Chapter 4: Input-Output Analysis and Structural Change

4.1 Introduction

Input-Output (IO) analysis deals with the empirical study of the interdependence among the various sectors of an economy. Vast literature exists on IO models. Such formulations are based primarily on the pioneering work by Leontief (1951). Later work by Isard et al. (1960), Miernyk (1965), Bulmer-Thomas (1982) and Miller and Blair (1985) helped to provide a useful foundation for IO analysis.

IO analysis is a frequently used tool to evaluate impacts of changes in production linkages among sectors. Multiplier analysis, however, focuses on the potential impact of structural change, rather than on its sources. The decomposition of IO models to identify such sources has become fashionable.

The most widely used decomposition techniques are multiplier decomposition, growth accounting and structural decomposition analysis (Siegel, Alwang and Johnson 1995). The output multiplier is decomposed to identify sources of change attributed to production- and consumption-related linkages. Basically growth accounting and structural decomposition analysis use the same technique, but applied at different levels of aggregation. The growth accounting studies are usually conducted at levels of aggregation that limit their usefulness for applied policy analysis, while structural decomposition analysis provides a detailed and systematic analysis of sources of structural change (Siegel, Alwang and Johnson 1995). Skolka (1989) and Rose and Chen (1991) suggest that the structural decomposition analysis is better suited to applied policy analysis because more intricate relationships are uncovered.

The following section gives a brief discussion of the background, the nature and the applications of input-output structural decomposition analysis. Then, various structural decomposition techniques are presented. In Section 4.3, the procedure of inflation of input-output tables is also explained. The fourth section outlines use of the structural decomposition analysis for policy development. Finally, the fifth section describes the data sources.

4.2 Input-Output Structural Decomposition Analysis

The input-output structural decomposition analysis, which is also labelled demand-side analysis, was first used in a paper by Rose and Chen (1987) that received limited circulation. It was formally defined in the IO review by Rose and Miernyk (1989), which was repeated in the widely cited paper by Skolka (1989) in a special issue of the *Journal of Policy Modeling* in honour of Wassily Leontief. The term of structural decomposition analysis has now become the standard nomenclature (Rose and Casler 1996).

The IO structural decomposition analysis is defined as the analysis of economic change by means of a set of comparative static changes in key parameters in an input-output table (Rose and Chen 1991). It basically involves a set of comparative static exercises in which sets of coefficients are changed, in turn, and activity levels compared to a reference point.

Several reasons for the recent increasing interest in structural decomposition analysis have been identified by Rose and Casler (1996). They may be summarised as follows. First, it overcomes many of the static features of IO models and is able to examine changes in sets of coefficients and activity levels. Some recent studies (see, for example Casler, Afrasiabi and McCauley 1991) indicate that structural decomposition analysis can be used as a forecasting tool. The second reason is that structural decomposition analysis is a pragmatic alternative to econometric estimation. Analysis of similar topics using econometrics requires a time series covering 10 years or more, and not only for output and primary factors of production but all intermediate inputs as well. In contrast, structural decomposition analysis requires only two IO tables. Another reason for the increasingly widespread use of structural decomposition analysis is that it has seen a broad set of applications. These include examining sources of change in various developmental stages, sources of change in international trade, technological change, energy use, workforce requirements and development planning.

In the analysis of growth and structural change, structural decomposition analysis has been developed to explore three subjects: (a) the principal causes of observed uniformities in the structural transformation; (b) the effects of factors that may be expected to determine sequences of industrialisation, such as the availability of resource endowments, market size and external policies; and (c) how productivity growth is associated with the reallocation of resources among sectors.

Structural change may be caused by many factors, the most important of which are the following: (a) emergence of new technologies; (b) changes in input prices – a change in relative prices may result in substitution among inputs; (c) growth of international

markets and competition; (d) changes in resource limitations; and (e) changes in consumer incomes, values and tasks. Because of the intangible nature of many of these underlying factors of change and the extreme complexity of the interrelationships involved, it is not possible to identify and measure the individual effects of each factor on an economic activity (Holland and Martin 1993). Instead, the sources of the shifts in the position of individual sectors can be investigated by applying an input-output structural decomposition analysis. In this case, the structural decomposition analysis is associated with the factors of domestic final demand, exports, imports of final products, imports of intermediate products and technical (input-output coefficients) change.

The input-output models provide an economy-wide environment which explicitly captures the linkages among different industries. Structural decomposition analysis has proved to be useful in identifying various factors affecting growth and structural changes in an economy. It has also proved to be useful in relating those changes to the differences in the size of the economies and the trade strategies followed in different economies (see, for example, Kubo, Robinson and Syrquin 1986).

There have been many studies which used an IO framework for examining structural changes in developed countries. For instance, Feldman, McClain and Palmer (1987), Holland and Martin (1993) and Lee and Schluter (1993) examined the pattern of growth and structural change in the US economy. Barker and Forssell (1993) and Driver (1994) did the same for the UK economy, Uno (1989) for the Japanese economy and Fujimagari (1989) for the Canadian economy. All studies mentioned deal with the examination of structural change in terms of output only, and there is none that examines structural change in terms of employment.

The structural transformation of an economy is frequently studied in terms of changes in the level of output. Feldman, McClain and Palmer (1987), Uno (1989), Fujimagari (1989) and Barker and Forssell (1993) used IO tables to decompose sectoral output change into the portion attributable to changes in final demand and the portion attributable to changes in input-output coefficients. According to Feldman, McClain and Palmer's results on the sources of structural changes in the United States for the period 1963-1978, it has been shown that (1) changes in output levels may be primarily attributed to changing final demand for the majority of industries, and (2) the technical-coefficient effect is relatively more important among the fastest growing and declining industries. Uno's results for the Japanese economy for the period 1970-1980 confirm conclusion (1). Fujimagari's results for the Canadian economy for the period 1961-1981 also confirm conclusion (1). For Canada, however, technical-coefficients effects are relatively more important in the declining industries, and less so for the fastest growing industries. Furthermore, technical-

coefficient effects have become relatively more important over time in a greater number of industries. Barker and Forssell's results are broadly in line with Fujimagari's conclusion.

In less developed countries few studies have adopted the IO framework for examining structural changes. Daryanto and Morison (1995) examined how changes in final demand and technology affected structural change in the Indonesian economy. In accordance with previous studies conducted in developed countries, they found that the effects of changing final demand were consistently more important than the effects of changing technological structure. It was also found that the sectors with the largest increase in final demand were those with the largest increase in technological coefficients and, correspondingly, the sectors with the smallest increase in final demand were generally those with a negative coefficient change in sectoral growth. This implies that the final demand and technological effects move together rather than offset one another, and this was found to be generally true in both the 'emerging' sectors and the 'declining' sectors. However, this study was not concerned with changes in the various components of final demand (domestic final demand, export demand, import demand) which affect structural change.

Structural decomposition analysis is also used to examine the effect of structural change within the agricultural sectors on the rest of the economy. Some examples of models include the analysis of the US economy by Lee (1990) and Holland and Martin (1993) and analysis of the UK economy by Barker (1991) and McDonald, Rayner and Bates (1991). More recently, Carri (1995) undertook a comparative analysis of structural change among different members of the European Union. Structural decomposition analysis was also used by Lee and Schluter (1993) to examine growth and structural change of the food and fibre industries in the US economy.

Structural decomposition analysis has been adapted to simulate the transformation over the complete range of developed and less developed countries, using cross-country data (Chenery and Syrquin 1980, Syrquin 1989). The cross-country model is used as one of the ways of generalising about the experience of a large number of developing countries, and gives an order of magnitude of the various effects.

Chenery and Syrquin (1980) calculated the sources of structural change in gross output for the complete transition from less developed to mature industrial economies, broken into four income intervals (adjusted to 1980 US dollars by Syrquin 1989). The income levels used in their study covered the full range of countries within this transition. Sources of structural change for the transition range which include domestic final demand (DD), exports (EE), imports (IS) and intermediate demand (IO) are presented in Table 4.1.

Expressing the magnitude of each contribution in percentage shares enables us to compare the results across income intervals.

Table 4.1 illustrates the sources of output growth for the transition range in order to draw some comparisons. Decomposition analysis shows that the sources of output growth varied between income intervals. The decline in the primary share is mostly due to demand (Engel) effects at low income levels and to trade effects thereafter.

Table 4.1: Sources of structural change: demand-side composition

Income interval	*Sources of changes in structure per cent*				*Total*	*Change in share*
(1980 US $)	*DD*	*EE*	*IS*	*IO*		*in gross output*
			Decline in share of primary			
$300 – $600	67.6	14.5	12.7	5.2	100	–6.8
$600 – $1200	48.8	19.8	22.9	8.5	100	–5.7
$1200 – $2500	29.6	26.1	33.3	11.0	100	–4.9
$2500 – $5000	13.4	29.5	45.9	11.2	100	–3.9
						–21.3
			Increase in share of manufacturing			
$300 – $600	22.5	19.5	30.5	27.5	100	5.3
$600 – $1200	15.3	26.3	29.0	29.4	100	5.5
$1200 – $2500	10.3	31.4	30.7	27.6	100	6.0
$2500 – $5000	6.9	35.7	27.8	29.6	100	5.9
						22.7

Sources: Chenery and Syrquin (1980) and Syrquin (1989)

The domestic demand contribution is of declining importance at higher income levels, while the contributions of imports and exports increase and become the dominant sources of the continued decline in the primary share. Although changes in technology (input-output coefficients) are less important than changes in trade pattern and domestic demand, this effect accounts for part of the decline at all income levels. The importance of technological change in explaining the fall in primary share increases as development proceeds.

One interesting feature is that the growth of domestic demand is less important in explaining the rise in manufacturing share than changes in trade patterns and technological change. It seems that import substitution is more important than export expansion in the early periods, while in the later ones export expansion is of greater importance. Import substitution and export expansion are quite significant at all income levels. Technological change also plays a significant role in explaining the rise in manufacturing share. Kubo et al. (1986) found that the magnitude of technological change contributes to the rise of the manufacturing share and the level of income.

The application of an IO framework for examining growth and changes in terms of employment, however, does not appear to have been done frequently. This is surprising considering the power of the IO method for examining structural change in terms of both output and employment. Few studies have been found in the literature on the application of IO analysis for examining the pattern of growth and structural change in employment. By applying IO analysis, Henderson, McGregor and McNicholl (1989) for Scotland, Mules (1991) for Australia, and Daryanto and Daryanto (1994) for Indonesia successfully demonstrated that the sources of growth and change in terms of employment can be explained by division into various structural components, i.e. technology, import substitution, labour intensity and interaction effects. However, those previous studies did not recognise explicitly domestic final demand and export as separate components of structural change.

By employing the structural decomposition IO method, this study analyses the key factors affecting growth and change in the Indonesian economy with special reference to the agricultural economy. The change in an industry's output or employment is decomposed according to the factors that have contributed to the change: domestic final demand, export, imports of final demand and intermediate demand, technology and labour productivity (for employment only).

4.3 Methodology

4.3.1 Material Balance Equation

The decomposition procedure utilised in this study was developed by Chenery (1980). The technique was then refined by Kubo, Robinson and Syrquin (1986) in terms of output and employment changes in the economy. The starting point for the structural decomposition procedure is the material balance equation.

In input-output accounts, the basic material balance for gross output for a particular sector i can be written as

$$X_i = W_i + F_i + E_i - M_i \qquad (1)$$

where Xi, Wi, F_i, E_i and M_i are gross output of sector i, intermediate demand for the output of sector i, domestic final demand for sector i, export demand for the output of sector i and import for sector i, respectively.

For convenience, the basic material balance in equation (1) can be written in matrix notation as

$$X = W + F + E - M \tag{2}$$

or

$$X + M = W + F + E\,. \tag{3}$$

Equation (3) can be separated into

$$X = W^d + F^d + E \tag{4}$$

and

$$M = W^m + F^m \tag{5}$$

where W^d, W^m, F^d and F^m are the domestic intermediate inputs, imported domestic inputs, final domestic demand for domestic products and final demand for imported products, respectively.

Let us assume that the fixed coefficients of u^w, u^f, m^w and m^f exist, and they are defined as

$$u^w = W^d / W \tag{6}$$

$$u^f = F^d / F \tag{7}$$

$$m^w = W^m / W \tag{8}$$

$$m^f = F^m / F\,. \tag{9}$$

Therefore, the domestic production and imports which appeared in equations (4) and (5) can be written as

$$X = u^w W + u^f F + E \tag{10}$$

$$M = m^w W + m^f F \tag{11}$$

where u^w is the diagonal matrix of the fixed ratio of domestic intermediate demand to total intermediate demand, u^f is the diagonal matrix of the fixed ratio of domestic final demand to total final demand, m^w is the diagonal matrix of the fixed ratio of imported intermediate demand and m^f is the diagonal matrix of the fixed ratio of imported final demand to total final demand.

Assuming that each sector produces only one output and that intermediate inputs are required in a fixed proportion to output in each sector, the demand for intermediate inputs by a sector can be written as a function of its output:

$$W_i = \sum_j X_{ij} = \sum_j a_{ij} X_j \tag{12}$$

where X_{ij} is the intermediate use of output i by sector j and a_{ij} is the corresponding input-output coefficient.

If A represents the input-output coefficient matrix, the intermediate demand matrix, W, can be written as

$$W = AX\,. \tag{13}$$

Rearranging equation (10) and solving for output X yields

$$X = (I - u^w A)^{-1}(u^f F + E) = R(u^f F + E) \tag{14}$$

where $R = \left(I - u^w A\right)^{-1}$.

This is the starting point for decomposition analysis.

4.3.2 The Decomposition of Output Change

The differences in the structure of an economy can be shown on production data by using output values which are disaggregated by sectors. The model solution to change in output for the economy, ΔX, between terminal year 1 and base year 0 can be expressed as

$$\Delta X = X_1 - X_0 \tag{15}$$

where the numbered subscripts refer to the two points in time. Substituting equation (14) in (15), the changes in output can be decomposed into

$$\begin{aligned}\Delta X &= (I - u_1^w A_1)^{-1}(u_1^f F_1 + E_1) - (I - u_0^w A_0)^{-1}(u_0^f F_0 + E_0) \\ &= R_1(u_1^f F_1 + E_1) - R_0(u_0^f F_0 + E_0) \\ &= R_1(u_1^f F_1 + E_1) - R_0(u_1^f F_1 + E_1 - u_1^f F_1 + E_1 + u_0^f F_0 + E_0) \\ &= R_0(u_1^f F_1 + E_1 - u_0^f F_0 + E_0) + [(R_1 - R_0)(u_1^f F_1 + E_1)].\end{aligned} \tag{16}$$

The first term in equation (16) can be decomposed into

$$\begin{aligned}&R_0(u_1^f F_1 - u_0^f F_1) + R_0(u_0^f F_1 - u_0^f F_0) + R_0(E_1 - E_0) = \\ &R_0(u_0^f \Delta F + \Delta u^f F_1 + \Delta E)\end{aligned} \tag{17}$$

and the second term in equation (16) can be rewritten as follows:

$$(R_1 - R_0)(u_1^f F_1 + E_1) = R_0(\Delta u^w W_1 + u_0^w \Delta A X_1) \tag{18}$$

where W is the vector of total intermediate demand which is defined as $W = AX = (\sum_j a_{ij} X_j)$.

The derivation of equation (18) can be shown as

$$\begin{aligned}&(R_1 - R_0)(u_1^f F_1 + E_1) = \\ &R_0(R_0^{-1} - R_1^{-1})R_1(u_1^f F_1 + E_1) = R_0(R_0^{-1} - R_1^{-1})X_1.\end{aligned} \tag{18a}$$

Since

$$\begin{aligned}R_0^{-1} - R_1^{-1} &= (I - u_0^w A_0) - (I - u_1^w A_1) \\ &= (u_1^w A_1 - u_0^w A_1) + (u_0^w A_1 - u_0^w A_0) \\ &= \Delta u^w A_1 + u_0^w \Delta A\end{aligned} \tag{18b}$$

equation (18a) is rewritten as

$$R_0(\Delta u^w A_1 + u_0^w \Delta A)X_1 = R_0(\Delta u^w W_1 + u_0^w \Delta A X_1). \quad (18c)$$

Substituting equations (17) and (18) in (16), the complete expression for measuring changes in output in the economy can be obtained as

$$\Delta X = R_0 u_0^f \Delta F + R_0 \Delta E + R_0 \Delta u^f F_1 + R_0 \Delta u^w W_1 + R_0 u_0^w \Delta A X_1 \quad (19)$$

where

$R_0 u_0^f \Delta F$ = real growth attributable directly and indirectly to change in domestic final demand (DFD)

$R_0 \Delta E$ = real growth attributable directly and indirectly to change in export demand (ED)

$R_0 \Delta u f F_1$ = real growth attributable directly and indirectly to change in import substitution of final demand (IS-F)

$R_0 \Delta u^w W_1$ = real growth attributable directly and indirectly to change in import substitution of intermediate demand (IS-W)

$R_0 u_0^w \Delta A X_1$ = real growth attributable directly and indirectly to change in input-output coefficient (IO).

The decomposition model can be defined either with comparative-year input-output coefficients and base-year volume weights or with base-year input-output coefficients and comparative-year volume weights. From equation (19), we can see that this output decomposition model uses mixed weights. All elements on the right hand side of equation (19) are weighted by the base-year input-output coefficients and the comparative-year volume weights. The output decomposition model is also easily derived:

$$\Delta X = R_1 u_1^f \Delta F + R_1 \Delta E + R_1 \Delta u^f F_0 + R_1 \Delta u^w W_0 + R_1 u_1^w \Delta A X_0 . \quad (20)$$

All elements on the right hand side of equation (20) are weighted by the comparative input-output coefficients and the base-year volume weights. These two equations (19 and 20) are analogous to Laspeyres and Paasche indexes. The equation of (19) is essentially the Laspeyres index and equation (20) is referred to as the Paasche index. It is clear that

the differences in the results between equations (19) and (20) result from the different weights used. So the decomposition equation contains an inherent index number problem. To avoid the index number problem in actual computation, Chenery, Robinson and Syrquin (1986) used the arithmetic average of Laspeyres and Paasche index decompositions.

In decomposing factors responsible for output change in the economy, interactive factors may emerge from the basic algebra of difference specifications. The interaction factors are due to two or more factors which are reflected in the decomposition terms. The mixed weights in those two equations are used in order to eliminate the interaction effects.

In the output decomposition model, treatment of the interaction factor varies and there is no consistent standard to be used. In recent literature, we can find, for example, Wolff (1985), Holland and Martin (1993), Barker and Forssell (1993) and Driver (1994) ignore the interaction factors in their model. They use either the Paasche or Laspeyres index, while Daryanto and Morison (1995), Daryanto and Daryanto (1994) and Office of Technology Assessment (1990) have considered the interaction factors as a separate variable and reported its magnitude. Kubo, Robinson and Syrquin (1986), Chenery, Robinson and Syrquin (1986) and Forssell (1988), for example, argue that the interaction factors should be eliminated through use of an average of the Laspeyres and Paasche indexes. The present research chooses equation (19) to calculate the level of output changes and all factors that have contributed to the change. This means that by using Laspeyres index decomposition model as indicated in equation (19), the interactive factor is implicitly distributed among the decomposition terms.

In terms of the underlying causes of the changing nature of output in the economy, as described in equation (19), Holland and Martin (1993) argue that domestic final demand primarily captures the effects of changes in consumer incomes, values and tastes, and it is influenced to a lesser extent by changes in the international market and competition, as well as changes in resource availability, exchange rates and comparative advantage. Changes in import substitution capture the growth in international competition, but are also influenced by the government policy regarding access to the domestic market. Changes in input-output coefficients primarily reflect the emergence of new technologies, and factor-factor substitution in response to changes in relative prices. It then can be argued that the causes of the output change in the economy, which are reflected in decomposition terms in equation (19), are generally not policy variables but most are subject to policy influence.

4.3.3 The Decomposition of Output Change Used in the Study

The method used in this study is similar to the approach by Kubo, Robinson and Syrquin (1986) but differs in one way. It treats imports differently. Because the Indonesian IO tables do not distinguish between intermediate and final uses of imports, imports must be assumed to be a function of total demand. Letting the import share of demand be $m_i = M_i / (D_i + W_i)$

equation (1) can be represented in matrix notation as

$$\begin{aligned} X &= AX + F + E - m(F + AX) \\ &= (I - uA)^{-1} (uF + E). \end{aligned} \tag{21}$$

Here u is a diagonal matrix of sector self-sufficiency ratios $(1 - m_i)$. Then the following solution can be derived:

$$X = R(uF + E) \tag{22}$$

where

$$R = (I - uA)^{-1}. \tag{23}$$

By using equation (22), the output in base year (X_0) can be written as follows:

$$X_0 = R_0(u_0F_0 + E_0). \tag{24}$$

Similarly, the output in terminal year 1 (X_1) can be written as follows:

$$X_1 = R_1(u_1F_1 + E_1). \tag{25}$$

Then, by using (24) and (25), it is possible to solve for the increase in output (ΔX) in terms of increases in internal and external demand (ΔF) and (ΔE) and changes in two sets of parameters (Δu) and (ΔA):

$$\Delta X = R_0u_0\Delta F + R_0\Delta E + R_0\Delta uY_1 + R_0u_0\Delta AX_1 \tag{26}$$

where Δ denotes the change in the values of variables and parameters, and Y is a vector of total domestic demand (= W + F).

Since the data used here are discrete, not continuous, the decomposition equation contains an inherent index number problem. The decomposition can be defined either with terminal

year input-output coefficients and initial year volume weights or with initial year input-output coefficients and terminal year volume weights, similar to Paasche and Laspeyres indices. The equation of (26) is essentially a Laspeyres-type approach.

The comparable expression on a Paasche approach is

$$\Delta X = R_1 u_1 \Delta F + R_1 \Delta E + R_1 \Delta u Y_0 + R_1 u_1 \Delta A X_0. \tag{27}$$

Inevitably, the numerical results differ between the two variants of the decomposition. In the absence of an ideal weighting scheme between two variants, the decompositions are computed using both variants and the averages of the two are presented.

The equations (26) and (27) can also be derived by using total differentiation of matrix. Total differentiation of (21) yields:

$$\begin{aligned} dX &= (I - uA)^{-1} d(uF + E) + d(I - uA)^{-1} (uF + E) \\ &= (I - uA)^{-1} (udF + Fdu + E) + d(I - uA)^{-1} (uF + E). \end{aligned} \tag{28}$$

Since the derivative of an inverse matrix B, B^{-1}, with respect to an element of B is given by $dB^{-1}/db = -B^{-1}\left(dB/db\right)B^{-1}$, it follows that

$$\begin{aligned} d(I - uA)^{-1} &= -(I - uA)^{-1} (-udA - duA) (I - uA)^{-1} \\ &= (I - uA)^{-1} (udA + duA) (I - uA)^{-1}. \end{aligned}$$

Thus, (28) becomes

$$dX = \left(I - uA\right)^{-1}\left(udF + Fdu + dE\right) + \left(I - uA\right)^{-1}\left(udA + duA\right)\left(I - uA\right)^{-1}. \tag{29}$$

After rearranging the terms in (29), the change in output can be decomposed into its sources according to demand categories as:

$$\begin{aligned} dX &= \left(I - uA\right)^{-1} udF && \text{(change in domestic final demand)} \\ &+ \left(I - uA\right)^{-1} dE && \text{(change in export demand)} \\ &+ \left(I - uA\right)^{-1} udAX && \text{(change in intermediate demand)} \\ &+ \left(I - uA\right)^{-1} du\left(F + AX\right) && \text{(change in domestic supply ratios or} \\ & && \text{import subtitution).} \end{aligned} \tag{30}$$

Furthermore, since the total change in output equals the sum of the changes in each sector, the total change in output can be decomposed either by sector or by category of demand. These relations can be shown schematically as follows:

$$
\begin{array}{ccccccccc}
DFD_1 & + & ED_1 & + & IS_1 & + & IO_1 & = & \Delta X_1 \\
DFD_2 & + & ED_2 & + & IS_2 & + & IO_2 & = & \Delta X_2 \\
\bullet & & \bullet & & \bullet & & \bullet & & \bullet \\
\bullet & & \bullet & & \bullet & & \bullet & & \bullet \\
\bullet & & \bullet & & \bullet & & \bullet & & \bullet \\
DFD_n & + & ED_n & + & IS_n & + & IO_n & = & \Delta X_n \\
\hline
\Sigma DFD_i & + & \Sigma ED_i & + & IS_i & + & IO_i & = & \Sigma \Delta X_i = \Delta X
\end{array}
\qquad (31)
$$

where DFD_i = effect of changes in domestic final demand in sector i

ED_i = effect of changes in export demand in sector i

IS_i = effect of changes in import substitution of final and intermediate goods in sector i

IO_i = effect of changes in input-output coefficients in sector i.

Reading down the column gives the sectoral composition of each demand category, while reading across the rows gives the decomposition of changes in sectoral demand by different demand categories. When making comparisons across time periods, it is convenient to divide the entire table by $\Sigma \Delta X_i$, so that all components across sectors and demand categories sum to 100.

Alternatively, it is sometimes convenient to divide the rows by ΔX_i and then to look at the proportional shares of the contribution of each demand category to the change in sectoral output. Both presentations are used in this study.

4.3.4 The Deviation Model of Structural Change in Output

According to Chenery, Robinson and Syrquin (1986), the decomposition model can be classified into two main different approaches. The first approach is called the absolute comparison model between two points in time, as outlined in section 4.3.3. The second approach is the deviation model which measures the output change as the deviation from the proportional or balanced growth. This alternative approach is more suitable for the purpose of measuring changes in relative shares of output in the economy that has occurred in a particular period. The deviation model will be discussed here by using a graphical method and then a mathematical method.

Figure 4.1 is a graph of structural change in a two-sector economy, comprising industry (I) and agriculture (A) sectors. The economy is initially at point E_0 and is producing industry and agriculture output in the amounts of X_I^0 and X_A^0, respectively. Later, the economy, when the growth rate of the industry sector is greater than that of the agriculture sector, is moving to point E_1 and is producing X_I^1 and X_A^1. In this case, the economy grows proportionally more X_I^1. If we assume for simplicity that real output is defined as the sum of sectoral output in constant prices, the total output growth (ΔX) between two periods is $(X_I^1 + X_A^1) - (X_I^0 + X_A^0)$ or $\Delta X = \Delta X_I + \Delta X_A$, where $\Delta X_i = X_i^1 - X_i^0$. To measure the structural change, the movement from E_0 to E_1 is decomposed into two steps. First, the economy is assumed to grow from E_0 so that industry and agriculture sectors expand proportionally. This balanced growth which means that all sectors maintain their original share of output takes the economy from point E_0 *to* E_1^1, where the aggregate output of E_1^1 $(= X_I^1 + X_A^1)$ is equal to the output of E_1 $(=X_I^1 + X_A^1)$. Second, since the aggregate outputs of E_1^1 *and* E_1 are equal, the structural change which is defined as deviations from proportional growth is indicated by the change in the output generated by moving from E_1^1 *to* E_1. The changes in sectoral output are given by δX_I and δX_A. In this case, the changes in production structure of the economy are biased towards industry by the amount of δX_I, and against the agricultural sector by the same amount of δX_A. The sum of changes in δ over the two sectors is equal to zero, since aggregate output is fixed along the line connecting E_1 and E_1^1.

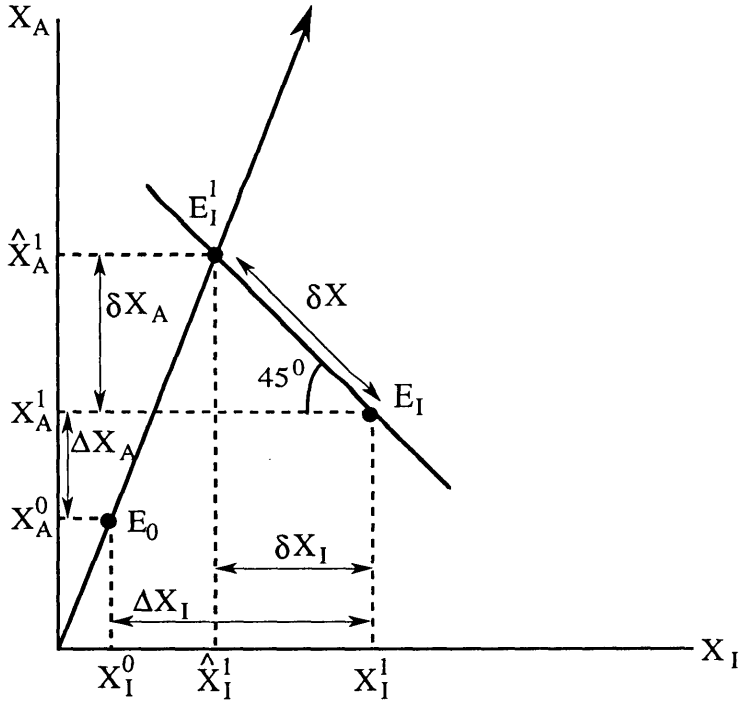

Figure 4.1: Measuring structural change

Let λ denote the ratio of the aggregate output of the comparative to base year and define:

$$\delta X = X_1 - \lambda X_0 \tag{32}$$

as measuring the deviation between the comparative-year output (X_1) and the balanced growth output (λX_0).

Because of the linearity of the input-output model with constant input-output coefficients, if all elements of domestic demand (i.e. domestic demand, exports and imports) expanded at the same rate, the aggregate output would also increase at the same rate in each sector and the structure of production would be unchanged. The balanced growth production X_B can be defined as

$$X_B = \lambda X_0 = R_0(u_0 \lambda F_0 + \lambda E_0). \tag{33}$$

The δX can be derived analogous to the ΔX decomposition in equation (26). Then, the derivation for balanced growth in output is given by:

$$\delta X = R_0 u_0 \delta F + R_0 \delta E + R_0 \Delta u \delta Y_1 + R_0 u_0 \Delta A \lambda X_1. \tag{34}$$

The first term in the right hand side of (34) captures the effects of deviation in domestic demand in all sectors (DFD). The second term captures the effects of deviations in export demand in all sectors (ED). The third term captures direct and indirect effects of changes in the import structure and the last term captures effects of changes in input-output coefficients (IO).

4.3.5 Decomposition of Employment Change

Employment growth can be also calculated by a simple extension of the output growth decomposition model. The difference between the number of economically active persons can be defined

$$\Delta L = L_1 - L_0 = \hat{l}_0 \Delta X + \Delta \hat{l} X_1 \tag{35}$$

where L is the level of employment, l is the labour-output ratio, and subscripts 1 and 2 refer to the two points in time. From equation (35), the change in employment over time

can be separated into two effects, one related to a change in the labour coefficient and the other related to a change in output. By using equation (26), the following decomposition with respect to employment growth can be derived:

$$\Delta L = \hat{l}_0 R_0 u_0 \Delta F + \hat{l}_0 R_0 \Delta E + \hat{l}_0 R_0 \Delta u Y_1 + \hat{l}_0 R_0 u_0 \Delta A X_1 + \Delta \hat{l} X_1 \qquad (36)$$

The first, second, third, fourth and fifth terms on the right hand side of equation (36) indicate the portion of the change in each industry's employment attributable to changing domestic final demand (DFD), export demand (ED), import substitution (IS), technology (IO) and labour productivity (LP).

4.3.6 Price Adjustment Procedures of Input-Output Tables

The basic data used for the analysis in this study are the Indonesian IO tables for the years 1971, 1985 and 1995 which were compiled by the Central Bureau of Statistics. The published IO tables are not fully consistent. There is a difference in the number of industries and their definitions. These differences were overcome with reclassification and aggregation which made them fully comparable.

All IO tables were compiled at current prices. Allowing a consistent comparison over time, the analysis of change in the economy over time requires constant input-output tables. In order for input-output data to be comparable in real terms, tables will be transformed to a common price system (the 1995 prices). This process of establishing constant-prices input-output tables is known as inflation because the current price of an industry is inflated to some price in the future. The inflating procedures are explained below.

The set of changes in input and output mix over time usually embodies two main groups of components: changes resulting from relative industrial price changes and changes resulting from a change in technology production or non-price changes such as quality (Feldman and Palmer 1985, Miller and Blair 1985, Kanemitsu and Ohnishi 1988). Price changes are considered to be an intertemporal phenomenon, so the distorting effect of prices must be taken into account. If price changes are ignored, a comparison based on current values would be misleading, especially in high-inflation economies with high variations in price changes across industries. Real technology or output changes can be observed separately after price changes have been dealt with.

Suppose that we have two independent input-output tables in current prices, i.e. one for year *0* and one for year *t*. Let A_0 and A_t be the matrices of technical coefficients in the

years *0* and *t*, respectively. The inflating procedure involves expressing A_0 in the prices of the year *t* (Taylor 1979). Defining P_t as the diagonal matrix of industrial price indexes capturing changes from year 0 to *t*, and A_0^t as A_0 updated with year t prices, we have

$$A_0^t = P_t A_0 P_t^{-1}. \tag{37}$$

P_t is a diagonal matrix where the i-th element is the price index for the i-th sector, while P_t^{-1} is a diagonal matrix where the j-th element is the price index for the j-th sector.

It should be noted that if only the price component had been the cause of differences, then the equality $A_0 = A_0^t$ in equation (37) would be expected. Otherwise, it implies that some real technological change has taken place from year *0* to year *t*, along with changes which can be attributed to prices.

Barring the case where constant price tables are taken for granted, the common way to handle the price effects in empirical studies is either deflating or inflating the current price tables with price indices from the researchers themselves (Daryanto and Morison 1992, Daryanto 1995, Daryanto and Morison 1995, Gunluk-Senesen and Kucukcifci 1994), or simply applying the constant price tables provided by the government or other agents (Feldman and Palmer 1985, Holland and Martin 1992, Lee and Schluter 1993).

The IO tables were supplied in current prices and it was necessary to construct inflators to convert the data to comparable price base. This proved more difficult than expected. There were many gaps and a significant number of the missing inflators. Due to the lack of sectoral inflators, the same index of inflator was applied to each sector. The inflator indices for the years 1971 and 1985 were 22.81 and 2.06, respectively. These indices were calculated from the wholesale price indices which were published by the Central Bureau of Statistics.

4.4 Industrialisation Strategy and Structural Change

The pace and pattern of structural change in an economy are strongly influenced by the industrialisation strategy pursued. Most frequently a distinction is made between an import-substitution and an export-oriented industrialisation strategy. It is generally accepted that both import-substitution and export-oriented industrialisation have a role to play in development. Success in economic growth depends on the nature and duration of these strategies (Lee 1993).

Much of the industrialisation in Indonesia, until the end of the 1970s, resulted from import-substitution policies. During the period of import substitution, trade and industrial policies were directed at influencing the pattern of industrialisation through protection of domestic industries. As with other developing countries, Indonesia adopted an import-substitution strategy beginning with final consumer goods and then moving to intermediate and capital goods. The regime that developed was characterised by escalating protection through tariff and non-tariff barriers, and high and variable effective rates of protection. It was biased against export production by imposing high costs on inputs, proliferation of administrative procedures and excessive government intervention.

Once import substitution had run its course, as with other developing countries in East and South East Asia, in the 1980s Indonesia moved away from import substitution in favour of a more export-oriented approach. There is a strong presumption from economic theory that a manufactured export-oriented strategy will lead to a more effective use of resources and have higher rates of investment than import substitution. This presumption was borne out by the OECD (Little, Scitovsky and Scott 1970), the National Bureau of Economic Research (Krueger 1977, Bhagwati 1978) and the World Bank (Balassa 1982).

Empirical studies show that, in the spectrum of developing countries, the rate of growth of GDP declines as one moves from strongly outward-oriented to strongly inward-oriented economies (Balassa 1984, World Bank 1987, Dollar 1992).

It would seem that developing countries adopted an export-oriented strategy or trade reforms for two major reasons (Fernandez and Rodrik 1990). First, in the face of economic crisis, policy makers embraced a host of reforms which included trade reforms. Second, reforms were undertaken in return for receiving structural or trade adjustment loans from the World Bank and the IMF.

In the 1980s Indonesia embarked upon trade liberalisation in response to several exogenous shocks: the world economic recession in the early 1980s, the decline in the prices of oil and other primary commodities, and the appreciation of the yen. The government reacted to the deteriorating external environment by devaluing the currency, slashing public spending, revamping the tax system, liberalising trade and financial sector markets, deregulating foreign investment and imposing the management of public investment.

The trade reform was highly successful in restoring economic growth and stimulating economic diversification. A combination of conservative fiscal management, competitive exchange rate management and trade and financial market liberalisation provided a major

impetus to private investment, particularly in non-traditional, export-oriented manufactured products. The contribution of exports to output doubled from 8.3 per cent in 1985 to 17 per cent in 1990. Exports contributed about one-half to the sector's growth during 1985-90 compared with only 13 per cent during 1980-85. Total manufactured exports during 1985-90 increased at an annual average rate of about 20 per cent in real terms. The share of manufactured exports in total non-oil exports (and total exports) increased from 60 per cent (17 per cent) to 80 per cent (about 50 per cent) between 1985 and 1990. This substantial shift in the main source of industrial growth from import substitution to export expansion in such a short time was a remarkable achievement of the Indonesian economy (Ahmed 1991).

To assess the effect of both strategies on the sources of structural change, those sources are analysed between the two periods. The first period is 1971-1985, which represents the import-substitution growth pattern, and the second is 1985-1995, which represents the export-oriented growth pattern.

4.5 Data Sources and Adjustments

Input-output tables for Indonesia are available for 1971, 1975, 1980, 1985 and 1995 (BPS 1976, BPS 1980, BPS 1985, BPS 1990 and BPS 1998). All are at current prices only. All tables have been published at three different levels of sector aggregation: detailed sectors, 66 sectors and 19 sectors. At detailed level, they contain minor differences in the level of commodity aggregation: 176 sectors in 1971, 179 sectors in 1975, 169 sectors in 1980 and 1985, 161 sectors in 1990 and 172 sectors in 1995.

Each IO table has been prepared in purchasers' prices and in producers' prices. In the present study, the IO tables in producer prices are used, so that all trade and transport margins are regarded as input originating from trade and transport sectors.

In the Indonesian IO tables for 1971 and 1975, the imports are treated as competitive and included in the final demand as negative entries. When imports are regarded as competitive, they share the same sector classification as domestic production. Since the full import matrices providing information on both final and intermediate use of imported commodities are not available for all IO tables (1971, 1985 and 1995) used in this present study, we must assume that import coefficients m_i used in the decomposition equations are the same for imports for both intermediate and final demand goods and services.

In estimating the sources of growth and structural change, the Indonesian IO tables for 26 sectors in 1971, 1985 and 1995 are used. The sector classification and description of each sector are given in Table 4.2. The 26-sector aggregation is chosen to permit comparability with the sectoral classification in the Social Accounting Matrix. The IO tables at current prices for the years 1971, 1985 and 1995 are shown in Appendices 4.2, 4.3 and 4.4 respectively.

In order to see real changes in the decomposition analysis, IO tables for 1971, 1985 and 1995 in current prices are transformed into the ones in 1995 constant prices by the same inflators. These price inflators are calculated from the wholesale price indices published by the BPS (1979, 1981, 1987, 1992, 1996).

All calculations are performed at the 26-sector level, with the results then aggregated for presentation to five broad sectors: primary, mining, light industry, heavy industry and services. Table 4.3 shows the mapping scheme that is used for the reclassification.

Table 4.2: The 26 sector classification for the Indonesian Input-Output Tables

IO Code	Sector	66 Sector IO Code [a/]
1	Farm food crops	1 – 6
2	Farm nonfood crops	7 – 17
3	Livestock	18 – 20
4	Forestry	21, 22
5	Fishery	23
6	Coal and petroleum	24, 25
7	Other mining	26
8	Food, beverages and tobacco	27 – 34
9	Textiles and leather	35, 36
10	Wood and furniture	37
11	Paper and printing	38
12	Chemicals and refining	39 – 41
13	Non-metallic mineral	43, 44
14	Basic metals	45, 46
15	Machinery	47 – 49
16	Other industry	42, 50
17	Electricity, gas and water	51
18	Construction	52
19	Trade and storage	53, 59
20	Restaurant and hotel	54
21	Rail and road transportation	55, 56
22	Sea & air transport, and communications	57, 58, 60
23	Financial services	61
24	Real estate	62
25	Public administration	63
26	Social and other services	64 – 66
P–1	Wage and salary	P–1
P–2	Operating surplus	P–2
P–3	Depreciation	P–3
P–4	Indirect tax	P–4
P–5	Subsidy	P–5
F–1	Domestic demand	F–1, F–2, F–3, F–4
F–2	Total export of goods and services	F–5, F–6
F–3	Total import of goods and services	F–7, F–8, F–9

Note: a/ Sector descriptions can be seen in Appendix 4.1.

Table 4.3: The sectoral re-classification for the Indonesian Input Output Tables

5-Sectors	26-Sectors
1. Agriculture	1. Farm food crops
	2. Farm nonfood crops
	3. Livestock
	4. Forestry
	5. Fishery
2. Mining	6. Coal and petroleum
	7. Other mining
3. Light Industry	8. Food, beverages and tobacco
	9. Textiles and leather
	10. Wood and furniture
	11. Paper and printing
4. Heavy Industry	12. Chemicals and refining
	13. Non metallic mineral
	14. Basic metals
	15. Machinery
	16. Other industry
5. Services	17. Electricity, gas and water
	18. Construction
	19. Trade and storage
	20. Restaurants and hotel
	21. Rail and road transportation
	22. Sea & air transport, and communications
	23. Financial services
	24. Real estate
	25. Public administration
	26. Social and other services

4.6 Summary

In this chapter, the methods of structural decomposition analysis and data have been discussed. It has been demonstrated that the structural decomposition analysis provides a detailed and systematic analysis of sources of structural change. By applying structural decomposition analysis, the principal factors affecting structural change in terms of output and employment can be classified in the following domains: technology, final demand, foreign trade and labour productivity.

The procedures of inflation of IO tables adopted in this study have also been discussed. These procedures were important to obtain consistent IO tables for this comparative study. The research period is divided into two periods, period 1 (1971–1985) and period 2 (1985–1995) which represent import-substitution growth pattern and export-promotion growth pattern in the Indonesian economy, respectively. The results of decomposition analysis for the Indonesian economy between 1971 and 1995 are presented in Chapter 5.

Chapter 5: An Application of Decomposition Analysis to the Indonesian Economy

5.1 Introduction

In this chapter the patterns of growth and structural change of output and employment in Indonesia for the periods 1971-1985 and 1985-1995 are evaluated. The policy changes introduced in Indonesia will be taken into account in assessing changing patterns of output and employment in Indonesia. For this purpose, basic policies of the Indonesian economy during the periods of study are highlighted in this section.

Indonesia's economy grew impressively for most of the past three decades of development process (1966-1996). Real GDP increased at an average rate of more than 6 per cent per year. Sustained rapid growth has allowed living standards to improve significantly, with a 4.5 annual increase in per capita income between 1970 and 1996 (based on World Bank data). The focus of growth in rural areas has also enabled Indonesia to achieve a substantial reduction in poverty from three fifths in 1970 to one seventh of the population in 1993.

During the first two decades of the development process, Indonesia enjoyed a more favourable external and macroeconomic policy environment than other developing countries. Government revenues increased dramatically due to the rising world market price for the country's oil exports. Oil profits have been channelled into rapid expansion of agricultural output and the development of infrastructure and education. The government also maintained sound macroeconomic policy management to ensure rapid economic growth in all sectors.

When petroleum prices fell in the mid-1980s, the government responded to the economic crises by undertaking two types of policies. First, since 1983, the government has adopted more austere macroeconomic policies to continue macroeconomic stability. Second, the government adopted structural adjustment policies to restructure the economy so as to reduce the dependence on oil as a source of foreign exchange and budget revenues, and to change sources of growth through a more diversified, export-oriented growth strategy. The measures designed to restructure the economy were (1) two major devaluations of the rupiah, (2) a major tax reform, (3) a comprehensive financial sector reform, (4) a series of trade-related reforms, and (5) a subtle change in policy emphasis

during the mid-1980s away from import substitution strategy in favour of a more export-oriented approach.

As a result of careful control over monetary and fiscal policies, despite the external shocks, Indonesia still managed to achieve an average growth rate of more than 5 per cent per year during the 1980s, with the non-oil export sector leading the way. Inflation has been kept down to an average of less than 10 per cent. Structural adjustment policies greatly improved the competitiveness of domestic industry, with manufactured goods becoming the fastest growing non-oil export. Indonesia's reliance on industrialisation for continued rapid growth of output, exports and employment will be essential to meet Indonesia's development goals in the years ahead.

The Indonesian economy has undergone a major economic and structural transformation. This takes the form of a change in the scale of the various sectors and industries and in the emergence of new industries. There were several reasons for the change, the most important being changes in economic policy, the oil booms of the 1970s as well as the boom in primary commodity prices, the negative oil shock in the early 1980s, the emergence of new technologies, the growth of domestic and international markets, and the changes in consumer demand and taste patterns. A better understanding of how these forces changed Indonesian production of goods and services and also employment in the past decades will enable future economic restructuring to be better anticipated.

In the previous chapter, the methods of structural decomposition analysis employed by this study were discussed. In these approaches output and employment growth of each sector are decomposed into four sources, namely, domestic demand expansion, export expansion, import substitution, and technological change. For the decomposition of employment there is an additional source variable: labour productivity. In this chapter, output and employment changes in the Indonesian economy from 1971 to 1995 are analysed using a 26 sector input-output framework. At the time of the study, the 1995 input-output account was the most recent table available on the Indonesian economy. All calculations are performed at the 26 sector level, with the results then aggregated for presentation to five broad sectors: agriculture, mining, light industry, heavy industry and services.

The chapter is organised into the following sections. Section 5.2 begins with a review of the structural change characterising the Indonesian economy. Section 5.3 presents the results of the model described in the previous chapter, determining sources of industrial growth by comparing them between two periods, period 1 (1971-1985) and period 2 (1985-1995). Special attention is given to findings for the importance of foreign trade in

the process of structural change. Section 5.4 discusses the changing pattern of the structural change. Section 5.5 evaluates the pattern of employment growth in the Indonesian economy. Comparison of the Indonesian experience with that of some other countries is presented in Section 5.6. Section 5.7 tests the hypotheses posited in this study. Finally, concluding remarks are given in Section 7.

5.2 Changes in Industrial Structure

The purpose of this section is to investigate the changes in the overall industrial structure that have taken place during the 1971-1995 period. The three input-output tables at constant prices for 1971, 1985 and 1995 have been used as the basis of the analysis.

Table 5.1 provides a sketch of the changes that occurred in the Indonesian economy over the 1971 to 1995 period. As shown in the table, the share of agriculture in the total value added in 1995 constant prices has declined from 35.00 per cent to 17.46 per cent. Though the importance of agriculture has declined, it still constitutes a significant portion of the economy. On the other hand, the industry (manufacturing) sector expanded of its share of the total value added by more than 11 percentage points. The industry sector increased its share of the total value added from 12.10 per cent in 1971 to 23.69 per cent in 1995. Thus, the 1971 to 1995 period provides clear evidence of the growing importance of the industrial component of the Indonesian economy.

Table 5.1: Value added by industrial origin at 1995 constant prices (percentage share)

Sector	1971	1985	1995
Agriculture	35.00	22.94	17.46
Mining	7.26	14.92	7.67
Light industry	5.99	6.29	13.07
Heavy industry	6.11	9.30	10.62
Services	45.64	46.54	51.19
Total	***100.00***	***100.00***	***100.00***

The share of the mining sector increased more than double, from 7.26 per cent in 1971 to 14.92 per cent in 1985, though by 1995 it had declined to 7.67 per cent. The increase up to 1985 was largely due to price increases rather than to changes in volume. Services increased its share in total value added, from 45.64 per cent in 1971 to 51.19 per cent in 1995.

Table 5.2 and 5.3 provide the sectoral share of exports and imports between 1971 and 1995, respectively. Table 5.2 presents a dramatic change in the composition of exports from mining and oil to non-mining and non-oil as the major contributor to total exports. In 1971, industry (manufacturing) constituted not more than 11 per cent of total exports. By 1995 the share of manufacturing exports surpassed the share of agricultural exports and overtook the share of mining and oil exports. As the share of agricultural and primary products exports declined and the share of manufacturing exports increased, Indonesia became less prone to external shocks. Table 5.2 shows a large swing in the share of agricultural and other primary commodities in total exports. Table 5.3 shows that the share of manufacturing sectors in total imports increased. Most of the imports comprise capital goods, intermediate goods and industrial raw materials.

Table 5.2: Export by industrial origin at 1995 constant prices (percentage share)

Sector	1971	1985	1995
Agriculture	32.72	6.88	1.62
Mining	33.67	43.43	15.03
Light industry	6.78	7.78	29.55
Heavy industry	3.77	29.29	27.75
Services	23.05	12.61	26.05
Total	*100.00*	*100.00*	*100.00*

Table 5.3: Import by industrial origin at 1995 constant prices (percentage share)

Sector	1971	1985	1995
Agriculture	3.12	5.09	2.78
Mining	0.43	7.19	2.85
Light industry	18.30	4.31	10.53
Heavy industry	70.19	65.23	65.99
Services	7.95	18.18	17.85
Total	*100.00*	*100.00*	*100.00*

Tables 5.4, 5.5 and 5.6 summarise the structural change in the Indonesian economy according to the degree of trade orientation and openness of the economy to international trade. Generally, the economy was found to be more integrated with the international market in the later period. Both its ratios of export and import increased from 8.02 per cent to 12.31 per cent and 10.98 per cent to 13.30 per cent during the 1971-1995 period, respectively. The agricultural sector's export ratio has decreased from 8.33 per cent in 1971 to 1.63 per cent in 1995, reflecting that this sector's production is less export-oriented. Its corresponding import ratio has increased from 1.21 per cent in 1971 to 3.01 per cent in 1995. The forestry and farm nonfood crops sectors were the leading contributor to the agriculture export ratios in 1971 (Appendices 5.1, 5.2 and 5.3).

However, in 1985 and 1995 the farm nonfood crops and fishery sectors were the leading contributors to the agriculture export ratio. The forestry sector was no longer the leading contributor to agricultural export ratios in both years.

Table 5.4: Export ratio and import ratio in 1971 (billion rupiahs at 1995 constant prices)

Sector	Intermediate demand	Final demand	Export	Import	Total output	Export ratio
	(1)	(2)	(3)	(4)	(5) =(1)+(2)+(3)-(4)	(6) =(3)/(5)
Agriculture	24394	23040	4256	574	51116	8.33
Mining	3258	197	4380	80	7755	56.48
Light industry	6301	16625	882	3366	20442	4.31
Heavy industry	13162	13532	491	12910	14275	3.44
Services	17608	49400	2998	1463	68543	4.37
Total	***64723***	***102794***	***13007***	***18393***	***162131***	***8.02***

Table 5.5: Export ratio and import ratio in 1985 (billion rupiahs at 1995 constant prices)

Sector	Intermediate demand	Final demand	Export	Import	Total output	Export ratio
	(1)	(2)	(3)	(4)	(5) =(1)+(2)+(3)-(4)	(6) =(3)/(5)
Agriculture	32331	24984	3194	1703	58806	5.43
Mining	16093	617	20150	2404	34456	58.48
Light industry	12894	33260	3610	1441	48323	7.47
Heavy industry	39238	19323	13588	21814	50335	27.00
Services	41126	110010	5852	6081	150907	3.88
Total	***141682***	***188194***	***46394***	***33443***	***342827***	***13.53***

Table 5.6: Export ratio and import ratio in 1995 (billion rupiahs)

Sector	Intermediate demand	Final demand	Export	Import	Total output	Export ratio
	(1)	(2)	(3)	(4)	(5) =(1)+(2)+(3)-(4)	(6) =(3)/(5)
Agriculture	76838	46597	1983	3711	121707	1.63
Mining	28205	4777	18391	3809	47564	38.67
Light industry	70968	107671	36155	14085	200709	18.01
Heavy industry	131770	77186	33957	88251	154662	21.96
Services	150578	310930	31873	23872	469509	6.79
Total	***458359***	***547161***	***122359***	***133728***	***994151***	***12.31***

In order to promote the development of plywood and sawnwood industries, export of raw logs was gradually banned in the early 1980s. The export restriction caused the forestry export ratio to decline significantly. However, by considerably reducing the supply of

timber in the world market, Indonesia has been able to increase the cost of raw material in world plywood industries, out-competing other plywood producing countries, and finally dominating the world plywood market. In 1980 Indonesia's share of the world plywood market was only 1 per cent. By 1992, a third of world plywood exports came from Indonesia. As a consequence of the raw logs export restriction, the export ratio of the wood and furniture sectors increased significantly from only 0.25 per cent in 1971 to 38.40 per cent in 1985 and 46.11 per cent in 1995 (Appendices 5.1, 5.2 and 5.3).

The export ratio of the light industry was 4.31 per cent in 1971, increasing to 7.47 per cent in 1985 and to 18.01 per cent in 1995; while its corresponding import ratio decreased from 14.68 per cent in 1971 to 3.12 per cent in 1985, and then increased to 7.88 per cent in 1995 (Tables 5.4, 5.5 and 5.6). Textiles and leather, and wood and furniture sectors were the major contributors to improved light industry's export ratio (Appendices 5.1, 5.2 and 5.3).

The heavy industry sector export ratio was the smallest among sectors in 1971, while in 1985 and 1995 it was the second highest, indicating that its production is more export oriented (Tables 5.4 and 5.6). The export ratios of this sector were 3.44 per cent, 27.00 per cent and 21.96 per cent in 1971, 1985, and 1995, respectively. Chemicals and refining, basic metals, machinery, and other industry sectors were the main contributing sectors to the higher export ratio in the heavy industry sector (Appendices 5.1, 5.2 and 5.3). However, the heavy industry sector's import ratios were always the highest among the sectors during the period 1971-1995.

The export and import ratios of the service sectors in 1971 were 4.37 per cent and 2.18 per cent, respectively, then increased to 6.79 per cent and 5.17 per cent in 1995, respectively (Tables 5.4, 5.5 and 5.6). These figures show that products of this sector had a low orientation towards trade.

In short, the early 1980s showed a clear sign of export substitution from primary exports to manufactured exports. The share of manufacturing sectors in total exports was increasing, while the share of primary sectors in total exports was decreasing. Not surprisingly, the fastest-growing exports of manufactures comprise unskilled labour intensive products.

5.3 Decomposition of Output Growth

The results of decomposing sectoral output growth in terms of its four sources of growth, that is, domestic final demand (DFD) effect, export demand (ED) effect, import substitution (IS) effect and technological change or input-output coefficient (IO) effect are presented in this section. Decomposition of output growth into components for the period 1971-1985 and the period 1985-1995 is presented in Tables 5.7 and 5.8, respectively. All decomposed terms are shown as arithmetic averages of Laspeyres and Paasche indexes. The first panel in these tables is absolute growth in billion rupiahs. The second panel is the percentage shares of different components in output growth in each industry; the figures across each row therefore sum to 100 per cent. Expressing the magnitude of each contribution in percentage shares enables us to compare the results across sectors. Because of the nature of relative share, the size of these figures depends not only upon their own absolute contribution, but also upon the contribution of other components to the total. Therefore, the interpretation of these shares should refer to corresponding figures of overall growth. For this reason, the third panel shows the percentage shares of different components in total output growth.

Table 5.7: The sources of economic growth: 1971–1985

Sector	DFD	ED	IS	IO	Total
		A. Absolute growth in billion rupiahs			
Agriculture	20312	300	198	–13121	7689
Mining	4080	21011	–844	2456	26703
Light industry	19664	4114	3945	159	27882
Heavy industry	13156	15407	3376	4121	36060
Services	75858	7315	–551	–256	82366
Total	***133070***	***48147***	***6124***	***–6641***	***180700***
		B. As percentage of sectoral output growth			
Agriculture	264	4	3	–171	100
Mining	15	79	–3	9	100
Light industry	71	15	14	1	100
Heavy industry	36	43	9	11	100
Services	92	9	–1	0	100
Total	***74***	***27***	***3***	***–4***	***100***
		C. As percentage of total output growth			
Agriculture	11	0	0	–7	4
Mining	2	12	0	1	15
Light industry	11	2	2	0	15
Heavy industry	7	9	2	2	20
Services	42	4	0	0	46
Total	***74***	***27***	***3***	***–4***	***100***

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.

Table 5.8: The sources of economic growth: 1985–1995

Sector	DFD	ED	IS	IO	Total
		A. Absolute growth in billion rupiahs			
Agriculture	72970	8997	–2257	–16808	62901
Mining	16097	2086	–1207	–3869	13107
Light industry	99828	45012	–5577	13122	152385
Heavy industry	75082	32314	–5676	2609	104329
Services	261351	44083	–2469	15636	318601
Total	***525327***	***132492***	***–17186***	***10691***	***651323***
		B. As percentage of sectoral output growth			
Agriculture	116	14	–4	–27	100
Mining	123	16	–9	–30	100
Light industry	66	30	–4	9	100
Heavy industry	72	31	–5	3	100
Services	82	14	–1	5	100
Total	***81***	***20***	***–3***	***2***	***100***
		C. As percentage of total output growth			
Agriculture	11	1	0	–3	10
Mining	2	0	0	–1	2
Light industry	15	7	–1	2	23
Heavy industry	12	5	–1	0	16
Services	40	7	0	2	49
Total	***81***	***20***	***–3***	***2***	***100***

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.

During the first period (1971-1985), at an aggregate level, the domestic final demand effect was the primary force for output growth. Table 5.7 shows that the domestic final demand effect was responsible for 74 per cent of total output growth. The export demand effect was the second largest influential component, accounting for 27 per cent. The import substitution effect has a positive impact on total output growth, while the technological change effect accounted for -4 per cent. The positive import substitution effect means that the market strategy for the entire economy was to substitute for imports. The negative technological change effect on overall growth indicates that the backward linkage of the entire economy was weakened.

During the second period (1985-1995), at an aggregate level, the domestic final demand effect was the largest influential component accounting for 81 per cent (Table 5.8). The increase in relative contribution of the domestic final demand effect was positive (7 per cent) compared with that of the first period. This finding tends to support the hypothesis that the larger the economy, the less important the foreign trade. In large economies like Indonesia, domestic demand is believed to be sufficiently large for producers to attain an

optimum level of production in a number of commodities (Urata 1989). The findings can also be explained partly by the higher investment rate in the economy in the second period.

During the second period, the export demand effect still contributed significantly to the total output growth accounting for 20 per cent of total output growth (Table 5.8). Although its relative share of total output dropped during the second period, the export demand effect played a positive role in all sectors, with the size of contributions varying from one sector to another. We can see from Table 5.8 a higher contribution from export in the second period, especially in agriculture, industry (light and heavy industries added together) and services sector compared with the first period.

The contribution of the import substitution effect was negative in the entire economy, accounting for –3 per cent in the second period of study (Table 5.8). The negative import substitution effect means that the market strategy for the entire economy was no longer to substitute for imports, but instead to serve the growing domestic and export demands. In the second period, the contribution of import substitution effect was negative on the light and heavy industry and was zero on agriculture, mining and services sectors.

The technological change effect played a positive role in the second period (2 per cent). This indicates that interindustrial linkages were enhanced as reflected by an increasing share of intermediate demand in final production.

During the first period, a majority of output growth was contributed by services and manufacturing (light and heavy industries) sectors, which together contributed to 81 per cent of the entire economy's output growth, while agricultural and mining sectors contributed 4 per cent and 15 per cent, respectively (Table 5.7). The period 1985–1995 witnessed a clear shift in the sectoral contribution to the output growth with the mining sector reducing its importance while the rest of the sectors of the economy took up the share left behind by the mining sector (Table 5.8). A notable increase in sectoral contribution was found in the agricultural and manufacturing sectors whose shares increased to 10 per cent (from 2 per cent) and 38 per cent (from 35 per cent), respectively.

During the first period, the agricultural sector was found to be domestically driven as domestic final demand effect contributed considerably to its output growth. The domestic final demand effect accounted for 264 per cent of total output growth in agricultural sector. The export demand effect explained only 4 per cent of total output growth in agricultural sector, while the import substitution effect accounted for 3 per cent. The

technological change effect on agricultural output growth was negative (–171 per cent). The agricultural sector contributed 4 per cent to the total output growth of the economy.

During the second period, the domestic final demand effect was still the largest component. However, its magnitude decreased from 264 per cent to 116 per cent. Instead, the export demand effect, which was still the second largest component increased from 4 per cent to 14 per cent. As a result, the role of export effect became stronger. In the second period, the contribution of agricultural sector in total output growth increased to 10 per cent.

In the first period, mining sector was export-oriented, accounting for 79 per cent of total sectoral output followed by domestic final demand effect by 15 per cent and technological effect by 9 per cent. The import substitution effect was negative (–3 per cent). The sector contributed 15 per cent to the total output growth of the economy. However, in the second period the export demand effect became the second-largest component. As a result, the growth pattern turned from export-led to the domestic demand-driven type. The contribution of this sector in total output growth decreased considerably from 15 per cent in the first period to only 2 per cent in the second period.

Like the agricultural sector, the light industry sector was found to be domestically driven during the period 1971–1985. The export demand effect represents 71 per cent, followed closely by the import substitution effect, which accounted for 14 per cent. The technological change effect explained only 1 per cent of total sectoral output growth. The light industry contributed 15 per cent to the total output growth in the economy. The domestic final demand effect was still the largest component. However, its magnitude decreased from 71 per cent to 66 per cent. The export demand effect increased from 15 per cent to 30 per cent. As a result, the role of export effect became stronger. The contribution of this sector in total output growth increased from 15 per cent in the first period to 23 per cent in the second period.

The heavy industry sector was found to be export-oriented in the first period. The export demand effect accounted for 43 per cent. The domestic final demand effect contributed 36 per cent to its output growth. The technological change effect explained 11 per cent of its output growth, while the import substitution accounted for 9 per cent. The heavy industry sector contributed 20 per cent to total output growth of the economy. The domestic final demand effect in the second period was the largest component. As a result, the growth pattern of this industry turned from export-led to the domestic demand-driven type. The export demand effect was the second largest component in the second period. However, its magnitude decreased from 43 per cent in the first period to 31 per cent in the

second period. This sector contributed 16 per cent in total output growth in the second period.

The service sector was found to be domestically driven in the first period, as domestic demand effect contributed 92 per cent to its output growth. The service sector contributed about 46 per cent to the overall output growth of the economy. In the second period, the domestic final demand effect in this sector was still the largest component. The contribution to the total output growth increased from 46 per cent in the first period to 49 per cent in the second period.

To indicate the differences in effect of trade policy on industrial structures, the decomposition results for the more disaggregated sectors of light and heavy industries (Appendices 5.4, 5.5, 5.6, 5.7, 5.8 and 5.9) will be analysed. The primary sources of change in total output growth of the nine Indonesian manufacturing sectors for the period 1971-1985 and 1985-1995 are summarised in Table 5. 9.

Table 5.9: Primary sources of change in total output growth of the Indonesian manufacturing sectors

Sector	1971-1985		1985-1995	
	Largest component	Smallest component	Largest component	Smallest component
Food, beverage and tobacco	DFD/IS	ED	DFD/ED	IS
Textiles and leather	ED/IS	IO	ED/DFD	IS
Wood and furniture	ED/DFD	IS	ED/DFD	IS
Paper and printing	DFD/IS	IO	DFD/ED	IS
Chemicals and refining	ED/DFD	IS	DFD/ED	IS
Non-metallic mineral	DFD/IS	IO	DFD/DE	IO
Basic metals	ED/IS	IO	DFD/DE	IS
Machinery	DFD/IS	IO	DFD/DE	IS
Other industry	ED/DFD	IS	DFD/DE	IS

In the first period of the study, the domestic final demand and import substitution effects contributed substantially to output growth in food, beverage and tobacco, paper and printing, non-metallic mineral, and machinery sectors. The export demand and import substitution effects contributed substantially to output growth in textiles and leather and basic metals sectors. The export demand and domestic final demand effects contributed substantially to output growth in wood and furniture and chemicals and refining sectors. There are five of nine manufacturing sectors which have technological effects which are the smallest components of the sources of change in total output growth.

One interesting feature was that the total changes in the level of domestic final demand and export demand were the most important factors in explaining changes in manufacturing output in the second period of the study. In this second period, the import substitution effect was less important for most of the manufacturing sectors.

The number of sectors in manufacturing that have the export demand effect always exceeding the import substitution effect conform to our expectation, given the changes in trade policies between the two periods.

In agriculture, domestic final demand effect had a more consistent impact as a source of output growth than other factors such as export demand, import substitution and technological change effects. This fact also largely explains the more contained growth rate of agriculture than the other sectors in the Indonesian economy. However, in relative terms, the domestic final demand effect in the agricultural sector is declining, since its capacity is constrained by Engel's Law.

To show the net effect of trade on output growth, relative shares linked to export demand and import substitution effects are compared. Over both periods of study, agriculture recorded positive net effects due to trade. During the first period of study, the expansive effect on sectoral output due to export demand exceeded the import substitution. During the second period of study, Indonesia also recorded positive net effects for agriculture due to trade factors, because the positive contribution of export demand greatly exceeded the opposite effect of import substitution. Generally, the same happened for other sectors of the economy, so that it is possible to conclude that the net balance of trade in agriculture and the rest of economy constituted a strategic boost for the Indonesian economy.

5.4 Decomposition of Structural Change

In order to detect the causes of structural change (or changes in the composition of output), it is convenient to measure the deviation of changes in sectoral output from what would have prevailed if there had been balanced growth. To do this, the deviation model of structural change introduced in Chapter 4 (equation 34) is used. Tables 5.10 and 5.11 present a decomposition of the sources of sectoral deviation from balanced growth at the five-sector level for the first and the second periods of study, respectively.

Table 5.10: Deviation from balanced growth: 1971–1985

Sector	DFD	ED	IS	IO	Total
		A. Absolute growth in billion rupiahs			
Agriculture	–19194	300	198	–13121	–31818
Mining	380	21011	–844	2456	23003
Light industry	–2303	4114	3945	159	5914
Heavy industry	–3763	15407	3376	4121	19141
Services	7832	7315	–551	–256	14341
		B. As percentage of sectoral output deviation			
Agriculture	60	–1	–1	41	100
Mining	2	91	–4	11	100
Light industry	–39	70	67	3	100
Heavy industry	–20	80	18	22	100
Services	55	51	–4	–2	100

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.

Table 5.11: Deviation from balanced growth: 1985–1995

Sector	DFD	ED	IS	IO	Total
		A. Absolute growth in billion rupiahs			
Agriculture	–11278	–503	–2353	–21170	–35303
Mining	3161	–38648	–1071	–7879	–44438
Light industry	24328	37128	–5856	16083	71682
Heavy industry	19952	1545	–7958	6731	20271
Services	25273	23570	–4405	22147	66585
		B. As percentage of sectoral output deviation			
Agriculture	32	1	7	60	100
Mining	–7	87	2	18	100
Light industry	34	52	–8	22	100
Heavy industry	98	8	–39	33	100
Services	38	35	–7	33	100

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.

During the first period of study, the output deviation for the agriculture sector was negative. The agriculture sector deviated from its past proportional growth trend during 1971-1985 by a very large margin of - Rp 31 818 billions (Table 5.10). This was a result of a large negative contribution from domestic final demand (60 per cent). Along with other forces, Engel's Law appears to work. Changes in input-output coefficients had the second largest impact on structural change in agriculture, contributing an average decrease of 41 per cent. The export demand and input substitution effects were not significant sources of structural change in agriculture.

During the first period of study, the mining sector had a structural change or deviation from 15 per cent proportional growth trend by Rp 23 003 billions (Table 5.10). This was a result of deviation in exports (91 per cent), a change in input-output used (11 per cent), import (- 4 per cent) and domestic final demand (2 per cent). In the mining sector, export demand effect played the dominant role in structural change.

During the first period, the output deviation for the light industry was positive. Export demand and import substitution effects played the dominant role in structural change in the light industry. Export demand and import substitution effect accounted for 70 per cent and 67 per cent of the deviation of the light industry output from balanced growth, respectively (Table 5.10).

Heavy industry showed an increasing trend from a proportional growth path during the first period (Table 5.10). This was a result of deviation of export demand (80 per cent), a change in input-output used (22 per cent), import substitution (18 per cent), and domestic final demand (-20 per cent).

During the first period of study, services grew by Rp 14 341 billions from its proportional growth path mainly as a result of structural change in domestic final demand (55 per cent) and export (51 per cent).

During the second period of study, the output deviations for agriculture and mining sectors were negative (Table 5.11). The declining trend from a proportional growth path in agriculture was caused mainly by significant structural changes in input-output coefficients and domestic final demand. In the mining sector, export demand was the major factor in explaining the declining trend from its proportional growth path. The input-output coefficient was the second-largest factor.

When compared to the pattern in 1985, the 1995 light industry output moved heavily towards the export market. The increases in export demand generated about Rp 37 128 billions more in exports than they would have under the structure in place in 1985.

In the meantime, light industry also gained Rp 24 328 billions more from the increase of domestic final demand. The domestic final demand effect had the second largest impact on structural change in light industry.

During the second period of study, domestic final demand dominated the other sources of structural change, accounting for 98 per cent of the deviation of heavy industry output from balanced growth. Although import substitution made a significant contribution to the

non-proportional growth of the heavy industry, it was not large enough to offset the effect of domestic final demand.

During the second period services grew by Rp 66 585 billions from its proportional growth path mainly as a result of structural change in domestic final demand (38 per cent), exports (35 per cent) and technological changes (33 per cent).

In summary, the relative decline in agricultural output in the first period of study was mainly caused by the compositional shift of domestic final demand, presumably resulting from the low income elasticity of demand for agricultural products and high income elasticity for most manufacturing products. The negative change in input-output coefficients in the first period of study was the second largest contributor to the non-proportional growth in the agricultural sector. During the second period of study, the effect of technological change played a much more important role in the process of structural change (accounting for 60 per cent of the non-proportional growth in agriculture).

5.5 Decomposition of Employment Growth

Table 5.12 shows how the five sources of change contributed to employment growth in each industry in the first period of study, between 1971 and 1985. The percentage change estimates in panel B are based on panel A, which shows the absolute changes in industry employment decomposed into each source of growth. The panel C that shows the percentage shares of different components in total employment growth is also based on panel A.

As shown in Table 5.12 panel C, total employment increased in the first period of study, between 1971 and 1985. Employment in all industries increased. Employment growth was strong in agricultural and services sectors. Strongest employment growth was contributed by both sectors, together contributing to 89 per cent of the entire employment growth. Employment growth in mining, light industry and heavy industry was not strong.

Changes in domestic final demand had the greatest effect on changes in industry employment. Domestic final demand captures the effects on industry employment of factors such as changes in the pattern of consumption and business investment due to changes in income, taste, population and government policies. The general growth of domestic final demand in the economy contributed to increases in employment in all industries.

Table 5.12: The sources of employment growth: 1971-1985

Sector	DFD	ED	IS	IO	LP	Total
			A. Absolute growth in persons			
Agriculture	9273644	43514	–46530	–6036945	7552011	10785694
Mining	114577	150629	–10928	23478	73479	351235
Light industry	1184068	1153014	371501	244790	–813735	2139638
Heavy industry	625707	527607	347050	162366	–1032223	630508
Services	12410455	1072494	–344724	329962	–2170092	11298095
Total	***23608451***	***2947257***	***316369***	***–5276348***	***3609440***	***25205170***
			B. As percentage of sectoral employment growth			
Agriculture	86	0	0	–56	70	100
Mining	33	43	–3	7	21	100
Light industry	55	54	17	11	–38	100
Heavy industry	99	84	55	26	–164	100
Services	110	9	–3	3	–19	100
Total	***94***	***12***	***1***	***–21***	***14***	***100***
			C. As percentage of total employment growth			
Agriculture	37	0	0	–24	30	43
Mining	0	1	0	0	0	1
Light industry	5	5	1	1	–3	8
Heavy industry	2	2	1	1	–4	3
Services	49	4	–1	1	–9	45
Total	***94***	***12***	***1***	***–21***	***14***	***100***

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.
LP = labour productivity.

Technological changes had the second-largest impact on changes in employment, contributing an average decrease of 21 per cent. Technological changes refer to changes in a particular industry's output to produce each unit of other industry's (and its own) output. Technological changes or changes in input-output coefficients may result from technological change or changes in the composition of goods produced by industry. The industry with the most significant declines in employment growth due to technological changes was the agricultural sector. In the case of mining, light industry, heavy industry and services, the technological changes contributed to an increase in employment.

The next greatest influence on overall industry employment was labour productivity, which increased employment growth by 14 per cent. The agricultural sector contributed to increases in employment in the economy due to decrease in labour productivity.

Changes in industry employment due to export demand increased the growth in total employment in the economy by 12 per cent. Growth in export demand had a particularly

large effect in mining, light industry and heavy industry, contributing 43 per cent, 54 per cent and 84 per cent to its industry's employment growth, respectively. Changes in import substitution had only a small effect on total employment growth in the economy. Changes in industry employment due to import substitution increased the growth in total employment in the economy by one per cent. However, in the case of light industry and heavy industry, growth in import substitution had a particularly large effect on the industry's employment growth. The import-substitution industrialisation strategy could have been a factor contributing to the increase in import substitution.

Total employment increased in the second period of study, between 1985 and 1995. Employment increased in all industries. These increases were concentrated in the services, light industry and agricultural sectors.

Table 5.13 shows that at an aggregate level the most important sources of growth in employment in the second period of study, between 1985 and 1995, were changes in domestic final demand, labour productivity, export demand and technological change.

Table 5.13: The sources of employment growth: 1985-1995

Sector	DFD	ED	IS	IO	LP	Total
			A. Absolute growth in persons			
Agriculture	36573751	3573856	–2045883	–13883533	–20438459	3779732
Mining	498520	51126	45014	366695	–567121	394233
Light industry	5683989	4411696	–598736	1104752	–6503150	4098551
Heavy industry	2259465	832795	–60597	73819	–1504589	1600893
Services	26936507	5356614	–276007	–669547	–20416993	10930574
Total	***71952232***	***14226087***	***–2936211***	***–13007814***	***–49430311***	***20803983***
			B. As percentage of sectoral employment growth			
Agriculture	968	95	–54	–367	–541	100
Mining	126	13	11	93	–144	100
Light industry	139	108	–15	27	–159	100
Heavy industry	141	52	–4	5	–94	100
Services	246	49	–3	–6	–187	100
Total	***346***	***68***	***–14***	***–63***	***–238***	***100***
			C. As percentage of total employment growth			
Agriculture	176	17	–10	–67	–98	18
Mining	2	0	0	2	–3	2
Light industry	27	21	–3	5	–31	20
Heavy industry	11	4	0	0	–7	8
Services	129	26	–1	–3	–98	53
Total	***346***	***68***	***–14***	***–63***	***–238***	***100***

Notes:
DFD = domestic demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.
LP = labour productivity.

Increase in labour productivity reduced employment growth across all industries. It had the greatest effect on employment in agricultural, services and light industry sectors.

Comparing Tables 5.12 and 5.13, export demand effect had a much greater effect on changes in industry employment in the second period than during the first period. The high employment growth in the light industry sector due to export demand growth may be partly due to export-oriented industrialisation strategy in the light industry over the period.

In the second period of study, changes in input-output coefficients decreased employment growth overall, but increased employment growth in mining and services sectors. Changes in input-output coefficient had the greatest effect on employment growth in the agricultural sector.

5.6 Comparison of Sources of Growth with Other Countries

The results of the present study can be compared directly with the results from other studies for Indonesia (Akita 1991), and with the results for other countries over various periods. These results are presented in Table 5.14.

It may, however, be pointed out that the comparisons among countries become less permissible because of the differences in the time periods of measuring the sources of growth, in spite of the fact that the studies on these countries growth sources were done by the same method of analysis. Moreover, the countries may exhibit a wide range of diversities in size of population, per capita income, production structure, role of foreign trade, natural endowments, policy factors, etc. Keeping in mind these limitations, however, the comparisons give a general view of how countries' development patterns have changed over time as analysed by the model.

A comparison of findings about the sources of output growth in the Indonesian economy shows that domestic final demand and export demand effects have made significant contributions. These results of the study are consistent with the results for other economies. In all countries, domestic final demand effect was the most important source of growth during the whole period of study. Belgium and the Netherlands were the only exceptions, i.e. the countries with smaller internal markets.

What is striking about the results for Indonesia is the rapid decline in the contribution of domestic final demand to output growth. During 1971-1975, the contribution of domestic

final demand effect in Indonesia was 113.6 per cent, which is by far the largest magnitude in the samples. By 1985-1995, however, the contribution slid down to 81 per cent. The annual decrease rate was 1.36 per cent during 1971-1995, even higher than the figures for Korea during 1975-1985 (1.2 percentage points).

Table 5.14: Comparison of sources of output growth

	Period	DFD	ED	IS	IO
Australia	1974–1986	99.7	17.6	– 8.4	– 8.9
	1983–1992	66.5	32.3	– 12.8	14.0
Belgium	1960–1970	63.7	52.5	– 60.3	44.1
	1970–1980	45.9	71.8	– 11.4	– 6.3
China	1956–1965	107.2	1.9	9.2	–18.3
	1965–1975	85.7	5.6	–1.3	10.1
	1975–1981	80.3	16.4	–7.9	11.2
	1987–1992	48.1	19.4	3.2	29.3
France	1960–1970	78.0	17.0	– 12.2	17.2
	1970–1980	88.0	39.6	– 21.0	– 7.2
	1977–1985	81.0	47.9	– 32.6	3.7
Germany	1960–1970	69.0	18.6	– 11.1	23.5
	1970–1980	66.4	63.2	– 15.8	– 13.8
	1978–1986	64.1	60.5	– 30.5	5.9
India	1959–1968	81.0	5.1	7.4	6.6
	1968–1973	91.6	6.0	9.3	–7.0
	1973–1981	81.0	8.3	–10.8	21.5
	1973–1984	72.5	5.4	–0.4	22.4
Indonesia	1971–1975	113.6	21.5	–8.3	–26.8
	1975–1980	79.1	20.3	–1.7	2.4
	1971–1985	***74.0***	***27.0***	***3.0***	***–4.0***
	1985–1995	***81.0***	***20.0***	***–3.0***	***2.0***
Italy	1960–1970	72.9	21.0	– 23.2	3.7
	1970–1980	71.1	31.0	0.5	– 10.0
Japan	1965–1970	82.6	14.9	– 3.2	5.7
	1970–1985	75.7	28.4	– 2.1	– 2.0
	1975–1985	74.0	26.0	– 2.9	– 2.9
Netherlands	1960–1970	79.0	40.5	– 11.2	17.5
	1970–1980	48.7	60.8	1.7	– 3.8
Korea	1975–1980	62.0	29.0	4.0	5.0
	1980–1985	54.0	31.0	5.0	10.0
	1975–1985	50.0	33.0	4.0	13.0
Taiwan	1964–1966	49.7	36.7	–2.9	16.5
	1966–1971	59.8	44.7	0.2	–4.6
	1971–1976	53.7	49.5	2.4	–5.7
	1976–1981	55.1	44.3	3.8	–3.1
Thailand	1975–1980	76.9	24.9	–1.2	–0.2
	1980–1985	81.7	22.5	–9.1	5.1
	1985–1990	87.1	33.7	–13.1	–6.8
USA	1972–1985	106.2	15.5	– 15.0	– 6.7
	1977–1985	116.2	6.9	– 9.3	– 13.8

Notes:
DFD = domestic final demand effect.
ED = export demand effect.
IS = import substitution effect.
IO = technological change effect.

Source: Akita (1991), Bhardwaj and Chadha (1991), Carri (1995), de Laine, Lee and Woodbridge (1997), Limskul (1995), Liu (1998), OECD (1992).

The empirical results of sources of output growth in Table 5.14 reveal that the absolute values of the contribution of export demand effect increased over time. Export expansion contributed significantly to the growth of total output in the Indonesian economy (20-27 per cent). The effect of export expansion was more prominent during the 1971-1985 period, due in large part to the export by the mining sector. However, in the period of 1985-1995, the effect of export demand by the mining sector disappeared totally. The analysis of sources of output growth has revealed that the fluctuations in the contribution of export demand effect were obviously influenced by the fluctuations of oil prices. The positive trend of export demand effect in total output growth in Indonesia is consistent with the direction of changes in all countries, except India, USA and Japan.

In contrast to exports, mostly import substitution effects in Indonesia had a negative impact. When import substitution has a negative effect, it means part of the total domestic demand previously satisfied by domestic demand is replaced by imports. The negative contribution of import substitution in total output growth in Indonesia is consistent with the results for other economies (except Korea and Taiwan).

Although no clear trends emerge in the direction of change in input-output coefficients for the sample economies, it is interesting to notice that Indonesia recorded a positive change in input-output coefficients, from -26.8 per cent in 1971-1975 to 2 per cent in 1985-1995. These trends indicate increasingly strong linkages between sectors.

5.7 Hypotheses Testing

In order to evaluate the patterns of growth of output and employment in Indonesian agriculture for the periods 1971-1985 and 1985-1990, three hypotheses are posited in this study. First, it is hypothesised that for agriculture, the only sources of output growth are the domestic final demand factor, and the agriculture records positive net effects of trade on output growth. In agriculture, domestic final demand was consistently the largest influence component accounting for 264 per cent and 116 per cent in the first and the second periods of study, respectively (Tables 5.7 and 5.8). Over the periods of study, agriculture always recorded positive net effects due to trade (Tables 5.7 and 5.8). These results would support the null hypothesis.

Second, it is hypothesised that for agriculture, the sources of employment growth are final demand and labour productivity. Tables 5.12 and 5.13 show that the most important sources of growth in employment were changes in domestic final demand and labour productivity. With these results, the second hypothesis is thus maintained.

Third, it is hypothesised that the pattern of structural change in agriculture is influenced by changes in the domestic final demand and technological change. In both periods of study, the output deviation for agriculture was negative. This was a result of large negative contributions from domestic final demand and technological change. The foreign trade effects were not significant sources of structural change in agriculture. It is also interesting to note that the technological change effect was larger than domestic final demand effect in the second period of study. The third hypothesis is thus not rejected.

5.8 Concluding Remarks

On the basis of the models developed to analyse the sources of output growth and structural change from the demand side, Indonesian economy experience during 1971-1995 is analysed. The analysis shows that Indonesia enjoyed an extraordinarily rapid growth. Economic growth in Indonesia was accompanied by significant structural change. The rapid industrial growth reduced the importance of agriculture.

The empirical results of sources of output growth reveal that domestic final demand and export demand effects have made significant contributions. The analysis at the aggregate level indicates that the most important factor in total output growth during the periods under study was consistently the increase in output induced by changes in domestic final demand. However, the contribution from domestic final demand tends to decline over time. The direction of the changes in the contribution of domestic final demand factors in Indonesia was consistent with the pattern found in other economies, except for the USA and Thailand. The main cause of the rapid decline in the percentage contribution of domestic final demand to output growth was a declining role of consumption and investment in the economy.

As the Indonesian economy undergoes fundamental structural transformation, from a primarily agricultural to a highly industrial economy, the contribution of exports to output growth becomes relatively stronger in the process of economic development in the country, especially in the industrial (manufacturing) sectors. This trend is consistent with the direction of changes in all countries, except India, USA, and Japan. The increasing role of export demand effect in total output growth reflects the remarkable trade liberalisation policy pursued by Indonesia.

There is solid evidence that a series of structural adjustment policies with a view to help restructure the economy to move toward an outward looking structure based on manufactured exports has played a significant role in stimulating manufactured exports

gradually. The input-output tables exhibit clearly a shift away from dependence on primary exports toward manufactured exports. It may be concluded that it was export demand effect that overcame Indonesia's economic crisis due to the collapse of oil prices in the mid-1980s.

Employment patterns shifted in a manner consistent with changing industrial structure. The employment growth patterns shifted away from the agriculture sector to more sophisticated manufacturing industries and services. Since labour productivity rose rapidly in the Indonesian economy during the second period of study, employment in all sectors could have become smaller without the rapid expansion of domestic final demand and export demand. There is solid evidence that the growth of export-oriented manufacturing sectors, especially in the light industry, can make a strong contribution to such employment creation. The results indicate that policy reorientation of the Indonesian economy in the mid–1980s was broadly a success in stimulating growth of exports in sectors of emerging comparative advantage.

The study is not without limitations. First, the methodological framework does not explicitly incorporate policy variables and so it cannot trace out the sequence of causal links between policies and effects. Second, due to the lack of detail on sectoral output inflators, the national output inflators were used to obtain real input-output tables. This will distort the relative magnitude. Third, the growth-factor decomposition analysis based on an input-output tables approach is from the demand side and thus should be supplemented by a supply-side growth-factor decomposition analysis. Fourth, this study is essentially a comparative static analysis, which evaluates the static equilibrium solutions in the base and terminal years and does not take into account the continuous changes over the periods of study. Nevertheless, the present study adds to the scanty evidence available on the sources of growth and structural change in the Indonesian economy.

The input-output decomposition analysis suffers from its use of a simple accounting framework for evaluating the causal forces that explain structural change. This limitation presented the need for a more sophisticated general equilibrium model, where the interdependence between demand-side and supply-side causal forces is explicitly modelled. In next chapter, the literature in the fields of CGE modelling theory is reviewed.