Economic Implications of Taxing Agricultural Exports: The Case of Pakistan's Basmati Rice

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Abstract: The impact of an *ad valorem* export tax on Pakistan's Basmati rice trade is analysed in a partial equilibrium framework. Results suggest that producers of Basmati rice lost a considerable amount of their producer surplus while consumers gained in terms of their consumer surplus. The national treasury received tax revenues as well as some positive increases in foreign exchange earnings. The nation as a whole thus gained. However, the tax pushes up international prices, which may encourage other producers to increase their production and compete for their shares. A gradual decrease in the level of the export tax and an increase in producer price may take care of the adverse effects of the export tax.

Introduction

It is not always necessary that a country's major export trade policy goal should be the expansion of its export sales. Governments often have programmes that aim at reducing exportable quantities of particular commodities to protect domestic consumers and/or to raise revenues for the national treasury (Houck, 1986, pp. 120–131). A frequently used programme for the achievement of these goals is the taxing of exports. In particular, a large country with some market power has the option to maximize its national welfare by applying an export tax (McCalla and Josling, 1985, pp. 133–141).

Imposition of an export tax may have different implications for different sectors of the national economy. This paper attempts to evaluate such implications and to quantify their impact, particularly on the producers, consumers, government revenue, and foreign exchange earnings of the exporting country. The analysis is confined to an estimation of the effects of taxes placed on Pakistan's Basmati rice exports in a partial equilibrium framework.

Theoretical Framework

The impact of an export tax can perhaps best be illustrated in graphical form (Figures 1 and 2). Figure 1 represents the case of a large country that has some market power to influence foreign demand for its exports, and therefore faces a downward-sloping excess-demand curve (*ED*) as compared to a small country (Figure 2) that faces horizontal *ED* from the rest of the world.

In the absence of an export tax (free trade), world prices transmit fully to the domestic economy, so that domestic prices (P_d) are equal to world prices (P_w). Consequently, the exporting country's total supply (Q_s) is greater than its total domestic demand (Q_d). This creates an excess supply (*ES*) for the rest of the world. The difference between Q_s and Q_d is exported, and is equal to the quantity traded (Q_t) in panel (b) in Figures 1 and 2.

After an *ad valorem* tax is imposed, the exporting country's *ES* shifts to ES^*, reducing Q_t to Q_t^*. This leftward shift of ES has different impacts on P_w and P_d. In the case of a large country, there is an upward pressure on ED from rest of the world, and consequently P_w rises to P_w^* (Figure 1). In the case of a small exporting country, P_w remains intact since such a country faces a horizontal ED for its exports (Figure 2).

Imposition of a tax reduces the domestic price by the amount of the tax, and P_d falls to P_d^*. This causes downward pressure on domestic production and upward pressure on domestic consumption; producers respond by moving from a to b along their supply curve (S_d), while consumers move from c to d along their demand curve (D_d). As a consequence, the quantity supplied reduces to Q_s^*, and the quantity demanded increases to Q_d^*. The country now has less to export (Q_t^*) than when it had no tax on its exports.

The imposition of an export tax thus has the following impacts. First, it reduces the producer surplus (*PS*) by the amount equal to area $P_d abP_d^*$. Second, it increases consumer

surplus (*CS*) by the amount equal to area $P_d cdP_d^*$. Third, the treasury of the exporting country receives export tax earnings equal to area *efbd* or *jklm*. Fourth, the social costs of imposing the tax are equal to the sum of the changes in *PS*, *CS*, and tax revenue to the treasury. These costs are clearly positive in the case of a small country, and are equal to areas *ced* and *afb* in Figure 2. In the case of a large country, the magnitude and sign of the social cost depend upon the nature of the ED of the rest of the world and how effectively the exporting country can exploit its market power to raise extra tax revenues to offset the "deadweight" losses, namely the areas *cid* and *ahb* in Figure 1. Lastly, whether an export tax has a positive or negative impact on foreign exchange earnings depends on the difference between the areas caQ_sQ_d and $efQ_s^*Q_d^*$ in both cases; but it will be clearly negative in the case of a small exporting country and will depend upon the magnitude of the two areas in the case of a large country.

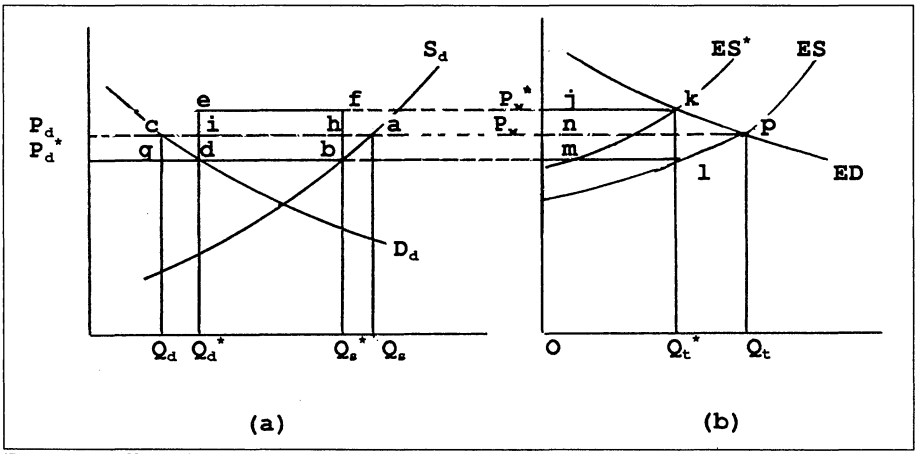

Figure 1—Effect of an Export Tax: Large-Country Case

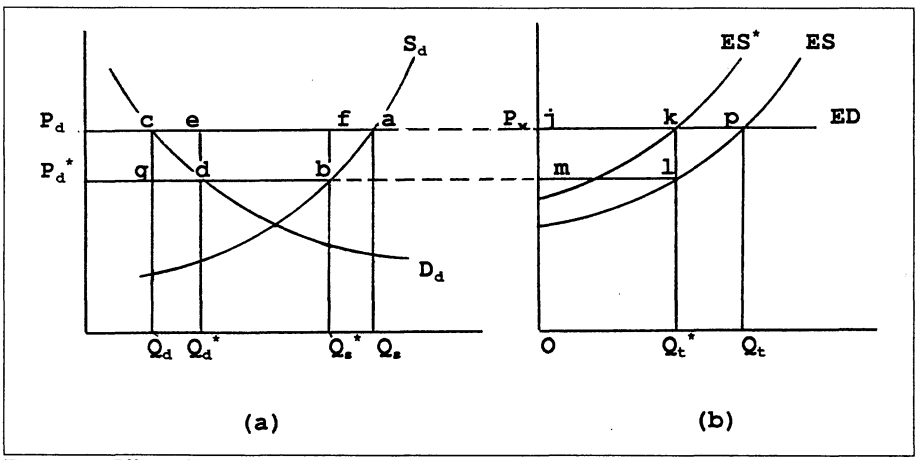

Figure 2—Effect of an Export Tax: Small-Country Case

Model Specification and Estimation Techniques

While Basmati rice is traded freely on the domestic market in Pakistan, its export is monopolized by the state-run Rice Export Corporation of Pakistan. The RECP procures rice at the procurement price announced by the government each year, and then sells it on the world market (Chishti, 1990). A comparison of the procurement and export prices of Basmati rice, given in Table 1, indicates that the latter prices were much higher than the former throughout the 1968–88 period; export prices were more than twice as high as procurement prices during the latter half of the reference period. This is a clear indication of the fact that Pakistan has been taxing its rice exports.

Table 1—Rice Price Ratios

Year	Procurement/ Export	Basmati/ Thai	Basmati/ US
1968/69	0.82	1.25	1.33
1969/70	0.87	1.20	1.19
1970/71	0.86	1.44	1.08
1971/72	0.69	2.34	1.59
1972/73	0.32	2.35	1.63
1973/74	0.42	1.34	1.00
1974/75	0.31	1.43	1.39
1975/76	0.46	1.44	1.25
1976/77	0.79	1.35	1.11
1977/78	0.60	1.65	1.35
1978/79	0.40	2.01	1.86
1979/80	0.41	2.13	1.87
1980/81	0.48	1.64	1.43
1981/82	0.52	1.49	1.27
1982/83	0.46	2.17	1.74
1983/84	0.48	2.18	1.59
1984/85	0.41	2.49	1.58
1985/86	0.40	3.08	1.75
1986/87	0.41	3.42	2.10
1987/88	0.49	3.14	2.24

Sources: Government of Pakistan, *Economic Survey 1989–90*, and IMF, *International Financial Statistics Yearbook*, 1989, pp. 182–183.

In the world market, Pakistan's Basmati rice enjoys a special preference among its customers (Ali and Flinn, 1989; and Slayton, 1984). The fine cooking quality and distinct aroma of this rice variety have given Pakistan a special advantage in the world rice market, obtaining much higher prices than the two leading rice exporters, Thailand and the USA (Table 1).

In the light of these considerations, the theoretical framework applicable to a large country, as shown in Figure 1, seems an appropriate methodology for analysing the effects and implications of Pakistan's Basmati rice policies. In terms of the symbols used in Figure 1, the procurement and export prices of Basmati rice are represented by P_d^* and P_w^*, respectively, and the difference between the two indicates the tax that goes to the national treasury. Without the imposition of this tax, world and domestic prices would have been the same at P_w.

As has already been pointed out, taxing Basmati rice exports has differential effects on producers and consumers as well as for the national treasury and foreign exchange earnings. Such impacts and the social cost of the programme can be quantified as follows:

$$(1)\quad \Delta PS = -P_d abP_d^* = -\int_{P_d^*}^{P_d} S(P)dP < 0$$

$$(2)\quad \Delta CS = P_d cdP_d^* = -\int_{P_d^*}^{P_d} D(P)dP > 0$$

(3) $G = efbd = (P_w^* - P_d^*)(Q_s^* - Q_d^*) = jklm = TQ_t^* > 0$

(4) $NSC = \Delta PS + \Delta CS + G <=> 0$

(5) $\Delta FE = npQ_tO - jkQ_t^*O = P_wQ_t - P_w^*Q_t^* <=> 0$

where ΔPS, ΔCS, and ΔFE denote changes in producer surplus, consumer surplus, and foreign exchange earnings, respectively; $S(P)$ and $D(P)$ are the total supply and domestic demand functions; G is export tax revenue; and NSC is net social cost. The definition of all other symbols coincides with those used in Figures 1 and 2.

Equations (1) and (2) estimate changes in the producer and consumer surpluses caused by the export tax; Equation (3) estimates revenue accruing to the national treasury; Equation (4) works out the net social cost to the economy resulting from the imposition of the export tax; and Equation (5) provides estimates of whether the foreign exchange earnings from rice exports have been affected by this tax and, if so, in what direction.

Among the variables involved, P_d^*, P_w^*, Q_s^*, and Q_d^* are already observable in the form of the country's domestic procurement and export prices and quantities produced and consumed on the domestic market. Data have to be generated for other variables such as P_w, P_d, Q_s, and Q_d, which requires the estimation of related functions including the export demand (ED) and export supply (ES) functions as well as the domestic demand, D_d, and total supply, S_d, functions.

A 2SLS econometric estimation technique with data for 20 years (1968–88) gives the following estimates of demand and supply functions:

(6) $S_d = 427.3568 + 0.10532\ PD$

(7) $D_d = 661.8715 - 0.056696\ PD$

(8) $ED = 642.932 - 0.76625\ PE$

where PD and PE denote the domestic and export prices, respectively. The fourth function, ES, can be calculated from (6) and (7), as follows:

Equating S_d and D_d gives the value of PD (1447.4725) for which quantity exported becomes zero. For the mean value of PD (2880.3), the quantity exported (ES) is 232.13. Substituting these values in the export function, $ES = d + (dES/dPD)PD$, we obtain:

(9) $ES = -234.5016 + 0.162008\ PD$

The values of the intercepts in Equations (6)–(9) are valid only for the mean values of the quantities and their respective prices. For other values, the equations would be:

(10) $S_d = a + 0.10532\ PD$

(11) $D_d = b - 0.056696\ PD$

(12) $ED = c - 0.76625\ PE$

(13) $ES = d + 0.162008\ PD$

where intercepts a–d vary with values of prices and quantities for each year.

Equations (12) and (13) represent the export demand and export supply functions. The relationship between PE and PD is given by:

(14) $PD + T = PE \times EXR,\ T > 0$

(15) $PD = PE \times EXR,\ T = 0$

where EXR = exchange rate and T = export tax.

Equations (12), (13), and (14) give P_w^*, P_d^* and Q_t^* while Equations (12), (13), and (15) estimate P_w and Q_t of Figure 1. In the latter case, estimates for PE and PD are needed first; the resultant equations are then equated in the form given in (15) and solved for the tax-free equilibrium quantity traded (Q_t), which is given by:

$$(16)\quad Q_t = \frac{(0.162008c^{*}\ EXR) - 0.76625d}{0.76625 + 0.162008\ EXR}$$

Substituting the value of Q_t into (12) gives the tax-free equilibrium export price, P_w, which is given by:

$$(17)\quad P_w = \frac{c - Q_t}{0.76625}$$

Empirical Findings and Conclusions

The estimated results given in Table 2 indicate that the export tax imposed on Pakistan's Basmati rice has had a positive social welfare effect for the domestic economy. The tax gave an annual average net social gain of Rs 83.86 million,[2] Rs 284.47 million, Rs 624.94 million, and Rs 946.60 million during the 1968–73, 1973–78, 1978–83, and 1983–88 periods. Producers of Basmati rice lost, on average, Rs 112.41 million and Rs 1314.83 million in producer surplus while consumers, on the other hand, gained Rs 53.11 million and Rs 831.32 million in consumer surplus during the 1968–73 and 1983–88 periods. The national treasury, in addition, received Rs 143.16 million and Rs 1,430.11 million as tax revenue during the reported periods. The nation as a whole thus benefited. Foreign exchange earnings, on average, decreased by $1.93 million per year in the initial period but increased subsequently by $10.51 million, $16.55 million, and $14.48 million during the 1973–78, 1978–83, and 1983–88 periods.

Results suggest that Pakistan has been able to obtain a positive net social gain from the export tax on Basmati rice. The tax, however, has some adverse effects. First, it hurts producers and causes a considerable decrease in their producer surplus. Second, it drives up international prices, which may encourage other producers to increase their production and compete for their shares. A gradual decrease in the level of the export tax and an increase in the producer price may take care of these adverse effects.

Notes

[1]Peshawar Agricultural University and University of Illinois, respectively.

[2]The average exchange rate was Rs 10.585 per US$ during the period under study.

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Table 2—Implications of Taxing Basmati Rice Exports (1968/69–1987/88)

Year	ΔPS	ΔCS	G	NSC	ΔFE
1968/69	-62.67	50.49	22.65	10.47	1.72
1969/70	-39.55	33.79	10.88	5.12	1.10
1970/71	-27.21	16.28	21.31	10.38	-0.20
1971/72	-88.03	44.12	80.30	36.40	0.89
1972/73	-344.59	120.85	580.67	356.93	-13.15
Average	-112.41	53.11	143.16	83.86	-1.93
1973/74	-387.80	189.09	477.79	279.07	-3.63
1974/75	-1182.74	683.91	810.97	312.15	59.81
1975/76	-620.47	342.13	658.12	379.79	3.76
1976/77	-151.56	56.72	280.58	185.74	-8.30
1977/78	-332.99	167.95	430.63	265.59	0.91
Average	-535.11	287.96	531.62	284.47	10.51
1978/79	-1358.25	936.01	796.80	374.57	47.55
1979/80	-1277.20	712.57	1300.08	735.45	4.66
1980/81	-1223.12	630.47	1487.79	895.14	-13.34
1981/82	-1219.75	835.39	887.75	503.39	26.26
1982/83	-1256.76	877.48	995.43	616.15	17.62
Average	-1267.02	798.38	1093.57	624.94	16.55
1983/84	-1121.36	579.05	1715.01	1172.70	-28.02
1984/85	-1369.09	993.87	983.91	608.70	25.88
1985/86	-1320.50	770.98	1658.54	1109.01	5.68
1986/87	-1377.06	880.04	1375.11	878.09	36.22
1987/88	-1386.15	932.66	1418.00	964.51	32.63
Average	-1314.83	831.32	1430.11	946.60	14.48

Note: Changes in producer and consumer surpluses (ΔPS and ΔCS), government revenue (G), and net social loss/gain (NSC) are in Rs million and changes in foreign exchange earnings (ΔFE) are in $million.

McCalla, A.F., and Josling, T.E., *Agricultural Policies and World Markets*, Macmillan Publishing Company, London, UK, 1985.

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Discussion Opening—*Farman Ali* (University of East Anglia)

The paper by Chishti and Schmidt provides an interesting time-series 2SLS estimation of the net social gain resulting from the imposition of an export tax on Pakistani Basmati rice. It is particularly comforting to know that the authors found a positive net social gain. However, the paper has some deficiencies.

The difference between the procurement price and the export price of Basmati rice does not necessarily mean the existence of an export tax. This difference could be due to handling and transport charges and could widen with an increase in fuel cost. The ratios in Table 1 make it clear that the figure for 1972/73 is less than half of the previous year's value because of the oil shock and the subsequent rise in transport cost.

I am not convinced by the view that Pakistan's behaviour as a Basmati rice exporter may be viewed as that of a large country because Pakistan is not the sole producer of Basmati rice and, since there are other varieties of rice, consumers may switch from consumption of Basmati to its substitutes if there is an increase in the price of Basmati. It is thus hard to believe that Pakistan can affect or influence the world rice market.

The only explanatory variable used in the demand and supply functions is the domestic price of Basmati rice. The inclusion of other variables such as consumer income, rainfall, export tax, and price of other varieties of rice could also be considered.

The basic diagnostic statistics such as R^2, t-ratios, etc., are not provided, so that we do not know how reliable the results are. For example, if the goodness of fit is poor, then there is no need to proceed any further. Similarly, if the coefficients are not significant, then there is no point in relying on them.

[Other discussion of this paper and the authors' reply appear on page 258.]