STRUCTURAL CHANGE OF THE INDONESIAN ECONOMY 1971-1985: AN INPUT-OUTPUT DECOMPOSITION APPROACH[1]

Arief Daryanto
Department of Agricultural and Resource Economics, Faculty of Agriculture, Bogor Agricultural University, Bogor 16143, Indonesia.

Julian B. Morison
Australian Rural Management Services, P.O. Box 145, Kingswood, SA 5062, Australia.

ABSTRACT In this paper a decomposition method is used to examine structural change in the Indonesian economy. The decomposition method can ascribe the sources of the shifts in position of individual sectors to changes in final demand, technology and cross effects. Using two comparable input-output tables, 1971 and 1985, it is found that changes in final demand are more important than technological change in affecting structural change in the agricultural sector and the Indonesian economy as a whole. It should be noted, however, that the two main elements of change, final demand and technology, moved in the same direction in their impacts on structural change.

I. INTRODUCTION

The various hypotheses advanced to explain the process of structural change in economic development can be classified as (1) demand-oriented explanations, based on generalisation of Engel's Law, and (2) technology-oriented explanations, which include the substitution of processed for natural materials (Chenery and Syrquin 1986). Using input-output analysis, these hypotheses have been much examined in developed countries, but few studies have been done in less-developed countries. It is timely therefore to investigate the main determinants of changes in the structure of the Indonesian economy.

Input-output analysis was first applied to the analysis of structural change in the US economy by Leontief, *et al.* (1953). The main problem analysed in that study was the effect of changes in input-output coefficients between 1919 and 1939 on the structure of production and labour use, with external trade and domestic demands held constant. Since then, the input-output model has been used extensively to analyse structural change. A detailed discussion of the use of input-output methods on such studies can be found, for example, in Skolka (1989).

The objective of this study is to look at how changes in the key factors, final demand and technology, have affected structural change of the Indonesian economy, with emphasis on the agricultural sector.

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In the next part of this paper, structural decomposition analysis is explained. The results of a decomposition analysis for the Indonesian economy between 1971 and 1985 are then presented in Section 3.

2. METHODOLOGY

The starting point for analysing structural change and sources of growth is the balance equation of the input-output accounts:

$$[\mathbf{I} - \mathbf{A}]\ \mathbf{X} = \mathbf{Y} \qquad (1)$$

where **I** = a 29 x 29 identity matrix, **A** = a 29 x 29 matrix of technological coefficients, **X** = a 29 x 1 vector of industry outputs, **Y** = a 29 x 1 vector of final demands. The solution of this model is

$$\mathbf{X} = [\mathbf{I} - \mathbf{A}]^{-1}\ \mathbf{Y} \qquad (2)$$

Given exogenously specified final demand, equation (2) can be used to determine production requirements necessary to satisfy the demand.

The input-output model can be expressed in terms of value-added or net output, by assuming that the relationship between each value added and industry output in the same sector is constant with respect to scale. We can derive the value-added requirement (equation (3)), by pre-multiplying both sides of equation (2) with a diagonal matrix, **B**, which consists of the value added per unit of output ratios for each sector. The solution can be written as follows:

$$\mathbf{V} = \mathbf{B}\,[\mathbf{I} - \mathbf{A}]^{-1}\ \mathbf{Y} \qquad (3)$$

where **V** is a 29 x 1 vector of value added for each industry. Letting $\mathbf{B}[\mathbf{I} - \mathbf{A}]^{-1} = \mathbf{C}$,

$$\mathbf{V} = \mathbf{C}\ \mathbf{Y} \qquad (4)$$

Equation (3) suggest that industry value added can change either because of changes in **Y**, the vector of final demands, or due to changes in the elements of the matrix **C**, which consists of two components, the inverse matrix of technological coefficients and the matrix of value added per unit output ratios. Each element c_{ij} gives the direct and indirect requirement for the i-th value added when the j-th final demand changes by one monetary unit.

To assess the relative contributions of changing final demands and coefficients to changing value added or net output levels, Vaccara and Simon (1968) and Feldman, McClain and Palmer (1987) used the following decomposition method.

The differences in the structure of an economy between two years (here, 1971 and 1985) can be shown on production data by using value added or net output values which are disaggregated by sectors. The model solution to the change in value added for the economy, $\Delta\mathbf{V}$, between 1971 and 1985, can be represented as follows:

$$\Delta \mathbf{V} = \mathbf{V}_{85} - \mathbf{V}_{71} \tag{5}$$

and by substitution

$$\Delta \mathbf{V} = \mathbf{C}_{85}\,\mathbf{Y}_{85} - \mathbf{C}_{71}\,\mathbf{Y}_{71} \tag{6}$$

This difference can be expressed as

$$\Delta \mathbf{V} = \mathbf{C}_{85}\,\mathbf{Y}_{85} - \mathbf{C}_{85}\,\mathbf{Y}_{71} + \mathbf{C}_{85}\,\mathbf{Y}_{71} - \mathbf{C}_{71}\,\mathbf{Y}_{71} \tag{7}$$

or

$$\Delta \mathbf{V} = \mathbf{C}_{85}\,(\mathbf{Y}_{85} - \mathbf{Y}_{71}) + (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71} \tag{8}$$

Each element of the first term on the right hand side of equation (8) indicates the portion of the change in each industry's net output from 1971 to 1985 attributable to changing final demands, weighted by 1985 technological coefficients. Each element of the second term on the right hand side of equation (8) indicates the portion of net output change attributable to changing input-output coefficients, weighted by the 1971 levels of final demand.

Alternatively, the differences expressed by equation (6) can be written as:

$$\Delta \mathbf{V} = \mathbf{C}_{85}\,\mathbf{Y}_{85} - \mathbf{C}_{71}\,\mathbf{Y}_{85} + \mathbf{C}_{71}\,\mathbf{Y}_{85} - \mathbf{C}_{71}\,\mathbf{Y}_{71} \tag{9}$$

or

$$\Delta \mathbf{V} = \mathbf{C}_{71}\,(\mathbf{Y}_{85} - \mathbf{Y}_{71}) + (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{85} \tag{10}$$

Each element of the first term on the right hand side of equation (10) indicates the portion of the change in each industry's net output from 1971 to 1985 attributable to changing final demands, weighted by the 1971 coefficients of the technology. Each element of the second term on the right hand side of equation (10) indicates the portion of net output change attributable to changing input-output coefficients, weighted by the 1985 levels of final demand.

The elements of the vectors representing contributions of final demand change to changing net output and of input-output coefficients to changing output are not identical. Therefore, Vaccara and Simon (1968) took the simple arithmetic average as their indicator. Average change in final demand is expressed as:

$$[\,\mathbf{C}_{85}\,(\mathbf{Y}_{85} - \mathbf{Y}_{71}) + \mathbf{C}_{71}\,(\mathbf{Y}_{85} - \mathbf{Y}_{71})\,]\,/2 \tag{11}$$

while average change in technical coefficients is expressed as:

$$[\,(\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71} + (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{85}\,]\,/2 \tag{12}$$

In Vaccara and Simon's approach, the decomposition depends on whether they take the matrix from an earlier year or the matrix from a later year. In their approach, they then used the average indices of net output change for each industry between years *i* and *j* due to changes in final demand, and to changes in input-output coefficients. Fromm (1968), however, criticises this averaging procedure. According to him, Vacarra and

Simon's average values for each industry provide rough approximation to contributions of changes in final demand and technological coefficients.

Fromm (1968) made an analogy between the estimates used in Vaccara and Simon's method and the Paasche and Laspeyres measures. The differences in net industry output attributable to changes in final demand, $\mathbf{C}_{71}(\mathbf{Y}_{85} - \mathbf{Y}_{71})$, and to changes in coefficients, $(\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71}$, are essentially Paasche measures. These are due to the use of technological coefficients and levels of final demand from an earlier year as the weights. The Laspeyres measures of the differences in net industry output attributable to changes in final demand and to changes in coefficients are $\mathbf{C}_{85}(\mathbf{Y}_{85} - \mathbf{Y}_{71})$ and $(\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{85}$, respectively. In this case, the technological coefficients and levels of final demand from the later year (1985) were used. It is then clear that the differences in the results from the two equations (8) and (10) resulted from the different base year used in calculating the changes.

According to Robertson (1989), it would seem more appropriate to use either the Paasche or Laspeyres measure. A procedure which uses either the Paasche or Laspeyres for both causes of change, final demand and coefficient change, would show an interaction effect. This is due to the sum of each component which will not equal the actual change in net output. The remainder is due to a cross-effect arising from the interaction of the two component effects. By taking the Paasche measure, Robertson (1989) derived the cross effect (CE) by subtracting the estimates of $\mathbf{C}_{71}(\mathbf{Y}_{85} - \mathbf{Y}_{71})$ and $(\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71}$ from the expression of total change in net output [Equation (6)]. The result is

$$\begin{aligned}
\mathbf{CE} &= (\mathbf{C}_{85}\,\mathbf{Y}_{85} - \mathbf{C}_{71}\,\mathbf{Y}_{71}) - [\mathbf{C}_{71}(\mathbf{Y}_{85} - \mathbf{Y}_{71}) + (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71}] \\
&= (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{85} - (\mathbf{C}_{85} - \mathbf{C}_{71})\,\mathbf{Y}_{71} \\
&= \mathbf{C}_{85}(\mathbf{Y}_{85} - \mathbf{Y}_{71}) - \mathbf{C}_{71}(\mathbf{Y}_{85} - \mathbf{Y}_{71}) \\
&= (\mathbf{C}_{85} - \mathbf{C}_{71})(\mathbf{Y}_{85} - \mathbf{Y}_{71}) \qquad (13)
\end{aligned}$$

From equation (13) it can be seen that the cross-effect will tend to be negative when elements of the final demand vector move in the opposite direction to the elements of the technological coefficient. The cross-effect will be positive, if all these elements are declining in each industry. The size of the cross effect is a function of the magnitude of the effect attributed the identified variables. If both final demand and the input-output coefficients are found to have a large impact on the net output change, it would not be surprising if the cross effect of these two factors is also large.

In models of structural decomposition, treatment of the cross effect varies and there is no consistent set of procedures available to deal with it. For example, Feldman, *et al.* (1987) allocated the cross effect equally among the other sources of change, Wolff (1985) ignored the cross effect, and Uno (1989) treated it separately and reported its magnitude. In this study, the cross effect that affects the change in net output is kept as a separate variable and its value is reported. The cross effect is not similar to a residual in regression analysis which represents unexplained variance. Although the cross effect can be explained and accurately calculated for each identified variable, it is interpreted in equation (13) as a simultaneous change of two variables. Thus the cross effect reflects the overall effect which cannot unambiguously be assigned either to changing final demand or to changing technology.

The following equation expresses the decomposition of the change in net industry output for the period 1971-1985 into that caused by changes in final demand, changes in technological coefficients and changes in cross effect. The equation is:

$$\Delta \mathbf{V} = [\mathbf{C}_{71} (\mathbf{Y}_{85} - \mathbf{Y}_{71})] + [(\mathbf{C}_{85} - \mathbf{C}_{71}) \mathbf{Y}_{71}] + [(\mathbf{C}_{85} - \mathbf{C}_{71}) (\mathbf{Y}_{85} - \mathbf{Y}_{71})] \quad (14)$$

The changes in final demand which appear in the first term on the right hand side of equation (14) can be further decomposed into two components, namely the direct and indirect effects of changes in final demand. Similarly, the changes in technological coefficients which appear in the second term on the right hand side of equation (14) can also be distinguished between the direct and indirect effects.

The direct and indirect effects of final demand changes can be calculated by using the following equation:

$$\begin{aligned} \Delta \mathbf{V}_f &= \mathbf{C}_{71} (\mathbf{Y}_{85} - \mathbf{Y}_{71}) \\ &= \alpha_{71} (\mathbf{Y}_{85} - \mathbf{Y}_{71}) + (\mathbf{C}_{71} - \alpha_{71}) (\mathbf{Y}_{85} - \mathbf{Y}_{71}) \end{aligned} \quad (15)$$

where $\alpha = \mathbf{BA}$. **A** is a 29 x 29 matrix of technological coefficient at a given year. The first term on the right hand side of equation (15) indicates the direct effect of changes in final demand on the net output in each sector, while the indirect effect of changes in final demand is indicated by the second term on the right hand side of equation (15).

The direct and indirect effects of changes in technology on the net output in each sector are expressed in the first and second terms on the right hand side of equation (16), respectively:

$$\begin{aligned} \Delta \mathbf{V}_c &= (\mathbf{C}_{85} - \mathbf{C}_{71}) \mathbf{Y}_{71} \\ &= (\alpha_{85} - \alpha_{71}) \mathbf{Y}_{71} + [(\mathbf{C}_{85} - \mathbf{C}_{71}) - (\alpha_{85} - \alpha_{71})] \mathbf{Y}_{71} \end{aligned} \quad (16)$$

Robertson (1989) interpreted the elements of the column vector $(\alpha_{85} - \alpha_{71}) \mathbf{Y}_{71}$ in equation (16) as indicating the effect on each sector of a change in the value added to output ratio in its own production function, on the value of its output sales to other sectors, and the effects of changes in value added direct requirements in the production functions of its clients. The elements of the vector $(\mathbf{C}_{85} - \mathbf{C}_{71}) \mathbf{Y}_{71}$ in equation (16) indicate the effect on each sector of change in the value added to output ratio in its own production function, on the value of its output sales, and the effects of technological change across the rest of the economy on its share of total value added, through changes in the direct and indirect value added requirements.

3. RESULTS

Consistent 29-sector input-output tables at constant 1985 prices for the years 1971 and 1985 were compiled from the larger (66 sectors), published national tables. The procedure is described in Daryanto and Morison (1992). The aggregation schemes and definitions for the 29-sector 1971 and 1985 tables are available from the authors on request.

3.1 Changes in Sectoral Structures: An Overview

The sectoral structures are defined in terms of the shares attributable to three major sectors: agriculture, industry and services. Agriculture is comprised of Paddy (1), Other Food Crops (2), Rubber (3), Crude Coconut and Palm Oil (4), Tobacco (5), Tea (6), Coffee (7), Other Agriculture and Crops (8), Livestock (9), Forestry (10), and Fisheries (11). Industry includes Mining and Quarrying (12), Manufacture of Food Products (13), Manufacture of Oil and Fat (14), Sugar Factory (15), Manufacture of Other Food Products and Beverages (16), Manufacture of Cigarettes (17), Manufacture of Wood, Bamboo and Rattan Products (18), Other Manufactures (19), Oil Refinery (20), Electricity, Gas and Water Supply (21), and Construction (22). Services is comprised of Trade (23), Restaurants and Hotels (24), Transportation and Communication (25), Finance, Real Estate and Business Services (26), Public Administration and Defence (27), Social and Community Services (28), and Other Services and Unspecified Sector (29).

The following portrait of the Indonesian economy between 1971 and 1985 is based on the I/O tables in constant prices. Although the tables are not presented in detail in this paper, calculations from these tables indicate that the Indonesian economy has undergone rapid structural change during this period.

In 1971 the relative contributions to GDP were services 39.6 per cent, agriculture 36.4 per cent and industry 23.9 per cent. In 1985, the contribution of the services sector was stable at 39.8 per cent, but the shares of agriculture and industry had changed to 22.9 per cent and 37.4 per cent respectively. In 1971, the sectoral contribution to GDP for services, industry and agriculture were Rp 16,847 billion, Rp 15,478.50 billion and Rp 10,174.50 billion respectively. In 1985 the corresponding sectoral contribution were services Rp 38,824 billion, industry Rp 36,481 billion and agriculture Rp 22,341 billion. Whereas in industry and services, GDP increased by 3.5 and 2.3 times, respectively, agriculture increased by just over 1.4 times during the period 1971 to 1985.

The interindustry or intermediate transactions are relatively sparse compared to the final demand and value added. The intermediate portion was only 35.5 per cent of total gross output in 1971 and 37.7 per cent of total gross output in 1985. Agriculture, industry and services accounted for 39.2 per cent, 37.3 per cent and 23.5 per cent of total intermediate transactions in 1971, respectively, while in 1985 agriculture, industry and services accounted for 22.8 per cent, 49.9 per cent and 27.3 per cent of total intermediate transactions.

This indicates that during the process of development, the total use of intermediate goods and services relative to total gross output tended to increase, although it declined for agriculture. The increase in intermediate usage of goods and services reflects the evolution to a more complex system with a higher degree of fabrication, and the substitution of manufactured for primary commodities, or the substitution of fabricated for natural materials. This tendency generally occurs in the process of industrialisation in LDCs (Kubo, Robinson and Syrquin 1986).

Looking at the columns of the input-output tables which show the purchasing patterns of the sectors, the proportion of intermediate inputs in total purchases tended to decline over the period 1971-1985 for the agricultural sectors but increased for the

industrial sectors (Table 1). The share of intermediate inputs in the services sectors fell slightly.

Another important characteristic of the input structure of the industrial sector is that the agricultural sector is a major supplier of inputs to the industrial sector.

The total output is defined as a summation of interindustry transactions and final demand. Again the input-output tables for 1971 and 1985 indicate that over all sectors final demand equalled 64.5 per cent and 62.4 per cent of total output in 1971 and 1985 respectively. Agriculture, industry and service accounted for 24.7 per cent, 40.2 per cent and 35.2 per cent of final demand in 1971 respectively, while these aggregate sectors accounted for 12.6 per cent, 38.6 per cent and 48.8 per cent of final demand in 1985.

Table 2 shows the changes in the shares of various sectors in final demand between 1971 and 1985. The noticeable changes are the decline in the share of agriculture and the increase in the share of industry as well as the small increase in services. The decline in the share of agriculture in final demand implies a shift in demand away from agricultural goods to industrial commodities.

As shown in Table 3, the single largest final demand sector is household consumption, which accounted for 50.2 per cent of the total final demand in 1985. However, this share declined from 63.8 per cent in 1971 to 50.2 per cent in 1985. The two sectors that experienced a relative increase were government consumption, which increased from 6.4 per cent in 1971 to 10.0 per cent in 1985, and exports which increased from 11.3 per cent in 1971 to 19.8 per cent in 1985.

There were two significant features that characterised the Indonesian economy in 1971. First, more than 88 per cent of total imports were in industrial sectors. The second feature was the high proportion of primary commodities (agriculture and mining) that contributed to national exports. In 1971 about 67 per cent of total exports (32 per cent from agriculture and 35 per cent from mining and quarrying) were primary commodities.

From Table 4, it can be seen that the mining and quarrying products still dominated Indonesia's exports in 1985 (60.8 per cent of total exports). Table 4 shows how the exports of industrial products increased from 1971 to 1985. Their share (including mining and quarrying products) to total exports increased from 44.9 per cent in 1971 to 77.4 per cent in 1985. However, the share of agricultural products shows a decline during the period 1971 to 1985; from 32.1 per cent in 1971 to only 9.9 per cent in 1985.

3.2 The Pattern of Structural Changes for the Whole Economy Between 1971 and 1985

Table 5 shows the changes in net output or value added by sector ranked according to net output growth between 1971 and 1985. Between 1971 and 1985, net output for all sectors increased by 130 per cent to Rp 97,642 billion from Rp 42,497 billion, representing an average annual rate of increase of 9.29 per cent. From 1971 to 1985, there was a wide variation in the degree of net output change among sectors. The largest relative increases in net output occurred in Manufacture of Wood, Bamboo and Rattan Products (18), Mining and Quarrying (12), Manufacture of Cigarettes (17) and

Table 1 Intermediate Input Ratios (percentage)

No.	Sector	Intermediate Inputs	
		1971	1985
1	Paddy	6.69	10.85
2	Other Food Crops	45.26	11.64
3	Rubber	56.87	83.00
4	Crude Coconut and Palm Oil	30.61	24.20
5	Tobacco	55.26	31.73
6	Tea	46.86	11.07
7	Coffee	35.08	32.31
8	Other Agriculture and Crops	17.53	20.02
9	Livestock	30.37	49.29
10	Forestry	25.89	12.85
11	Fisheries	30.96	22.33
12	Mining and Quarrying	8.63	15.94
13	Food Product	46.50	67.10
14	Oil and Fat	79.39	71.00
15	Sugar Factory	48.86	62.18
16	Other Food Products and Beverages	68.08	84.79
17	Cigarettes	66.95	59.75
18	Wood, Bamboo and Rattan Products	67.93	61.19
19	Other Manufacturing Industry	31.33	39.59
20	Oil Refinery	64.06	68.32
21	Electricity, Gas and Water Supply	49.91	78.04
22	Construction	64.08	65.15
23	Trade	13.17	13.39
24	Restaurants and Hotels	74.22	53.64
25	Transportation and Communication	34.46	41.06
26	Finance, Real Estate and Business Services	22.40	18.80
27	Public Administration and Defence	0.00	0.00
28	Social and Community Service	27.86	25.86
29	Other Services	32.79	38.33
	Agriculture	32.38	22.86
	Industry	44.00	49.07
	Services	27.72	26.12

Manufacture of Food Products (13), while the largest relative decreases in net output occurred in Electricity, Gas and Water Supply (21), Fisheries (11) and Rubber (3).

Table 5 also shows the decomposition of growth during the 1971-1985 period. In this table, the growth is indicated in terms of value (at 1985 prices) and index of change. Column 10 in Table 5 shows the index of change in value added in each of the sectors, defined as $(\mathbf{V}_{85}/\mathbf{V}_{71})$ 100. The index of final demand effect, column 11, is calculated by adding the growth attributable to changes in the final demand vector to the value added in 1971 and dividing by the value added in 1971, that is, $\{[(\mathbf{V}_{71} + \mathbf{C}_{71}(\mathbf{Y}_{85} - \mathbf{Y}_{71})]/\mathbf{V}_{71}\}$ 100. The index of coefficient change is defined as $\{[\mathbf{V}_{71} + (\mathbf{C}_{85} - \mathbf{C}_{71})\mathbf{Y}_{71}]/\mathbf{V}_{71}\}$ 100, and the index of the cross effect is defined as $\{[\mathbf{V}_{71} + (\mathbf{C}_{85} - \mathbf{C}_{71})(\mathbf{Y}_{85} - \mathbf{Y}_{71})]\}$ 100. An index of 100 for net output indicates that there was no growth due to final demand and technological changes, an index of under 100 indicates that there was a negative growth, and an index greater than 100 indicates positive growth.

Table 2 Final Demand Structure (percentage)

No.	Sector	1971	1985
1	Paddy	0.00	1.95
2	Other Food Crops	87.40	81.89
3	Rubber	58.77	72.78
4	Crude Coconut and Palm Oil	44.78	51.07
5	Tobacco	47.71	7.47
6	Tea	66.30	59.23
7	Coffee	51.92	71.09
8	Other Agriculture and Crops	23.68	28.17
9	Livestock	52.56	55.67
10	Forestry	42.78	25.41
11	Fisheries	63.98	82.13
12	Mining and Quarrying	61.30	63.84
13	Food Products	54.47	80.81
14	Oil and Fat	65.76	79.92
15	Sugar Factory	95.45	79.24
16	Other Food Products and Beverages	86.71	85.30
17	Cigarettes	90.19	85.38
18	Wood, Bamboo and Rattan Products	47.90	54.85
19	Other Manufacturing Industry	56.21	40.62
20	Oil Refinery	33.22	34.04
21	Electricity, Gas and Water Supply	23.47	35.47
22	Construction	92.16	92.78
23	Trade	67.37	53.05
24	Restaurants and Hotels	86.37	86.89
25	Transportation and Communication	66.08	64.89
26	Finance, Real Estate and Business Services	60.77	56.22
27	Public Administration and Defence	100.00	100.00
28	Social and Community Services	95.31	93.98
29	Other Services	75.93	64.38
	Agriculture	53.43	47.76
	Industry	66.17	69.17
	Services	73.09	74.13

Table 3 Final Demand by Expenditure Sector, 1971 and 1985

	1971		1985	
	(B Rp)[a]	%	(B Rp)[a]	%
Household Consumption	32 006	63.65	57 201	50.23
Government Consumption	3 204	6.37	11.401	10.01
Gross Fixed Cap. Formation	8 648	17.20	21 780	19.13
Changes in Stock	694	1.38	976	0.86
Export	5 680	11.30	22 522	19.77
Total	50 282	100.00	113 880	100.00

[a] Billion Rupiah

The entries in column 11 of Table 5 show what the 1985 industry (sector) indices of net output (1971=100) would have been had there been no change in final demand during the period and only a change in the technological relationships, reflected in the input-output coefficients. An index of 100 indicates that there was a neutral effect of technological change between 1971 and 1985, an index of under 100 reflects savings in input requirements for meeting the same final demand, an index of over 100 indicates an increase in input requirements to produce a given final demand. A similar interpretation can be made for final demand. For example, an index of over 100 indicates that there was an increase between 1971 and 1985 in the output of a given industry if only final demand had changed over this period and the coefficients had remained constant.

Column 11 indicates that the changes in final demand indices over this fourteen-year period varied from a high of 632 for Manufacture of Wood, Bamboo and Rattan Products (18) to a low of 87 for Tea (6). This range of 545 index points is smaller than the range of 1188 index points given in the changes in net output indexes. Thus, if only final demand had changed between 1971 and 1985 while the input-output coefficients had remained constant, there would have been a substantial narrowing of the extent to which indices of output change for individual sectors differed from the average index. Changing structural coefficients over this period thus tended to increase the variability of the sector indices of output change.

Column 12 of Table 5 indicates that the influence of coefficient change also varied widely among sectors, with coefficient changes tending to decrease output requirements in 12 sectors and increase them in 17 sectors. The largest positive impacts of coefficient change were experienced by sectors Manufacture of Wood, Bamboo and Rattan Products (18), Restaurants and Hotels (24) and Other Food Crops (2). The largest negative impacts of coefficients change were experienced by sectors Rubber (3), Electricity, Gas and Water Supply (21), and Paddy (1).

Column 13 of Table 5 indicates that the influence of cross effects also varied widely among sectors. Because this study has focused on final demand and technological change, the details of cross effect are not discussed here. However, it can be noted that if both final demand and technological coefficients are found to have a large impact on the net output change, generally, the values of cross effect are also large.

In most cases, the individual sector indices of output change (Table 5) which reflect changes in both final demand and input-output coefficients, vary from the average index to a greater extent than do either of the component indices. This is supported by the results in Table 6, which indicate measures of variability in net output, final demand, technological and cross effects. In general, the results show that the two elements of change in net output (final demand and technological change), moved together rather than offset one another between 1971 and 1985. The coefficient of correlation between the indexes of final demand and technological change is positive ($r = 0.43$) and is significant at the 0.05 level. Thus, it can be concluded that there is a significant positive association between final demand and technological effects, although the degree of their relationship is not very strong.

From Table 5, column 12, the average index of technological change is calculated to be 103. This implies that technology has had only a slightly positive effect on output growth over the study period. The influence of the technological effect among sectors

Table 4 Sectoral Distributions: Exports and Imports (percentage of total)

No.	Sector	Exports		Imports	
		1971	1985	1971	1985
1	Paddy	0.00	0.34	0.00	0.00
2	Other Food Crops	2.11	0.23	0.16	2.64
3	Rubber	13.66	3.20	0.01	0.00
4	Coconut and Palm Oil	0.95	1.69	0.00	0.46
5	Tobacco	0.79	0.18	0.12	0.13
6	Tea	1.21	0.53	0.00	0.00
7	Coffee	1.63	1.80	0.00	0.00
8	Other Agriculture and Crops	1.99	0.66	2.71	1.74
9	Livestock	0.46	0.13	0.15	0.09
10	Forestry	8.11	0.39	0.02	0.02
11	Fisheries	1.19	0.78	0.02	0.01
12	Mining and Quarrying	34.75	60.82	0.44	7.19
13	Food Product	0.11	0.05	0.95	0.62
14	Oil and Fat	2.64	0.08	0.09	0.07
15	Sugar Factory	0.26	0.09	1.25	0.03
16	Other Food Products and Beverages	3.15	0.47	6.27	0.69
17	Cigarettes	0.00	0.02	0.01	0.00
18	Wood, Bamboo and Rattan	0.01	4.44	0.19	0.03
19	Other Manufacturing Industry	2.38	7.48	78.53	65.12
20	Oil Refinery	1.55	3.98	1.00	2.98
21	Electricity, Gas and Water	0.00	0.00	0.00	0.00
22	Construction	0.00	0.00	0.00	0.00
23	Trade	6.12	5.10	0.00	0.00
24	Restaurants and Hotels	0.00	0.94	0.00	2.66
25	Transportation and Communication	16.56	4.09	4.23	3.99
26	Finance, Real Estate and Bus. Services	0.00	2.32	2.21	5.57
27	Public Administration and Defence	0.00	0.00	0.00	0.00
28	Social and Community Service	0.00	0.00	0.00	2.53
29	Other Services	0.38	0.17	1.62	3.42
	Agriculture	32.10	9.93	3.19	5.09
	Industry	44.85	77.43	88.73	76.73
	Services	23.05	12.64	8.08	18.18

however, varied widely. It can also be seen from Table 5 that in most sectors the final demand effect was positive, and there is a tendency for final demand to dominate the technological effect in contributing to changes in net output or value added in each sector.

From the preceding discussion, it is evident that between 1971 and 1985 increases in net output were dramatic. Over the period 1971 – 1985 the annual average rate of change was 9.29 per cent. But all sectors did not share equally in this expansion. During this period, the output of 3 sectors declined. Highly varied effects of the rising level of final demand were also revealed. The influence of coefficient change also varied widely among sectors. Between 1971 and 1985, changes in final demand had a negative effect on output in 4 sectors, while changing input coefficients had a positive output effect in 15 sectors, negative in 13 sectors, and 2 sectors had a coefficient index equal to 100.

Table 5 Decomposition of Output Growth Between 1971 and 1985, Ranked by Index of Output Growth

No.	Sector	Rank[a]	VA85[b]	VA71[c]	ΔVA[d] (M Rp)[e]
(1)	(2)	(3)	(4)	(5)	(6)
18	Wood, Bamboo and Rattan	1	1008297	82819	925478
12	Mining and Quarrying	2	16995824	3037939	13957885
17	Cigarettes	3	1372564	276654	1095910
13	Food Product	4	126714	26593	100122
28	Social and Community Service	5	2577329	622589	1954740
26	Finance, Real Estate & Bus. Serv.	6	6406492	1565525	4840967
22	Construction	7	6223896	1720877	4503019
27	Public Admin. and Defence	8	6374999	1839951	4535048
20	Oil Refinery	9	1863527	550205	1313322
24	Restaurants and Hotels	10	2455023	762683	1692340
8	Other Agriculture and Crops	11	1500363	589711	910652
14	Oil and Fat	12	282913	114545	168368
29	Other Service	13	3299808	1425015	1874793
19	Other Manufacturing Industry	14	6366521	2864327	3502194
9	Livestock	15	2464544	1146474	1318070
16	Other Food Products and Bev.	16	1530379	794872	735508
25	Transportation and Comm.	17	5746113	3264135	2481978
23	Trade	18	11964832	7371338	4593494
7	Coffee	19	440159	284737	155422
2	Other Food Crops	20	6548509	4265045	2283464
4	Crude Coconut and Palm Oil	21	1251135	830370	420765
1	Paddy	22	6365575	4255430	2110145
5	Tobacco	23	356747	252800	103947
6	Tea	24	194826	148260	46566
10	Forestry	25	1403810	1201084	202726
15	Sugar Factory	26	305276	277899	27377
21	Electricity, Gas and Water	27	395844	429035	-33191
11	Fisheries	28	1656502	1927844	-271343
3	Rubber	29	163477	568185	-404707

[a] This is ranked in descending order based on the index of total change.
[b] Value added in 1985 which is calculated by using equation (4), $VA85 = C_{85}\ Y_{85}$.
[c] Value added in 1971 which is calculated by using equation (4), $VA71 = C_{71}\ Y_{71}$.
[d] Changes in VA = $C_{85}\ Y_{85} - C_{71}\ Y_{71}$.
[e] Million Rupiah.
[f] Final Demand Effect = $(Y_{85} - Y_{71})\ C_{71}$
[g] Technological Effect = $(C_{85} - C_{71})\ Y_{71}$
[h] Cross Effect = $(C_{85} - C_{71})\ (Y_{85} - Y_{71})$.
[i] (10) = { (4) : (5) } * 100
[j] (11) = { [(5) + (7)] : (5) } * 100
[k] (12) = { [(5) + (8)] : (5) } * 100
[l] (13) = { [(5) + (9)] : (5) } * 100

Table 5 (continued...)

Changes due to			Index of Change			
FDE[f] (M Rp)	TE[g] (M Rp)	CE[h] (M Rp)	TOTAL[i]	FDE[j]	TE[k]	CE[l]
(7)	(8)	(9)	(10)	(11)	(12)	(13)
440862	106669	377947	1217	632	229	556
12908026	577069	472790	559	525	119	116
743334	85111	267464	496	369	131	197
88148	1480	10493	476	431	106	139
2195158	-38794	-201624	414	453	94	68
3422258	547664	871045	409	319	135	156
4587267	-3195	-81052	362	367	100	95
4535047	0	1	346	346	100	100
1096486	92624	124212	339	299	117	123
882673	378988	430679	322	216	150	156
959496	122793	-171637	254	263	121	71
123255	18699	26413	247	208	116	123
1838335	34564	1895	232	229	102	100
2622183	512307	367704	222	192	118	113
2076395	-272661	-485664	215	281	76	58
1268610	-209044	-324058	193	260	74	59
3603868	-489521	-632369	176	210	85	81
5079724	-214342	-271888	162	169	97	96
345561	-70789	-119350	155	221	75	58
352768	2004259	-73564	154	108	147	98
707817	-153136	-133916	151	185	82	84
2849107	-1805038	1066076	150	167	58	125
-10671	17868	96751	141	96	107	138
-19309	50610	15265	131	87	134	110
1462054	-346744	-912584	117	222	71	24
-927	8755	19549	110	100	103	107
758442	-270801	-520832	92	277	37	-21
439661	-374642	-336361	86	123	81	83
-34081	-387281	16654	29	94	32	103

As noted earlier, most sector indices of net output, which reflect changes in both final demand and technology, vary from the average index to a considerably greater extent than do either of the individual component indices which reflect only changes in final demand or technological coefficients. This implies that the two elements of change in overall output moved together rather than offset one another. This is specially true of the extremes in the array of indices of total change in net output. This finding is consistent with Vaccara and Simon's (1968) analysis of the sources of output change in the United States between 1947 and 1958. The sectors with the largest increase in final demand are those with the largest increase in technological coefficients and, correspondingly, the sectors with the smallest increases in final demand are generally those that experienced a negative output effect from coefficient change. This is illustrated clearly in Table 7 which indicates that for sectors in the group that

Table 6 Various Measures of Variability for Total Net Output (TNO), Final Demand Effect (FDE), Technological Effect (TE) and Cross Effect (CE) Indices

	N[a]	MEAN[b]	MEDIAN[c]	TRMEAN[d]	STDEV[e]	SEMEAN[f]	MIN[g]	MAX[h]
TNO	29	274.4	215.0	248.6	226.4	42.0	28.8	1217.5
FDE	29	256.8	221.7	249.2	113.9	24.9	87.0	632.3
TE	29	103.3	102.4	101.3	37.9	7.0	31.8	228.8
CE	29	114.3	100.1	103.0	94.8	17.6	-21.4	556.4

[a] number of sectors used in this study
[b] mean output for all sectors
[c] median value;
[d] 5% trimmed mean
[e] standard deviation
[f] standard error of the mean
[g] minimum value
[h] maximum value.

experienced the largest changes in net output, the effect of both final demand and coefficient change was to increase output growth; while the opposite is true for sectors in the group in which output decreased or increased the least. The only significant exceptions were the final demand index for Electricity, Gas and Water Supply (21), and the coefficient index for Social and Community Service (28). Most of Social and Community Service's output are delivered to final demand and most of Electricity, Gas and Water Supply's output are used as intermediate output.

There was evident from Table 7 that the products produced by the 'emerging' sectors (Manufacture of Wood, Bamboo and Rattan Products, Mining and Quarrying, Manufacture of Cigarettes, Food Product and Social and Community Service) were becoming increasingly attractive as intermediate inputs as well as final demand; while the declining or the lowest output growth in the industries such as Electricity, Gas and Water Supply, Fisheries and Rubber reflects the declining importance of the products in production and consumption.

3.3 The Pattern of Structural Change in the Agricultural Sector Between 1971 and 1985

Between 1971 and 1985, net output for agriculture, which consists of 11 sectors, rose 50 per cent from Rp 4,255 billion to Rp 6,366 billion, for an average annual rate of increase of 4.6 per cent. This average annual rate of increase for the agricultural sector is lower than the economy wide average. Between 1971 and 1985, there was wide divergence in the degree of output change within the agricultural sectors. Between 1971 and 1985, net output increased in 9 sectors and decreased in 2 sectors. The increases in net output occurred in Livestock (9), Coffee (7), Other Food Crops (2), Crude Coconut and Palm Oil (4), Paddy (1), Tobacco (5), Tea (6), Forestry (10) and Sugar Factory (15). The decreases in net output occurred in 2 sectors, namely Fisheries (11) and Rubber (3).

A further observation is that the changes in final demand are predominantly positive in the agricultural sector (Table 8 and Figure 1). This is true for 8 out of the 11 sectors. Seven sectors showed declining inputs from 1971 to 1985, while inputs of 4 sectors

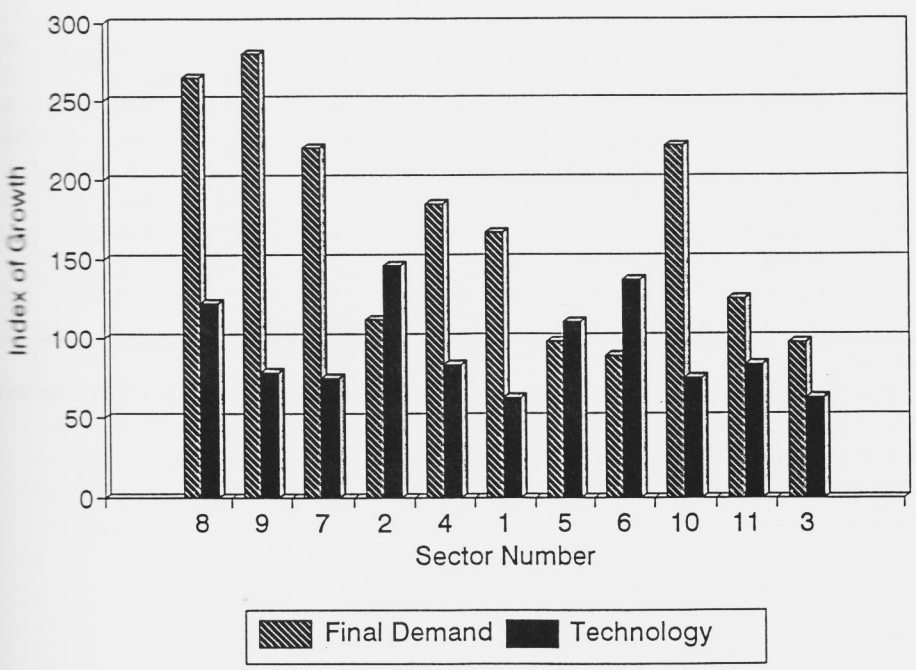
Table 7 Sectors Experiencing the Largest and Smallest Changes in Net Output Between 1971 and 1985[a]

Sectors		Output Change (per cent)	Final Demand Index	Coefficient Index
Largest output growth				
Wood, Bamboo and Rattan (18)	'emerging sectors'	1217.4	AOA[b]	AOA
Mining and Quarrying (12)		559.4	AOA	AOA
Cigarettes (17)		496.1	AOA	AOA
Food Products (13)		476.5	AOA	AOA
Social and Community Service (28)		413.9	AOA	BOA
Smallest output growth				
Forestry (10)	'declining sectors'	116.8	BOA[c]	BOA
Sugar Factory (15)		109.8	BOA	BOA
Electricity, Gas and Water (21)		92.2	AOA	BOA
Fisheries (11)		85.9	BOA	BOA
Rubber (3)		28.7	BOA	BOA

[a] The overall average of final demand index is 257, and the overall average of coefficient index is 103

[b] AOA: Sector index is above overall average

[c] BOA: Sector index is below overall average.



Source: Table 8.

Figure 1. Final Demand and Technology Effects in Agricultural Sectors

Table 8 Decomposition of Agricultural Output Growth Between 1971 and 1985, Ranked by Index of Output Growth

No.	Sector	Rank[a]	VA85[b]	VA71[c]	ΔVA[d] (M Rp)[e]
(1)	(2)	(3)	(4)	(5)	(6)
8	Other Agriculture and Crops	1	1500363	589711	910652
9	Livestock	2	2464544	1146474	1318070
7	Coffee	3	440159	284737	155422
2	Other Food Crops	4	6548509	4265045	2283464
4	Crude Coconut and Palm Oil	5	1251135	83070	420765
1	Paddy	6	636775	4255430	2110145
5	Tobacco	7	356747	252800	103947
6	Tea	8	194826	148260	46566
10	Forestry	9	1403810	1201084	202726
11	Fisheries	10	1656502	1927844	–271343
3	Rubber	11	163477	568185	–404707

Table 8 (continued...)

No.	Changes due to			Index of Change			
	FDE[f] (M Rp)	TE[g] (M Rp)	CE[h] (M Rp)	TOTAL[i]	FDE[j]	TE[k]	CE[l]
(1)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8	959496	122793	–171637	254	263	121	71
9	2076395	–272661	–485664	215	281	76	58
7	345561	–70789	–119350	155	221	75	58
2	352768	2004259	–73564	154	108	147	98
4	707817	–153136	–133916	151	185	82	84
1	2849107	–1805038	1066076	150	167	58	125
5	–10671	17868	96751	141	96	107	138
6	–19309	50610	15265	131	87	134	110
10	1462054	–346744	–912584	117	222	71	24
11	439661	–374642	–336361	86	123	81	83
3	–34081	–387281	16654	29	94	32	103

Source: taken from Table 5

[a] Ranked in descending order based on the index of total change within the agricultural sectors

[b] Value added in 1985 calculated by using equation (4), $VA85 = C_{85}\ Y_{85}$

[c] Value added in 1971 calculated by using equation (4), $VA71 = C_{71}\ Y_{71}$

[d] Changes in VA = $C_{85}\ Y_{85} - C_{71}\ Y_{71}$

[e] Million Rupiah

[f] Final Demand Effect = $(Y_{85} - Y_{71})\ C_{71}$

[g] Technological Effect = $(C_{85} - C_{71})\ Y_{71}$

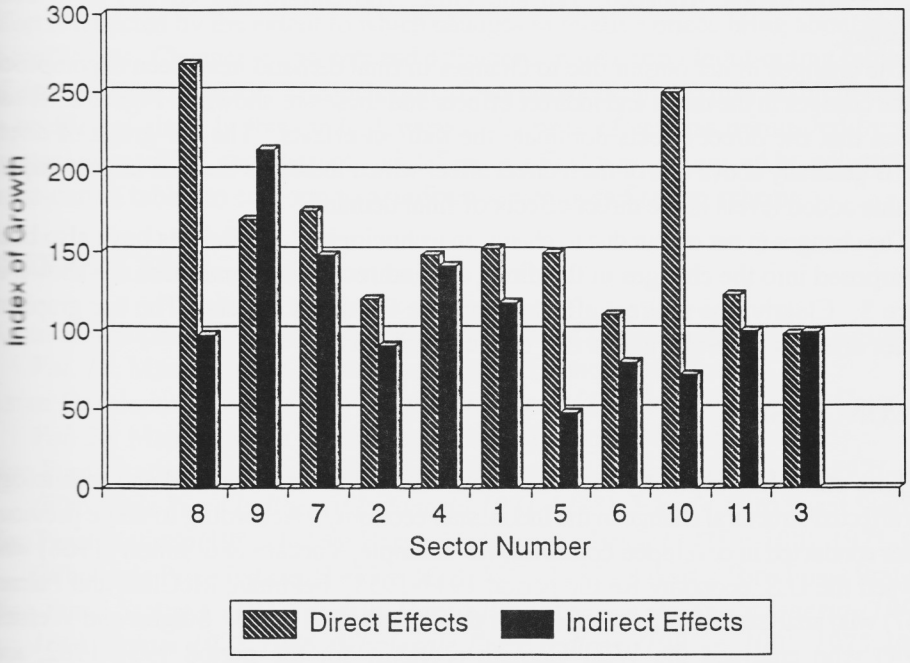
[h] Cross effect $(C_{85} - C_{71})\ (Y_{85} - Y_{71})$

[i] (10) = { (4) : (5) } * 100

[j] (11) = { [(5) + (7)] : (5) } * 100

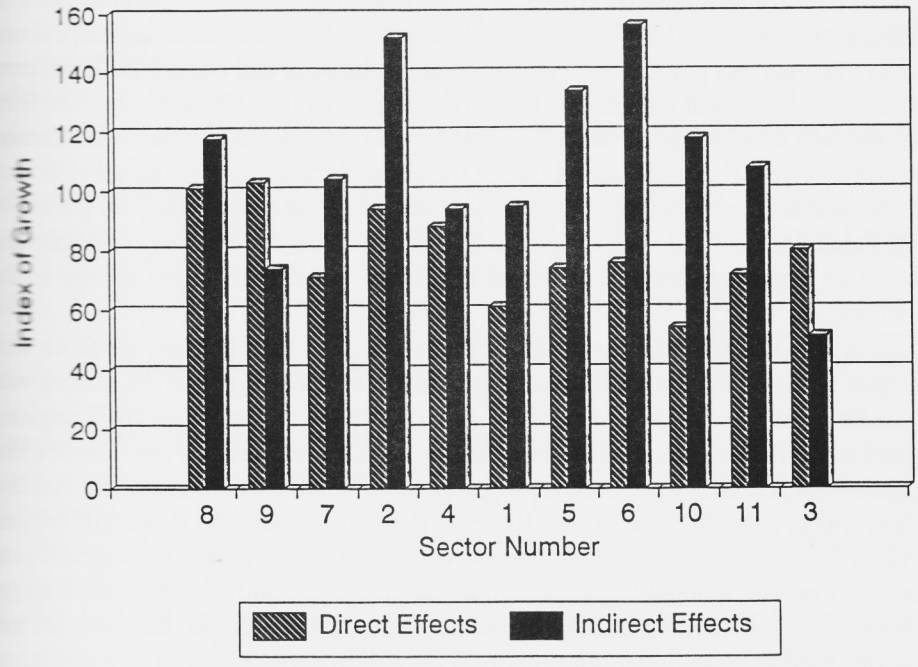
[k] (12) = { [(5) + (8)] : (5) } * 100

[l] (13) = { [(5) + (9)] : (5) } * 100



Source: Appendix 1.

Figure 2. Direct and Indirect Effects of Final Demand in Agricultural Sectors



Source: Appendix 1.

Figure 3. Direct and Indirect Effects of Technology in Agricultural Sectors

(Other Food Crops, Tobacco, Tea and Other Agriculture and Crops) have been expanding.

The changes in net output due to changes in final demand have been decomposed into the changes in the direct and indirect effects and these are shown in Figure 2. It can be seen that the direct effects dominate the indirect effects. The bar graph of direct effect is generally above that of the indirect effect which indicates that the largest impact on value added levels is the direct effects of final demand.

The changes in net output due to change in technological coefficients have also been decomposed into the changes in the direct and indirect effects and these are shown in Figure 3. Clearly, the indirect effects dominate the direct effects. The bar graph of indirect effect is generally above that of the direct effect.

4. CONCLUSION

This study has explicitly looked at how changes in final demand and technology have affected structural change in the Indonesian economy. According to some previous studies conducted in developed countries, for example, Vaccara and Simon (1968) who analysed the U.S. economy for the period 1947-1958, Feldman, McClain and Palmer (1987) who analysed the U.S. economy for the period 1963-1978, Staglin and Wessels (1974) who analysed the West German economy for the period 1958-1962, and Robertson (1989) who analysed the New Zealand economy for the period 1972-1982, the effects of changing final demand have been shown to be consistently more important than the effects of changing technological structure. The findings of this study are in general agreement with those previous studies.

It was found that the changes in final demand are the most important factor in affecting structural change in the Indonesian economy. The final demand components, which are private and government consumption, investment and export, have different importance for different industries. Due to limitations of time this study has not been concerned with the changes in various components of final demand which are affecting structural change. This study found that in the agricultural sectors the direct effects of final demand is more substantial than its indirect effects in determining the growth of the agricultural sector. This means that the first-round effects of changing final demand is the more important effect in determining the source of growth and change in the agricultural sector.

It was found that the sectors with the largest increase in final demand are those with the largest increase in technological coefficients and, correspondingly, in the sectors with the smallest increase in final demand are generally those which also show a negative influence of coefficient change to the sectoral growth. This implies that the final demand and technological effects seem to move together rather than offset one another, and this was found to be generally true in both the 'emerging' sectors and the 'declining' sectors.

In this study, input-output coefficient changes are interpreted as technological changes. However, it should be kept in mind that the input-output coefficient changes can result from substitution effects, fabrication effects, price effects, the concepts and definitions used in preparing input-output tables, and imperfect data. The substitution effect is reflected by the extent to which a commodity replaces, or is replaced by, other commodities. The fabrication effect is reflected by the extent to which an industry has

come to absorb a greater or smaller ratio of intermediate inputs to total inputs. The price effect is reflected by the extent to which changes in relative prices bring about changes in coefficients. Changes in concepts and definitions in preparing input-output tables can affect coefficient stability. The inclusion of inaccurate estimates may result in changes in coefficient size. In this study, however, the price effect was minimized by using constant price tables, and concept and definition effect was minimized by adjusting the input-output tables to conform to a uniform sector classification scheme.

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Appendix 1. Indices of Change in Net Output, Direct and Indirect Effects of Final Demand and Technology Ranked by Indices of Change in Net Output in the Indonesian Economy, 1971-1985 (M Rp)[a]

No	Sector	Rank[b]	VA85[c]	VA71[d]	ΔVA[e]	Changes due to						
						FDE[f]	DFE[g]	IFE[h]	TE[i]	DTE[j]	ITE[k]	CE[l]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
18	Wood, Bamboo and Rattan Prod.	1	1008297	82819	925478	440862	277708	163154	106669	161711	-55042	377947
12	Mining and Quarrying	2	16995824	3037939	13957885	12908026	1627456	11280571	577069	286945	290124	472790
17	Cigarettes	3	1372564	276654	1095909	743334	76174	667161	85111	52591	32520	267464
13	Food Product	4	126714	26593	100122	88148	128817	-40669	1480	-22548	24028	10493
28	Social and Comm. Service	5	2577329	622589	1954740	2195158	59702	2135456	-38794	29613	-68407	-201624
26	Finance, Real Estate and Business Service	6	6406492	1565525	4840967	3422258	762387	2659871	547664	454427	93237	871045
22	Construction	7	6223896	1720877	4503019	4587267	410508	4176759	-3195	85864	-89059	-81052
27	Public Adm. and Defence	8	6374999	1839951	4535048	4535047	0	4535047	0	0	0	1
20	Oil Refinery	9	1863527	550205	1313322	1096486	800816	295670	92624	637254	-544630	124212
24	Restaurants and Hotels	10	2455023	762683	1692340	882673	384084	498589	378988	-60263	439252	430679
8	Other Agric. and Crops	11	1500363	589711	910652	959496	976764	-17268	122793	8243	114551	-171637
14	Oil and Fat	12	282913	114545	168368	123255	138608	-15353	18699	-72255	90954	26413
29	Other Service	13	3299808	1425015	1874793	1838335	460026	1378309	34564	277315	-242751	1895
19	Other Manufacturing Ind.	14	6366521	2864327	3502194	2622183	5298567	-2676384	512307	795628	-283321	367704
9	Livestock	15	2464544	1146474	1318070	2076395	792204	1284191	-272661	25974	-298635	-485664
16	Other Food Prod. and Bev.	16	1530379	794872	735508	1268610	561006	707604	-209044	62782	-271827	-324058
25	Transportation and Comm.	17	5746113	3264135	2481978	3603868	1846324	1757544	-439521	-194636	-294885	-632369
23	Trade	18	11964832	7371338	4593494	5079724	3159982	1919742	-214342	-175814	-38528	-271888
7	Coffee	19	440159	284737	155422	345561	211159	134402	-70789	-82962	12173	-119350
2	Other Food Crops	20	6548509	4265045	2283464	352768	828922	-476153	2004259	-212234	2216493	-73564
4	Crude Coconut and Palm Oil	21	1251135	830370	420765	707817	385100	322717	-153136	-99443	-53693	-133916
1	Paddy	22	6365575	4255430	2110145	2849107	2230814	618294	-1805038	-1656033	-149005	1066076
5	Tobacco	23	356747	252800	103947	-10671	122850	-133521	17868	-66960	84827	96751
6	Tea	24	194826	148260	46566	-19309	11049	-30358	50610	-33631	84240	15265
10	Forestry	25	1403810	1201084	202726	1462054	1806404	-344350	-346744	-533959	187215	-912584
15	Sugar Factory	26	305276	277899	27377	-927	42862	-43788	8755	30207	-21452	19549
21	Electricity, Gas and Water Supply	27	395844	429035	-33191	758442	752807	5635	-270801	-148662	-122139	-520832
11	Fisheries	28	1656502	1927844	-271343	439661	428428	11232	-374642	-538217	163575	-336361
3	Rubber	29	163477	568185	-404707	-34081	-20261	-13820	-387281	-108315	-278966	16654

Appendix 1. (continued...)

No.	Sector	Rank[b]	Index of Change in VA (1971=100)							
			TOTAL[m]	FDE[n]	DFE[o]	IFE[p]	TE[q]	DTE[r]	ITE[s]	CE[t]
(1)	(2)	(3)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
18	Wood, Bamboo and Rattan Prod.	1	1217	632	435	297	229	295	34	556
12	Mining and Quarrying	2	559	525	154	471	119	109	110	116
17	Cigarettes	3	496	369	128	341	131	119	112	197
13	Food Product	4	476	431	584	-53	106	15	190	139
28	Social and Comm. Service	5	414	453	110	443	94	105	89	68
26	Finance, Real Estate and Business Service	6	409	319	149	270	135	129	106	156
22	Construction	7	362	367	124	343	100	105	95	95
27	Public Adm. and Defence	8	346	346	100	346	100	100	100	100
20	Oil Refinery	9	339	299	246	154	117	216	1	123
24	Restaurants and Hotels	10	322	216	150	165	150	92	158	156
8	Other Agric. and Crops	11	254	263	266	97	121	101	119	71
14	Oil and Fat	12	247	208	221	87	116	37	179	123
29	Other Service	13	232	229	132	197	102	119	83	100
19	Other Manufacturing Ind.	14	222	192	285	7	118	128	90	113
9	Livestock	15	215	281	169	212	76	102	74	58
16	Other Food Prod. and Bev.	16	193	260	171	189	74	108	66	59
25	Transportation and Comm.	17	176	210	157	154	85	94	91	81
23	Trade	18	162	169	143	126	97	98	99	96
7	Coffee	19	155	221	174	147	75	71	104	58
2	Other Food Crops	20	154	108	119	89	147	95	152	98
4	Crude Coconut and Palm Oil	21	151	185	146	139	82	88	94	84
1	Paddy	22	150	167	152	115	58	61	96	125
5	Tobacco	23	141	96	149	47	107	74	134	138
6	Tea	24	131	87	107	80	134	77	157	110
10	Forestry	25	117	222	250	71	71	56	116	24
15	Sugar Factory	26	110	100	115	84	103	111	92	107
21	Electricity, Gas and Water Supply	27	92	277	275	101	37	65	72	-21
11	Fisheries	28	86	123	122	101	81	72	108	83
3	Rubber	29	29	94	96	98	32	81	51	103

Appendix 1 footnotes.

a Million Rupiah.

b This is ranked in descending order based on the index of total change.

c Value added in 1985 which is calculated using equation (4), $VA85 = C_{85}\ Y_{85}$.

d Value added in 1971 which is calculated using equation (4), $VA71 = C_{71}\ Y_{71}$.

e Changes in $VA = C_{85}\ Y_{85} - C_{71}\ Y_{71}$

f Final Demand Effect = $(Y_{85} - Y_{71})\ C_{71}$

g Direct Final Demand Effect = $\alpha_{71}\ (Y_{85} - Y_{71})$.

h Indirect Final Demand Effect = $(C_{71} - \alpha_{71})\ (Y_{85} - Y_{71})$.

i Technological Effect = $(C_{85} - C_{71})\ Y_{71}$.

j Direct Technological Effect = $(\alpha_{85} - \alpha_{71})\ Y_{71}$.

k Indirect Technological Effect = $[(C_{85} - C_{71}) - (\alpha_{85} - \alpha_{71})]\ Y_{71}$.

l Cross Effect = $(C_{85} - C_{71})\ (Y_{85} - Y_{71})$.

m (14) = { (4) : (5) } * 100

n (15) = { [(5) + (7)] : (5) } * 100

o (16) = { [(5) + (8)] : (5) } * 100

p (17) = { [(5) + (9)] : (5) } * 100

q (18) = { [(5) + (10)] : (5) } * 100

r (19) = { [(5) + (11)] : (5) } * 100

s (20) = { [(5) + (12)] : (5) } * 100

t (21) = { [(5) + (13)] : (5) } * 100