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Late Industrialisation and Structural Change: The Indonesian Experience

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Abstract:
In this paper, we explore economic growth and structural change in Indonesia during the 1975-2000 period using an input-output-based structural change decomposition method. The analysis focuses on the sources and pattern of growth during the inward-oriented phase from 1975 to 1985, the outward-oriented phase from 1985 to 1995 and the recent, crisis and recovery phase from 1995 to 2000. The results reveal that between the inward- and outward-oriented phases, the key source of manufacturing growth shifted from import-substitution to export-expansion. During the final phase of crisis and recovery, value added growth stemmed almost entirely from exports. Between the first two phases, although the influence of macro consumption and investment demand on sectoral growth did not change much, their reallocation effect showed marked differences. Results on the impact of other factors, such as value-addition effect and technical change, also provide important insights into the process of structural change and late industrialisation.

Keywords: Structural change, liberalisation, export-orientation, economic crisis

JEL: F02, F43, C67, L52
1. Introduction

Late industrialisation is often considered to involve a sequential shift in the engines of manufacturing growth from traditional to modern industries (Amsden, 2001). The industrialisation experience of East Asia’s Newly Industrialised Countries (NICs), especially Korea and Taiwan, demonstrates this. Before their entry into technology- and scale-intensive industries during the mid-seventies, they had accumulated nearly a decade-long manufacturing experience in traditional and light industries. The East Asian industrialisation was assisted by a policy regime, which nurtured learning and innovation by adopting an export-oriented industrialisation strategy.

Indonesia offers a slightly different example of late industrialisation on account of following a different sequence of industrialisation and of a fluctuating policy regime. Compared to Korea and Taiwan, Indonesia’s industrialisation began much later, from the seventies, with a state-led heavy industrialisation-drive under an import-substituting, export-pessimistic industrialisation strategy (Hill, 1996). This gave way to an export-oriented industrialisation strategy, based mainly on resource- and labour-intensive industries, from the mid-eighties. The nineties saw science-based industries playing a leading role in manufacturing exports, thanks to an acceleration in foreign investment, especially from the NICs and Japan.

The manufacturing growth from the late sixties until the economic crisis of 1997 has been one of the fastest in the contemporary world. Between 1975 and 2000, manufacturing’s share in total value added and exports rose from 10.8% and 9.4% to 27% and 55.1%, respectively (see Section 2, Table 1). The economic crisis beginning late 1997, however, reversed this trajectory of rapid growth. The annual growth rate of output in 1998 turned negative for most sectors, accompanied by widespread unemployment in manufacturing and services, worsening of the investment
climate and a net outflow of capital (Hill, 1999).

Given this background, this paper investigates the sources and pattern of growth during the inward-oriented phase from 1975 to 1985, the outward-oriented phase from 1985 to 1995 and the more recent, crisis and recovery phase from 1995 to 2000. We employ an, extended, input-output (IO)-based method of structural change decomposition. The IO-framework is appropriate for analysing structural change due to its recognition of the sectoral interdependence of an economy. For Indonesia, this approach has the particular advantage that the IO tables provide the most exhaustive (in terms of coverage) and detailed (in terms of sectors) sets of comparable data from 1975 onwards.1 We decompose the sectoral value added growth for each phase into, the contributions from the input-coefficients (technical change), the value-addition effect, the import-substitution effect and the growth in the final demand components. The latter is decomposed further into the aggregate growth in each final demand component (macro demand) and the changes in their inter-sectoral allocation (reallocation effect). The relative contribution of these factors across industries and policy-regimes provide us with important insights into the dynamics of growth and late industrialisation.

In Section 2, we discuss the salient features of the policy-transition in Indonesia, followed by an evaluation of the changes in the economic structure in terms of the changes in sectoral shares in value added and exports, from 1975 to 2000. Section 3 discusses the IO decomposition techniques, derives the decomposition formula and proposes some hypotheses for empirical examination. In Section 4 we describe the data and sectoral classification. The results of the analysis are discussed and explained in Section 5. The final section sums up.

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1 The Indonesian statistical office (BPS) on private communication with the author confirmed the superior coverage of the IO data vis-à-vis the national accounts data.
2. The Indonesian Economic Performance under the “The New Order”

2.1 The Background

In a relatively short span of over two decades from the late sixties until the crisis of the late nineties, Indonesia has transformed itself from a stagnant, agrarian economy to one where manufacturing exports anchor rapid and sustained economic growth. Underlying this transformation of the economy, however, has been a fluctuating policy and external environment as well as important structural changes.²

The poor state of the economy when the New Order of General Soeharto assumed power in 1966 led to the relaxation of restrictions on imports and exports, liberalisation of the investment policy and the adoption of orthodox monetary and fiscal policies. These policies succeeded in containing inflation, rehabilitating physical infrastructure and triggering an economic recovery. The increases in oil prices in 1973 and later in 1979 led to an expansion in state investment in industry and a return to the (pre-1971) restrictive trade and foreign investment policies. The oil-revenues were recycled into large-scale investment in state-owned enterprises in sectors such as iron & steel, petroleum, aluminium and fertilisers.

The inward-oriented industrialisation programme generated sustained growth during the 1971-1981 period. However, the fall in oil prices coupled with a slowing down of economic growth during the 1982-1986 period led to the liberalisation and opening up of the economy. The deregulation measures involved reductions in tariff and non-tariff barriers, liberalisation of foreign investment regulations, financial sector reforms and efforts to reduce monopoly power of the big businesses through state-induced divestiture. This phase ushered in greater independence

² We draw heavily on Hill (1996, 1999), which provide comprehensive accounts of many dimensions of the Indonesian economic growth over the last thirty years.
for the private sector firms and generated substantial increases in foreign investment (Pangestu, 1991; Thee, 1991). A point to bear in mind, however, is that in both the regulated and the liberalised phases of economic policy, Indonesian manufacturing experienced considerable variations at the sectoral level in the degree of protection, monopoly power, ownership structure, etc. (Basri & Hill, 1996; Thee, 2002).

Using the IO tables for 1975, 1980, 1985, 1990, 1995 and 2000, we examine the pattern of structural change during this period, with an emphasis on the effect of the policy-transition during the mid-eighties and the impact of the crisis of the late 1990s. The tables for 170 sectors (with small yearly variations) have been aggregated to 130 sectors for comparison (see section 4, for details on the adjustments made to the data).

2.2 The Pattern of Structural Change

In Table 1, we present the sectoral shares of value added and exports, in constant 1983 prices, from 1975 to 2000 for 29 major sectors of the economy. Among the 29 sectors, 22 are in manufacturing, and are grouped into resource-intensive, labour-intensive, scale-intensive, differentiated, and science-based groups (see the notes for Table 1).³

Some typical features of structural change as it is conventionally understood can be noted from the table. Over the 25-year period, the combined share of primary and Oil, Gas & Mining (oil & gas) declined from nearly 50% to a quarter of the total value added. In exports, the oil & gas sector alone accounted for about three quarters of the total exports during the 1970s; an often-noted explanation for the import-substituting, export-pessimistic industrialisation strategy of the time. The export-share of oil & gas, however, began to fall dramatically from the early

³The terms sector and industry are used interchangeably.
eighties onwards, reaching about 16% of the total exports by the year 2000. The share of the services sectors in the total value added of the economy remained stable, with the notable exception of the finance & insurance sector; its share increased rapidly following the banking reforms of the late eighties.

With the decline of the oil & gas sector, the contribution of manufacturing to total value added and exports began to rise, especially since the mid-eighties. While manufacturing’s contribution to value added has been hovering around 10% during the 1975–1985 period, by the year 2000, its share increased to 27%. The resource-intensive industries have traditionally been the leading contributors to manufacturing value added. Although their contribution to the total value added of the economy increased marginally over time, their share in the total manufacturing value added declined from over 60% in the seventies to about 40% in 2000. In this group, food, beverages & tobacco (food) has always accounted for most of the value added. Its share in the group fell substantially during the late eighties, with the significant increases in the share of wood products & furniture (wood products). The industrial policy during the New Order regime had placed emphasis on the development of scale-intensive industries, utilising the revenues from oil & gas. However, the contribution of these industries to the total value added of the economy increased only marginally between 1975 and 1985 (from 2.1% to 3.6%), but registered a faster increase after the liberalisation of the economy (5.6% in 1990 and 8.2% in 2000). In this group, while textiles, paper & printing (paper) and iron & steel were responsible for most of the early growth, motor vehicles made important contributions during the nineties. During the latter period, the labour-intensive and science-based manufacturing groups have also become important contributors to the total value added of the economy.
Table 1. Pattern of structural change in Indonesia: 1975–2000

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sectoral composition of value added</th>
<th>Sectoral composition of exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>27.7 20.6 22.2 16.7 11.6 7.9</td>
<td>6.0 6.7 6.1 2.3 1.1 0.8</td>
</tr>
<tr>
<td>Oil, Gas &amp; Mining</td>
<td>20.5 26.3 14.2 14.6 9.8 17.6</td>
<td>73.9 70.8 40.6 27.9 17.3 16.2</td>
</tr>
<tr>
<td>Petroleum Refinery</td>
<td>0.6 0.3 5.0 3.2 2.0 5.5</td>
<td>1.0 6.8 23.7 14.4 7.5 13.3</td>
</tr>
<tr>
<td>Food, beverages &amp; tobacco¹</td>
<td>6.3 5.1 4.7 6.7 8.7 7.9</td>
<td>2.5 1.4 1.3 5.0 4.2 3.8</td>
</tr>
<tr>
<td>Wood products &amp; furniture¹</td>
<td>0.2 0.6 1.2 2.2 1.7 1.7</td>
<td>0.0 0.8 4.8 10.3 8.8 6.1</td>
</tr>
<tr>
<td>Rubber &amp; rubber products¹</td>
<td>0.7 0.8 0.7 0.8 0.8 1.1</td>
<td>2.9 2.6 3.7 3.1 2.9 1.8</td>
</tr>
<tr>
<td>Non-metallic mineral products¹</td>
<td>0.3 0.5 0.7 0.5 0.7 0.9</td>
<td>0.0 0.1 0.1 0.6 0.5 1.1</td>
</tr>
<tr>
<td>Garments &amp; leather²</td>
<td>0.5 0.5 0.4 1.0 1.5 2.2</td>
<td>0.0 0.2 1.6 6.8 9.8 8.0</td>
</tr>
<tr>
<td>Other manufacturing²</td>
<td>0.0 0.1 0.1 0.1 0.1 0.2</td>
<td>0.0 0.0 0.0 0.2 0.6 0.6</td>
</tr>
<tr>
<td>Textiles³</td>
<td>0.4 0.5 0.9 1.6 2.5 2.5</td>
<td>0.0 0.1 1.1 3.9 6.7 7.3</td>
</tr>
<tr>
<td>Paper, paper products &amp; printing³</td>
<td>0.3 0.2 0.4 0.9 1.3 1.6</td>
<td>0.1 0.0 0.1 0.7 2.2 3.9</td>
</tr>
<tr>
<td>Industrial chemicals³</td>
<td>0.5 0.5 0.8 0.9 1.2 1.2</td>
<td>2.8 0.2 1.0 1.6 2.1 2.6</td>
</tr>
<tr>
<td>Iron &amp; steel³</td>
<td>0.0 0.2 0.5 0.6 0.9 0.5</td>
<td>0.0 0.0 0.1 0.5 0.5 0.5</td>
</tr>
<tr>
<td>Non-ferrous metals³</td>
<td>0.1 0.1 0.4 0.6 0.7 0.5</td>
<td>0.7 1.4 2.9 3.7 4.3 2.9</td>
</tr>
<tr>
<td>Shipbuilding &amp; repairing³</td>
<td>0.1 0.1 0.2 0.1 0.1 0.1</td>
<td>0.0 0.1 0.2 0.4 0.3 0.2</td>
</tr>
<tr>
<td>Other transport³</td>
<td>0.0 0.0 0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Motor vehicles³</td>
<td>0.6 0.6 0.4 0.7 1.1 1.8</td>
<td>0.0 0.0 0.0 0.1 0.5 0.5</td>
</tr>
<tr>
<td>Aircraft³</td>
<td>0.0 0.0 0.1 0.1 0.1 0.0</td>
<td>0.1 0.0 0.0 0.1 0.1 0.1</td>
</tr>
<tr>
<td>Metal products⁴</td>
<td>0.2 0.3 0.4 0.4 0.5 0.7</td>
<td>0.0 0.0 0.0 0.3 0.7 1.0</td>
</tr>
<tr>
<td>Non-electrical machinery⁴</td>
<td>0.2 0.5 0.4 0.9 0.8 0.9</td>
<td>0.1 0.0 0.1 0.1 1.5 4.1</td>
</tr>
<tr>
<td>Drugs &amp; medicines⁵</td>
<td>0.1 0.1 0.2 0.2 0.2 0.2</td>
<td>0.0 0.0 0.1 0.0 0.0 0.1</td>
</tr>
<tr>
<td>Plastics⁵</td>
<td>0.0 0.1 0.2 0.2 0.5 0.7</td>
<td>0.0 0.0 0.1 0.3 0.3 0.6</td>
</tr>
<tr>
<td>Electrical apparatus, nec⁵</td>
<td>0.0 0.1 0.1 0.0 0.1 0.2</td>
<td>0.0 0.0 0.0 0.0 0.3 1.2</td>
</tr>
<tr>
<td>Radio, TV &amp; comm. equipment⁵</td>
<td>0.1 0.3 0.3 0.4 0.9 1.9</td>
<td>0.1 0.2 0.4 0.5 3.8 7.9</td>
</tr>
<tr>
<td>Professional goods⁵</td>
<td>0.0 0.1 0.0 0.1 0.3 0.2</td>
<td>0.0 0.0 0.1 0.3 0.9 0.8</td>
</tr>
<tr>
<td>Total Manufacturing</td>
<td>10.8 11.2 13.1 19.0 24.5 27.0</td>
<td>9.4 7.3 17.9 38.5 51.1 55.1</td>
</tr>
<tr>
<td>Electricity Gas &amp; Water</td>
<td>0.3 0.3 0.4 0.6 0.6 0.5</td>
<td>0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Construction</td>
<td>5.0 5.0 6.6 5.8 6.7 4.0</td>
<td>0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Finance &amp; Insurance</td>
<td>2.4 2.0 2.6 3.8 4.1 4.1</td>
<td>0.0 0.2 2.3 3.0 3.3 1.3</td>
</tr>
<tr>
<td>Other Services</td>
<td>32.6 34.4 36.0 36.2 40.6 33.4</td>
<td>9.7 8.1 9.3 14.0 19.7 13.3</td>
</tr>
<tr>
<td>Total</td>
<td>100.0 100.0 100.0 100.0 100.0 100.0</td>
<td>100.0 100.0 100.0 100.0 100.0 100.0</td>
</tr>
</tbody>
</table>

Notes: Manufacturing groups: ¹ Resource Intensive, ² Labour Intensive, ³ Scale Intensive, ⁴ Differentiated, ⁵ Science Based.

Source: Input-Output tables; Statistik Industri, BPS, Jakarta, various issues.

In these industry-groups, the main contributors to value added have been garments & leather and
Radio, TV & Communication equipment (consumer electricals & electronics), respectively.

This rapid increase in the share of manufacturing in the total value added of the economy is dwarfed only by its performance in exports, where it registered a more than five-fold increase in its share from 9.4% in 1975 to 55.1% in 2000. The manufacturing export boom began in the eighties, after facing a decline during the 1975-1980 period. The early surge in manufacturing exports in the eighties stemmed mainly from the resource- and labour- intensive industries such as wood products and garments & leather, respectively, and, to a smaller extent, a scale-intensive industry like the textiles. The increase in the export share of wood products is generally attributed to the ban on log exports in 1981 and the consequent increase in the exports from the plywood industry. During the 1990s, while the export-share of these industries continued to remain high, although declining for many, consumer electricals & electronics and non-electrical machinery showed rapid increases in their shares, especially during the latter half of the nineties.

A major reason for the surge in manufacturing exports, from the late eighties through the nineties, has been the export-oriented investment from the four Asian NICs—South Korea, Taiwan, Hong Kong and Singapore—and Japan (Pangestu, 2002). Japan had been the single largest foreign investor during the inward-oriented phase of industrialisation with most of the investment directed to the textile and garment industries. By the 1990s three quarters of the FDI approvals were from the four NICs, of which Korea was the most important in terms of the number of projects (Hill, 1991). Part of this resulted from a relocation of industries from the NICs in the much-acclaimed flying geese pattern, and the strategy of the international buyers to disperse production locations (Thoburn, 2001). In textiles and garments, unfulfilled market quotas under the Multi Fibre Agreement (MFA) has been a major reason for foreign investment and export growth.
In imports, manufacturing’s share declined from 70.5% in 1975 to 58.8% in 1980—the period of intense import-substituting regime (detailed results are not reported in order to save space). Since then, in tune with the shift away from import-substitution to export promotion, the manufacturing import-share showed a steady increase until 1990, but declined substantially during the crisis and recovery phase of 1995-2000.

The above discussion was intended to provide a snapshot picture of the Indonesian economy’s growth trajectory over the 25-year period considered. The fast-paced growth of the economy until the crisis has been characterised by shifts in the engines of economic growth from primary and oil & gas during the seventies, to manufacturing and services from the mid-eighties. While the resource- and labour-intensive manufacturing sectors anchored the manufacturing export-boom of the late eighties, science-based industries have come to play a leading role during the nineties. The latter are also among the handful of manufacturing sectors that continued to increase their export-share in the post-crisis era.

Taking the above overview as a benchmark, we examine the pattern and sources of growth in value added during the three phases mentioned before—the phase of inward-orientation (1975-85), the phase of outward-orientation (1985-1995), and the phase of crisis and recovery (1995-2000).

3. The Structural Change Decomposition Method and the Hypotheses

The IO-framework, due to its recognition of the interdependent structure of an economy, has been an attractive tool for explaining the variations in key economic variables. These variables include output, value added, energy use, labour requirements, volume of imports and output of services (Dietzenbacher et al., 2000). Structural change and growth in this framework has been
analysed most commonly using output as the relevant variable.\(^4\) In this paper, however, we use value added instead of output as the variable whose changes are decomposed. This is because, Indonesia being a transitional economy, undergoing changes in industrial organisation and production relations, more insights may be gained by analysing the changes in value added. (This point will be further illustrated in the discussion of the value-addition effect later in this section.)

In decomposing the change in the Left Hand Side (LHS) variable under consideration (value added in our case), the contributing factors need to be weighted using appropriate weights. One approach is to weight each contributing factor by either the initial year values or the final year values of the other factors. This approach, however, has the disadvantage that it generates interaction terms in the decomposition equation, which are hard to interpret. This problem can be eliminated by using initial year values as the weights for the change in some factors and final year values as the weights for the change in the other factors. The problem here is that there can be \(n!\) decompositions when there are \(n\) factors identified as contributing to a change in the LHS variable. Dietzenbacher & Los (1998) suggested an ad hoc solution that involves the use of two polar equations, the unweighted average of which yields result close to the average of all the possible \(n!\) decompositions. In the first polar equation, the weights for a factor—whose contribution is measured—are formed by the initial year (final year) values of the (other) factors to the left of this factor, and the final year (initial year) values of those to the right. In the second equation, these weights are reversed, i.e., the initial year value are replaced by the final year values and vice versa, hence the name polar. We follow this method to derive the decomposition equation for value added change.

The final aspect to consider is whether the decomposition of the change in a variable should

\(^4\)For example, see Wolff (1994).
be undertaken in an additive or in a multiplicative framework. While the component factors sum to the value of the LHS term in the additive case, it is the product of the component factors that equal the LHS term in the multiplicative framework. The choice between the two methods is fairly arbitrary. But given the simplicity of the additive framework in deriving the polar equations, we chose to employ that in the study.

3.1 The Decomposition Formula for Value Added Change

We start by defining the well-known equation for output in the input-output framework, using matrix notations (unless mentioned otherwise, capital letter in bold indicates a matrix; a hat over a bold capital letter indicates a diagonal matrix; capital letter in italics indicates a vector; small letter in italics stands for a scalar).

\[
X = (I - A)^t Y
\]

in which, \(X\) is the \((n \times 1)\) vector of output, \(I\) the \((n \times n)\) identity matrix, \(A\) the \((n \times n)\) matrix of input coefficients and \(Y\) the \((n \times 1)\) vector of final demand.

Equation (1) can be rewritten to replace the vector of output by the vector of value added (Dietzenbacher et al., 2000).

\[
V = \hat{K}(I - A)^t Y
\]

where, \(V\) is the \((n \times 1)\) vector of value added and \(\hat{K}\) the \((n \times n)\) diagonal matrix with the ratio of value added to output on its diagonal.
To capture the contribution of import-substitution in production, we introduce the \((n \times I)\) vector of domestic supply ratio \(U\), which is the ratio of domestic production less exports to total supply.

\[
U = \frac{(X - E)}{(F + T)}
\]  

(3)

in which, \(X\), \(E\), \(F\) and \(T\) are the \((n \times I)\) vectors of output, export, total final demand (domestic plus imported, but excluding export) and total intermediate input demand, respectively.

The value added equation (2) now takes the following form:

\[
V = \mathbf{K} (I - \mathbf{U}\mathbf{A})^{-1} (\mathbf{U}F + E)
\]  

(4)

where, \(\mathbf{U}\) is the \((n \times n)\) diagonal matrix, whose diagonal is formed by the elements of the vector \(U\) and \(\mathbf{A}\) the \((n \times n)\) matrix of input coefficients (derived from the total intermediate input matrix, as opposed to the domestic intermediate input matrix from which the coefficient matrix \(\mathbf{A}\) is derived in equation (1)).

Greater insights on the sources of structural change, especially in a transitional economy like Indonesia, can be gained by splitting the vectors of final demand \(F\) (which is the sum of vectors of private consumption, government consumption, investment demand and inventory changes) and exports \(E\) in the following way.

\[
F = Pp + Gg + Cc + Nn, \text{ and } E = Qq
\]
where, \( P, G, C, N \) and \( Q \) are the \((n \times 1)\) reallocation vectors of private consumption, government consumption, investment demand, inventory changes and exports. These are derived by dividing each cell of their respective final demand vectors by their column sums, i.e., by the scalars \( p, g, c, n \) and \( q \). The latter may be called the macro final demand, in their respective final demand categories. By splitting up the final demand vectors in the above fashion, we are able to distinguish the impact of the change in a final demand category, say consumption demand, on the change in value added in a sector (e.g., electronics), between the reallocation of consumption demand to that sector (e.g., from the primary sector) and the economy-wide or macro increase in consumption demand.

Equation (4) can now be rewritten as:

\[
V = \hat{K} \left[ (I - \hat{U} \hat{A})^{-1} \left( \hat{U}(Pp + Gg + Cc + Nn) + Qq \right) \right]
\]  

(5)

Based on equation (5), we derive the two polar decomposition equations (as noted in the beginning of this section) for a change in value added between two periods, and take their arithmetic average. (See Appendix for the derivation of the decomposition equation.)

Our decomposition formula, which decomposes a change in value added (\( \Delta V \)) into 13 components, may be written in a simplified form as follows.

\[
\Delta V = \Delta V_k + \Delta V_u + \Delta V_o + \Delta V_p + \Delta V_g + \Delta V_c + \Delta V_a + \Delta V_c + \Delta V_c + \Delta V_n + \Delta V_o + \Delta V_q
\]  

(6)
where, the subscripts stand for the corresponding factors in equation (5). The nature of each factor’s contribution is explained below.

$\Delta V_k$ (value-addition effect) is the change in the ratio of value added to output. Since the variations in this component can result from many factors (organisational changes, inter-industry relations, especially the level of ancillarisation and vertical integration, and efficiency in the use of intermediate inputs), the reasons for its change in each sector would be hard to pin down. A simplified assumption to make, at least for the manufacturing sectors, is that the share of value added in output is influenced mainly by the degree of vertical integration. Following the industrial organisation literature, we associate a decline in vertical integration (mirroring a decline in value-addition) to a decrease in the monopolistic structure of the industry.\(^5\) However, we provide other explanations also (for specific industries) in the discussion of the results.

$\Delta V_u$ (import-substitution effect) captures the contribution of the domestically produced intermediate inputs and final demand goods vis-à-vis the imports, to the change in value added.

$\Delta V_a$ (technological change) shows the contribution of the input coefficients.

$\Delta V_p, \Delta V_g, \Delta V_c, \Delta V_n$ and $\Delta V_q$ (rereallocation effect) capture the change in value added resulting from the changes in the inter-industry allocation of private consumption, government consumption, investment, inventory changes and exports, respectively.

$\Delta V_p, \Delta V_g, \Delta V_c, \Delta V_n$ and $\Delta V_q$ (macro final demand effect) show the effect of an economy-wide

\(^5\) An important assumption here is that industries have internalised technological and transactional economies: the two other important determinants of vertical integration (see for a discussion, Perry, 1989). Given that the Indonesian industrialisation is still in its early stage, technological or transactional economies appear to provide a less plausible explanation for vertical integration, compared to imperfect competition. Of course, there are exceptions to this general rule, especially in the outward-oriented phase, which we would see in Section 5.
change in the respective final demand component on sectoral value added change.

3.2 The Hypotheses

Formulating hypotheses about the growth-contribution of each of the 13 factors between the inward- and outward-oriented phases, and across the 29 sectors is a complex task. Firstly, these factors themselves are influenced by a multiplicity of events (note, for example, our earlier discussion on the multiplicity of factors that can cause changes in value-addition). Secondly, industries differ from each other not only due to their intrinsic characteristics (e.g. factor intensity, ownership structure), but also on account of the diverse degree of protection they enjoyed. Needless to say, industries with different degrees of protection can be expected to differ in their technological effort, export-orientation, factor intensity and vertical integration, to name a few. However, as pointed out by Basri & Hill (1996), unravelling the nature, magnitude and causes of protection across industries is a complex and difficult task. Therefore, instead of attempting to predict the growth-contributing effect of each factor, we hypothesise, at the cost of oversimplification, the major factors that may have been responsible for growth in the inward- and outward-oriented phases.

3.2.1 The Hypotheses on the Major Sources of Growth (1975-85)

The early phase of growth was characterised by high levels of protection (albeit varying in its degree), rapid technological change and massive state-sponsored investment. The seventies saw the manufacturing sectors experiencing super growth (Hill, 1996). These suggest that the growth in the oil-boom period resulted mainly from the increases in the investment demand, consumption demand and a high import-substitution effect. Available evidence also suggests a
backlog of consumer demand and an expansion of the capacity in manufacturing and, to some extent, services (ibid). We, therefore, expect a reallocation of the consumption and investment demand to these sectors. The seventies also saw the rapid weeding out of traditional and labour-intensive technologies, most of which were antiquated and were in place from the 1930s. We, therefore, expect that the technical coefficients made substantial contribution to growth (in manufacturing industries) during this phase. Value-addition can result from many sources, among them, vertical integration is an important source. Given that an imperfect market environment is a key determinant of vertical integration, we expect a positive contribution of the latter in industries where protection was high. For reasons explained in the previous paragraph, we desist from identifying any sector where the contribution of this factor might have been the highest.

3.2.2 The Hypotheses on the Major Sources of Growth (1985-95)

Export-led manufacturing growth and a manufacturing-based economic growth have been the distinguishing features of the post-liberalised economy. During this phase, we expect substantial contributions from macro export demand as well as a reallocation of export demand to the manufacturing sectors (from the primary and oil & gas sectors). Also, macro investment, macro consumption and their reallocation (lower than exports in general) are expected to continue their growth-promoting role in manufacturing and services. The effect of technology is clearly ambiguous, given that the export-led manufacturing growth during this phase rested principally on the domestic comparative advantages of resource-abundance and cheap labour. The value-addition effect may have declined in general owing to the competitive pressures of the liberalised era. While this is a theoretical relationship, distinct inter-industry differences may be expected.
3.2.3 The Hypotheses on the Major Sources of Growth (1995-2000)

The economic crisis of the late 1990s caused a decline in output, per capita income and investment, with the economy experiencing a net outflow of capital. As Hill (1999) notes, drawing on the Mexican economic crisis and recovery, the best means for recovery from a crisis is an export-led recovery. We explore the extent to which the hypothesis of export-led recovery is true in the Indonesian context.

Before proceeding to discuss the results, we outline the data used and their sources, the aggregation procedures and the construction of the linked-IO tables.

4. The Data

We use the 170-sector (with small yearly variations) IO tables published by the Central Statistical Agency (BPS) of Indonesia for the years 1975, 1980, 1985, 1990, 1995 and 2000. Changes in the sectoral classification, especially from 1985 onwards, led us to aggregate the tables into 130 sectors for comparison (aggregation procedure is explained in the following paragraph). In the tables for 1995 and 2000, government consumption expenditure were moved from the final demand category to the intermediate demand category, to reflect the open economy character of the Indonesian economy. But to maintain consistency with the earlier tables, we have moved the government consumption expenditure back into the final demand category in the 1995 and 2000 tables. The $130 \times 130$ tables have been converted into constant 1983 prices using the following price indices: the relevant Wholesale Price Indices (WPI) for the primary and manufacturing sectors, the implicit service price indices for the services sectors. The WPI data are taken from *Indikator Ekonomi* published by the BPS, and implicit service price
indices from the Groningen Growth and Development Centre (GGDC) database. We deflated each cell in a given row by the price index of the output category corresponding to that row.

The original tables have been aggregated into 130 sectors based on the procedure suggested by Miller & Blair (1985). It can be represented in matrix notation in the following way:

\[ \overline{M} = eMe' \]

where, \( M \) is the original \((m \times m)\) matrix, \( \overline{M} \) the aggregated \((n \times n)\) matrix—\((130 \times 130)\) matrix in our case—, \( e \) the \((n \times m)\) summation matrix of ones and zeros, and \( e' \) the transpose of the matrix \( e \).

We present the results for the 29 major sectors, by pre-multiplying the decomposition equations with a \((29 \times 130)\) summation matrix.

5. Results and Discussion

The results of the decomposition of the sectoral value added growth during the inward-oriented (1975-85), outward-oriented (1985-95) and crisis and recovery (1995-2000) phases are presented in Figures 1, 2 and 3, respectively. In the figures, the annual compounded rate of growth of value added is measured on the secondary (right hand side) \( Y \)-axis and is indicated by the diamond markers, connected by a smooth line. The government consumption demand and the inventory

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6 The GGDC database provides value added data in current and constant prices, from which we derived the implicit price indices for services (see http://www.eco.rug.nl/ggdc/index-dseries.html#top).

7 Sectors for which price indices were not directly available, we used the indices of the nearest three- and, in some cases, two-digit sectors.

8 Note that, for the ease of understanding, we present the results of the decomposition of the growth in value added, instead of the change in value added as represented in our decomposition equation. Also, while in the figures we
changes have been combined to have ‘other’ macro final demand and ‘other’ reallocation effect, reducing the number of contributing factors to 11. These two final demand components have been combined because of their very small contributions, especially of the inventory changes. The contribution of each factor to the period growth in value added is represented by the 11 colours in each bar, measured in percentages on the primary (left hand side) Y-axis.

The figures reveal that, for the majority of sectors, the annual growth rate of value added increased after the economic reforms. In the final period of crisis and recovery, the growth rates declined substantially and even turned negative for some sectors.

In the following subsections, we discuss the decomposition results for each of the three phases. The value-addition effect is discussed separately at the end.

5.1 Growth During the First Phase (1975-85)

Growth and structural change in this phase exemplifies what Chenery (1979) describes as resulting from the interaction of trade policies, a large domestic market and a large endowment of natural resources. An important feature of such a growth is the high levels of import-substitution effect, which we observe for most manufacturing sectors (Figure 1). Its impact was the biggest in iron & steel, non-electrical machinery, electrical apparatus nec. (electrical machinery), industrial chemicals, etc. There are high inter-industry variations in the effect of import-substitution. These variations can be related to the then-prevailing policy of local content stipulations, which differed across industries. For example, while local content restrictions were high in the machinery industry, such restrictions were limited in the automobile industry, mainly show the annual compounded growth rate, the decomposition is made of the total percentage growth rate (period-growth rate) for each period considered.
due to the lack of domestic suppliers (Simatupang, 1996).

Macro consumption demand, as expected, was important in the primary sector, the services sectors and manufacturing sectors like food, textiles, paper, drugs & medicines, plastics, etc. While the latter two sectors were also benefited by a sizeable contribution from the reallocation of consumption demand, sectors like primary, food and garments & leather experienced a negative reallocation effect. Our expectation about the important positive contribution of investment demand to value added growth in manufacturing proved right in a handful of sectors.
Macro investment demand made substantially high contributions to growth in the transport industries, non-metallic minerals, metal products, non-electrical machinery and construction. These industries, with the exception of motor vehicles, metal products and non-electrical machinery, were also benefited from a positive reallocation of investment.

Increases in macro export demand were significant in rubber products, non-ferrous metals, petroleum refinery, wood products, garments & leather, textiles, etc. These sectors also experienced a positive reallocation of export demand, mainly as a result of a substantially high negative reallocation of export demand in the oil & gas sector.

In line with our hypothesis, the input or the technical coefficient (technological change) made positive contributions in several manufacturing industries, particularly in non-metallic minerals, paper, chemicals and consumer electricals & electronics.

As would be expected, macro government consumption demand was the main driver of growth in other services (mainly due to its impact on public administration). Government consumption was a significant contributor to growth also in the paper industry. This industry grew essentially by feeding the domestic market and government departments under a massive wall of protection, but transformed into a major export-earner for the country in the following phase (van Dijk, 2003).

5.2 Growth During the Second Phase (1985-95)

The most remarkable feature of growth in the second phase was the decline in the import-

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9 Although we have combined government consumption expenditure with inventory changes in the graphical representation, the current discussion is based on the separate results for these two final demand components that we have not reported.
substitution effect and the emergence of a perverse export-expansion effect (Figure 2). The sectors that grew the fastest in this phase did so largely due to the growth in exports. The increases in macro exports as well as the reallocation of export demand, principally from the oil & gas and petroleum refinery sectors, turned out to be an important source of manufacturing growth. These two factors made the biggest impact in garments & leather, other manufacturing, textiles, non-ferrous metals, paper, electrical machinery, professional goods and consumer electricals & electronics. In the last of these industries, the contribution of export demand began to peak during the 1990s (the results for five-year intervals are not documented, but are available on request).

It has often been suggested that industries, which experienced a high import-substituting effect can achieve rapid increases in exports (see Poot et al., 1990). Indeed, most of these industries—in particular, non-electrical machinery and electrical machinery—transformed from being highly import-substituting industries in the first phase to export-oriented ones in the second.

Macro investment and consumption demand seem to follow a similar pattern in the second phase as they did in the first. There are, however, differences when it comes to the reallocation effects of these two final demand components. For example, in the transport sector, all industries except motor vehicles experienced a negative reallocation of investment during the second phase; the effect was just the opposite in the first phase. Similarly, in professional goods and garments & leather, the reallocation of consumption demand became an important positive contributor during the second phase; the opposite effect prevailed during the previous phase.
The contribution of the input coefficient was less impressive in the second phase compared to the first. This confirms the observations of some commentators that the post-reform growth has been hindered by the insufficient technological capability of the Indonesian firms and the poor state of their human capital (see Lall, 1998). In spite of the general decline in the effect of the technical coefficient, a few sectors like paper, iron & steel and non-ferrous metals benefited substantially from this factor. Note, however, that in the paper industry, technology is primarily embodied in the state-of-the-art machines that are imported, mainly from Finland. Therefore, technological change in this sector does not necessarily speak of improvements in own technological capability.
and human capital.

5.3 Growth During the Third Phase (1995-2000)

During the final phase, the annual value added growth declined substantially across most sectors of the economy (Figure 3). The two major exceptions to this are the oil & mining and the petroleum refinery sectors, which experienced higher growth rates than in the preceding phase. The worst affected of all sectors were iron & steel, construction, the primary sector, other services, all of which experienced a negative growth in value added. The sectors that continued to register a positive growth at 5% or more were electrical machinery, consumer electricals & electronics, metal products, motor vehicles, paper, garments & leather, non-metallic minerals and rubber products.

What factors have influenced the pattern of growth during this phase? Figure 3 tells us that all factors, with the key exception of macro export demand, contributed negatively to growth in this phase. Apart from macro exports, reallocation of export demand to electrical machinery, consumer electricals & electronics, paper, etc., made important contribution to value added growth in these sectors. In other words, these industries were able to increase their share of overall exports from Indonesia, thereby bringing about a better than average growth.

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10 For a recent discussion on the importance of building up technological capabilities, see Lall (2001).
The results for the final phase also bring out an important aspect of the crisis. Given that consumption and investment are the immediate casualties of an economic crisis, and particularly so in the Indonesian case, the sectors that depended on them most were also the worst affected. These sectors are other services (of which, real estate & business services is the most important) and construction. In both these sectors, the same factor (consumption demand and investment demand, respectively), which was responsible for the fast growth in the first two phases, also contributed to the slowing down of the growth in the final phase.
5.4 The Value-Addition Effect

The final component to discuss is the value-addition effect (contribution of a change in the value added output ratio), which is a difficult factor to explain. During the first phase, many manufacturing industries experienced a negative contribution from this factor (Figure 1). This may be explained in terms of the decline in manufacturing protection from the early eighties and the resulting decline in vertical integration. Industries, which experienced substantial positive value-addition effect in this phase, such as wood products, iron & steel and metal products, were, in line with our hypotheses, also the ones that received significant protection from imports. During the outward-oriented phase, all these industries, except metal products, experienced a negative value-addition effect (Figure 2).

An important exception to our hypothesis is the motor vehicles industry, which experienced a decline in the value-addition effect in the first phase, but an increase in the second and third phases. One reason for this could be the following. In the early stages of the development of this industry, foreign component makers set up plants, often as joint ventures with local suppliers, with a view to circumvent domestic protection (Okamoto & Sjöholm, 1999). These firms initially imported most of their parts and components before starting local production. Thus it has been the supplier-dominated character of the motor vehicles industry in the initial phase, and the later shift towards own production that might explain the nature of the contribution of the value-addition effect in this industry.

Value-addition is also influenced by other sector-specific factors. Consider the case of the paper industry. During its early phase of growth, thanks to the impressive overall economic growth and the resulting increases in demand, this industry relied heavily on imported pulp, the key raw material. From the mid-eighties onwards, partly as a fallout of the ban on log exports (in
1981) and the expansion of the wood processing industry, the domestic production of pulp expanded resulting in the integration of the pulp and paper industries (van Dijk, 2003).\textsuperscript{11} This explains the highly negative influence of the value-addition effect in this industry during the first phase and its positive influence in the following phase.

Admittedly, for the final phase of crisis & recovery, the impact of the value-addition effect is hard to pin down to specific factors, owing to the economic crisis.

6. Summing Up

We used an extended input-output-based decomposition method to examine the pattern and sources of structural change in Indonesia over the period 1975-2000. This period, which covered most of the industrialisation experience of Indonesia, was divided into the three different phases of inward-orientation, outward-orientation and crisis and recovery. We attributed the sectoral value added growth in each of these three phases to 13 contributing factors. The results offered us with important insights as to how structural change and late industrialisation are shaped by policy regimes and economic circumstances.

Our results illustrate that the dramatic progress achieved by the Indonesian economy from the late sixties rested on distinctive forces across the three phases. The most significant difference between the sources of growth between the inward- and outward-orientated phases has been the dominance of the import-substitution effect in the first, and its near complete replacement by the export-expansion effect in the second. The fact that even after liberalisation the import-

\textsuperscript{11} It should be remembered that pulp and paper are treated as one industry in our classification. As a result, backward integration of the paper industry to the pulp industry shows up as an increase in the vertical integration in the pulp & paper industry.
substitution effect remained important in state-dominated sectors like chemicals and iron & steel, lends support to the view that domestic industry and trade continued to be subject to controls until the financial crisis of the late nineties (cf. Thee, 2002).

We found that the reallocation effect of consumption demand and investment demand changed considerably after liberalisation. This may suggest that the economic reforms played a facilitating role for structural change by altering the preferences of the final demand consumers.

We related the variations in the value-addition effect between the inward- and outward-oriented phases to the variations in the degree of market imperfections (importantly, imperfect competition) between the two phases. While this was based on the theoretical, positive influence of imperfect competition on vertical integration, for deviations from this trend, we provided industry-specific explanations.

The post-reform phase witnessed less contribution from the technical coefficients compared to the previous phase, with a few exceptions like wood products, paper and iron & steel. This result must be seen in the light of the observation that even in a high-technology sector like electronics, production is concentrated in fairly low value-added activities (cf. Hill, 1996).

Chenery (1979) argued that developing countries that achieved their early growth based either on natural resources or on an import-substituting industrialisation strategy, would find their transition to sustained growth relatively difficult. This is because of a lack of anticipation about the need for changing the structure of savings, production and trade in the case of the former countries, and of inappropriate technological choices in the case of the latter. Although Indonesia has been both resource-rich and followed an import-substituting strategy of industrialisation, it withstood the difficulties of transition relatively well before falling prey to the economic crisis of 1997-1999.
The crisis has had the catastrophic effect of reversing the fast-growth trajectory of the previous three decades. Hill (1999) notes that the best course for recovery from an economic crisis is through an increase in exports, as the Mexican economic recovery demonstrated. If our results, for the period 1995-2000, are any indication, the Indonesian economy is following such a course.
References:


Appendix. Derivation of the Decomposition equation for value added change

Let $R$ be the Leontief inverse in equation (5):

$$R = (I - \hat{U}\hat{A})^{-1} \quad (A.1)$$

We can now rewrite equation (5) to represent the change in value added between two periods as:

$$\Delta V = \Delta \left[ \hat{K}R\hat{U} \left( Pp + Gg + Cc + Nn \right) \right] + \Delta (\hat{K}Rq) \quad (A.2)$$

From this equation we derived the two polar equations, described in section 3. The second of these polar equations is derived by reversing the weights in the first equation. The average of these two polar equations yields the following,

$$\Delta V = \frac{1}{2} \left[ \Delta \hat{K} \left( R_0 \hat{P}_0 + R_0 \hat{G}_0 + R_0 \hat{C}_0 + R_0 \hat{N}_0 \right) \right] + \frac{1}{2} \left[ \Delta \hat{K} \left( R_1 \hat{P}_1 + R_1 \hat{G}_1 + R_1 \hat{C}_1 + R_1 \hat{N}_1 \right) \right]$$

$$+ \frac{1}{2} \left[ \hat{K}_0 \Delta R \left( \hat{P}_0 + \hat{G}_0 + \hat{C}_0 + \hat{N}_0 \right) \right] + \frac{1}{2} \left[ \hat{K}_1 \Delta R \left( \hat{P}_1 + \hat{G}_1 + \hat{C}_1 + \hat{N}_1 \right) \right]$$

$$+ \frac{1}{2} \left[ \hat{K}_0 \Delta \hat{P}_0 \hat{P}_0 + \hat{K}_1 \Delta \hat{P}_1 \hat{P}_1 \right] + \frac{1}{2} \left[ \hat{K}_0 \Delta \hat{G}_0 \hat{G}_0 + \hat{K}_1 \Delta \hat{G}_1 \hat{G}_1 \right]$$

$$+ \frac{1}{2} \left[ \hat{K}_0 \Delta \hat{C}_0 \hat{C}_0 + \hat{K}_1 \Delta \hat{C}_1 \hat{C}_1 \right]$$

\[12\] The complete derivation of the equations is not reported in order to save space, but can be provided to interested readers.
where, the subscripts 1 and 0 stand for the final and the initial periods, respectively.

Since $R$ involves an inverse, decomposing it is a complex task. We, therefore, use the formulations $R_1 = R_o R_o^{-1} R_1$ and $R_0 = R_o R_1^{-1} R_1$. After some manipulations, the first *polar* decomposition of $\Delta R = \Delta(A - \dot{A})^{-1}$ can be written as,

$$
\Delta R = R_0 \left[ \Delta \hat{U} \frac{1}{2} \left( \dot{A}_0 + \dot{A}_1 \right) + \frac{1}{2} \left( \dot{U}_0 + \dot{U}_1 \right) \Delta \hat{A} \right] \dot{R}_1
$$

By changing the weights we can write the *polar* equivalent of the above equation. Substituting these two equations in the second line of equation (A.3), we have

$$
\begin{align*}
\frac{1}{4} & \left[ \underline{K}_0 R_0 \left[ \Delta \hat{U} \left( \dot{A}_0 + \dot{A}_1 \right) \right] R_1 \left[ \dot{U}_1 \left( P_1 P_1 + G_1 g_1 + C_1 c_1 + N_1 n_1 \right) + Q_1 q_1 \right] \right] \\
\frac{1}{4} & \left[ \underline{K}_1 R_1 \left[ \Delta \hat{U} \left( \dot{A}_0 + \dot{A}_1 \right) \right] R_0 \left[ \dot{U}_0 \left( P_0 p_0 + G_0 g_0 + C_0 c_0 + N_0 n_0 \right) + Q_0 q_0 \right] \right]
\end{align*}
$$

Substituting this result back in equation (A.3) completes our derivation of formulae for the 13 contributing factors to the change in value added. Combining the first line of equation (A.5) with the third line of equation (A.3), we have the import-substitution effect ($\Delta V_o$). The second term in equation (A.5) captures the contribution of the input coefficients ($\Delta V_o$) to value added change. The formulae for other contributing factors are indicated by the terms in the square brackets in equation (A.3). Equation (6) in the main text represents these factors in a simplified form, with the ensuing discussion explaining the nature of each factor’s contribution to value added change.
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