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BACKWARD AND FORWARD LINKAGES OF THE PLANTATION SECTOR VIS-A-VIS THE OTHER SECTORS IN KERALA'S ECONOMY, 1973-74

I

NEED FOR STUDYING LINKAGES OF PLANTATION SECTOR OF KERALA

Kerala is in the southern most tip of India and lies between 8°18' and 12°48' north latitude and between 74°82' and 77°24' east longitude. Its equatorial moist climate makes it the most salubrious for the cultivation of plantation crops (which in the present study includes coconut, tea, coffee, rubber, cashewnut, banana, pepper and cardamom).

Approximately 38 per cent of the total cultivated area in Kerala in 1973-74 was under plantation crops. Sixty-three per cent of the export earnings of the State came from the sale of plantation sector's products, both raw and manufactured. In the same year plantations and industries based on plantations (the latter being coir and coir products, tea, coffee, cashew processing, the manufacturing of edible oil and rubber products) accounted for 42 per cent of the total value of output and 44 per cent of the total value added in the State. It provided employment to more than 5 lakh persons which works out to 13 per cent of the total number of people employed. If one looks only at the unregistered manufacturing sector, in 1973-74 the share of industries based on plantations worked out to 30 per cent of the output of the unregistered sector while they accounted for 25.9 per cent of the employment and 28.5 per cent of the total wage bill of the unregistered sector.

Further, Appendix Table 1 shows that in a period of three decades (from 1952-53 to 1984-85) the area under plantation crops as a percentage of the total cropped area in the State increased from 34 per cent to 50 per cent which is a good indicator of the growing importance of the plantation sector in Kerala.

As is known, linkage is an investment opportunity offered by one industry to another. Output of a sector is linked to the other sectors of the economy through its demand for inputs called its backward linkage. On the other hand, every sector's output demanded by other sectors is named its forward linkage (Hirschman, 1958; Thoburn, 1973).

A priori, it can be said that the linkage of the plantation sector to the rest of the economy is likely to be low. It demands inputs from very few sectors, *e.g.*, from itself, agriculture and animal husbandry, fertilisers, electricity and machinery so that its backward linkage would be low. Similarly, the traditional industries to which it supplies inputs, *i.e.*, coir, cashew oil, etc., are known to be passing through difficult times at present. They in turn also do not have important backward linkages. Although these industries have a high employment coefficient, they have a low wage coefficient. Coir and cashew are considered to be sweated industries. Moreover, in these industries, there is hardly any scope for skill formation or for learning by doing. Take, for instance, the production of coir or cashew. They hardly require efficient use of the faculties of a worker.

Hirschman, the propounder of the linkage hypothesis, recognises this when he says that "the grudge against what has become known as the 'enclave' type of development is due to this ability of primary products from mines, wells and plantations to slip out of a country without leaving much of a trace in the rest of the economy...." But, at the same time, Hirschman points out that the earnings from the export of the product of these activities can exert important developmental effects by "financing imports which can become very powerful agents of development" (Hirschman, 1958). Has this happened in the case of Kerala? If not, why? No complete answer can be given to this question. However, the linkages in the presence of import leakages should throw some light on these aspects.

At this point, it would suffice to mention that a major part of the export earnings in Kerala goes towards financing the import of food, in particular of rice and paddy, which accounts for 50 per cent of the import bill (taking only competitive imports). Hence, the comparative advantage to Kerala of specialising in the cultivation of plantation crops depends on the relative price of paddy and the plantation crops. On the one hand, Kerala is dependent on food from the rest of the world and, on the other hand, she is hardly able to make use of the earnings from her exports to increase the overall productivity in the economy and to achieve a higher rate of growth.

II

EMPIRICAL RESULTS

Method Used

This study uses Rasmussen's (1953) method of measuring the backward and forward linkages. The advantage in using his measure is that it takes into account the indirect requirements also, by making use of the inverse of the input coefficient matrix. The power of dispersion analogous to the backward linkage effect is defined by him as:

$$\frac{\frac{1}{n}Z_j}{\frac{1}{n^2}\sum_{j=1}^{n} Z_j}$$

where $Z_j = \sum_{i=1}^{n} Z_{ij}$

and n = number of industries.

Z_{ij} is an element in the ith row and jth column of the Leontief inverse matrix, *i.e.*, $(I - A)^{-1}$, where A is the matrix of input coefficients. U_j measures the relative extent to which an increase in final demand for the product of industry number j is dispersed throughout the system of industry. Analogous to the forward linkage effect is defined by the sensitivity of dispersion given by

$$U_i = \frac{\frac{1}{n}Z_i}{\frac{1}{n^2}\sum_{i=1}^{n} Z_i} \quad \text{where } Z_i = \sum_{j=1}^{n} Z_{ij}$$

which measures the extent to which the system of industry draws upon the industry number i. He supplements these average measures by a measure of variability characterised by

$$V_j = \sqrt{\frac{1}{n-1}\sum_{j=1}^{n}\left(Z_{ij} - \frac{1}{n}Z_j\right)^2} \Big/ \frac{1}{n}Z_j$$

$$V_i = \sqrt{\frac{1}{n-1}\sum_{j=1}^{n}\left(Z_{ij} - \frac{1}{n}Z_i\right)^2} \Big/ \frac{1}{n}Z_i$$

A sector with a high power of dispersion if accompanied by a low variability characteristic V_j is identified as the 'key sector'.[1]

Z matrix = $(I - A)^{-1}$ is called the output multiplier matrix. Similarly, employment, wage and income multiplier matrices can be derived by pre-multiplying the $(I - A)^{-1}$ matrix by a diagonal matrix of sectoral labour output ratio L, or a diagonal matrix of

sectoral wage coefficients (W), or a diagonal matrix of sectorwise value-added ratio V respectively.

The linkage measures given above are known to have certain limitations (see Krishna Bharadwaj, 1966; Diamond, 1934; Hazari, 1970; Panchamukhi, 1975; Raj, 1953). The major limitations of the Rasmussen indices are that *(a)* they examine the inter-industry transactions from the supply side with all final demand effects excluded from the analysis, *(b)* the indices are derived in terms of unweighted increases in intermediate output, *(c)* a high backward linkage might come about because of heavier reliance on purchased inputs, *(d)* demand taken into account is the induced demand, *(e)* input coefficients are estimated in value terms, therefore very sensitive to price changes so that linkage effects are affected by the particular scheme of aggregation adopted in an input-output table, more so when inverse of input-output is used for this, and *(f)* input coefficients are themselves not stable as introduction of new activities would change these.

Bearing in mind all these limitations, the backward and forward linkages of the plantation sector and of the other sectors in Kerala's economy are quantitatively estimated using Rasmussen's method. One may not attach great importance to the absolute value of these estimates of the linkages presented here but the rank of the sectors in terms of the multiplier effect found here may not be far removed from reality. A high linkage of a particular sector does not imply that Kerala should concentrate on these industries, because an altogether different product mix could be thought of, which may be more conducive for the economic development and welfare of the State. The linkage indices in this case are only used to highlight the nature of plantation as an economic activity.

Since an Input-Output table for Kerala was not readily available, we had to first construct one. Thus, a 24 x 24 Input-Output Table for Kerala at purchaser's prices was constructed for the year 1973-74. The method of aggregation of the various industries into the 24 sectors is very important and is given in Appendix Table 2.[2]

It would have been better to construct the Input-Output Table at producer's prices, as input coefficients arrived at this way would be more stable, but the nature of the available data proved to be a constraint in doing so (Mathur *et al.*, 1961).

Another major limitation of the present exercise is the method of incorporating the unregistered sector. For lack of direct data on the input-output coefficients of the unregistered sector, the technological coefficients of the registered manufacturing sectors were assumed to be the same for their counterparts in the unregistered sector although this is not strictly valid because the technology of unregistered sector is known to be very different from that of the registered sector. The method of arriving at the unregistered sector's output is briefly given below using the following notations:

P_T = total value of domestic production,

P_R = value of output of the registered sector,

P_{UR} = value of output of the unregistered sector,

M = value of imports (including foreign, coastal, rail-borne and through check-posts),

E = value of exports (including foreign, coastal, rail-borne and through check-posts),

C = consumption (private consumption + government consumption + investment),

I = intermediate demand,

$$P_T = P_R + P_{UR} \quad \ldots\ (1)$$

The unregistered sector's value of output would be

$$P_{UR} = P_T - P_R \quad \ldots\ (2)$$

$$\text{But } P_T + M - E = C + I \quad \ldots\ (3)$$

$$\therefore P_{UR} = C + I - M + E - P_R \quad \ldots\ (4)$$

For each sector the unregistered sector's output was calculated making use of equation (4).

To obtain the output, income, wage and employment multipliers for each sector, the $(I - A)^{-1}$ matrix was calculated. A second variant of it was calculated to take into account the import leakages. This was constructed as follows:

First a diagonal matrix M consisting of import coefficients was constructed (Kashyap, 1979), diagonal elements of matrix M being M_i/X_i where M_i are imports into the ith sector and X_i is the output level of the ith sector. This was used to calculate the matrix $R = (I + M - A)^{-1}$ which allows for the import leakages. Only competitive imports were included in this matrix, the non-competitive imports being given as a row vector outside the input-output matrix. The imports include foreign, coastal, rail-borne and imports coming in through the check-posts (showing goods coming into Kerala from the neighbouring States).

Employment, wage and income multipliers were calculated as follows (for both the variants, *i.e.*, with and without import leakages) and are similar to the output multiplier matrix Z explained earlier.

Without import leakages	*With import leakages*
$N_1 = L(I - A)^{-1}$	$N_2 = L(I + M - A)^{-1}$
$N'_1 = W(I - A)^{-1}$	$N'_2 = W(I + M - A)^{-1}$
$Y = V(I - A)^{-1}$	$Y' = V(I + M - A)^{-1}$

where L = diagonal matrix of sectoral labour output ratio (labour required per rupee one lakh of output)

W = diagonal matrix for sectoral wage coefficients (wages per rupee of output)

V = diagonal matrix of sectorwise value-added ratio (value-added per rupee of output)

N_1 and N_2 = employment multiplier matrix without and with import leakages respectively. A typical N_{ij} element indicates the increase in industry i's employment given an increase of one unit in j's final demand.

Matrices N'_1 [N'_2] and Y (Y') are respectively the wage multiplier and income multiplier matrices interpreted in a similar fashion. Given N_1 N_2, N'_1 N'_2, Y Y', the V_i, V_j and U_i, U_j for each of the matrix can be calculated.

Another type of multipliers could be calculated by closing the Leontief (1953, 1966)

model adding a column of consumption coefficients and a row of labour coefficients. These multipliers would give the total direct, indirect and induced changes. However, these are not calculated here.

DISCUSSION OF EMPIRICAL RESULTS

It may be noted from Table I that the different multipliers show different results (without introducing import leakages) as judged by the rank correlation of the various sectors for the four types of multipliers used, *e.g.*, sectors having high backward linkages as shown by the output multipliers do not correspond with the ones showing high employment, wage or income multiplier, nor do they show a high employment multiplier with a high income multiplier, or a high wage multiplier with a high income multiplier (except that in the case of employment and wage multipliers there is some correspondence). In the case of forward linkages the same is to be seen except for the relation between income and output and between income and employment so that forward linkages show greater correspondence between the four multiplier indices.

However, when import leakages are introduced, the results for all the four multipliers correspond with each other, *i.e.*, the picture presented here is less conflicting (Table II).

TABLE I. RANK CORRELATIONS OF LINKAGE INDICES-KERALA'S ECONOMY 24 x 24 MODEL (WITHOUT IMPORT LEAKAGES)

Linkages on matrix multipliers	Backward linkages based on				Forward linkages based on			
	Z	N_1	N_1'	Y	Z	N_1	N_1'	Y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Z	1.00				1.00			
N_1	0.32	1.00			0.44	1.00		
N_1'	0.43	0.71	1.00		0.42	0.72	1.00	
Y	0.34	0.33	0.49	1.00	0.73	0.76	0.49	1.00

TABLE II. RANK CORRELATIONS OF LINKAGE INDICES - KERALA'S ECONOMY 24 x 24 MODEL (WITH IMPORT LEAKAGES)

Linkages on matrix multipliers	Backward linkages based on				Forward linkages based on			
	Z'	N_2	N_2'	Y'	Z'	N_2	N_2'	Y'
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Z'	1.00				1.00			
N_2	0.61	1.00			0.79	1.00		
N_2'	0.64	0.90	1.00		0.55	0.81	1.00	
Y'	0.74	0.79	0.75	1.00	0.83	0.80	0.61	1.00

The sector specific linkages are given in Table III. From this table one finds that the plantation sector figures in high forward linkage industries only in terms of output and income multipliers but not in terms of wage or employment multipliers. It figures nowhere among the high backward linkage industries. That is, the plantation sector has a low backward linkage effect in terms of output, employment, wage and income multipliers. Is the same true of the industries based on the plantation sector, namely, tea, coffee, cashew processing, coir and coir products and the edible oil industry? One finds that in the case of these industries too the backward linkage effects are low.[3]

In developmental literature greater importance is given to the backward linkages than to the forward linkage (Rasmussen, 1953; Thoburn, 1973). It is possible that industries with high forward linkages and with high backward linkage can be set up through trade

linkages (*i.e.*, the industries inducing forward linkages becoming the exporting industries and those with high backward linkage doing so through import of inputs). However, as Thoburn (1973) points out, exporting is a more difficult and an uncertain activity.

TABLE III. LINKAGE ANALYSIS OF KERALA'S ECONOMY, 1973-74:24 x 24 INTER-INDUSTRY MODEL

Linkage effect	Output multiplier matrix (Z_1)	Wage income multiplier matrix (N_1')	Employment multiplier matrix (N_1)	Income multiplier matrix (Y)
(1)	(2)	(3)	(4)	(5)
Without import leakage				
High forward linkage effect	24(1),2(2),12(3), 15(4),17(5),1(16), 10(7)	1(1),24(2),15(3), 4(4),17(5),12(6), 20(7)	1(1),15(2),4(3), 17(4),24(5), 10(6),5(7),9(8)	24(1),2(2),1(3), 15(4),3(5),17(6), 23(7),10(8),4(9)
High backward linkage	12(1),13(2),10(3), 14(4),18(5),8(6), 17(7),6(8),11(9), 20(10),7(11)	1(1),4(2),12(3), 15(4),18(5),13(6), 17(7),7(8),20(9), 24(10),6(11),14(12)	1(1),4(2),7(3), 10(4),6(5),12(6), 15(7),17(8),5(9)	12(1),13(2),3(3), 24(4),15(5),4(6), 10(7),17(8),1(9), 6(10),23(11),5(12).
High backward and forward linkages	12,10	1,24,15,4,12,17,20	1,4,10,17,5	24,23,4,17,10,15,1,3.
With import leakages	(Z_2)	N_2'	N_2	Y'
High forward linkage effect	24(1),2(2)	24(1),1(2),4(3),	24(1),1(2),4(3), 5(4)	24(1),2(2)
High backward linkage	24(1),13(2),12(3) 15(4)	24(1),13(2),4(3) 1(4),15(5),12(6)	24(1),1(2),13(3), 4(4),5(5),16(6) 6(7)	24(1),13(2),15(3),
High backward forward linkages	24	24,1,4	24,1,5,4	24

Figures in parentheses indicate the ranks of the sectors in each group.

Further, even Rasmussen (1953) defines a key sector in terms of its backward linkage. Hence, in terms of Rasmussen's definition, in Kerala's economy neither the plantation sector, nor the industries based on it can be characterised as key sectors. Therefore, the rapid growth of the plantation sector may not be able to provide a growth stimulus to the economy.

Comparing the backward and forward linkages of the agriculture and animal husbandry sector with that of the plantation sector, one finds that the former shows high backward and forward linkages on account of wage, employment and income multipliers and continues to do so even when import leakages are introduced (except in the case of income multiplier).

The other sectors which show a high backward and forward linkage without introducing import leakages are cotton textiles, chemicals, non-metallic products, metals, construction and electricity.[4]

However, when import leakages are introduced only, very few sectors exhibit both high backward and forward linkages. The new sector which shows a high backward linkage when import leakages are introduced is the fertiliser industry. Construction, agriculture and animal husbandry continue to figure as high linkage industries, while fishing and fish processing continue to show a high backward linkage in terms of the employment multiplier but not in other terms.

One must add that none of the sectors shows an even spread. Every sector for each type of multiplier and for backward and forward linkages shows a high value of V_i and V_j, *i.e.*, they are spread very unevenly so that the second criterion to be fulfilled by a Key

Industry in terms of Rasmussen indices is fulfilled by none of the sectors considered here.

Qualifications that need to be made about the results presented above are that:

(a) The method of incorporating the unregistered sector in this exercise is not very desirable (*i.e.*, borrowing the input coefficients of the registered sector), but in the present state of availability of data nothing better could be done. This is a major limitation in so far as one is not able to compare the linkages of the unregistered sector with that of the registered sector.

(b) The input-output table has been worked out at 1973-74 purchaser's prices, therefore the coefficients derived here are not likely to be stable over time.

(c) The check-post import to and exports of 1975-76 have been included with certain adjustments. If the exports relatively to the imports are over-estimated, the output of the registered sector would be over-estimated and vice versa.

Hence, without placing much importance on the cardinal magnitude of the linkages (however, the ranking of industries on the basis of the linkage estimates is likely to be in the right direction), one may say that the backward linkages of the plantation sector are rather low.

Therefore, the plantation sector cannot act as a 'key sector' to enable Kerala to take off into self-sustained economic growth. But as has been seen, the linkages of agriculture and animal husbandry with the rest of the economy are better than that of the plantation sector. Hence, the present trend in Kerala of converting the lands under paddy into cash crop cultivation needs to be viewed with alarm, particularly when the forward and backward linkages of agriculture and animal husbandry seen from the results of this exercise are found to be high. Further, for example, if rubber is processed here, the linkage of the rubber products industry is likely to be high. It is not high at present since it is not processed here on a large scale, so it does not get reflected in the present exercise.

If rubber is processed and exchanged for food (which is imported by Kerala), then it would promote a horizontal division of labour, that is, exchange of finished for finished goods rather than the exchange of an unfinished good for a finished good (as at present) leading to a vertical division of labour, the latter, as is known, puts the producer of raw materials at a disadvantage in the process of exchange (Hettne, 1978).

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This paper forms only one chapter of the thesis on "Impact of Plantations on Kerala's Economy". The social, historical and institutional factors connected with plantations which affect Kerala's economy have been dealt with at length in the other chapters, hence are not included here.

APPENDIX TABLE I

AREA UNDER PLANTATION CROPS KERALA; 1952-53 TO 1984-85

('000 hectares)

Year	Cardamom	Cashewnut	Coconut	Tea	Coffee	Rubber	Pepper	Banana and other plantations	Total area under plantation crops	Total cropped area	Area under plantation crops as a percentage of total crop area
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1952-53	25.54	35.41	430.40	44.98	12.61	62.58	78.80	31.02	721.34	2,089.11	34.63
1960-61	28.61	54.32	500.76	37.63	16.80	122.87	99.75	44.42	905.16	2,348.86	38.54
1970-71	47.49	102.71	719.14	37.59	31.56	179.26	117.54	48.76	1,284.05	2,932.54	43.79
1980-81	54.04	141.28	651.37	36.16	57.95	237.77	108.07	63.57	1,350.21	2,884.84	46.80
1981-82	54.52	139.96	666.62	35.63	57.95	237.77	108.24	64.04	1,364.73	2,905.26	46.97
1982-83	54.39	141.31	674.38	35.21	57.91	256.28	107.47	62.15	1,389.10	2,862.07	48.53
1983-84	54.42	142.34	682.28	35.02	62.37	271.20	106.14	64.77	1,418.54	2,861.70	49.57
1984-85	58.77	136.86	687.48	35.98	64.01	311.98	105.84	51.41	1,452.33	2,876.64	50.49

Sources: 1. Government of Kerala: Agricultural Statistics in Kerala, Bureau of Economics and Statistics, Trivandrum, 1975.

2. Government of Kerala: Statistics for Planning, Bureau of Economics and Statistics, Trivandrum, 1977, 1980, 1983 and 1986.

APPENDIX TABLE 2

SECTORISATION OF KERALA'S ECONOMY, 1973-74

Sectors	Industries sectorwise
1. Agriculture and animal husbandry	Paddy, pulses, tapioca, sugarcane, chillies, ginger, turmeric and livestock products excluding ghee, and meat and other processed food like sugar, etc.
2. Plantations	Tea, rubber, coffee, cashew, coconut, cardamom, pepper, banana, betelnut and tobacco (excluding processing of cashew, tea and coffee).
3. Forestry	
4. Construction	
5. Fishing and fish processing	
6. Food processing and agro-based industries	Slaughtering, preparation and preservation of meat (200), manufacture of dairy products (201), canning and preservation of fruits and vegetables (202), sugar manufacturing (206), manufacture of sugar confectionary (209-2), manufacture of food products (others 219), other food processing activities (219-9), distilling and rectifying of spirits (220), manufacture of malt liquors and malt (222), manufacture of beedi (226), manufacture of cigar and cheroot (227-2), tanning and curing of leather (290), manufacture of matches (317).
7. Flour mills and starch	Flour mills (204-1), rice mills (204-2, manufacture of starch (217).
8. Tea, coffee and cashew processing	Tea processing (212), coffee curing, roasting, grinding (213), coffee curing (213-1), cashewnut processing (214), cashewnut processing, packing, others (214).
9. Coir and coir products	Manufacture of coir and coir products (268), manufacture of coir ropes and twines (268-3).
10. Textiles	Cotton ginning, cleaning and bailing (230), spinning and weaving (cotton textiles) (231), printing, dyeing and bleaching of cotton (232), weaving and finishing of cotton (handlooms) (235), weaving and finishing of cotton powerlooms (236), knitting mills (260), embroidery and making of laces (262), manufacture of rain coats, hats, etc. (265), manufacture of umbrellas (265-1).
11. Edible oil	Manufacture of edible oils and fats (211).
12. Chemicals	Manufacture of inorganic chemicals (301-1). Manufacture of synthetic resin (316-2), manufacture of ammunition and fireworks (318), manufacture of sizing materials and textile chemical auxiliaries (319-3).
13. Fertilisers	Manufacture of fixed fertilisers (311-3), manufacture of pesticides formulations (311-5).
14. Drugs and pharmaceuticals	Manufacture of allopathic medicines (313-1), manufacture of ayurvedic medicines (313-2), manufacture of perfumes and toilet, others (314-8).

(Contd.)

APPENDIX TABLE 2 *(Contd.)*

Sectors	Industries sectorwise
15. Manufacture of nonmetallic mineral products except petroleum and coal	Manufacture of structural clay products (320), manufacture of fire bricks (320-1), manufacture of bricks and tiles (320-4), manufacture of earthenware and pottery (322), manufacture of Chinaware (323-1), manufacture of hume pipes and other cement and concrete products including slabs, etc. (329-2).
16. Paper and paper products products	Manufacture of paper boards and straw boards (280-5), manufacture of paper and paper boards (281), manufacture of containers and boxes of paper and paper board (281-3), manufacture of paper and paper board articles (283), printing and publishing of newspapers (284), printing and publishing of books and journals (285), book binding (288), printing and publishing and publishing of post cards (289).
17. Basic metal and metal products	Manufacture of iron and steel (330-1), manufacture of castings and forgings (331-1), manufacture of structurals (331-2), manufacture of iron and steel (331-9), manufacture of copper (333), manufacture of aluminium (335), manufacture of drums and tanks (340-3), manufacture of structural metal products (341), manufacture of metal furniture and fixtures (342), manufacture of bolts and nuts (343-2).
18. Manufacture of machinery	Manufacture of agricultural implements (343-5), manufacture of hand tools (other) (343-9), manufacture of metal utensils and cutlery (345), manufacture of cutlery (345-1), manufacture of metal products, others (349), manufacture of agricultural machinery and equipments (352), manufacture of diesel engine and others (352-9), manufacture of oil mill (353-2), manufacture of textile machinery (353-5), manufacture of industrial machinery and others (353-9), manufacture of pharmaceutical machinery (354-1), manufacture of mining machinery, others (354-9), manufacture of nonelectrical machinery (356), manufacture of mixtures and reactors (356-2), manufacture of machine tools (357), manufacture of jobbery and engineering (359-9).
19. Electrical equipment	Manufacture of electric motors (360-4), manufacture of parts and accessories (360-8), manufacture of insulated cables and wires (36), manufacture of electrical machinery and apparatus (369), electrical repair shop (972).
20. Transport equipment	Ship building (370-1), boat building (370-1), manufacture of ship parts and accessories (370-8), manufacture of motor vehicle parts (374), manufacture of motor cycles and scooter parts (375), manufacture of bicycles and cycle rickshaw (376), manufacture of bullock carts and push carts (378), repair of motor vehicles (973).
21. Rubber products	Tyre and tube industries (300), manufacture of rubber footwear (301-1), manufacture of rubber products (others) (302-9).

(Contd.)

APPENDIX TABLE 2 *(Contd.)*

Sectors	Industries sectorwise
22. Wooden products	Manufacture of veneers and plywoods (270), manufacture of other plywood products (270-9), manufacture of sawing and planning of wood (271), manufacture of wooden and cane boxes (272), manufacture of structural wooden goods (273), manufacture of wooden industrial goods such as bobbins, blocks, handles, etc. (274), manufacture of wooden furniture and fixtures (276).
23. Plastic	Manufacture of plastic products (303).
24. Electricity	Generation and transmission of electricity (40).

NOTES

1. A key sector is one which has an ability to call forth a relatively large increase in the output of other sectors. Thus, in the present study, an attempt is made to see whether the plantation sector could be considered to be a key sector in Kerala's economy.

2. The inter-industry transaction flow matrix is not shown in this paper for lack of space.

3. Tea, coffee and cashew processing show a high backward linkage in terms of output multiplier and coir and coir products show a high forward linkage in terms of the employment multiplier but when import leakages are introduced they figure nowhere.

4. The case of electricity is different as its forward linkages are likely to be exaggerated because it is the total fuel consumption which forms the raw elements of electricity in the exercise here.

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