_d) were equalized, as follows:

$$E_s = E_d \tag{10a}$$

Since P_d/EXR (exchange rate) = P_e or $P_d = P_e*$EXR, replacing P_d in the above equation we obtained:

$$P_e = US\$398.63 \text{ per M. ton} \tag{10b}$$

Putting the value of P_{df} = 398.63 from (10b) for E_d in equation (8)

$$E_{df} \text{ (export demand at free trade)} = 468.7365 - 0.23247(P_e = 398.63) \tag{11a}$$

$$E_{df} = 376.067 \text{ M. tons} \tag{11b}$$

Equating $E_{df} = E_{sf}$ (export supply at free trade) $\tag{12a}$

$$P_{df} = \text{Pak Rs.8846.24 per M. ton} \tag{12b}$$

After computing P_e and P_{df} in equations (10b) and (12b), the pre-WTO scenario's welfare effects specified in model (1) to (4) were estimated, as follows:

$$\Delta PS = -\left\{ \int_{P_d = 8262.30}^{P_{df} = 8846.24} (676.9517 + 0.052582P_d)dp \right\} \tag{13a}$$

$$= -\left\{ 676.9517P_d + (0.052582/2)P_d^2 \right\}/{}^{8846.24}_{8262.30}$$

$$= -\left\{ \left\{ 676.9517(8846.24) + \left(\left(\frac{0.052582}{2}\right)(8846.24)^2 \right) \right\} - \right.$$

$$\left. \left\{ 676.9517(8262.30) + \left(\left(\frac{0.052582}{2}\right)(8262.30)^2 \right) \right\} \right\}$$

$$= - \text{Rs.657953 thousand}$$

$$= - \text{Rs.657.95 million} \tag{13b}$$

$$\Delta CS = + (\text{acdf}) = \int_{P_d = 8262.30}^{P_{df} = 8846.24} (840.7971 - 0.008451P_d)dp \tag{14a}$$

$$= \text{Rs.448759.20 thousand}$$

$$= \text{Rs.448.76 million} \tag{14b}$$

$$ET \quad = (\text{ghij}) = (P_e - P_d)E_s \tag{15a}$$

$$= \text{US\$62555.42}$$

$$= \text{Rs.1403792 thousand}$$

$$= \text{Rs.1403.79 million} \tag{15b}$$

$$NWG/C = \Delta PS + \Delta CS + T \tag{16a}$$

$$= \text{Rs.1194598.00 thousand}$$

$$= \text{Rs.1194.60 million} \tag{16b}$$

3.2 Post-WTO Situation

Figure 2 best reflects interventions made in the *Basmati* rice economy during the second part of the study period. Using a similar approach as explained for the pre-WTO situation, the following supply and demand functions were used for the post-WTO period (1995-2005):

$$S_d \quad = \quad 898.4736 + 0.052582P_d \tag{17}$$

$$D_d \quad = \quad 1437.392 - 0.008451P_d \tag{18}$$

$$E_s \quad = \quad -538.919 + 0.061033P_d \tag{19}$$

$$E_d \quad = \quad 749.3228 - 0.23247P_e \tag{20}$$

$$\quad = \quad 298.5887 + 1.1063P_w \tag{21}$$

For the estimation of free market price (P_{df}):

$$E_s \quad = \quad E_d \tag{22a}$$

Since $P_d/EXR = P_e$ or $P_d = P_e*EXR$, replacing P_d in the above equation we get:

$$P_e \quad = \quad \text{US\$387.79 per M. ton} \tag{22b}$$

Putting values of P_e = 387.79 given in (22b) in E_d (20):

$$E_{df} = 749.3228 - 0.23247(Pe = 387.79) \tag{23a}$$

$$E_{df} = 659.17 \text{ M. tons} \tag{23b}$$

$$\text{Equating } E_{df} = E_{sf} \tag{24a}$$

$$P_{df} = \text{Rs.19630.23 per M. ton} \tag{24b}$$

For estimation of NSWG/C specified in model (1) to (4), we estimate various components of SWG/C, as follows:

$$\Delta PS = -\left\{ \int_{P_d = 19292.28}^{P_{df} = 19630.23} (898.4736 + 0.052582P_d)dp \right\} \tag{25a}$$

$$= -\text{Rs.649480.00 thousand}$$

$$= -\text{Rs.649.48 million} \tag{25b}$$

$$\Delta CS = \int_{P_d = 19292.28}^{P_{df} = 19630.23} (1437.392 + 0.008451P_d)dp \tag{26a}$$

$$= \text{Rs.430193.50 thousand}$$

$$= \text{Rs.430.19 million} \tag{26b}$$

$$ET = (ghij) = (P_e - P_d)E_s \tag{27a}$$

$$= \text{US\$60604.84}$$

$$= \text{Rs.3063899.00 thousand}$$

$$= \text{Rs.3063.90 million} \tag{27b}$$

$$NWG/C = \Delta PS + \Delta CS + T \tag{28a}$$

$$= \text{Rs.2844612 thousand}$$

$$= \text{Rs.2844.61 million} \tag{28b}$$

4. Implications of WTO's Trade Liberalization in Domestic Economy

WTO Agreements, particularly the Agreement on Agriculture, aim at steadily reducing "domestic support", "import tariffs" and "export subsidies" and eliminating/abolishing all such protection/support policies over a specified period (www.wto.org). This means that the WTO in general aims at introducing and implementing free trade. So, if no government interventions were present, a free trade price P_{df} = Rs.8846.24 would have prevailed instead

of the existing domestic price P_d = Rs.8262.30 per metric ton during the pre-WTO period (Figure 1). This means that in a free trade situation, the estimated loss and gain to the producers and consumers respectively would not happen. Similarly, there would have been no export tax earned. So estimates of the existing scenario would have been reversed. Thus, effects of implementation of free trade would have been as follows:

$$\Delta PS \quad = Rs.657.95 \text{ million} \tag{29}$$

$$\Delta CS \quad = - Rs.448.76 \text{ million} \tag{30}$$

$$ET \text{ (export tax)} = - Rs.1403.79 \text{ million} \tag{31}$$

$$NWG/C = - Rs.1194.60 \text{ million} \tag{32}$$

Similarly, welfare effects of a free-trade scenario for the post-WTO period would have been as follows:

$$\Delta PS \quad = Rs.649.48 \text{ million} \tag{33}$$

$$\Delta CS \quad = - Rs.430.19 \text{ million} \tag{34}$$

$$ET \quad = - Rs.3063.90 \text{ million} \tag{35}$$

$$NWG/C = - Rs.2844.61 \text{ million} \tag{36}$$

4.1 Implementation of WTO Trade Liberalization in International Markets

Certain empirical studies have suggested that implementation of the Agreement on Agriculture and other WTO agreements would raise world prices. FAO (2005) and Akhtar (1999) have found that impacts of trade liberalization on world commodity prices would be positive. Another study, by Anderson *et al*. (2006), found that a move to free trade would increase farm employment, the real value of agricultural output and exports, real returns to farm land and unskilled labour, and real net farm incomes in developing countries.

According to Wailes (2004), the average level of protection on rice is over 70 per cent. Bouet (2006) and Tokarick (2005) project that full trade liberalization would increase world rice prices by only 2-3 per cent, whereas the USDA (2003) estimates that rice prices would rise by about 10 per cent. Wailes (2004) presents the results from two models. A static partial equilibrium model of rice markets that is highly disaggregated by type of rice projects, predicts that full trade liberalization would increase the price of long grain rice by 2 per cent, on average, and that of medium and short grain rice by a full 90 per cent. Thus, the weighted average price increase is 33 per cent. The second model is less disaggregated by type of rice, but includes

dynamic effects. According to this model, full trade liberalization would increase rice prices by 25-35 per cent. All the forgoing studies reveal that trade liberalization would increase rice prices in the world market, but their estimates are varying. Therefore, preferring a modest estimate, an assumption of a 5 per cent rise in world prices (P_w) was made and its effects on Pakistan's domestic economy examined.

Pre-WTO scenario

Using equation (9) and a 5 per cent-enhanced value of P_w, that is, $1.05P_w$:

$$E_d \quad = \quad 1.360216 + 1.1063(P_w = 355.6407) \tag{37a}$$

$$= \quad 394.805 \text{ thousand M. tons} \tag{37b}$$

Equating $E_d = 394.805$ with E_s given in (7) and solving for P_d:

$$E_d \quad = \quad E_s \tag{38a}$$

$$394.81 = -163.845 + 0.061033P_d$$

$$P_d \quad = \quad 9153.253 \text{ Rs. per M. ton} \tag{38b}$$

Substituting $P_d = 9153.253$ in (5 and 6) and solving for S_d and D_d:

$$S_d \quad = \quad 676.9517 + 0.052582P_d \tag{39a}$$

$$= \quad 1158.25 \text{ thousand M. tons} \tag{39b}$$

$$D_d \quad = \quad 840.7971 - 0.008451P_d \tag{40a}$$

$$= \quad 763.44 \text{ thousand M. tons} \tag{40b}$$

Welfare Effects

Welfare effects of the changes in Pakistan's *Basmati* rice domestic price from the existing level of $P_{d0} = $ Rs. 8262.30 to a new level of $P_{df} = $ Rs. Rs.9153.252, are measured in terms of changes in producers' and consumers' surpluses (ΔPS & ΔCS), using the following model:

$$\Delta PS = \int_{P_{d0}}^{P_{df}} S(P)dp \tag{41a}$$

$$= \int_{P_{d0}=8262.30}^{P_{df}=9153.253} (676.9517 + 0.052582)dp$$

$$= \text{Rs.1011.08 million} \tag{41b}$$

$$\Delta CS = -\int_{P_{d0}=8262.30}^{P_{df}=9153.253} (840.7971 - 0.008451)dp \tag{42a}$$

$$= -\text{Rs.}683.55 \text{ million} \tag{42b}$$

$$NWG/C = \Delta PS + \Delta CS \tag{43a}$$

$$= 1011.08 - 683.55$$

$$= \text{Rs.}327.53 \text{ million} \tag{43b}$$

Post-WTO Scenario

In the foregoing fashion, a 5 per cent-enhanced world price P_w would cause the domestic price to rise from the existing level of P_{d0} = Rs. 19292.28 to a new level of P_{df} = Rs.19950.35 and the associated welfare effects would be measured as:

$$\Delta PS = \int_{P_{d0}}^{P_{df}} S(P)dp \tag{44a}$$

$$= \int_{P_{d0}=19292.28}^{P_{df}=19950.35} (898.4736 + 0.052582P_d)dp$$

$$= \text{Rs.}1270.216 \text{ million} \tag{44b}$$

$$\Delta CS = -\int_{P_{d0}=19292.28}^{P_{df}=19950.35} (1437.392 + 0.008451P_d)dp \tag{45a}$$

$$= -\text{Rs.}836.7886 \text{ million} \tag{45b}$$

$$NWG/C = \Delta PS + \Delta CS \tag{46a}$$

$$= 1270.216 - 836.7886$$

$$= \text{Rs.}433.4274 \text{ million} \tag{46b}$$

5. Results and Discussion

The domestic *Basmati* rice price (US$368.18 per M. ton) was kept lower than the Pakistan average export price (US$551.94 per M. ton). Thus producers suffered losses in their producer surpluses of Rs.657.95 million per year. The government collected Rs.1403.79 million per year as export tax during the pre-WTO period. Although consumers benefited by Rs.448.76 million per year in their consumer surpluses, losses to producers were greater than

benefits to consumers. However, due to export tax earnings, an overall benefit of Rs.1194.60 million per year was estimated for the Pakistani society.

There has been an increase in domestic prices during the post-WTO period (1995-2005) to US$381.61 per M. ton. But average export prices were US$476.52 per M. ton, that again resulted in losses to producers of Rs.649.48 million per year. The consumers' surplus stood at Rs.430.19 million per year while export tax collected was Rs.3063.90 million. Losses in producers' surpluses were larger than benefit to consumers' surpluses, but the net social benefit was Rs.2844.61 million per year, mainly due to export tax.

The interventions in the *Basmati* rice economy resulted in net social welfare gain in both the pre- and post-WTO periods due to export tax collection. Such a scenario obscured the real welfare of producers and consumers, as export tax would minimize/be abolished in a free trade situation and producers' and consumers' surpluses would remain for a comparative evaluation of welfare effects. Therefore, from a trade liberalization perspective, the study reveals the trend that losses to producers' surplus had been greater than benefits in consumers' surplus due to government interventions and, that if trade liberalization was introduced in the domestic economy, it would have incurred greater gains to *Basmati* rice producers than losses to consumers. However, the magnitude of gains or losses depends upon the level of price prevailing. The results show a similar trend for the international market i.e. trade liberalization in world *Basmati* rice markets would have benefited Pakistan's economy by Rs.327.53 million and Rs.433.43 million per annum during the pre- and post-WTO periods respectively. However, this benefit would have been in the form of a gain in producers' surplus during both the pre- and post-WTO periods.

6. Conclusion and Recommendations

A comparison of the pre- and post-WTO periods reveals that the price and tariff related government policy interventions have decreased during the post-WTO period compared to the pre-WTO period. This is evident from relatively narrowing gaps between Pakistan's domestic price and export price in the former period compared to the pre-WTO period. The estimated welfare effects in terms of producers' and consumers' surpluses revealed heavier losses than gains during both the periods, but relatively less losses during the post-WTO period. Trade liberalization simulations for the domestic economy revealed larger producers' gains relative to losses to consumers if trade was liberalized. Trade liberalization simulations for the world market also reflected higher gains for the domestic economy of Pakistan.

In light of the foregoing results, it is recommended that the positive trend of a narrowing gap between domestic and export (international) prices needs

to be continued until international prices prevail at the domestic level so as to improve the profitability of producers. Furthermore, Pakistan should continue implementing trade liberalization in line with the WTO regime. Efforts should also be geared up for trade liberalization on a global basis. The government should act as a facilitator of trade as envisaged in the "Green Box" of the Agreement on Agriculture and other WTO agreements. It should concentrate on research, development and out-reach related investments for improvement in productivity and quality of *Basmati* rice.

Note

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