Economic Welfare Analysis of State Interventions in the Sugarcane Economy of Pakistan

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Abstract

The instant study of Pakistan's Sugarcane economy identified state policy interventions and estimated welfare effects associated with state interventions prevailed during the study period. The study points out that Sugarcane crop had been subjected to 'price support-cum-import tax' regime during both study sub periods i.e. during 1985-1995 and 1995-2005. These interventions were found associated with welfare effects – higher losses to consumers, Rs.142842.28 million than gains to producers Rs.134671.18 million during pre-WTO period. Similar trend continued during post-WTO period where consumers suffered higher, Rs.208424.66 million per year than benefit received by the producer, Rs.199521.21 million per year. Based on the analysis, the study presents the following recommendations. First, government interventions should be minimized and gap between domestic and international prices should be narrowed down till the two prices arrive at the same level. Second, trade liberalization process should be stepped up, and more specifically, world prices should be allowed to prevail in domestic Sugar market. Third, Government of Pakistan should gradually reduce its role in trading through State Trading Enterprises (STEs) and act as facilitator of trade as per WTO agreements. More investment should be made in research and development, out-reach activities and quality aspects of sugarcane crop.

Key words: Agriculture in trade liberalization, Agriculture policy, Sugarcane economy, Government policy.
JEL Classification: Q17, Q18, Q28

1. Introduction

Sugarcane is one of the major crops grown in Pakistan and plays a significant role in its agricultural economy. The area under sugarcane crop has increased on average from 896,640 hectares in 1980-85 to 1,012,500 hectares during 2001-05, (Agricultural Statistics of Pakistan, various issues). The production of sugarcane crop in Pakistan has been in the hands of private producers. However, marketing and trade of sugarcane / sugar has mainly been regulated or managed by government in one or the other way (Trading Corporation of Pakistan, 2006 and Scott, Siddiqi, William and Muhammad, 1990). Despite government interventions in the sugarcane economy, the area under the crops has increased significantly. This has tempted to investigate into underlying causes using economic welfare analysis approach. The approach is based on government policies particularly price interventions during pre-WTO (1985-95) and post-WTO (1996-05) study period. The study is distinctive because it is first of its kind assessing economic welfare of producers and consumers of sugarcane in Pakistan applying pre and post-WTO scenario. Although, similar studies for other crops of Pakistan are available such as Zulfiqar and Chishti (2008) on wheat crop, Zulfiqar, et al (2009a) on cotton crop and Zulfiqar, et al (2009b) on rapeseed crop. These studies have shown that lessening of government interventions in line with WTO agreements have produced net social welfare gain to the economy. These results are in line with some of the international level research e.g. by Anderson (2003) and FAO (2005) that shown welfare gains for agricultural sector of food exporting developing countries particularly.

The economic welfare analysis of sugar economy has been based on domestic wholesale price, import price and world trade price of sugar. The analysis of these prices helped in determining various types of interventions Government of Pakistan has been adopting to regulate its Sugar economy during the 20 years of study period. A critical view of the data on various category of prices as reflected in Table 1 (Please refer to Annexure - A), suggests that Pakistan's domestic wholesale price (P_d) has remained, on average, at US\$461.88 (Rs[1].1611.50) per M. ton against the world average trade price (P_w) of US\$336.30 (Rs.11723.53) per M. ton. This reflects that Pakistan has supported its Sugarcane crop during the 19852005 study periods. During the same period, Pakistan has imported Sugar at an annual average import price (P_i) of US\$300.81 (Rs.10486.57) per M. ton and the price received at domestic market from consumers was US\$461.88 (Rs.16101.50) per M. ton. This suggests taxing import at US\$161.07 (Rs.5615.04) per M. ton. In economics terminology, Pakistan Sugar economy has been under 'price support-cum-import tax' regime.

2. Material and Methods

Unlike other crops, sugarcane is not imported into or exported from Pakistan. Hence, to develop a full model of domestic supply and demand and external trade of sugarcane, white sugar imports has been converted into its cane equivalent, using the prevailing sugar recovery rate (8.7%, average for study period). Consequently, a cane import supply (I_{ssc}) function in the model was used. The model assumes that, instead of price of cane, sugar price (P_{dsr}) determines sugarcane and sugar economy of Pakistan. Thus, sugar prices have been taken as determinants of sugarcane area, supply of sugarcane (S_{dsc}) as a consequence and demand of sugarcane (D_{dsc}).

For analysis purpose, time series data of 20 years from 1986 to 2005 was used. The major sources of the data collection were FAO's website (www.fao.org; statistical databases), Government of Pakistan's publications (Agricultural Statistics of Pakistan, Statistical Year Book and Pakistan Economic Surveys for various years) and UN databases 'comtrade'. The required variables were developed using time series data through various statistical and econometric tools. The analytical methods used in this study include (a) analysis of prices and identification of government interventions and (b) computation of associated welfare effects to estimate changes in producer and consumer surpluses.

Mainly there are three stakeholders involved when we determine the impact of domestic and trade policies. These stakeholders include producers, consumers and government. Impact on producers is determined in the shape of producer surplus (PS) i.e. extra benefit to producers and impact on consumers is estimated through consumer surplus (CS) i.e. net benefit of consumption. However, while talking of economy or a nation's welfare, it also includes state or government and impact on it is determined through revenue or cost to the government. The working mechanism of the methodological assumptions is explained in the following Para.

3. Identification of Government Interventions

As we know that WTO's agreements advocate for gradually eliminating the state interventions and allowing trade liberalization. Therefore, to analyze the welfare effect, the study period (1985-2005) was divided into two sub-periods: pre-WTO (1985-1995) and post-WTO (1995-2005). The mean values of prices for the two sub-periods were computed, as

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[1] Pakistani currency called Rupees and abbreviated as Rs.

follows:

	Pre-WTO period	**Post-WTO period**
	(1985-1995)	(1995-2005)
Pakistan's wholesale price (P_d)	US$501.16(Rs.11106.0)	US$422.60(Rs.21097.00)
World average price (P_w)	US$378.18(Rs.8380.80)	US$294.41 (Rs.14697.34)
Pakistan's import price (P_i)	US$304.49(Rs.6747.75)	US$297.13 (Rs.14933.41)

As reflected here, average P_d was US$501.16 per M. ton against average P_w at US$378.18 and average P_i at US$304.49 during the pre-WTO period reflecting 'price support-cum-import tax' regime. Graphically it has been shown in Figure 1. During post-WTO period average P_d has been US$422.60 while P_w at US$294.41 and P_i at US$297.13. This scenario again pictures 'price support-cum-import tax'. The same is graphed in Figure 2.
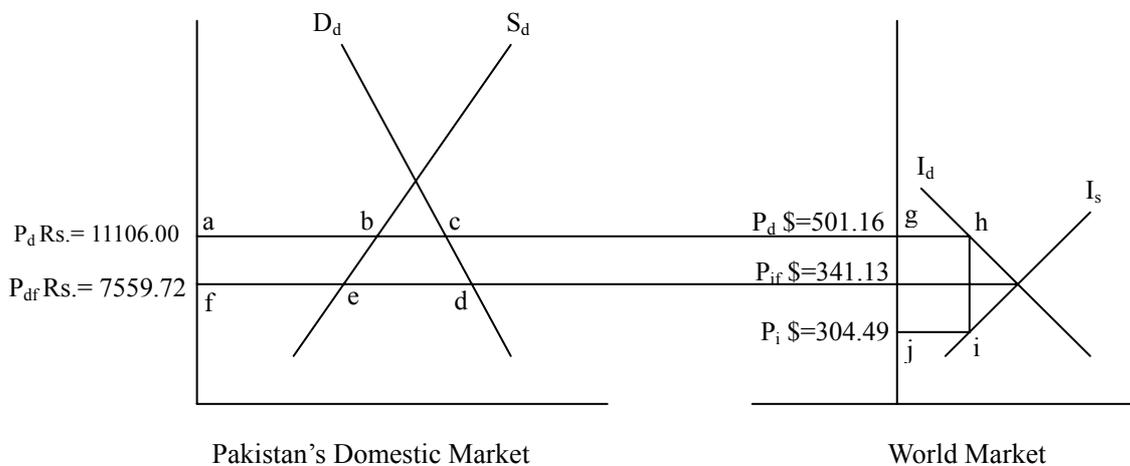

Figure 1. Price support-cum-import tax regimeduring pre-WTO 10 years

4. Computation of Welfare Effects

Welfare effects of both pre- and post-WTO) scenarios were measured in terms of changes in producer and consumer surpluses (ΔPS & ΔCS) along with computation of import tax (IT) to arrive at net social welfare gains or costs (NSWG/C) of the policy regimes.

Pre-WTO situation
The welfare effects of 'price support-cum-import tax' policy regime of pre-WTO period are depicted in Figure 1, below.

The following model was used to capture the welfare effects.

$$\Delta PS = (abef) = \int_{Pd}^{Pdf} S(P)dp \qquad (1)$$

$$\Delta CS = -(acdf) = -\int_{Pd}^{Pdf} D(P)dp \qquad (2)$$

$$IT = (ghij) = (Pi - Pd)Is \qquad (3)$$

$$\text{NSWG/C} = \Delta PS + \Delta PS + IS \tag{4}$$

The Sugarcane supply and demand functions estimated by Zulfiqar (2008: 115) were adopted; these were:

$$S_{dsc} = 37071.7800 + 0.096817 P_{dsr} \tag{5}$$
$$D_{dsc} = 41309.1856 - 0.110330 P_{dsr} \tag{6}$$
$$I_{dsr} = 4237.4056 - 0.207147 P_{dsr} \tag{7}$$
$$I_{ssr} = -4865.193 + 20.049 P_{isr} \tag{8}$$
$$= 2317.268 + 0.93649\ P_{wsr} \tag{9}$$

To arrive at free market price (P_{if}), import supply (I_s) and import demand (I_d) were equalized, as follows:

$$I_{ssr} = I_{dsr} \tag{10a}$$
$$4237.4056 - 0.207147 P_d = -4865.193 + 20.049 P_i$$

Replacing P_d with P_i and computing value for P_i

$$P_{ifsr} = US\$341.13 \text{ per M. ton} \tag{10b}$$

Putting value of $P_i = 341.13$ into I_s function

$$I_{ssr} = -4865.193 + 20.049\ (P_i = 443.71) \tag{11a}$$
$$= 2671.43 \text{ thousand M. ton} \tag{11b}$$

Equating $I_{ssr} = 2671.43$ with I_{dsr} and solving for P_{dsr} $\tag{12a}$

$$I_{dsr} = 2200.56 = 4237.4056 - 0.207147 P_{dsr} \tag{12b}$$
$$P_{dfsr} = Rs.7559.72 \text{ per M. ton} \tag{12c}$$

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

$$\Delta PS = \int_{P_{df}=7559.72}^{P_d=11106} (37071.7800 + 0.096817 P_d)\,dp \tag{13a}$$

$$= \left\{ 37071.78 P_d + \left(\frac{0.096817}{2}\right) P_d^2 \right\} \Big/ {}_{7559.72}^{11106}$$

$$= \left\{ \left\{ 37071.78(11106) + \left(\left(\frac{0.096817}{2}\right)(11106)^2\right) \right\} - \left\{ 37071.78(7559.72) + \left(\left(\frac{0.096817}{2}\right)(7559.72)^2\right) \right\} \right\}$$

$$= Rs.134671184.30 \text{ thousands}$$
$$= Rs.134671.18 \text{ million} \tag{13b}$$

$$\Delta CS = -\left\{ \left(\int_{P_{df}=7559.72}^{P_d=11106} (41309.1856 - 0.110330 P_d)\,dp \right) \right\} \tag{14a}$$

$$= - Rs.142842275.10 \text{ thousands}$$
$$= - Rs.142842.28 \text{ million} \tag{14b}$$

$$IT = (ghij) = (P_d - P_i)I_s \tag{13a}$$
$$= US\$ 380908.8 \text{ thousands}$$
$$= Rs. 8441196 \text{ thousands}$$
$$= Rs.8441.20 \text{ millions} \tag{13b}$$

$$SWG/C = \Delta PS + \Delta PS + IT \tag{14a}$$
$$= Rs.270105.5 \text{ thousands}$$
$$= Rs.270.11 \text{ million} \tag{14b}$$

On average, an overall social welfare gain of Rs.270.11 million per year was received by the

society during the study period 1985-95. The producers gained welfare to the tune of Rs.134671.18 million per year due to government support. For these calculations we had to use supply and demand of sugarcane as price of sugar. We can say that producers of cane and sugar have gained but can not say how much fraction belonged to each of these two stakeholders. However, consumers suffered losses of Rs.142842.28 million per annum due to higher prices. The total losses in consumer surplus can be attributed to the general sugar consumers of the country. In addition Government of Pakistan received import tax worth Rs.8441.20 millions per annum on import of sugar. It may be observed that losses to the consumers were higher then benefits to the producers. The net social benefit was only realized due to import tax the government has collected.
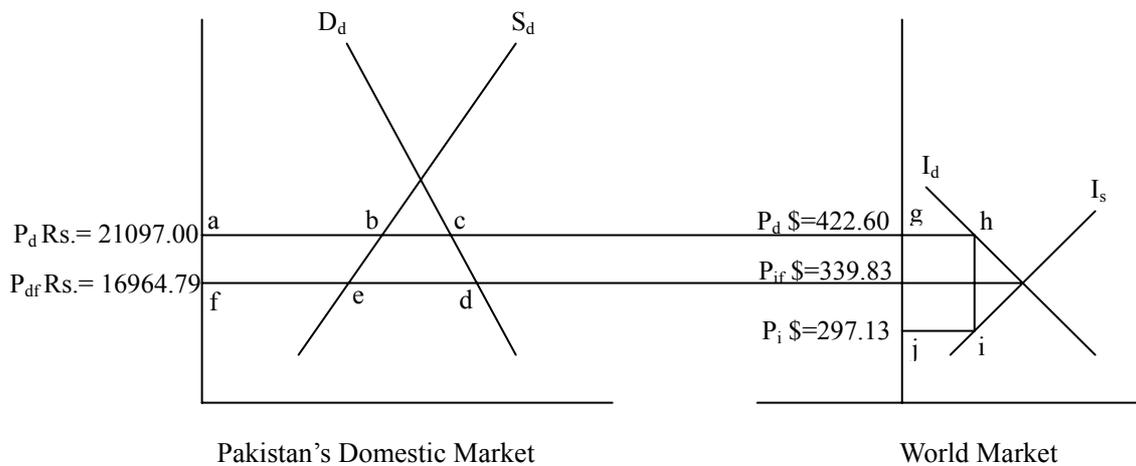

Figure 2. Price support-cum-import tax regime during post-WTO 10 years

Post-WTO situation

The 'price support-cum-import tax' regime remained in practice during post-WTO also. This scenario is reflected Figure 2 below.

The welfare effects were estimated using the model (1) to (4) again for post-WTO scenario. The Sugarcane supply and demand functions estimated by Zulfiqar (2008: 117) were adopted as follows:

$$S_{dsc} = 46441.8318 + 0.096817P_{dsr} \tag{15}$$
$$D_{dsc} = 52538.6672 - 0.110330P_{dsr} \tag{16}$$
$$I_{dsr} = 6096.8354 - 0.207147P_{dsr} \tag{17}$$
$$I_{ssr} = -4230.55796 + 20.049P_{isr} \tag{18}$$
$$= 2306.919 + 0.93649\ P_{wsr} \tag{19}$$

The estimates for the post-WTO period i.e.1995-2005 were as under.

$$\Delta PS = \int_{P_{df}=16964.79}^{P_d=21097.00} (46441.8318 + 0.096817P_d)dp \tag{20a}$$

$$= Rs.199521213.9\ thousands$$
$$= Rs.199521.21\ million \tag{20b}$$

$$\Delta CS = -\left\{\int_{Pdf=16964.79}^{Pd=21097.00} (52538.6672 - 0.110330Pd)dp\right\} \qquad (21a)$$

$$= - \text{Rs.}208424658.10 \text{ thousands}$$
$$= - \text{Rs.}208424.66 \text{ million} \qquad (21b)$$

$$\text{IT} \quad = (ghij) \quad = (P_d - P_i)I_s \qquad (22a)$$
$$= \text{US\$ } 216639.60 \text{ thousands}$$
$$= \text{Rs.}10815053 \text{ thousands}$$
$$= \text{Rs.}10815.05 \text{ millions} \qquad (22b)$$

$$\text{NSWG/C} = \Delta PS + \Delta PS + \text{IT} \qquad (23a)$$
$$= \text{Rs.}1911609 \text{ thousands}$$
$$= \text{Rs.}1911.61 \text{ million} \qquad (23b)$$

It appears that the Government of Pakistan interventions in sugar economy have resulted, on average, in an overall social welfare gain of Rs.1911.61 million per year to the society during the study period 1995-05. While, producers of sugarcane / sugar benefited by Rs.199521.21 million per year but consumers suffered losses of Rs.208424.66 million per annum due to higher prices. In addition government generated revenue of Rs.10815.05 millions on import of sugar. Again, it may be seen that losses to the consumers were higher then benefits to the producers. The net social benefit was only due to import tax the government has generated.

5. Results and Discussion

(1) During pre-WTO period (1985-95), the domestic sugar price (US$501.16 per M.ton) remained at much higher level as against the world average price (US$378.18 per M.ton). thus the producers of sugarcane / sugar benefited in their producer surpluses to the tune of Rs.134671.18 million per year along with a gain of Rs.8441.20 million per year by the government in the form of import tax. On the other hand, due to higher prices consumers have to suffer Rs.142842.28 million per year in their consumer surpluses. However, gains to producers along with import tax resulted into a net benefit to the society to the tune of Rs.270.11 million per year.

(2) The domestic prices, during post-WTO period (1995-2005), were (US$422.60 per M.ton) as against world average prices (US$294.41 per M.ton). This helped producers to gain Rs.199521.21 million per year and an income to the tune of Rs.10815.05 million per year to the treasury in the form of import tax. The high domestic prices caused losses of Rs.208424.66 million per year to consumers. However net losses remained lower than the gains (to producers and government treasury). Consequently, a net social gain of Rs.1911.61 million per year accrued to the society.

(3) The government interventions in Pakistan Sugar economy caused net social welfare gains in both the earlier and the latter period. The said gains occurred when import tax revenues were associated with state interventions during both the periods and were taken into account. It may be observed that such tax earnings concealed what actually happened to the welfare of producers and consumers. Trade liberalization under WTO regime aim at minimizing such tax earnings and producers and consumers' surpluses would remain for a comparative evaluation of welfare effects. Hence, with the motive to see the effect of state interventions in the sugar economy on producers and consumers, then changes in producers and consumers surpluses are of importance. Thus, in case of instant study, if welfare effects of existing policies on producers and consumers are compared, then losses in consumers surplus had been greater (Rs.142842.28 million per annum) than gains in producers' surplus (Rs.134671.18

million per annum) during pre-WTO period. Similarly in case of post-WTO period, losses to consumers had been higher (Rs.208424.66 million per annum) than gains to the producers (Rs.199521.21 million per annum). Therefore, a comparison of producers and consumers surpluses reflects a negative impact of state interventions in the sugar economy of Pakistan.

6. Conclusion and Recommendations

The analysis and discussions carried out in forgoing sections conclude on the following recommendations in order to arrive at higher gain then losses when comparing producers and consumers surpluses.

(1) The intensity of state interventions in sugar economy seems to have been intensified during post-WTO periods, as reflected from relatively higher gap between domestic and world prices than that of pre-WTO period. It is therefore recommended that the government should minimize its interventions and allow international prices to prevail in the domestic market.

(2) The welfare effects of existing domestic policy interventions estimated in terms of producers and consumers' surpluses exposed more losses than gains during both pre- and post-WTO periods. Therefore, Pakistan should implement trade liberalization as per procedures set by WTO to minimize gap between producers and consumers surpluses.

(3) The Government of Pakistan should gradually reduce its role in sugar trade through State Trading Enterprises (STEs). Instead, it should step up its role as facilitator of trade as per 'Green Box' of Agreement on Agriculture and other WTO agreements. More investment should be made in the areas such as research and development, out-reach activities and quality aspects of sugarcane crop.

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Annexure - A

Table 1. <u>Pakistan's sugar prices for 1985-2005</u>

(prices per M. ton)

Year	Pakistan's Domestic Price		World Price (US$)	Pakistan Import Price (US$)
	Pak Rs.	US$		
1985-86	8920	552.70	364.17	223.26
1986-87	9570	557.07	359.03	213.80
1987-88	9700	551.16	393.83	217.45
1988-89	9690	504.28	420.10	284.09
1989-90	11360	529.72	484.80	426.95
1990-91	11260	502.17	378.97	363.84
1991-92	11620	467.72	323.19	312.30
1992-93	12290	473.42	321.19	286.87
1993-94	12910	428.00	344.39	321.76
1994-95	13740	445.36	392.16	394.60
Average	**11106.00**	**501.16**	**378.18**	**304.49**
1995-96	16760	499.28	375.43	415.13
1996-97	21260	545.22	344.25	351.47
1997-98	19540	452.36	319.31	291.81
1998-99	19090	407.99	253.80	278.76
1999-00	21110	407.76	235.49	283.34
2000-01	27110	463.91	263.69	269.69
2001-02	22870	372.32	237.81	292.16
2002-03	20770	355.05	259.95	236.90
2003-04	19010	330.18	270.59	239.73
2004-05	23450	391.94	383.76	312.32
Average	**21097.00**	**422.60**	**294.41**	**297.13**

Source: FAO (<u>www.fao.org</u>; Statistical database)