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Trade Experience of Indian Agriculture: Behaviour of Net Export Supply Functions for Dominant Commodities

V. Ratna Reddy and K. Badri Narayanan

The trade experience of developing countries reveals that there has been a steady decline in their share in world agricultural exports. However, the reasons for such a decline cannot be attributed to the trade policies of the developed countries alone, but also to their own policies. The policies of over-valued exchange rates, low producer prices, export taxation, excessive industry protection and incentives for import substitution are mainly responsible for poor agricultural performance and retarded exports in most of the less developed countries (LDCs) (see MacBean, 1989). India, which is dominantly an agrarian economy, is no exception in this regard. In India, the capital intensive industrialisation has deprived the agricultural sector of sufficient share in resources and also caused inefficient allocation of scarce resources in the industrial sector. The unfavourable commodity composition and stronger trade partners have compounded the pessimistic view about export prospects and thereby strengthened the argument for a capital intensive strategy (see Mellor and Lele, 1975). As a consequence, this has caused the neglect of trade in agriculture.

The recent debt crisis and marked reduction in both bilateral and multilateral flows of concessional finance have demonstrated unequivocally that India cannot depend on external finance for its investments and import requirements. This has stressed the need for foreign trade as a leading sector of development (Asian Development Bank, 1988). It is argued, in this context, that trade has been a catalyst in some of the more successful development experiences and agricultural commodities have figured both as successful exports and as problem areas on the import side. Agricultural trade, therefore, can be an influential factor in shaping the pattern and extent of economic growth and development. Further, the pressure on the agricultural sector is increasingly felt consequent to the failure of the industrial sector to reduce our external debt burden. The discussion on the basic strategy, to circumvent our foreign exchange as well as external debt problems, revolves around the policies of import substitution and export promotion. These twin strategies play an important role in stabilising the trade scenario (see Panchamukhi, 1978).

It is on this back drop, an attempt is made in this paper to examine the export performance of Indian agriculture since 1960. Besides, an attempt is also made to estimate the net export supply functions for specific commodities. For this purpose, data pertaining to agricultural trade (exports and imports) are obtained from Food and Agriculture Organization (FAO) Trade Yearbooks. The analysis of the trends in agricultural trade is based on selected farm products, which account for more than 80 per cent of the total agricultural exports or imports. The data on production of specific commodities, that are used to analyse the factors influencing agricultural exports, are drawn from FAO yearbooks of production. Time-series data pertaining to the past 26 years have been used, i.e., 1960 to 1985, in order to examine

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the performance of agricultural trade in India. Broadly, the issues discussed in the paper include the profile of agricultural trade in India during the past two and half decades, the desirability of our exports in the light of domestic availability, on the one hand and relative prices, on the other, and the factors influencing our net exports, which is carried out with the help of net export supply functions.

I

INDIA'S AGRICULTURAL TRADE: A PROFILE

In this section, an attempt is made to analyse the performance of major commodities that are responsible for India's net agricultural exports (deficit or surplus). During the past 26 years there have been considerable changes in the exports and imports of agricultural commodities (see Table I). The share of agricultural exports as well as imports has come down considerably, though the fall is steeper in the case of imports. As a result, the net agricultural exports have changed from negative to positive over the period. It can be observed from Table I that while the share of agricultural exports has declined steadily over the period, the share of agricultural imports has recorded a sudden fall from 27.5 per cent in 1975 to 10 per cent in 1980. Positive net agricultural exports after 1980 are mainly due to the fall in imports (even in absolute terms) after 1975 rather than an increase in exports. This indicates that our agricultural strategy is positively improving the balance of payment position through import substitution.

<table>
<thead>
<tr>
<th>Table I: Trade Performance of Indian Agriculture, 1960-85 (US $ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total agricultural exports</td>
</tr>
<tr>
<td>(2)</td>
</tr>
<tr>
<td>2. Total agricultural imports</td>
</tr>
<tr>
<td>(29)</td>
</tr>
<tr>
<td>3. Net agricultural exports</td>
</tr>
<tr>
<td>(2) (-2)</td>
</tr>
<tr>
<td>4. Country's balance of trade as a whole</td>
</tr>
</tbody>
</table>

Source: Calculated from FAO Trade Yearbooks for different years. Figures in parentheses are percentages to the respective total.

This proposition becomes clear if we look into the details of various commodities that are responsible for the changes in agricultural trade over the period. The break-up of exports and imports of various commodities indicates that the positive net agricultural exports after 1975 can mainly be attributed to the decline in the imports of cereals and cereal preparations (see Tables II and III). This decline in cereal imports may be adduced to the advent of new agricultural technology since more than 90 per cent of cereal trade is due to rice and wheat where the new technology has made a clear dent. Further, during this period their share in exports has increased significantly. This rise in exports is more prominent in the case of rice than wheat, whereas the reverse is true in the case of imports due to the prominence of wheat in the domestic consumption. Among other commodities, none has showed any considerable change in their trade performance during the period, except in 1975 which experienced exceptional shifts in the export shares of sugar, tea, etc.
### TABLE II. CONTRIBUTION OF VARIOUS COMMODITIES TO AGRICULTURAL EXPORTS (per cent)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Wheat and wheat flour</td>
<td>-</td>
<td>0.03</td>
<td>0.38</td>
<td>0.08</td>
<td>0.61</td>
<td>0.38</td>
<td></td>
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<tr>
<td>2. Rice</td>
<td>-</td>
<td>0.08</td>
<td>0.85</td>
<td>0.71</td>
<td>6.61</td>
<td>2.55</td>
<td></td>
</tr>
<tr>
<td>3. Cereals and cereal preparations</td>
<td>0.03</td>
<td>0.20</td>
<td>1.37</td>
<td>1.04</td>
<td>9.03</td>
<td>5.43</td>
<td></td>
</tr>
<tr>
<td>4. Miscellaneous food preparations</td>
<td>-</td>
<td>0.06</td>
<td>0.59</td>
<td>0.43</td>
<td>0.44</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>5. Fruits and vegetables</td>
<td>8.84</td>
<td>10.80</td>
<td>15.11</td>
<td>9.54</td>
<td>8.75</td>
<td>10.94</td>
<td></td>
</tr>
<tr>
<td>6. Sugar and honey</td>
<td>0.60</td>
<td>3.19</td>
<td>3.89</td>
<td>3.44</td>
<td>4.23</td>
<td>1.69</td>
<td></td>
</tr>
<tr>
<td>7. Coffee, tea, cocoa and spices</td>
<td>51.62</td>
<td>45.46</td>
<td>42.23</td>
<td>26.05</td>
<td>41.15</td>
<td>46.87</td>
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</tr>
<tr>
<td>8. Raw cotton</td>
<td>2.91</td>
<td>3.23</td>
<td>0.86</td>
<td>1.32</td>
<td>5.31</td>
<td>3.49</td>
<td></td>
</tr>
<tr>
<td>9. Jute</td>
<td>0.10</td>
<td>0.94</td>
<td>1.17</td>
<td>0.86</td>
<td>0.37</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>10. Tobacco</td>
<td>5.23</td>
<td>6.91</td>
<td>6.55</td>
<td>7.38</td>
<td>6.64</td>
<td>5.94</td>
<td></td>
</tr>
<tr>
<td>11. Feeding stuff</td>
<td>5.91</td>
<td>11.81</td>
<td>11.47</td>
<td>6.61</td>
<td>7.56</td>
<td>7.05</td>
<td></td>
</tr>
<tr>
<td>12. Oilseeds and oils</td>
<td>-</td>
<td>1.57</td>
<td>2.46</td>
<td>5.69</td>
<td>4.20</td>
<td>5.97</td>
<td></td>
</tr>
<tr>
<td>13. Others</td>
<td>24.76</td>
<td>15.83</td>
<td>14.30</td>
<td>7.74</td>
<td>12.32</td>
<td>11.96</td>
<td></td>
</tr>
<tr>
<td>Total agricultural exports</td>
<td>587.40</td>
<td>696.20</td>
<td>662.00</td>
<td>1,688.90</td>
<td>2,448.90</td>
<td>2,348.50</td>
<td></td>
</tr>
<tr>
<td>($ million)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
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</tr>
</tbody>
</table>

*Source: Calculated from FAO Trade Yearbooks for different years.*

### TABLE III. CONTRIBUTION OF VARIOUS COMMODITIES TO AGRICULTURAL IMPORTS (per cent)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wheat and wheat flour</td>
<td>53.69</td>
<td>53.22</td>
<td>40.60</td>
<td>79.70</td>
<td>6.45</td>
<td>-</td>
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<tr>
<td>2. Rice</td>
<td>10.58</td>
<td>10.41</td>
<td>12.23</td>
<td>4.47</td>
<td>0.39</td>
<td>0.23</td>
<td></td>
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<tr>
<td>3. Cereals and cereal preparations</td>
<td>42.59*</td>
<td>65.96</td>
<td>54.79</td>
<td>86.49</td>
<td>9.80</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td>4. Miscellaneous food preparations</td>
<td>-</td>
<td>0.04</td>
<td>0.07</td>
<td>0.02</td>
<td>0.36</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>5. Fruits and vegetables</td>
<td>6.36</td>
<td>6.05</td>
<td>10.10</td>
<td>4.66</td>
<td>4.24</td>
<td>12.44</td>
<td></td>
</tr>
<tr>
<td>6. Sugar and honey</td>
<td>0.03</td>
<td>0.05</td>
<td>0.09</td>
<td>0.04</td>
<td>7.39</td>
<td>18.55</td>
<td></td>
</tr>
<tr>
<td>7. Coffee, tea, cocoa and spices</td>
<td>0.80</td>
<td>0.10</td>
<td>0.20</td>
<td>0.14</td>
<td>1.48</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>8. Raw cotton</td>
<td>24.68</td>
<td>12.03</td>
<td>19.33</td>
<td>2.17</td>
<td>-</td>
<td>0.01</td>
<td></td>
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<tr>
<td>9. Jute</td>
<td>2.67</td>
<td>3.01</td>
<td>0.03</td>
<td>0.15</td>
<td>-</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>10. Tobacco</td>
<td>-</td>
<td>0.04</td>
<td>0.004</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>11. Feeding stuff</td>
<td>-</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
<td>0.09</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>12. Oilseeds and oils</td>
<td>22.87</td>
<td>8.61</td>
<td>10.20</td>
<td>4.64</td>
<td>18.52</td>
<td>14.57</td>
<td></td>
</tr>
<tr>
<td>Total agricultural imports</td>
<td>621.50</td>
<td>903.90</td>
<td>658.10</td>
<td>1,762.30</td>
<td>1,455.20</td>
<td>1,493.60</td>
<td></td>
</tr>
<tr>
<td>($ million)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td></td>
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</tbody>
</table>

*Source: Calculated from FAO Trade Yearbooks for different years.*

*This figure does not tally with the figures of 1 and 2 due to definitional problems in this particular year.*

As far as imports are concerned, oilseeds and oil have caused a heavy outflow of foreign exchange. This commodity group alone has accounted for more than 50 per cent of our agricultural imports during the eighties. Moreover, its share has increased considerably over the period, i.e., from 4.03 per cent in 1965 to 51.58 per cent in 1985. In the case of sugar and honey (of which sugar is the major contributor), there has been some variation in both exports and imports during 1980 and 1985. The net exports of this commodity group show a declining trend after 1975 and became negative after 1980. And the country seems to have become self-sufficient in the case of raw cotton as its imports recorded a steady decline (from 24.7 per cent in 1960 to 0.01 per cent in 1985) over the period of 26 years. This coupled
with a marginal rise in exports has led to net exports of raw cotton in recent years.

On the whole, the balance sheet reveals a trade surplus in agricultural trade in recent years. This is achieved mainly through the policy of import substitution rather than through an export oriented policy. Though the policy of import substitution may not be the best one for solving the balance of payments problem, self-sufficiency in food is a much cherished goal of economic policy in many LDCs and this is significant in the context of external pressures that come along with food assistance. On the other hand, over-emphasis on food self-sufficiency may result in inefficient resource allocation at the national level. Besides, in the absence of trade in food, food insecurity would increase and a harvest failure in one region could be disastrous. Moreover, food security comes cheaper in an open world economy (see MacBean, 1989).

II

EXPORTS VIS-A-VIS DOMESTIC CONSUMPTION

Even if we consider the policy of import substitution as a viable proposition, we have not been able to achieve self-sufficiency in regard to essential commodities like oilseeds. Recent policies directed towards improving the production of these commodities are steps in the right direction. However, our objective should not be limited to attaining self-sufficiency but also be directed towards export promotion. In this context, one should remember that policies of export promotion should not be at the cost of domestic consumption. It would be interesting to look into this aspect at the present level of our exports and imports of agricultural commodities. For this purpose, we have considered two indicators: (i) per capita availability of a particular commodity and (ii) relative prices of exports, i.e., export price to domestic price. The net exports of a particular commodity are expected to be at the cost of domestic consumption if the per capita availability is declining over the period and if the price ratio of export-domestic prices is less than one.

The data on per capita availability and the ratios of export/import prices are presented in Table IV. These figures indicate that there is an increase in per capita availability of all the selected commodities over the period. This rise is more prominent in the case of rice and wheat, which can be attributed to the new agricultural technology. As far as price ratios are concerned, we seem to have the most favourable situation in the case of tobacco followed by cotton, tea and rice. Of these commodities, tobacco and tea are our traditional exports. But concentrated efforts are required for these commodities, especially tobacco, cotton and tea, because their export performance does not seem to be stable in recent years (Table II). The ratios seem to be fluctuating in the case of jute which is in accordance with its export performance. On the other hand, wheat and sugar have revealed unfavourable price ratios. Of these two, the case of sugar is more relevant as the present level of wheat exports are marginal and the price ratios are also not bad when compared to sugar. The price ratios of sugar are less than 0.5 in all the years except 1975 and the per capita availability of sugar is stagnated at 8 kg. per year from 1970 onwards. Despite these unfavourable conditions, we have been exporting sugar throughout the period of 26 years except for a few years. In fact, sugar exports have increased from 19 thousand metric tonnes (1.6 million dollars) in 1960 to 783 thousand metric tonnes (220 million dollars) in 1985. Exports with unfavourable price ratios would have adverse effects on domestic consumption as well as production of agricultural and agro-based commodities. It is neither economical nor socially desirable to
sell these goods at a lower price in the international markets while the domestic consumers pay a higher price in the domestic market. If it is only to earn foreign exchange, one has to look for other commodities where we have favourable price ratios. Therefore, one desires that exports of agricultural and agro-based commodities linked with adverse effects on the domestic economy, should be discouraged. This, in turn, would result in increasing the domestic per capita availability and probably reduce the consumer prices.

TABLE IV. PER CAPITA AVAILABILITY AND EXPORT-DOMESTIC PRICE RATIOS OF VARIOUS COMMODITIES

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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>1. Rice</td>
<td>109.0</td>
<td>120.1</td>
<td>116.0</td>
<td>118.0</td>
<td>122.0</td>
<td>3.3</td>
</tr>
<tr>
<td>2. Wheat</td>
<td>23.2</td>
<td>20.0</td>
<td>24.0</td>
<td>2.2</td>
<td>40.0</td>
<td>2.2</td>
</tr>
<tr>
<td>3. Sugar</td>
<td>5.0</td>
<td>6.0</td>
<td>0.3</td>
<td>0.4</td>
<td>8.0</td>
<td>0.9</td>
</tr>
<tr>
<td>4. Raw cotton</td>
<td>1.5</td>
<td>2.4</td>
<td>2.4</td>
<td>1.8</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td>5. Tea</td>
<td>0.7</td>
<td>1.4</td>
<td>1.1</td>
<td>0.8</td>
<td>2.0</td>
<td>0.8</td>
</tr>
<tr>
<td>6. Tobacco</td>
<td>0.6</td>
<td>1.7</td>
<td>1.3</td>
<td>1.3</td>
<td>0.6</td>
<td>1.8</td>
</tr>
<tr>
<td>7. Jute</td>
<td>1.9</td>
<td>0.8</td>
<td>2.3</td>
<td>1.1</td>
<td>2.0</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Note:- A = Per capita availability in kg per year.
       B = Ratio of export price/domestic price.

III

ESTIMATES OF NET EXPORT SUPPLY FUNCTIONS

The net export supply function indicates the relative influence of relevant price and non-price factors, which include supply side as well as demand side factors. Here, we have defined net exports of a commodity as its total exports minus imports and hence net exports of a commodity can be either negative or positive depending on the relative positions of exports/imports. This is preferred to the estimation of demand and supply functions separately due to the following reasons: (1) The impact of both the variables will be collapsed in a single variable, (2) the sign and dominance of the variable would be indicative of the importance of supply or demand and (3) the data irregularities do not allow the use of two variables of supply and demand separately.

The net export supply of a commodity is considered to be a function of internal and external prices, domestic production and availability, country’s balance of trade position and exchange rate. The functional form is thus:

\[ X_i^e = \gamma_0 + \gamma_1 \frac{PE_i}{PD_i} + \gamma_2 DP_i + \gamma_3 PCA_i + \gamma_4 GDP + \gamma_5 BT + \gamma_6 ER \]  

\[ ... (1) \]

where \( X_i^e \) = net exports (exports - imports) of the i-th commodity, which is defined in terms of quantity as well as value,

\( PE_i = \) export price of the i-th commodity,

\( PD_i = \) domestic price of the i-th commodity,

\( DP_i = \) total domestic production of the i-th commodity,

\( PCA_i = \) per capita availability of the i-th commodity,
GDP = India's gross domestic product at factor cost,
BT = overall balance of trade position of the country,
    i.e., net total exports of the economy as a whole,
ER = exchange rate in terms of rupees per dollar.
    i ranges from 1 to 7 including the following commodities: (1) rice, (2)
    wheat, (3) sugar, (4) tobacco, (5) cotton, (6) jute and (7) tea.

The net exports are taken both in quantity and value terms to nullify the impact of price
fluctuations. Besides, all the variables are measured in US dollars in order to circumvent
the effects of exchange rate fluctuations on valuation in domestic currency (see Panchamukhi, 1986).

The price ratio (export price to domestic price) included in equation (1) is expected to
capture the profitability of exporting the commodity. Following the theory of supply, the
price ratio is expected to have a positive influence on net exports. In the case of price variables
taken separately, the export price will have a direct positive impact on exports, while the
impact of domestic price on net exports of a commodity is somewhat indirect. The domestic
price is, usually, determined by the factors of supply and demand in the domestic market.
Therefore, this variable is expected to have an inverse relation with the net exports of a
commodity. However, the impact of relative price on export supply measured by $\gamma_i$ is
expected to have a positive sign.

Total domestic production ($DP_i$) is expected to have a positive sign as higher production
results in higher exportable surplus, ceteris paribus. The variable, per capita availability
($PCA_i$) is taken in order to account for the population pressure. In the long run, production
and per capita availability may not go together. Besides, it may be socially desirable if per
capita availability determines the net exports rather than total production. The impact of per
capita availability on net exports need not be uni-directional as it depends on the nature of
the commodity, present level of availability, etc. For instance, in the case of commodities
like tobacco, which are not socially desired much, higher exports can be made even at low
per capita availability, but in the case of essential commodities like food, this may not be
acceptable. Therefore, depending on the nature of the commodity, $\gamma_i$ may have either positive
or negative sign.

The balance of trade (BT) position of the country determines its foreign exchange position
and its importance is crucial in determining the overall growth of the economy. Hence, the
influence of this variable on the net exports of a particular commodity is likely to be negative,
particularly when confronted with unfavourable price ratios. This is so, because the pressure
on the exports of a commodity is expected to be less when there is a comfortable balance
of trade position (i.e., net exports $\geq 0$) and vice versa. On the other hand, the gross domestic
product, which reflects the robustness of the economy, is expected to have a direct relation-
ship with exports.

The exchange rate plays a crucial role in explaining the variations in net exports of a
commodity especially in a country where exchange rates are volatile. The exchange rate is
higher when the domestic currency's purchasing power is lower in relation to other or
standard currency and vice versa. Higher exchange rates (devaluation of domestic currency)
leads to an improvement in exports through improving the position of farmers, but worsens the position of consumers. Therefore, the exchange rate is expected to have a positive relationship with net exports of a commodity.

(i) Estimation Procedure

The estimates of net exports supply functions are carried out on time-series data for 26 years, i.e., from 1960 to 1985. As a first step in the procedure is the data generation process through making the data stationary with the help of detrending process. Through this process the trend is eliminated. On this data, the unrestricted autoregressive distributed lag formulation is used. The models with lagged dependent variables are called distributed lag models and those with lagged dependent as well as independent variables are formed as autoregressive distributed lag models. The unrestricted autoregressive distributed lag formulation is chosen as the relationship between variables is expected to be dynamic rather than static. And the recommended length of the lag in this formulation is two since we are using annual data. Following this method, the final formulation will be:

\[
X_{it} = \gamma_0 + \gamma_{i1} PR_{it} + \gamma_{i2} PR_{it-1} + \gamma_{i3} PR_{it-2} + \gamma_{i1} DP_{it} + \gamma_{i2} DP_{it-1}
+ \gamma_{i3} DP_{it-2} + \gamma_{i4} PCA_{it} + \gamma_{i5} PCA_{it-1} + \gamma_{i6} PCA_{it-2}
+ \gamma_{i1} GDP_{it} + \gamma_{i2} GDP_{it-1} + \gamma_{i3} GDP_{it-2} + \gamma_{i4} BT_{it} + \gamma_{i5} BT_{it-1}
+ \gamma_{i6} BT_{it-2} + \gamma_{i7} ER_{it} + \gamma_{i8} ER_{it-1} + \gamma_{i9} ER_{it-2}
+ \gamma_{i1} X_{it-1} + \gamma_{i2} X_{it-2} + \gamma_{i3} X_{it-3} \]

(2)

where \( PR_i = (PE/PD) \) = price ratio.

The number of permutations and combinations of specifications are estimated using the selected independent variables, following the method of OLS, in order to avoid multicollinearity problem and to find the appropriate model for the analysis. The appropriateness of the model is tested with the help of Box-Pierce-Ljung Portmanteau test statistic. The most popular and over-riding test of model adequacy is a diagnostic Chi-square test. This is an aggregate test for testing the statistical significance of a number of autocorrelations of the residual series of different orders simultaneously. The original test suggested by Box and Pierce has subsequently been improved by other researchers, notably Ljung and Box and hence the test is named as Box-Pierce-Ljung Portmanteau (B-P-LP) test statistic. Though a number of specifications are estimated, only the selected equations which are tested appropriate and are consistent in signs, are retained for the purpose of analysis. However, some of the specifications are presented in the Appendix Table.

(ii) Results and Discussion

It may be noted at the outset that in some of the specifications, domestic prices (\( DP_i \)) and export prices (\( EP_i \)) are used separately also instead of their ratio, in order to capture the demand pressures in internal and external markets for all the commodities. The selected regression estimates are presented in Table V.
TABLE V: REGRESSION ESTIMATES

**Rice (value terms)**

\[
X_{t} = 3635.84 - 0.085DP_{t} + 28.73PCA_{t} - 0.004GDP_{t+2} - 0.052BT_{t}^{*} \\
(3.67) (1.52) (0.89) (3.10) (5.91)
\]

\[\overline{R^2} = 0.71, \ B-P-LP \ statistic = 11.16, \ \chi_{ab}^2 = 16.81, \ N = 22\]

**Wheat (quantity terms)**

\[
X_{t}^{*} = -14342 + 332.48PCA_{t} + 0.005BT_{t+2} + 0.429X_{w_{t-1}}^{*} \\
(3.04) (3.04) (1.72) (3.71)
\]

\[\overline{R^2} = 0.65, \ B-P-LP \ statistic = 12.62, \ \chi_{ab}^2 = 18.48, \ N = 17\]

**Sugar (value terms)**

\[
X_{t} = -468.60 + 5633.0PR_{t} - 0.430DP_{t+2} + 0.453X_{s_{t-1}}^{*} \\
(0.40) (4.34) (2.57) (3.42)
\]

\[\overline{R^2} = 0.73, \ B-P-LP \ statistic = 12.61, \ \chi_{ab}^2 = 18.48, \ N = 23\]

**Tobacco (value terms)**

\[
X_{t}^{*} = 499.46 + 139.29PR_{t} - 3.175PD_{t} - 0.003GDP_{t} - 0.017BT_{t}^{*} + 11326.66ER_{t}^{*} + 1.015X_{t}^{*} \\
(1.13) (0.79) (0.99) (3.56) (3.33) (3.26) (3.27)
\]

\[\overline{R^2} = 0.63, \ B-P-LP \ statistic = 12.63, \ \chi_{ab}^2 = 13.28, \ N = 23\]

**Cotton (value terms)**

\[
X_{t}^{*} = -5268.24 + 9.279PE_{t+2} + 3.252DP_{t+1} - 0.017BT_{t}^{*} \\
(4.75) (1.88) (3.63) (2.53)
\]

\[\overline{R^2} = 0.71, \ B-P-LP \ statistic = 15.62, \ \chi_{ab}^2 = 18.48, \ N = 23\]

**Jute (quantity terms)**

\[
X_{t} = -47.07 + 3.338PD_{t+1} - 327.01ER_{t+1} \\
(0.64) (1.49) (0.81)
\]

\[\overline{R^2} = 0.12, \ B-P-LP \ statistic = 13.03, \ \chi_{ab}^2 = 20.09, \ N = 23\]

**Tea (value terms)**

\[
X_{t}^{*} = -2156.73 + 17.21PE_{t} + 0.394DP_{t} + 0.001GDP_{t} \\
(0.90) (4.17) (0.67) (1.24)
\]

\[\overline{R^2} = 0.85, \ B-P-LP \ statistic = 23.93, \ \chi_{ab}^2 = 24.32, \ N = 23\]

---

Figures in parentheses are ‘t’ values. * and ** indicate levels of significance at 1 and 5 per cent respectively. \( \chi_{ab}^2 \) = table values of \( \chi^2 \) for testing B-P-LP statistic. The statistic is not significant for all the specifications, indicating that all the selected models are appropriate.
The regression estimates indicate that the selected specifications for all the commodities, except for jute, are robust and explain more than 60 per cent of the variations in the net commodity exports even after taking out the trend in the series. The low explanatory power of the model in the case of jute may, however, be attributed to the fluctuating scenario observed in its net exports. The presence of autoregressive process in the case of three commodities and the significance of lagged variables suggest that the relationships between independent and dependent variables are dynamic rather than static. However, it may be observed from the estimates that none of the selected variables is consistent in explaining the variations in net exports for all the commodities.

Price variables appear to be important in the case of commercial crops, i.e., sugar, tobacco, cotton and tea. In all the cases, price variables carry correct signs and are also significant in the case of sugar, cotton and tea. Relative price ratio turned out significant and positive for sugar while the export price seems to play an important role in the case of cotton and tea. This indicates that international prices seem to have a favourable impact on commercial crop exports while they do not play much role in the case of food crops like rice and wheat.

In the case of food commodities, domestic production and availability are expected to be important. The estimates indicate that per capita availability of rice and wheat has positive association with their net exports. This indicates that the higher the per capita availability of these commodities in the domestic market, the higher will be their exports. This is a desirable indication as the exports of food related goods should not be at the cost of domestic consumption. On the other hand, the net exports of cotton seem to move along with domestic production. But the inverse relationship observed between net exports and domestic production in the case of sugar seems to re-emphasise our earlier argument that we have been exporting sugar despite adverse price ratios and stagnant per capita availability.

Gross domestic product (GDP) of a country (expected to have a positive association with the net exports) turned out to be negative and significant in the case of rice and tobacco, which is hard to explain. However, similar inverse relationship observed in the case of balance of trade (BT) position of the country in the case of these commodities may give some clues in this regard. The net exports of rice, tobacco and cotton appear to be moving in the opposite direction with balance of trade position of the country. In this context, it may be noted that these commodities are the top three in which we have favourable price ratios (see Table IV) and hence, these commodities are viewed as desirable foreign exchange earners. Therefore, the exports of these commodities are most needed under deteriorating balance of trade position, which, in turn, explains the inverse relationship.

The exchange rate variable does not seem to be important in explaining the variations in net exports as it turned out to be significant, with the expected positive sign, only in the case of tobacco. On the other hand, it can be observed that the previous year’s net commodity exports appear to influence this year’s exports of the commodity in the case of wheat, sugar and tobacco.

The overall results, thus, does not give any general pattern in the relationships between net exports and other explanatory variables for all the commodities. However, it may be inferred that internal factors like production, availability, GDP and balance of payments position play a more important role than the external factors like export prices and exchange rate, though prices do influence the net commodity exports in the case of commercial crops. Another interesting phenomenon that comes out of our analysis is that the commodities that
have favourable price ratios are used as shields against our volatile balance of payments position. This further strengthens our earlier argument that our trade policies are more in the lines of import substitution than export oriented which would be desirable in the long run.

IV

CONCLUSIONS

The present paper makes an attempt to examine the performance of India’s agricultural exports during the past two and half decades (1960-85) and estimates the net export supply function for seven specific commodities (rice, wheat, sugar, tobacco, cotton, jute and tea) which contribute more than 80 per cent to India’s agricultural trade. The autoregressive distributed lag formulations are followed while estimating the supply functions and the appropriateness of the models is tested with the help of Box-Pierce-Ljung Portmanteau test statistic.

The analysis brings out clearly that the share of agricultural exports has been declining over the period. This may be attributed to the stagnant output, low yield rates and non-competitiveness in the world markets. Besides, more importantly, we still depend on our traditional export crops like tea and tobacco rather than going in for new exportable commodities. This narrow view is mainly due to our trade policies which follow the import substitution path rather than the export oriented one. It may be pointed out, in this context, that even with import substitution policies, we are not able to achieve self-sufficiency in some of the important commodities like oilseeds.

In recent years there have been arguments in favour of and against import substitution as well as export promotion, though they weigh more in favour of the latter. The import substitution policies followed in the early post-war years are viewed as obsolete and detrimental to economic growth and development while the export promotion strategy has established its superiority. It is argued that the import substitution syndrome of policies not only resulted in the loss of neoclassical static allocative efficiency but also imposed dynamic losses on the entire economy which include directly unproductive profit seeking and rent seeking activities, mismanagement of foreign investments, gray area dynamic effects, etc. (Bhagwati, 1988; Meier, 1990). On the other hand, apart from the external pressures that come along with external dependence, export promotion policies are not considered to be appropriate under the conditions of labour market imperfections and in the absence of free resource movements. However, after reviewing the downside and upside effects in detail, Bhagwati concluded that the countries following export promotion strategies in the post-oil shock years are much better off than the countries with import substitution strategies. This is mainly attributed to their greater capacity to deal with external adversity by using export expansion more successfully to adopt to world slow-down and thus avoiding import contraction (Bhagwati, 1988).

On the contrary, the present analysis suggests that India is still following import substitution policies as far as agricultural trade is concerned. It is observed that internal factors like production, per capita availability, etc., play an important role in explaining the variations in net exports. On the other hand, external factors like prices and foreign exchange rate appear to be less important. This draws support even from the finding that we still export some of the commodities like sugar, whose price ratios are unfavourable to us. However, price ratios and export prices seem to influence commercial crop exports to some extent. Besides, it is observed that the commodities that have good demand in the international
markets are used as shock absorbers for the balance of payments position. This further strengthens our argument that import substitution policies dominate the agricultural trade scenario in India. Therefore, it may be suggested that more concentrated efforts should be made to produce and export more of the commodities like tobacco and cotton for which India enjoys comparative advantage. Further, the composition of exports should be shifted in favour of non-traditional high value products like processed foods.

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APPENDIX TABLE

### Rice

1. \( X^*_{Ri} = 1344.85 - 0.013 DP_{t}^{***} - 0.002 GDP^{*}_{t-1} - 0.014 BT^{*}_{t} \) (quantity terms),
   \[ (3.09) \quad (1.93) \quad (4.63) \quad (5.22) \]
   \[ \bar{R}^2 = 0.65 \quad \text{B-P-LP statistic} = 23.56 \quad \chi^2_{ab} = 18.48 \quad N = 22 \]

2. \( X^*_{Ri} = 3915.78 - 0.037 DP_{t}^{***} - 0.004 GDP^{*}_{t-2} - 0.054 BT^{*}_{t} \) (quantity terms),
   \[ (3.13) \quad (1.96) \quad (4.45) \quad (7.01) \]
   \[ \bar{R}^2 = 0.72 \quad \text{B-P-LP statistic} = 13.18 \quad \chi^2_{ab} = 18.48 \quad N = 22 \]

3. \( X^*_{Ri} = 3837.55 - 19.57 PCA_{t} - 0.005 GDP^{*}_{t-2} - 0.056 BT^{*}_{t} \) (value terms),
   \[ (2.85) \quad (1.73) \quad (4.84) \quad (7.02) \]
   \[ \bar{R}^2 = 0.71 \quad \text{B-P-LP statistic} = 14.68 \quad \chi^2_{ab} = 18.48 \quad N = 22 \]

### Wheat

1. \( X^*_{Wi} = -17502 + 377.19 PCA_{t}^{**} - 0.068 BT_{t-2} \) (quantity terms),
   \[ (2.73) \quad (2.51) \quad (1.75) \]
   \[ \bar{R}^2 = 0.33 \quad \text{B-P-LP statistic} = 8.84 \quad \chi^2_{ab} = 20.09 \quad N = 17 \]

2. \( X^*_{Wi} = 6013.26 - 2019.61 PR_{t-1} - 19.75 PE_{t} + 0.135 BT_{t-1} \) (value terms),
   \[ (3.65) \quad (3.81) \quad (3.85) \quad (3.85) \]
   \[ \bar{R}^2 = 0.71 \quad \text{B-P-LP statistic} = 10.09 \quad \chi^2_{ab} = 18.48 \quad N = 17 \]

3. \( X^*_{Wi} = 2771.75 - 3244.88 PR_{t-1} + 0.097 BT_{t-1}^{***} \) (value terms),
   \[ (1.39) \quad (3.57) \quad (2.04) \]
   \[ \bar{R}^2 = 0.43 \quad \text{B-P-LP statistic} = 14.39 \quad \chi^2_{ab} = 20.09 \quad N = 17 \]

4. \( X^*_{Wi} = 4232.73 + 26.14 PE_{t} - 0.125 BT_{t-1}^{*} \) (value terms),
   \[ (2.28) \quad (4.65) \quad (2.93) \]
   \[ \bar{R}^2 = 0.57 \quad \text{B-P-LP statistic} = 9.02 \quad \chi^2_{ab} = 20.09 \quad N = 17 \]

(Contd.)
### APPENDIX TABLE (Contd.)

#### Sugar

1. \( \chi^2_{S_{i1}} = -324.49 + 27.18 \text{PE}_{i1}^* \) (quantity terms),
   \[
   R^2 = 0.27 \quad \text{B-P-LP statistic} = 14.62 \quad \chi^2_{tab} = 21.67 \quad N = 23
   \]

2. \( \chi^2_{S_{i1}} = -717.62** + 15.70 \text{PE}_{i1}^* + 1423.85 \text{PR}_{i}^{***} \) (quantity terms),
   \[
   R^2 = 0.35 \quad \text{B-P-LP statistic} = 7.77 \quad \chi^2_{tab} = 20.09 \quad N = 23
   \]

3. \( \chi^2_{S_{i1}} = -744.98*** + 2084.29 \text{PR}_{i}^* \) (quantity terms),
   \[
   R^2 = 0.31 \quad \text{B-P-LP statistic} = 7.31 \quad \chi^2_{tab} = 21.67 \quad N = 23
   \]

4. \( \chi^2_{S_{i1}} = -1001.66 - 0.36 \text{DP}_{i2} - 6951.36 \text{PR}_{i}^* \) (value terms),
   \[
   R^2 = 0.59 \quad \text{B-P-LP statistic} = 11.70 \quad \chi^2_{tab} = 20.09 \quad N = 23
   \]

#### Tobacco

1. \( \chi^2_{T_{Q_{1}}} = 33.82 - 0.20 \text{PE}_{i1}^{**} - 1444.75 \text{ER}_{i}^* \) (quantity terms)
   \[
   R^2 = 0.26 \quad \text{B-P-LP statistic} = 9.91 \quad \chi^2_{tab} = 20.09 \quad N = 23
   \]

2. \( \chi^2_{T_{Q_{1}}} = 32.66 - 0.21 \text{PE}_{i1} + 0.84 \text{PR}_{i} - 451.06 \text{ER}_{i}^{***} \) (quantity terms)
   \[
   R^2 = 0.23 \quad \text{B-P-LP statistic} = 9.98 \quad \chi^2_{tab} = 18.48 \quad N = 23
   \]

3. \( \chi^2_{T_{Q_{1}}} = 46.70*** - 10.98 \text{PR}_{i}^{***} + 341.94 \text{ER}_{i}^{***} \) (quantity terms)
   \[
   R^2 = 0.22 \quad \text{B-P-LP statistic} = 6.88 \quad \chi^2_{tab} = 20.09 \quad N = 23
   \]

4. \( \chi^2_{T_{Q_{1}}} = 702.97*** - 0.89 \text{PE}_{i1} + 702.98 \text{ER}_{i} - 0.003 \text{GDP}_{i} - 0.018 \text{BT}_{i} + 0.89 \chi^2_{T_{Q_{1}}} \) (value terms)
   \[
   R^2 = 0.64 \quad \text{B-P-LP statistic} = 14.00 \quad \chi^2_{tab} = 15.09 \quad N = 23
   \]

5. \( \chi^2_{T_{Q_{1}}} = 660.41 + 9314.82 \text{ER}_{i} - 19.41 \text{PR}_{i} - 0.003 \text{GDP}_{i} - 0.068 \text{BT}_{i} + 0.79 \chi^2_{T_{Q_{1}}} \) (value terms)
   \[
   R^2 = 0.63 \quad \text{B-P-LP statistic} = 13.30 \quad \chi^2_{tab} = 15.09 \quad N = 23
   \]

6. \( \chi^2_{T_{Q_{1}}} = 259.48 + 2.34 \text{PE}_{i1}^{***} + 8101.10 \text{ER}_{i}^{**} - 0.003 \text{GDP}_{i} - 0.010 \text{BT}_{i}^{***} \) (value terms)
   \[
   R^2 = 0.43 \quad \text{B-P-LP statistic} = 7.91 \quad \chi^2_{tab} = 16.81 \quad N = 23
   \]

7. \( \chi^2_{T_{Q_{1}}} = 126.88 + 117.24 \text{PR}_{i} + 9595.32 \text{ER}_{i} - 0.001 \text{GDP}_{i} - 0.009 \text{BT}_{i} \) (value terms)
   \[
   R^2 = 0.37 \quad \text{B-P-LP statistic} = 10.98 \quad \chi^2_{tab} = 16.81 \quad N = 23
   \]

(Contd.)
APPENDIX TABLE (Concl.)

**Cotton**

1. \[ X_t^* = -528.03^* + 0.49 DP_{t-2} + 1093.04ER_{t-1}^{**} - 111.41PCA_{t-2} \ (\text{quantity terms}) \]
   \[ \bar{R}^2 = 0.40 \quad \text{B-P-LP statistic} = 3.19 \quad \chi^2_{lab} = 18.48 \quad N = 23 \]

2. \[ X_t^* = -515.65^* + 157.93PCA_{t-2} + 1243.91ER_{t-1}^{**} \ (\text{quantity terms}) \]
   \[ \bar{R}^2 = 0.41 \quad \text{B-P-LP statistic} = 3.84 \quad \chi^2_{lab} = 20.09 \quad N = 23 \]

3. \[ X_t^* = -527.55^* + 0.29 DP_{t-2} + 1150.04ER_{t-1}^{**} \ (\text{value terms}) \]
   \[ \bar{R}^2 = 0.42 \quad \text{B-P-LP statistic} = 3.29 \quad \chi^2_{lab} = 20.09 \quad N = 23 \]

4. \[ X_t^* = -5306.06^* + 8.73DP_{t-1} - 3101.07PCA_{t-1} - 0.014BT_{t}^{***} + 8.48PE_{t-2} \ (\text{value terms}) \]
   \[ \bar{R}^2 = 0.71 \quad \text{B-P-LP statistic} = 13.67 \quad \chi^2_{lab} = 16.81 \quad N = 23 \]

5. \[ X_t^* = -5032.29^* + 1736.01PCA_{t-1} + 9.59PE_{t-2} - 0.019BT_{t}^{**} \ (\text{value terms}) \]
   \[ \bar{R}^2 = 0.69 \quad \text{B-P-LP statistic} = 15.01 \quad \chi^2_{lab} = 18.48 \quad N = 23 \]

**Jute**

1. \[ X_t^* = 134.38 + 0.55PD_{t-1} - 1203.59ER_{t-1} \ (\text{value terms}) \]
   \[ \bar{R}^2 = 0.04 \quad \text{B-P-LP statistic} = 8.17 \quad \chi^2_{lab} = 20.09 \quad N = 23 \]

**Tea**

1. \[ X_t^{**} = -364.96 + 19.19PE_{t}^* - 0.001GDP_{t} \ (\text{value terms}) \]
   \[ \bar{R}^2 = 0.84 \quad \text{B-P-LP statistic} = 25.04 \quad \chi^2_{lab} = 20.09 \quad N = 23 \]

2. \[ X_t^{**} = -24.35 - 0.26PE_{t} - 0.04DP_{t} + 0.0001GDP_{t} \ (\text{quantity terms}) \]
   \[ \bar{R}^2 = 0.03 \quad \text{B-P-LP statistic} = 19.62^* \quad \chi^2_{lab} = 18.48 \quad N = 23 \]

*Note:* Figures in parentheses are 't' values.

*, ** and *** indicate levels of significance at 1, 5 and 10 per cent respectively.

\[ \chi^2_{Lab} = \text{table values of } \chi^2 \text{ for testing B-P-LP statistic.} \]

* 's' indicates that B-P-LP is significant, indicating that those specifications are not appropriate.
NOTES

1. See Foreword to Tolley and Zadrozny (1975).
2. However, the unfavourable price ratios are mainly due to the protection and price incentives to farmers accorded by the Common Agricultural Policy (CAP) of European Economic Community (EEC) countries. These policies give rise to surpluses. In order to dispose of these surpluses, farmers are given subsidies to exports. "In the EEC these usually take the form of export restitutions. The EEC farm budget measures the difference between the high domestic price and the much lower price for exports. Such policies for sugar, dairy products and wheat have dumped EEC surpluses on world markets and depressed and destabilised international prices." See MacBean (1989, pp. 109-110). An important question that arises is: Can a developing country like India afford to pursue such policies?
3. This may be attributed to domestic shortages and fall in the unit value realisations-reflecting a decline in sugar prices abroad (see Government of India, 1982, 1984 and 1985).
4. The authors benefited from the discussions with R.S. Deshpande on this aspect.
5. For an interesting discussion on this aspect, see Edwards (1987).
7. OLS estimates are preferred to Generalised Least Squares (GLS) or Maximum Likelihood (ML) estimates in the case of small samples.
8. For details see Nazem (1989). The computer programme for this test is provided by R.S. Vaidya.

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