

# On Liberalising Agricultural Trade

## A Note of Caution from India's Experience with Tea Trade

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*A basic apprehension regarding the policy of promoting exports of agricultural products is its impact on food security, in particular on domestic food prices. This concern becomes important in the light of the evidence of the weak supply response of agricultural production.*

*This paper examines the factors that determine exports of tea and observes that tea exports are insensitive to price incentives and to changes in world demand and decrease with increasing share of domestic consumption. It is also observed that the possibility of trade in tea links the domestic price of tea to the international price, suggesting that if trade in agricultural products is extended to essential commodities, their domestic prices are likely to rise.*

*The experience of tea suggests that a policy of export of agricultural commodities, particularly essential commodities, cannot be recommended without caution.*

### I Introduction

THE structural reforms being adopted by India consist mainly of (i) fiscal reforms, (ii) financial sector reforms including weakening the Foreign Exchange and Regulation Act (FERA) permitting direct foreign investment, (iii) internal liberalisation (or privatisation and reduction of the role of the state), and (iv) trade liberalisation, including trade in agricultural commodities and trade in services. The analytic framework to justify the economic reforms is the subject of a major debate between the proponents and the opponents of the structural reforms. Trade in agriculture is one of the major elements of this controversy between the supporters and critiques of economic reforms. The basic apprehension of the critiques is regarding food security and the impact of agricultural trade on the price the poor have to pay for essential food items. It is often argued that there is inadequate exportable surplus in agriculture in the short run, and that the agricultural supply response is not driven primarily by monetary considerations due to non-commercial nature of most of India's agriculture and because of certain institutional factors that are specific to India.

The debate between the protagonists and antagonists should, one would expect, be based both on theoretical and empirical arguments. This debate however, is quite often not supported by adequate theoretical analysis. On the empirical side also aggregate econometric relations of a structural type are quite commonly used in the debate and they suffer from four main drawbacks. First, the structural models are based on an economic structure that is assumed to be invariant during the entire sample period, and the time series nature of the data is ignored. Second,

if the economic time series are non-stationary it is now quite well known that the traditional structural equations portray spurious correlations and erroneous conclusions. Third, the statistical evidence drawn from the time series data of the past are generated from the old economic regime. It offers insufficient evidence on what is likely to happen under a change in the economic regime brought about by structural reforms. Fourth, aggregate relations do not capture the institutional specifics that are associated with the constituent parts, thereby possibly giving us a blurred picture. From the last point one would conclude that there is a need to specify the import and export functions in a disaggregated form with a few major commodity groups — such as major agricultural commodities, consumer goods, capital goods, and services. Such a disaggregated approach will provide a greater

insight into the factors that determine the imports and exports of goods and services.

When our own thinking was along these lines we had come across a paper by Hanumantha Rao and Gulati (1994) that advocated a policy shift towards exporting of agricultural commodities in which we have a comparative advantage. We then decided to examine India's experience with respect to an agricultural commodity for which we already have exports and for which India has a comparative advantage. We thus examined India's experience with respect to tea exports. It may be noted that we are examining export experience with respect to a commercial crop grown as a plantation crop while the usual debate is about trade in (essential) agricultural commodities such as foodgrains. We argue therefore quite cautiously that the empirical evidence presented in this paper only

TABLE 1: INDIAN TEA INDUSTRY – PROFILE (1950-1993)

Year	Area (in Hect)	Prodn (Metric Tons)	Yield (Kgs/ Hect)	Export (Metric Tons)	Value of Exports (Rs)	Unit Export Price (Rs/Kg)	Share in World Export (Per Cent)	Share in Domestic Consumption in Prodn (Per Cent)
1950	315656	278212	881	200780	804214	4.01	49.9	26.6
1955	320238	307704	961	166708	1136132	4.35	43.4	32.7
1960	330738	312077	971	193063	119983	6.21	40.1	40.7
1965	341762	366374	1072	199365	1149747	5.77	38.8	45.3
1970	354133	487135	1182	202335	1498033	7.40	38.6	51.5
1975	363303	487135	1341	218480	2460213	11.26	37.4	55.9
1980	381086	569172	1494	224780	4325461	19.24	31.2	62.9
1985	398966	656162	1645	214937	7035904	32.73	28.7	63.2
1990	416269	720338	1731	210024	11133510	53.01	28.6	69.4
1991	420500	754192	1794	202918	11345533	55.91	29.5	69.0
1992	422591	703931	1666	174962	9953306	56.89	29.3	76.7
1993	425026	758063	1784	179763	11672657	64.93	29.4	73.9
Annual compound growth rate (per cent)								
	1.02	10.59	10.41		11.48			

suggests (and does not prove) that one must give sufficient importance to institutional constraints, poor supply response and the possibility of agricultural commodity prices increasing in the short run. Such an increase in agricultural commodity prices at a period when the governments of the developing countries are forced to reduce the fiscal deficit, and subsidies in particular, can only lead to consumption deprivation and poverty.

The plan of the paper is as follows. Section II raises a few methodological issues. Section III provides a brief profile of India's tea production and trade. Section IV presents econometric evidence regarding some of the issues raised in Section II. Finally, the paper concludes with some cautious remarks in Section V on agricultural policy in a changing economic environment.

## II Methodological Issues

In this paper we are concerned mainly with trade reforms, and in particular reforms facilitating trade in agricultural commodities. Trade liberalisation can be justified under two alternative analytic frameworks. First, trade barriers can be treated as market imperfections in an otherwise perfectly competitive market environment. Then by appealing to the traditional neoclassical economic theory one can argue that removal of trade barriers would improve economic welfare.<sup>1</sup> Second, one may allude to the classical theories of specialisation, comparative advantage, Heckscher-Ohlin and Samuelson theorem of factor price equalisation to justify the virtues of free trade.

The logic behind some of the trade related reforms seems to be based on a partial equilibrium, comparative statics and *ceteris paribus* assumptions. The policy prescriptions become shaky if one relaxes the *ceteris paribus* assumption and uses a general equilibrium framework. This can be illustrated for example with the policy prescription of devaluation of a third world currency in order to increase its exports and decrease its imports and thereby reducing its current account deficit. A fallacy of composition is likely to operate in this case. If a third world country exports primarily primary commodities and if its competitors are some other developing countries that also export primary commodities then if all these competing third world countries devalue their currencies they increase the cost of their imports without in any way improving their export performance.

The task of examining the impact of reforms from analytic and empirical viewpoints is a very complex one. What we

propose to do in this paper is only to highlight some of the issues raised above by examining critically the suggestions made by Hanumantha Rao and Gulati (1994) that the developing countries should divert resources away from industry to agriculture in which they have a comparative advantage, and that they should export agricultural commodities. In order to give some substance to our arguments and views we present some empirical evidence on the factors that determine the exports of an agricultural commodity, tea, for which India has enjoyed a position of comparative advantage for a long time. In view of the discussion presented above the following issues need to be examined:

- (1) What factors determine the performance of Indian tea exports?
- (2) What is the long-term relation between tea exports and its determinants which is devoid of any spurious correlations?
- (3) Are the tea exports responsive to changes in world price for tea and the exchange rate?
- (4) What are the long-term trends in production, domestic consumption and exports of tea in India?
- (5) Is there a perfect competition in tea trade

- or is the trade confined to a few trading centres and a few trading countries?
- (6) What is the degree of competition or collusion in international tea trade in terms of market linkages as evidenced by prices for tea prevailing at various international markets?
- (7) Are domestic prices of tea affected by the world price for tea? Is the domestic price of tea increasing or decreasing over time as a result of trade and changes in the exchange rate?
- (8) What are the institutional factors that are specific to India's tea production and tea exports that have bearing on tea exports?

TABLE 4: TESTING FOR UNIT ROOT

Variables	ADF Test	
	Levels	First Differences
Calcutta	2.939	-89.7785*
Cochin	2.192	-99.277*
Sri Lanka	0.512	-94.038*
Kenya	11.297	-9.523*
London	-7.9465*	-64.539*

Notes: \* Significant at the 1 per cent level. Numbers reported in the Table are t-values of  $\alpha_1$ . ADF unit root test is based on one lag.

TABLE 2: INDIA'S TEA EXPORT DEMAND EQUATION - PERIOD 1950-93

Variables	In Levels			In Logs		
	I	II	III	I	II	III
Constant	105518.71 (1.13)	178431.98* (2.23)	100377.58 (0.96)	0.63 (0.19)	3.40 (1.09)	0.63 (0.19)
Unit value (Rs)	-257.56 (-0.34)	-1226.63* (-3.13)		-0.01 (-0.16)	-0.16* (-2.97)	
Unit value (\$)			-541.29 (-0.06)			-0.01 (-0.16)
India's share in world prodn of tea	1242.74 (0.79)	-159.63 (-0.13)	1395.53 (0.81)	0.28 (0.84)	-0.23 (-0.95)	0.28 (0.84)
World demand for tea imports	0.19* (3.26)	0.19* (3.30)	0.18* (3.24)	0.81* (3.94)	0.73* (3.43)	0.81* (3.94)
Ratio of domestic consumption to domestic prodn	-93579.38 (-1.28)	-158171.01* (-2.69)	-819327.76 (-1.17)	-0.25 (-1.69)	-0.42* (-3.29)	-0.25 (-1.68)
Exchange rate (Rs/\$)	-2757.43 (-1.46)		-3307.18* (-3.48)	-0.21* (-2.18)		-0.23* (-3.80)
R <sup>2</sup>	0.32	0.28	0.32	0.36	0.28	0.36
DW	2.20	2.07	2.21	2.19	1.85	2.19

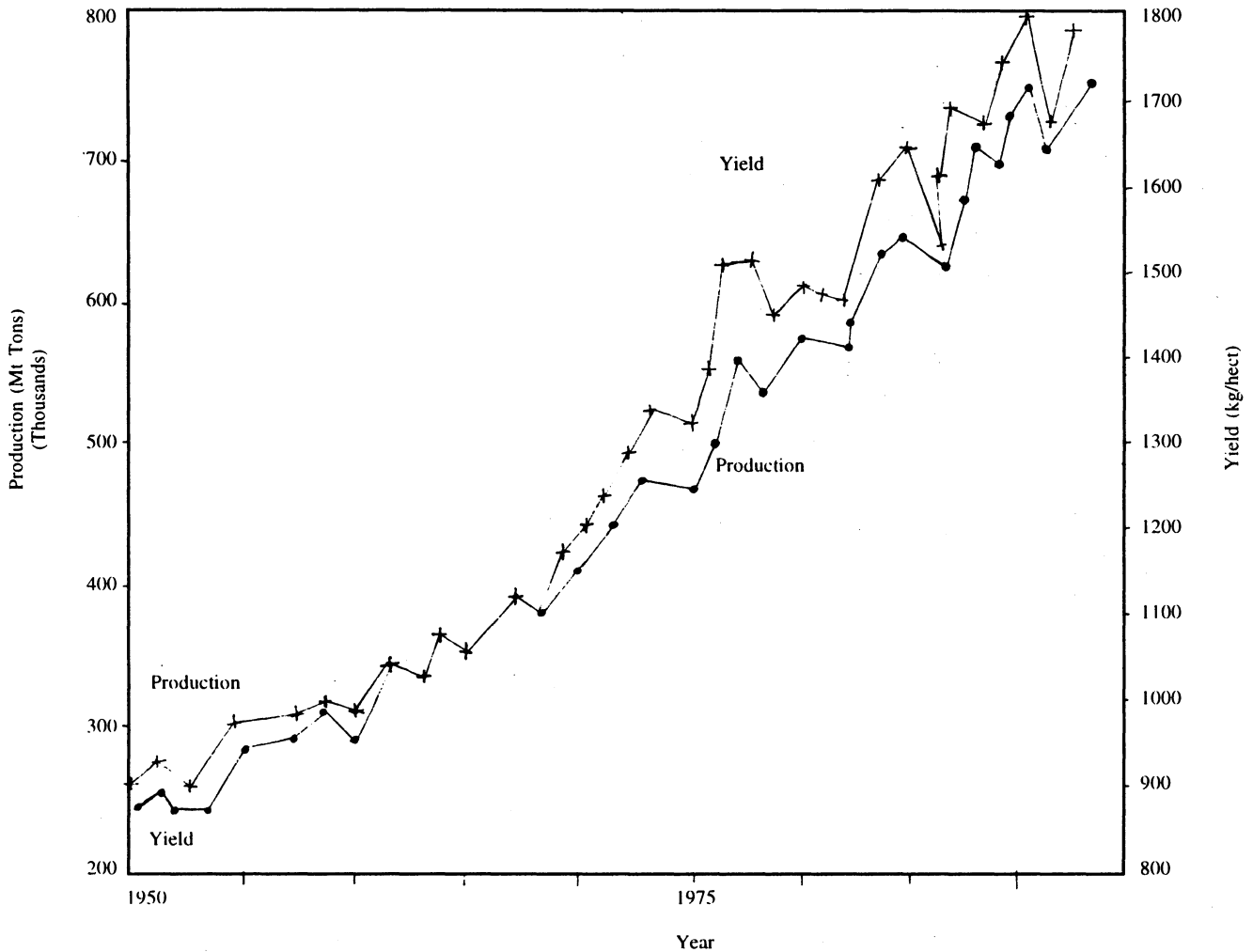
Notes: Values in the parentheses are t-statistics; \* indicates significance at 5 per cent level of significance.

TABLE 3: INDIA - TESTING FOR UNIT ROOT

Variable Form	ADF Test					
	Exports	Price \$	PDSH	WIPC	Consh	Exrt
	Variables in Levels					
Undifferenced	-68.70*	-4.98*	-1.97	0.37	-0.75	8.62
First differences	-141.3*	-79.98*	-39.40*	-94.38*	-131.2*	1.73
Second differences						-53.30*
	Variables in Logarithms					
Undifferenced	-70.37*	-3.92*	-1.55	-0.47	-1.92	3.02
First differences	-143.2*	-62.70*	-41.63*	-96.57*	-134.5*	-18.60*

Notes: \* Significant at the 1 per cent level. Numbers reported in the Table are t-values of  $\alpha_1$ . ADF unit root test is based on one lag.

FIGURE 1: INDIAN TEA: PRODUCTION AND YIELD



We shall attempt to answer some of these questions in the rest of the paper.

### III Profile of India's Tea Production, Consumption and Trade

Indian tea industry has enjoyed a prominent place in the world. The history of the Indian tea industry up to the dawn of independence can be briefly described as a case of expansion and consolidation. By 1950 tea had become an important agricultural crop of the country. It accounted for over 18 per cent of the total employment in the organised sector of the economy, 14 per cent of the country's export earning and 1.16 per cent of the Gross National Product. The area under tea cultivation was 3.15 lakh hectares and it was a major source of development in the relatively backward hilly regions of the country. In 1950 India was the largest producer and exporter of tea in the world.<sup>2</sup>

Let us now examine the performance of

tea industry after 1950. Table 1 presents some facts about India's tea industry giving a major thrust to export supply factors. The area under the crop has increased from 3.15 lakh hectares to 4.25 lakh hectares, registering an annual compound growth rate of 1.02 per cent. Production has increased from 278.21

thousand metric tons to 758.06 thousand metric tons, nearly a three-fold increase. The annual compound growth rate of production during last 43 years is 10.5 per cent. Fig 1 also shows a long-term increasing trend in production. Yield of tea increased from 881 kg/hect to 1,784 kg/hect.<sup>3</sup> Fig 1 shows that

TABLE 5: TESTING FOR COINTEGRATION - ENGLE-GRANGER METHOD

Equations	Values of		ADJ R <sup>2</sup>	ADF for Residual	PP for Residual
	$\alpha$ ( $\alpha'$ )	$\beta$ ( $\beta'$ )			
Cochin on Calcutta	0.8509	0.7782*	0.99	-57.89*	-38.65*
Calcutta on Cochin	3.5194	1.0429*	0.99	-64.47*	-46.06*
Calcutta on Sri Lanka	12.1397	0.4164*	0.99	-49.24*	-60.41*
Sri Lanka on Calcutta	-3.814	1.4082*	0.96	-37.61*	-43.34*
Kenya on Calcutta	-3.028	1.281*	0.88	-29.96*	-17.25*
Calcutta on Kenya	12.213	0.370*	0.95	-66.44*	-28.16*

Notes: \* Significant at 1 per cent level.

The cointegration regression for two variables

$$P_t = \alpha + \beta P_t + u_t; \text{ and } P_t = \alpha' + \beta' P_t + u_t$$

where  $P_t$  and  $P_t$  are non-stationary time series,  $\alpha$ ,  $\alpha'$  and  $\beta$ ,  $\beta'$  are constant and cointegrating parameter respectively.

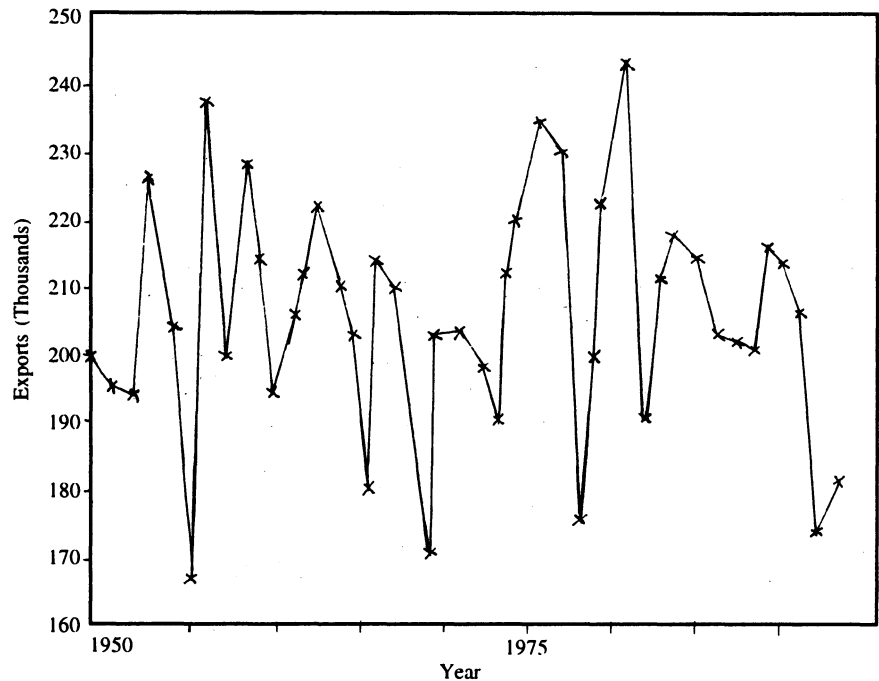
ADF and PP test is based on one lag.

the yield rate has more fluctuations than production. India's tea exports (in terms of quantity) show no trend, rather they fluctuate erratically (Fig 2). During the last 43 years exports have varied between 166.71 and 240.18 thousand metric tons. The unit value of export (expressed in Rs/kg) has significantly increased from Rs 4.01 per kg in 1950 to Rs 64.93 per kg in 1993. The price movement was sluggish between 1950 and 1973. After 1973, price increase was faster and in 1977 price was doubled compared to the price of the previous year. Taking into account the fact that exports in physical quantity did not increase with the increase in unit value of export, one may interpret that the value of the rupee was becoming cheaper, which is also supported by the fact that the unit value of tea exports are more or less stable during the fixed exchange rate regime of 1950 to 1973. India's share in total world's export has declined very significantly from around 50 per cent to 29 per cent. Figure 3 shows a continuous decline in India's share of tea exports. On the other hand domestic consumption of tea has increased significantly (Figure 3). The share of domestic consumption in production has gone up from 26.6 per cent to 76.7 per cent.

It may be suspected that India's tea exports are affected primarily by competition from other tea exporting countries and from a high domestic demand for tea. It may be noted that tea is a peculiar commodity for which there is only one major substitute, coffee, whose export performance also is driven by quite similar forces. An increase in population and an increase in per capita domestic consumption of tea increase the domestic demand for tea. As the rate of growth of tea production is less than the rate of growth of consumption the ratio of domestic consumption to domestic production is increasing over time.

The declining share of India's exports needs some explanation. There are several factors that seem to explain this. First, there is increasing competition from other tea exporting countries such as Sri Lanka, Kenya, China and Indonesia. Second, domestic consumption of tea has also registered a substantial increase. Third, only good quality tea can be exported. Good quality tea is harvested when the tea plantation is approximately more than five years and less than 40 years old. There has been very little effort in India to maintain or conserve good quality tea through replantation as the cost of replantation is relatively high compared to loss in revenue due to producing and marketing a lower quality of tea in the domestic market (Tandon Committee Report, p 42). A very high tax rate on income from tea cultivation is perhaps another major deterrent for increasing production and export of good quality tea.

FIGURE 2: TEA EXPORTS OF INDIA



#### IV

#### India's Tea Export Performance: An Econometric Analysis

Our first attempt was to specify and estimate the tea export function for India. Employing the standard structural equation methodology associated with the financial programming approach, we estimated the tea export demand. We specified that it depends on (i) unit price in US \$, (ii) share of country's production to the total world production, (iii) total world demand for tea imports, (iv) share of domestic consumption to total production, and (v) the exchange rate (Rs/\$). One may question the use of exchange rate as an additional variable when its effect is already accounted for by the price of tea expressed in US dollars. While the term price in US \$ will reveal response of tea exports to world price for tea the term exchange rate will show if there is any additional export incentive as a result of change in the exchange rate (usually a devaluation). The results of the estimated equations are presented in Table 2. We used annual time-series data for the period 1950-93.

It may be noted that  $R^2$  associated with the estimated equations are quite low. This inference may be examined against the fact that some of the explanatory variables such as exchange rate, India's share in world tea exports, ratio of domestic consumption in tea production have time trends while the India's tea export volume has more or less fluctuated widely around a constant mean. Only the world demand for tea and exchange

rate emerge with statistically significant coefficients. The exchange rate appears with a significant negative coefficient while the most commonly held view suggests a positive coefficient. This result may again be noted against the time series pattern — the volume of exports fluctuates around a constant mean while the exchange rate has an increasing trend. The unit value of exports (in \$ per kg) also does not have a significant coefficient. The regression specification that ignores the time series nature of the data, one could argue, may have generated spurious correlations.

The regression results reported in Table 2 do not take due account of the fact that the data used are time series. We now proceed to examine the data and the relationships between variables by noting that they are time series. First, we examine each time series and see whether it is stationary or non-stationary employing the unit root tests. If a time series is found to be non-stationary, we next examine, likewise, if its first difference is stationary. Using this procedure we determine the order of integration of a time series. Then we stipulate that the regression relation be between stationary variable only. If any of the variables are non-stationary, they are replaced by the appropriate difference of that variable which is stationary. Table 5 presents the results of unit root tests using the time series data from 1950-1993. The results determine the order of integration of the variables. From the table it is evident that when the variables are used in levels, India's tea exports, price in US \$ are stationary time series, while

India's share in world production, world demand for imports are integrated of order one, and the exchange rate is integrated of order two. When the variables are expressed in logarithms a similar conclusion arises, except that the exchange rate becomes stationary in the first difference of the logarithm.

The corresponding time series regression relation which is devoid of spurious correlations due to common time-trends is given below:

$$\begin{aligned} \text{EXPORT} = & 206229.17 + 440.51 \text{ UNPRI} \\ & (24.18) \quad (0.09) \\ & - 1451.08 \Delta \text{PDSH} + 0.02 \Delta \text{WIPC} \\ & (-0.67) \quad (0.38) \\ & - 222887.02 \Delta \text{CONSH} \\ & (-3.13) \\ & - 587.09 \Delta^2 \text{EXRT} \quad \dots(1) \\ & (-0.20) \end{aligned}$$

$$R^2 = 0.23, \text{ adf (lag=1)} = -56.80, \text{ PP (lag=1)} = -39.57.$$

$$\begin{aligned} \text{Log(EXPORT)} = & 12.23 + 0.01 \text{ Log(UNPRI)} \\ & (511.93) \quad (0.34) \end{aligned}$$

$$\begin{aligned} -0.17 \Delta \text{Log(PDSH)} + 0.22 \Delta \text{Log(WIPC)} \\ (-0.49) \quad (1.02) \end{aligned}$$

$$\begin{aligned} -0.45 \Delta \text{Log(CONSH)} \\ (-3.65) \end{aligned}$$

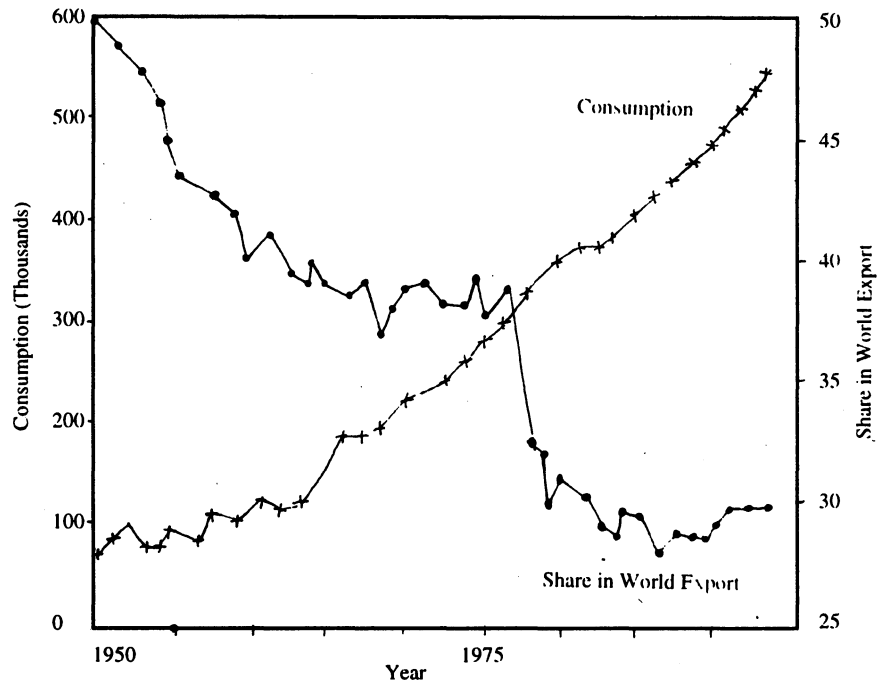
$$\begin{aligned} -0.14 \Delta \text{Log(EXRT)} \quad \dots(2) \\ (-0.70) \end{aligned}$$

$$R^2 = 0.30, \text{ ADF (lag=1)} = -64.51, \text{ PP (lag=1)} = -40.40$$

From the statistical evidence furnished above it is quite clear that India's tea exports are not influenced by any of these explanatory variables except the domestic consumption as share of domestic production. The share of domestic consumption is increasing over time and correspondingly the exports are decreasing.

It is useful to enquire whether this poor export performance is due to the Indian tea market being not well-integrated with the other major tea markets in the world. We next examine how well the tea markets in various locations are integrated. Given the time series nature of the data we shall employ time series methods with data from 1950-1993. If markets are closely integrated with one another then prices in different markets, separated by geographic distance, must move together in time. From a time series perspective this is equivalent to stating that prices of tea in different markets, Cochin, Calcutta, Kenya, Sri Lanka, London, etc. must be cointegrated pairwise. We tested this hypothesis of market integration by performing a unit-root test for non-stationarity and t-test on the bivariate regressions for cointegration. The results of our analysis are presented in Tables 4 and 5. From these tables it is clear that all the price-time series except London price are non-stationary (Table 4). To see whether

FIGURE 3: INDIAN TEA: CONSUMPTION AND SHARE IN EXPORTS



these non-stationary prices move together we estimated linear relationships between them pairwise. The results are reported in Table 4. From these it follows that the two estimates of  $\beta$  and  $\beta'$  are such that '1' is bracketed between them. Similarly in some cases (Calcutta and Sri Lanka, and Kenya and Calcutta) the estimates of  $\alpha$  and  $\alpha'$  bracket '0'. These results demonstrate that various tea prices move together in time suggesting that the tea markets are well-integrated. Figure 4 presents the co-movement of tea prices in tea markets at Calcutta, Cochin, Sri Lanka and Kenya. It must be noted that this phenomenon of cointegration of prices is consistent with two widely different hypothesis, one that the tea market is perfectly competitive and the other it is oligopolistic with one leader (price-setter) and all the other as followers.

## V

### Concluding Remarks

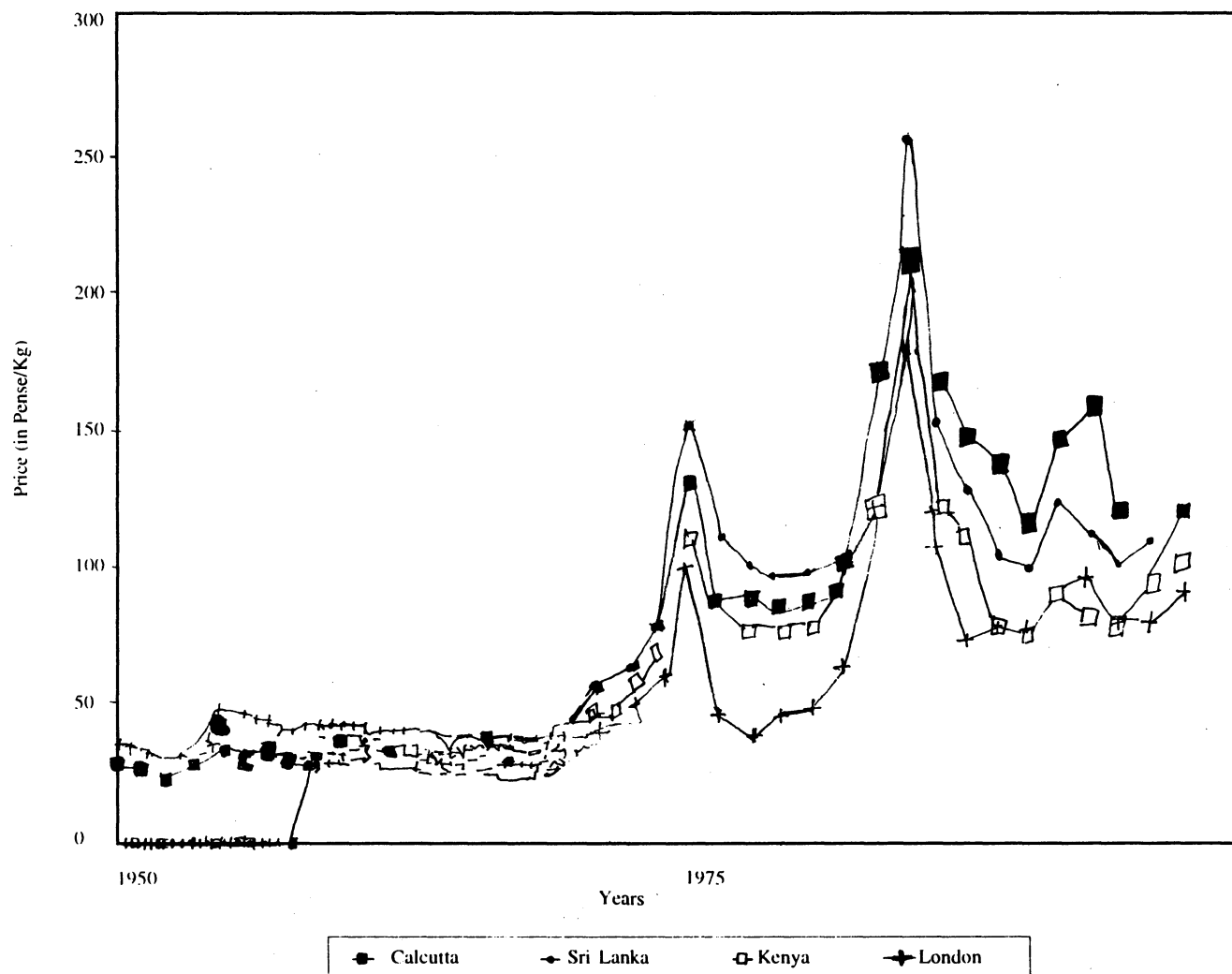
When a country is going through a policy reform and regime-shift it is difficult to obtain empirical support for the policy reforms from the past historical experience. However, regarding the issue of exporting an essential agricultural commodity for which India has a comparative advantage we do have rich historical data, viz. experience with tea exports.

The statistical evidence presented in the previous section, based on detailed time series data on tea exports of India, suggests the distinct possibility that for all those commodities for which domestic

consumption forms a major share of domestic production and for those agricultural commodities which are essential, such as tea and foodgrains, exports cannot increase in the short and medium term without an increase in production relative to consumption. But such increase in production will take a considerable time. Hence, one must have a cautious policy regarding agricultural exports taking due note of domestic consumption and production response to price changes. The results reported above regarding cointegration of tea prices in domestic and international markets also suggests that by allowing free exports of agricultural commodities we are likely to raise the domestic prices of foodgrains to equal their international prices, which are higher mainly due to devaluation of the domestic currency. Thus, liberalisation of agricultural trade is likely to give rise to a rise in domestic prices without a significant increase either in production or in exports.

While Hanumantha Rao and Gulati (1994) advocate export of foodgrains, our results for tea trade suggests that we should be quite cautious. Although our study refers to tea and not to foodgrains some features are quite common between them. Both are essential food items. Raj Krishna (1972), Rao (1986) and Binswanger (1989) had already warned us that production response for foodgrains in India is quite poor. Dependence on imports of essential agricultural commodities, particularly from major developed countries, will make the country vulnerable for political and economic exploitation. It is thus necessary to examine carefully a trade

FIGURE 4: PRICES: INTRA - COUNTRY COMPARISON



strategy for India which maintains food security and also generates export earnings. This suggests that trade liberalisation for agricultural commodities must be selective. One needs to examine in greater detail trade experience of developing countries with commercial agricultural crops along with trade in essential agricultural commodities. It is also necessary to examine in greater depth the relative strengths of agricultural and industrial product exports in generating sustainable export earnings. It is expected that the degree of competition is high in low-value added agricultural products whose production requires lower levels of technology and skills. The terms of trade are thus expected to be adverse to agriculture. Any attempt to redirect investment and trade away from industry to agriculture, as suggested by Hanumantha Rao and Gulati is likely to be an inefficient way to generate foreign exchange reserves to meet our import requirements. Only after having detailed

knowledge regarding relative advantages and disadvantages with respect to efficiency in export earnings and sustainable food security can one knowledgeably prescribe suitable trade policies for development. In view of this we feel that one should not take the suggestion of liberalisation of agricultural trade seriously without some more additional empirical insights.

#### Notes

[Based on a paper presented at the 31st Indian Econometric Conference held in May 1995 at Pune. Authors are thankful to V M Rao, Pulapre Balakrishnan, M V Nadkarni and S K Mallick for their comments. The usual caveat applies and the authors alone take responsibility for any errors that may still remain.]

1 The theory of the second best suggests, however, that if any country introduces tariffs and thus violates the first order conditions of the welfare optimum there is no sanctity to the free trade prescription for other countries. In the

international economic order that now prevails this result is worth noting.

- 2 Economic and Scientific Research Association, *Growth and Potential of Tea Industry of India*, 1983, India Exchange, Calcutta, pp 13-14.
- 3 Such a large increase in yield during a forty year period could be due to technological and/or managerial improvements.

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