

Inter-sectoral Interdependence and Growth in Vietnam: A Comparative Analysis with Indonesia and Malaysia[#]

by

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Abstract

This study examines the sources of growth in Vietnam employing a categorized growth-factor decomposition method. It conducts a comparative analysis of Vietnam, Indonesia and Malaysia. The major source of Vietnam's growth was export expansion. The secondary sector played a key role, contributing not only to the sector itself but also the primary and tertiary sectors. Malaysia's growth pattern was similar to Vietnam's; export expansion was the main driver and the secondary sector led output growth. However, heavy industries played a more important role than light industries. Indonesia exhibits a different growth pattern than Vietnam and Malaysia.

Keywords: Interdependence, Output Growth, Structural Changes, Southeast Asia, Vietnam, Input-Output Analysis

JEL classification: O14, O53

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1 Introduction

The Vietnamese economy's achievements in the 1990s are unambiguously impressive.

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Due to a comprehensive market-oriented reform program known as *doi moi* (renovation) introduced in 1986, the Vietnamese government managed to transform an economy characterized by highly centralized planning, stagnation, and macroeconomic instability in the mid-1980s to a mixed economy with reasonably stable prices and strong growth a decade later. GDP grew at an average annual rate of over 8% between 1990 and 1997. Exports expanded more quickly, in both volume and variety, and inflows of foreign goods, technology, and investment capital played an important role in the modernization of the economy (Kokko, 1998). While all sectors contributed to the overall growth, the industrial sector¹ was the main driver of GDP growth, as it expanded at an average annual rate of 13-14% from 1993-1997.

Because almost a decade has passed since ambitious objective was set at the 8th Party Congress in 1996 and only 15 years are left for the Vietnamese economy to become fully industrialized by 2020, this study examines the Vietnamese economy's progress and assesses whether it is on track to becoming fully industrialized. The two most important aspects that need to be considered are structural changes and the sources of growth. Clearly, structural changes in the form of a shift away from agriculture towards industry will be required if the economy is to become industrialized. Furthermore, the sources of industrial growth must be strengthened and diversified if the industrial sector is to sustain a high growth rate and to expand its share in the economy.

The literature on the Vietnamese economy until now has tended to focus on the supply response to reform policies. Most studies have examined overall economic growth and have attempted to interpret and explain the key factors driving the economy's growth performance at the macro-level². Structural changes have been discussed on an ad hoc basis but have not been the exclusive focus of any previous study. A descriptive analysis of the Vietnamese economy's growth and structure from 1975-1998 by Vo (2000) found a definite shift of the economy from agriculture towards non-agricultural sectors. Tarp *et al.* (2002) used the social accounting matrix for Vietnam in 2000 to examine the structure of the economy at that particular point in time.

There have been several studies on industrial development. Le and Tran (1999) discussed the accomplishments and difficulties of Vietnam's industrial sector from 1986-1999. They provided an overview of the industrial sector's growth and the contributing domestic and external factors during this period. Vo's study (2002) covered a similar period though it focused on the growth of each industry.

The interactions between the three sectors of an economy (the primary, secondary, and tertiary sectors³) play an important role in the output growth of each industry, which should also be considered in analyzing the process of industrialization. Theory and empirical evidence suggest strong dynamic interactions among these three sectors.

¹ While the industry sector includes manufacturing, mining, and construction, it mainly refers to manufacturing activities especially when industrialization is concerned.

² See, for example, van Arkadie and Mallon (2003) and Dodsworth *et al.* (1996)

³ The primary sector includes agriculture and mining. The secondary sector refers to all manufacturing industries and is thus interchangeable with "the manufacturing sector". The tertiary sector consists of all services activities, including construction. Therefore, the secondary sector in this paper differs from the industrial sector. A detailed sector classification is given in table 2.1.

Expansion in one sector is expected to have some effect on the growth of the other two sectors. However, the extent to which the growth of each sector can stimulate growth in the other two varies from sector to sector and depends on the structure of the economy. As the Vietnamese government pursues industrialization and the secondary sector increases in relative importance, it is imperative to examine the expected impact of such structural changes on the output growth of each industry as well as the overall growth of the economy.

The economic transformation and growth in Vietnam can also be usefully compared with that of the dynamic ASEAN countries (DACs), which here refer to Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Since adopting *doi moi*, the Vietnamese government has shown strong interest in the economic policies and experiences of the DACs. The Vietnamese government's goals of rapid industrialization and high economic growth are similar to the principal economic objectives of the DACs (Gates, 2000). However, Vietnam is comparatively a latecomer to the industrialization process among ASEAN countries, and thus, its policymakers can learn from the successes and failures of the DACs.

This study examines the sources of output growth in Vietnam during 1996-2000 using the 1996 and 2000 national input-output (I-O) tables. It employs a categorized growth-factor decomposition method, which is an extension of the standard growth-factor decomposition method. In the categorized method, all industries in the I-O tables are classified into the three sectors: the primary, secondary and tertiary sectors. The method is able to analyze the effects of the interdependence between the three sectors on the output growth of each industry in a coherent framework. This study adds to the existing body of knowledge on Vietnam's economic development as it is the first sources of growth analysis based on Vietnam's I-O tables.

In addition, this study conducts a comparative analysis on Vietnam from 1996-2000, Indonesia from 1990-1995 and Malaysia from 1987-1991. These periods are chosen due to the availability of the national I-O tables in the selected countries. Both Indonesia and Malaysia in their respective periods were far more industrialized than Vietnam. Both had also undergone the different phases of structural changes and industrial growth. The comparative analysis elucidates useful implications of the development process for Vietnam.

This paper consists of five sections. Section 2 explains the growth factor decomposition methods. Section 3 presents the findings on structural changes and the results of the standard as well as categorized growth factor decomposition analyses in Vietnam from 1996-2000. Section 4 conducts a comparative analysis of Vietnam, Indonesia and Malaysia. Lastly, section 5 presents the major findings and policy implications.

2 Method and the Data

2.1 Method

There have been many studies on the sources of output growth based on an I-O framework. Most of them used the same decomposition technique developed by Chenery and

Syrquin (1979) and examined the pattern of economic development in relation to development strategies. Among these studies were Akita (1991), Akita and Hermawan (2000), Chenery (1980), James and Fujita (1989, 1997), Martin and Holland (1992), Urata (1987), Zakariah and Elameer (1999).

Considering the dynamic interactions between the three basic sectors of the economy – the primary, secondary, and tertiary sectors – this study developed a categorized growth factor decomposition method as an extension of the standard decomposition method. In the categorized method, all industries are classified into these three sectors. The categorized method takes into account the role of interdependence between the three sectors while examining the sources of output growth of each industry. It can explicitly identify growth factors that originate from within the sector, to which a particular industry belongs, as well as those that come from the other two sectors.

Standard Growth Factor Decomposition Method

The growth-factor decomposition method used in this study is based on the following supply-demand balance equation for the national I-O accounts:

$$\mathbf{X} = \mathbf{AX} + \mathbf{D} + \mathbf{E} - \mathbf{M}, \quad (1)$$

where \mathbf{X} , \mathbf{D} , \mathbf{E} , and \mathbf{M} are vectors of gross output, domestic final demand, exports, and imports, respectively, while \mathbf{A} is a matrix of technical coefficients. If we let $\mathbf{M} = \hat{\mathbf{m}}(\mathbf{AX} + \mathbf{D})$, where $\hat{\mathbf{m}}$ is a diagonal matrix of import ratios, then we can rewrite equation (1) as

$$\mathbf{X} = \hat{\mathbf{p}}(\mathbf{AX} + \mathbf{D}) + \mathbf{E} \quad (2)$$

where $\hat{\mathbf{p}}$ is a diagonal matrix of domestic supply ratios ($=\mathbf{I} - \hat{\mathbf{m}}$).

Solving equation (2) for \mathbf{X} , we obtain gross domestic outputs necessary to satisfy a specific level of domestic final demand and exports:

$$\mathbf{X} = \mathbf{B}(\hat{\mathbf{p}}\mathbf{D} + \mathbf{E}) \quad (3)$$

where $\mathbf{B} = (\mathbf{I} - \hat{\mathbf{p}}\mathbf{A})^{-1}$ is termed the domestic Leontief inverse. Equation (3) can be used to solve for the change in gross outputs, $\Delta\mathbf{X} = \mathbf{X}_t - \mathbf{X}_0$, in terms of changes in domestic and export demands and changes in the two structural parameters, $\hat{\mathbf{p}}$ and \mathbf{A} :

$$\Delta\mathbf{X} = \mathbf{B}_t[\hat{\mathbf{p}}_t \Delta\mathbf{D} + \Delta\mathbf{E} + \Delta\hat{\mathbf{p}}_t(\mathbf{A}_0\mathbf{X}_0 + \mathbf{D}_0) + \hat{\mathbf{p}}_t \Delta\mathbf{A}\mathbf{X}_0] \quad (4)$$

This is the standard growth factor decomposition equation proposed by Chenery and Syrquin (1979).

The growth-factor decomposition equation (4) is obtained by using the terminal year structural parameters, $\hat{\mathbf{p}}_t$, and \mathbf{B}_t , and the base year volume weights, \mathbf{X}_0 and \mathbf{D}_0 . We can also obtain a decomposition equation based on the base year structural parameters, $\hat{\mathbf{p}}_0$, and \mathbf{B}_0 , and the terminal year volume weights, \mathbf{X}_t and \mathbf{D}_t . To solve an index number problem, in this study we use the simple average of these two equations.

In sum, the change in the gross output is decomposed into the following four major factors: (a) Effect of the expansion of domestic final demand (DD); (b) Effect of export expansion (EE); (c) Effect of the changes in import ratios (domestic supply ratios) or import substitution (IS); (d) Effect of the changes in technical coefficients (IO). Output growth due to the expansion of domestic final demand (DD) can be further de-

composed into four components in terms of domestic final demand sectors: household consumption expenditure (DD1); government consumption expenditure (DD2); capital formation (DD3); and changes in inventory (DD4). Thus, equations (4) can be written as:

$$\Delta X = (DD1+DD2+DD3+DD4)+EE+IS+ IO. \quad (5)$$

Categorized Growth-Factor Decomposition Equation in a Three-Sector Economy

Now, we consider an economy whose industries are classified into the three sectors: the primary (P), secondary (S), and tertiary (T) sectors. Then the domestic Leontief inverse is thought to be composed of nine sub-matrices. That is,

$$B_i = \begin{bmatrix} B_i^{PP} & B_i^{PS} & B_i^{PT} \\ B_i^{SP} & B_i^{SS} & B_i^{ST} \\ B_i^{TP} & B_i^{TS} & B_i^{TT} \end{bmatrix}.$$

Then equation (4) can be rewritten as:

$$\begin{bmatrix} \Delta X^P \\ \Delta X^S \\ \Delta X^T \end{bmatrix} = \begin{bmatrix} B_i^{PP} & B_i^{PS} & B_i^{PT} \\ B_i^{SP} & B_i^{SS} & B_i^{ST} \\ B_i^{TP} & B_i^{TS} & B_i^{TT} \end{bmatrix} \left[\begin{array}{c} \hat{p}_i^P \Delta D^P \\ \hat{p}_i^S \Delta D^S \\ \hat{p}_i^T \Delta D^T \end{array} \right] + \begin{bmatrix} \Delta E^P \\ \Delta E^S \\ \Delta E^T \end{bmatrix} + \begin{bmatrix} \Delta p^P \left(\sum_L A_0^{PL} X_0^L + D_0^P \right) \\ \Delta p^S \left(\sum_L A_0^{SL} X_0^L + D_0^S \right) \\ \Delta p^T \left(\sum_L A_0^{TL} X_0^L + D_0^T \right) \end{bmatrix} + \begin{bmatrix} \hat{p}_i^P \sum_L \Delta A^{PL} X_0^L \\ \hat{p}_i^S \sum_L \Delta A^{SL} X_0^L \\ \hat{p}_i^T \sum_L \Delta A^{TL} X_0^L \end{bmatrix} \quad (6)$$

Therefore, by expanding this equation, we obtain the growth-factor decomposition equation for each industry in each sector. For example, the equation for the secondary sector is given by:

$$\begin{aligned} \Delta X^S = & B_i^{SS} \left(\hat{p}_i^S \Delta D^S + \Delta E^S + \Delta \hat{p}^S \left(\sum_L A_0^{SL} X_0^L + D_0^S \right) + \hat{p}_i^S \sum_L \Delta A^{SL} X_0^L \right) \\ & + B_i^{SP} \left(\hat{p}_i^P \Delta D^P + \Delta E^P + \Delta \hat{p}^P \left(\sum_L A_0^{PL} X_0^L + D_0^P \right) + \hat{p}_i^P \sum_L \Delta A^{PL} X_0^L \right) \\ & + B_i^{ST} \left(\hat{p}_i^T \Delta D^T + \Delta E^T + \Delta \hat{p}^T \left(\sum_L A_0^{TL} X_0^L + D_0^T \right) + \hat{p}_i^T \sum_L \Delta A^{TL} X_0^L \right) \end{aligned} \quad (7)$$

We can then identify the following six major factors for the output growth of an industry in the secondary sector: (a) Effect of the expansion of domestic final demand within the secondary sector, or the total effects on output of each industry within the secondary sector of the expansion of domestic final demand in secondary industries ($B_i^{SS} \hat{p}_i^S \Delta D^S$); (b) Effect of export expansion within the secondary sector, or the total effect on output of each industry within the secondary sector of the expansion of exports in secondary industries ($B_i^{SP} \Delta E^S$); (c) Effect of the changes in import ratios (or domestic supply ratios) within the secondary sector, or the total effect on the output of each industry within the secondary sector of the changes in import ratios (or domestic sup-

ply ratios) in secondary industries ($(\mathbf{B}_i^{SS} \Delta \mathbf{p}^s (\sum_t \mathbf{A}_0^{SL} \mathbf{X}_0^L + \mathbf{D}_0^S))$); (d) Effect of the changes in technical coefficients, or the total effect on output of each industry within the secondary sector of the changes in technical coefficients associated with the secondary sector ($\mathbf{B}_i^{SS} \hat{\mathbf{p}}_i^s \sum_t \Delta \mathbf{A}^{SL} \mathbf{X}_0^L$); (e) Total effect on output of each industry within the secondary sector due to the changes in the demands for the primary sector (the terms with \mathbf{B}_i^{SP} in equation (7)); and (f) Total effect on output of each industry within the secondary sector due to the changes in the demands for the tertiary sector (the terms with \mathbf{B}_i^{ST} in equation (7)).

We can similarly obtain the categorized growth-factor decomposition equations for the primary and tertiary sectors. The sum of (a), (b), (c), and (d) above is the total effect on the output of each industry within the secondary sector due to the changes in the demands for the secondary sector (the terms with \mathbf{B}_i^{SS} in equation (7)), which can be termed within-sector demand effects. It should be noted that in the same way as the standard decomposition equation, we can obtain a categorized decomposition equation based on the base year structural parameters and the terminal year volume weights. Therefore, we also use the simple average of the two equations in the categorized decomposition analysis.

2.2 The Data

The Vietnam General Statistics Office (Vietnam GSO) compiled national competitive-import type Input-Output (I-O) tables for 1989, 1996 and 2000 based on producers' prices (Vietnam GSO, 1999, 2003). The first table is, however, very rudimentary; thus, the 1996 and 2000 tables were used for the growth factor decomposition analyses. The 1996 I-O table consists of 97 industries, while the 2000 table has 112 industries. These two tables were transformed into 50-industry tables. The results are, however, presented by using a 15-industry classification, as shown in table 1. It should be noted that in order to examine real changes over the study period, the original current price 2000 I-O table was converted into a 1996 constant price table using producer price indices by industry or GDP deflators by industry when the former are not available.

This study conducts a comparative analysis on Vietnam, Indonesia and Malaysia. The period of analysis for Indonesia and Malaysia are 1990-1995 and 1987-1991, respectively, due to the availability of national I-O tables. The Indonesian Central Bureau of Statistics (Indonesia CBS, 1995, 1998) published the 1990 and 1995 I-O tables, which are based on producers' prices. The 1990 table consists of 161 industries, while the 1995 table includes 172 industries. These I-O tables were transformed into 37-industry tables, which were then converted into 1983 constant price tables by GDP deflators by industry. In the case of Malaysia, the Malaysian Department of Statistics (Malaysia DS, 1994, 2002) published the 1987 and 1991 I-O tables, which are based on producers' prices. The 1987 table consists of 60 industries, while the 1991 table has 92 industries. For this study, these tables were transformed into 50-industry tables. The 1991 table was then converted into a 1987 constant price table using GDP deflators by industry. It should be noted that in the comparative analyses, the results are all presented using the 15-industry classification.

Table 1: Industry Classification

3 Sectors	15 Industries	50 Industries
1 Primary	1 Agriculture	1 Agriculture Farming
		2 Livestock Breeding
		3 Agriculture Services
		4 Forestry
		5 Fishery
	2 Mining	6 Coal mining
		7 Metal ore mining
		8 Stone and other non-metallic mineral quarrying
		9 Crude oil, natural gas
2 Secondary	3 Food/Beverages/Tobacco	10 Food Industries
		11 Beverages Industries
		12 Sugar refineries
		13 Coffee processing
		14 Tea processing
		15 Tobacco manufacturing
	4 Textile/Wearing Apparel	16 Processing seafood
		33 Textile products
	5 Wood products	34 Leather and leather products
		20 Wood and wood products
	6 Paper/Printing/Publishing	19 Paper pulp, paper and paper products
35 Printing & publishing industries		
7 Chemical Products	22 Industrial chemicals	
	23 Fertilizers and pesticides	
	24 Other chemical products	
	25 Rubber and plastic products	
	17 Glass and glass products	
8 Non-metallic mineral products	18 Ceramic and ceramic products	
	21 Building materials industries	
	31 Ferrous metals manufactures	
9 Iron/Steel/Nonferrous metals	32 Nonferrous metals	
	26 Professional and scientific equipment	
10 Machinery/Equipment	27 Transportation equipment	
	28 Machinery and equipment (except electrical)	
	29 Electrical machinery, equipment & appliances	
	30 Communication and broadcasting equipment	
	36 Other manufacturing industries	
	37 Electricity and Gas	
3 Tertiary	12 Electricity/Gas/Water	38 Water supply and distribution
		39 Construction
	13 Construction	40 Trade & repair work
		41 Hotels and restaurants
	14 Trade	42 Transport
		43 Communication
	15 Services	44 Tourism
		45 Finance
46 Insurance		
47 Science and technology		
48 Real estate, leasing and consulting services		
49 Government and other services		
50 Services serving ind., houshd. and community		

3 Structural Changes and Sources of Output Growth in Vietnam 1996-2000

3.1 Structural Changes

Using the 1996 and 2000 I-O tables, this section examines changes in Vietnam's industrial structure between 1996 and 2000. The share of agriculture in total output decreased from 21.4% to 15.6%, while the mining industry's output share increased from 4.8% to 8.7%. Therefore, the primary sector as a whole, including agriculture and mining, still played an important role in output. The share of the secondary sector in output rose from 34.5% to 39.8%, mainly due to the near doubling of textile and wearing apparel's share. The industry composition of value-added followed a similar pattern to that of output.

With regard to industry composition of exports, agriculture declined in relative importance, nearly halving its share in total exports. But, the share of mining increased significantly from 15.3% to 27.6%, reflecting a substantial increase in crude oil exports. On the other hand, the combined share of manufactured exports declined slightly from 45.2% to 43.6%. Among manufacturing industries, the share of textile and wearing apparel increased from 16.0% to 18.9%, which are the results of the government's efforts to promote exports of labor-intensive products, in which Vietnam has comparative advantages.

With regards to the industry composition of imports, machinery and equipment continued to account for more than a quarter of total imports, despite a slight decrease during this period. The large volume of imports of machinery and equipment was primarily driven by large FDI inflows and strong post-Asian crisis recovery in domestic investment during the study period. The second most important import item, chemical products, experienced a fall in import share, mainly reflecting a decrease in fertilizer imports. This might be due to additional import restrictions imposed on fertilizers during the period. In contrast, the textile and wearing apparel industry's import share increased and became the third largest manufacturing industry in imports, after the machinery and equipment industry and the chemical industry. This may be explained by an increase in the importation of textile materials used in the production of textile and wearing apparel exports.

In sum, the changes in the structure of the I-O tables indicate a shift in Vietnam's economy away from agriculture. The secondary sector grew in relative importance. However, since the mining industry also expanded at the same time, the primary sector continued to contribute significantly to the economy.

3.2 Standard Growth Factor Decomposition Analysis

Table 2 presents the results of the standard growth-factor decomposition analysis, with all entries expressed as percentages of total national output growth.⁴ During 1996-2000, Vietnam's output growth was driven mainly by export expansion (EE), accounting for 56.3% of total output growth. The industries most affected by export expansion were

Table 2: Sources of Output Growth, 1996-2000
Standard Growth Factor Decomposition Analysis
(as Percentage of Total Output Growth)

		(in %)							
Industry/Sector	IS	IO	DD1	DD2	DD3	EE	Total	G. Rate	
1 Agriculture	3.1	-1.4	-0.5	0.0	1.0	3.2	5.3	3.3	
2 Mining	-0.1	-1.1	0.1	0.0	0.9	15.9	15.6	29.6	
Primary	2.9	-2.5	-0.4	0.0	1.9	19.1	21.0	9.7	
3 Food/Beverages/Tobacco	1.3	0.8	5.4	0.0	1.0	3.4	11.9	9.5	
4 Textile/Wearing Apparel	1.2	1.3	2.8	0.0	0.0	11.2	16.6	30.5	
5 Wood products	-0.1	-1.5	0.0	0.0	0.3	0.1	-1.1	-7.7	
6 Paper/Printing/Publishing	0.1	-0.3	1.0	0.0	0.1	0.2	1.1	9.2	
7 Chemical Products	2.0	0.3	1.3	0.0	0.7	1.0	5.4	21.7	
8 Non-metallic mineral products	0.5	0.0	0.0	0.0	1.8	0.2	2.5	10.1	
9 Iron/Steel/Nonferrous metals	2.1	-0.8	0.1	0.0	1.0	1.4	3.8	33.9	
10 Machinery/Equipment	1.4	1.3	0.0	0.0	1.7	4.9	9.3	32.9	
11 Other Manufacturing-1.8	0.7	-0.6	0.0	-0.1	1.5	-0.4	-3.7		
Secondary	6.8	1.8	10.1	0.0	6.5	23.9	49.1	15.9	
12 Electricity/Gas/Water	-1.6	0.7	0.4	0.0	0.4	1.2	1.0	5.2	
13 Construction	0.0	-0.9	0.0	0.0	9.3	0.1	8.6	10.6	
14 Trade	-6.0	5.9	4.4	0.0	1.6	7.5	13.4	16.3	
15 Services	-2.0	-1.5	5.4	-0.2	0.8	4.5	7.1	5.2	
Tertiary	-9.6	4.2	10.2	-0.2	12.1	13.3	30.0	9.4	
Total	0.1	3.5	19.9	-0.2	20.5	56.3	100.0		

mining, particularly crude oil and natural gas, the textile and wearing apparel, and trade. In total, the secondary sector's export expansion accounted for almost a quarter of total output growth.

To a much lesser extent, capital formation (DD3) was the second largest source of output growth at 20.5%.⁵ As expected, the construction industry accounted for the largest share of this effect at 9.3% of total growth. In contrast, the secondary sector's capital formation accounted for only 6.5% of total growth. The increase in household consumption (DD1) was the third largest contributor to output growth at 19.9%. The industries that accounted for much of this effect were food, beverages and tobacco, services, trade, and textile and wearing apparel.

In the aggregate, import substitution (IS) had virtually no effect on output growth. However, the secondary sector accounted for the largest positive effect at 6.8% of total growth. This is reflective of the fact that government protection of certain manufacturing industries, e.g., automobile, fertilizer, iron, and steel, resulted in an increase in domestic production and a concurrent decrease in imports in these industries. Finally,

⁴ The analysis was conducted using the I-O tables for 50 industries; but the results are presented for 15 industries.

⁵ In the growth factor decomposition analysis for Vietnam, capital formation (DD3) includes changes in inventory.

changes in the technical coefficients (IO) were not a major source of growth, indicating that there was little change in production structure as represented by I-O coefficients.

The secondary sector as a whole accounted for almost half of total growth, which was much larger than its output share; almost half of its growth was brought about by the expansion of exports. This clearly indicates that export expansion in the secondary sector played a pivotal role in Vietnam's growth during the study period. Among manufacturing industries, the textile and wearing apparel industry and the machinery and equipment industry grew very rapidly. Together, they accounted for a quarter of total growth, and their growth was driven by export expansion. The chemical industry and the iron, steel, and nonferrous metal industry also grew very rapidly, but the main source of their growth was the effect of import substitution. The food, beverage, and tobacco industry grew at a much slower rate, but it accounted for 11.9% of total growth due to its preponderant share of total output.

The mining industry also grew very rapidly. Export expansion was solely responsible for this industry's significant contribution to output growth. On the other hand, agriculture's contribution was negligible, which is in contrast to its output share. The effects of import substitution and export expansion contributed equally to the agricultural industry's growth.

3.3 Inter-sectoral Interdependence and Sources of Output Growth: A Categorized Growth Factor Decomposition Analysis

Based on equation (6), tables 3 and 4 present the results of the categorized growth factor decomposition analysis. In table 3, each entry is shown as a percentage share of Vietnam's total output growth, while in table 4, each entry is shown as a percentage share of the growth of each industry or each sector.

In table 3, the primary sector column presents the total (direct and indirect) effects on output of each industry due to demand changes in the primary sector. It is the sum of the four effects originating in the primary sector. Similarly, the secondary and tertiary sectors' columns present the total (direct and indirect) effects on output of each industry due to demand changes in the secondary and tertiary sectors, respectively.

The secondary sector played a key role in the total output growth. In total, 51.6% of total growth was induced by the effects of demand changes in the secondary sector. Of this amount, the secondary sector induced growth in the primary and tertiary sectors by 3.6% and 4.1%, respectively, of total growth. The secondary sector's contribution at 51.6% was much larger than its share of output, which was 39.8% in 2000.

On the other hand, only 18.2% of total output growth was induced by demand changes in the primary sector, and its contribution to the growth of the secondary and tertiary sectors was merely 0.0% and 2.0%, respectively, of total growth. The primary sector's contribution was much smaller than its output share (24% in 2000). The tertiary sector's contribution to total growth at 30.2% was also smaller than its output share (35.9%). However, the tertiary sector induced significant growth in the secondary sector at 5.1% of total growth, thus indicating that the tertiary sector had strong backward linkages with the secondary sector.

It is apparent that most of the output growth of each sector was induced by within-sector demand effects.⁶ Within-sector effects accounted for 76.9%, 89.6%, and 79.4%

Table 3: Sources of Output Growth, 1996-2000
Categorized Growth Factor Decomposition Analysis
(as Percentage of Total Output Growth)

		(in %)			
Industry/Sector		Primary	Secondary	Tertiary	Output Growth
1	Agriculture	1.7	3.0	0.5	5.3
2	Mining	14.4	0.5	0.8	15.6
	Primary	16.1	3.6	1.3	21.0
3	Food/Beverages/Tobacco	-0.1	11.5	0.5	11.9
4	Textile/Wearing Apparel	0.0	16.5	0.1	16.6
5	Wood products	0.0	-1.4	0.4	-1.1
6	Paper/Printing/Publishing	0.0	0.7	0.3	1.1
7	Chemical Products	-0.1	4.9	0.6	5.4
8	Non-metallic mineral products	0.0	0.5	1.9	2.5
9	Iron/Steel/Nonferrous metals	0.0	3.2	0.6	3.8
10	Machinery/Equipment	0.1	8.5	0.6	9.3
11	Other Manufacturing	0.0	-0.5	0.1	-0.4
	Secondary	0.0	43.9	5.1	49.1
12	Electricity/Gas/Water	0.3	0.7	0.0	1.0
13	Construction	0.1	0.1	8.4	8.6
14	Trade	0.1	1.8	11.5	13.4
15	Services	1.6	1.5	3.9	7.1
	Tertiary	2.0	4.1	23.8	30.0
	Total	18.2	51.6	30.2	100.0

of the output growth of the primary, secondary, and tertiary sectors, respectively (see table 4). It is clear from the following that inter-sectoral linkages of the primary and the tertiary sectors are relatively stronger than those of the secondary sector: 1) in the primary sector, 17.0% and 6.2% of its output growth were induced by demand effects of the secondary and tertiary sectors, respectively; 2) in the tertiary sector, 6.8% and 13.8% of its output growth were induced by the demand effects of the primary and secondary sectors, respectively; and 3) in the secondary sector, however, 0.0% and 10.4% of its output growth were induced by the demand effects of the primary and tertiary sectors, respectively.

Within the primary sector, mining accounted for 15.6% of Vietnam's total output growth, and most of its growth was induced by within-sector demand effects. Table 5 presents the details of within-sector demand effects, in which each entry is presented as a percentage share of Vietnam's total output growth. The effect of export expansion within the primary sector is the main driver of the output growth of mining. The mining industry's export ratio increased substantially during the study period from 63.9% to 87.2%. The mining industry thus appears to have had relatively weak forward linkages to the secondary and tertiary sectors at that time. If and when stronger linkages

⁶ In equation (7), which describes the categorized growth factor decomposition equation for the secondary sector, within-sector demand effects are captured by the terms with B^{ss} in equation (7).

Table 4: Sources of Output Growth, 1996-2000
Categorized Growth Factor Decomposition Analysis
(as Percentage of the Output Growth of Each Industry or Each Sector)

Industry/Sector	Primary	Secondary	Tertiary	Output Growth	(in %)
1 Agriculture	32.9	57.0	10.1	100	
2 Mining	91.8	3.4	4.8	100	
Primary	76.9	17.0	6.2	100	
3 Food/Beverages/Tobacco	-0.4	96.6	3.9	100	
4 Textile/Wearing Apparel	0.1	99.4	0.6	100	
5 Wood products	-2.4	136.2	-33.8	100	
6 Paper/Printing/Publishing	2.3	65.1	32.6	100	
7 Chemical Products	-2.3	92.0	10.3	100	
8 Non-metallic mineral products	-1.1	22.2	78.9	100	
9 Iron/Steel/Nonferrous metals	1.1	83.3	15.7	100	
10 Machinery/Equipment	1.4	91.9	6.7	100	
11 Other Manufacturing	5.1	126.4	-31.5	100	
Secondary	0.0	89.6	10.4	100	
12 Electricity/Gas/Water	26.4	70.4	3.2	100	
13 Construction	0.8	0.6	98.5	100	
14 Trade	0.6	13.6	85.7	100	
15 Services	23.0	21.9	55.1	100	
Tertiary	6.8	13.8	79.4	100	
Total	18.2	51.6	30.2	100	

are developed with Vietnam's secondary sector through the increased flows of mining products to processing activities, it is expected that such linkages will generate higher growth and value-added in the economy.

Agriculture's contribution to Vietnam's total output growth was very small, and much of its growth was induced by the effects of demand changes within the secondary sector. However, import substitution effects within the primary sector contributed significantly to the output growth of agriculture. In contrast, the expansion of primary exports accounted for only 13.4% of agricultural growth. According to the results of the standard growth factor decomposition analysis (table 2), more than half of agricultural growth is attributed to export expansion. The substantial difference between these two figures is accounted for by the effects of export expansion in the secondary sector. Inter-sectoral interdependence thus played a critical role in the growth of agriculture.

Within the secondary sector, textile and wearing apparel had the largest contribution to Vietnam's total output growth at 16.6%, followed by food, beverage and tobacco and machinery and equipment (See table 3). As indicated in table 4, most of the growth of these manufacturing industries was induced by the effects of demand changes within the secondary sector. Export expansion was the main driver in the textile and wearing apparel industry and the machinery and equipment industry, while the expansion of domestic final demand was the main driver of output growth in the food, beverage and tobacco industry.

Table 5: Within-Sector Sources of Output Growth, 1996-2000
(as Percentage of Total Output Growth)

Industry/Sector	(in %)				
	IS	IO	DD	EE	Total
1 Agriculture	2.8	-1.4	-0.3	0.7	1.7
2 Mining	-0.3	-1.0	0.1	15.7	14.4
Primary Sector	2.5	-2.5	-0.3	16.4	16.1
3 Food/Beverages/Tobacco	1.4	0.8	6.2	3.1	11.5
4 Textile/Wearing Apparel	1.3	1.3	2.8	11.2	16.5
5 Wood products	0.0	-1.5	0.0	0.1	-1.4
6 Paper/Printing/Publishing	0.2	-0.3	0.8	0.0	0.7
7 Chemical Products	2.0	0.7	1.5	0.8	4.9
8 Non-metallic mineral products	0.6	0.2	-0.3	0.1	0.5
9 Iron/Steel/Nonferrous metals	2.2	-0.8	0.5	1.3	3.2
10 Machinery/Equipment	1.8	1.1	1.1	4.6	8.5
11 Other Manufacturing	-1.8	0.7	-0.9	1.4	-0.5
Secondary Sector	7.7	2.1	11.6	22.6	43.9
12 Electricity/Gas/Water	-1.8	0.6	0.6	0.6	0.0
13 Construction	0.0	-0.9	9.4	0.0	8.4
14 Trade	-6.4	5.9	6.0	6.0	11.5
15 Services	-2.2	-1.4	5.6	2.0	3.9
Tertiary Sector	-10.5	4.1	21.5	8.6	23.8

The chemical product industry and the iron and steel industry also recorded large output growth. Again, most of the output growth of these industries was induced by effects originating in the secondary sector. In contrast with the above top three manufacturing industries, however, import substitution effects played an important role in the growth of these two industries, accounting for 37.8% and 58.7%, respectively, of their growth.

It should be noted that while the non-metallic mineral products industry accounted for 2.5% of Vietnam's total output growth, most of its growth was induced by effects originating in the tertiary sector (see table 4). Within the tertiary sector, the construction industry would have generated significant demand for non-metallic mineral products (e.g., cement).

In all, nearly half of the output growth of the secondary sector was induced by export expansion within the sector itself. Because of the inter-sectoral interdependence noted above, exports in the secondary sector played a significant role in the growth of not only the secondary sector but also agriculture.

Within the tertiary sector, trade was the largest contributor to Vietnam's output growth at 13.4%, which was followed by construction and services (see table 3). As shown in table 4, most of the growth of construction and trade was induced by the effects of demand changes within the tertiary sector. On the other hand, the primary and secondary sectors contributed 23.0% and 21.9%, respectively, to the growth of services, indicating that the services industry has strong forward linkages with the primary and secondary sectors.

In sum, the growth pattern observed from 1996-2000 seems to have followed Petty-Clark's law (Clark, 1940). There was a significant shift in output and demand from the primary to secondary sector even within a short time period. The secondary sector accounted for about half of total output growth and much of its growth was induced by the demand effects within the secondary sector. This is despite the fact that its output share was less than 40% in the period. On the other hand, primary sector's contribution to total output growth was 21%, but merely 16 percentage points were induced by demand changes within the primary sector, which was much smaller than the sector's output share. The effects of export expansion in the secondary sector played an important role in the output growth of agriculture.

4 A Comparative Analysis with Indonesia and Malaysia

Vietnam had a much smaller GDP than Malaysia and Indonesia: Vietnam's GDP was 35% of Malaysia's and 19% of Indonesia's. Vietnam's GDP per capita was also smaller at 10% of Malaysia's and 50% of Indonesia's. According to the World Bank (2005), in Vietnam, more than 30% of the population was still living below the national poverty line in 1998, while comparable figures for Malaysia and Indonesia were approximately 15%.

Indonesia and Malaysia are both natural resource-rich countries. Primary exports have contributed significantly to these two economies, especially in the early stages of industrialization. Vietnam, however, does not have similar levels of natural resources. Although Vietnam has mineral resources, which have contributed significantly to export revenue in recent years, its oil reserves on a per capita basis are only a fraction of those of Indonesia and Malaysia (Riedel, 1999). Vietnam also had the smallest amount of arable land per capita among the three countries. Therefore, while resource-based industries have played an important role in the development of Indonesia and Malaysia, their roles have been limited in Vietnam.

Vietnam, like Indonesia but unlike Malaysia, has an abundant labor supply, with a population of 78 million and a population density of 241 persons per km² in 2000. Its population density is, in fact, the highest among all three countries. Vietnam also has a relatively high level of human development. As an example, its adult literacy rate was the highest among the three countries in 2000. Thus, it has the potential for the development of labor-intensive industries, especially in the early stages of its economic development.

4.1 Industrial Structure

Table 6 presents the industrial structures of Vietnam from 1996-2000, Malaysia from 1987-1991, and Indonesia from 1990-1995 in terms of output and value added. Vietnam had the largest agricultural share in both output and value-added among the three countries, thus confirming that Vietnam is still a highly agriculture-based economy in 2000. However, agriculture's share of economic output decreased markedly in all three countries during the aforementioned periods, while the secondary sector gained in rela-

tive importance and exceeded 20% in value added in the terminal year.

Within the secondary sector, light industries (industries 4-7) accounted for a greater share of output and value-added in Vietnam and Indonesia than heavy industries (industries 8-11 for Vietnam; industries 3 and 8-11 for Indonesia). In Vietnam, heavy industries grew very rapidly during the study period, but the output share of heavy industries was still 13.3% in 2000, which was much smaller than the share of light industries at 25.5%. In Indonesia, despite the inclusion of the oil refining industry, heavy industries still comprised a smaller segment of the economy in comparison to light industries: heavy industries accounted for 15.0% of total output in 1995, while light industries accounted for 19.1% of total output. On the other hand, in Malaysia, heavy industries' share of total output was much larger than light industries'. In 1987, heavy industries accounted for 21.7% of total output in Malaysia, and this increased markedly in the study period due mainly to the rapid expansion of the machinery and equipment industry: by 1991, heavy industries' share of total output had increased to 30.2% of total output, which is in sharp contrast to light industries' 13.6%.

4.2 Inter-sectoral Interdependence and Sources of Output Growth: A Categorized Growth Factor Decomposition Analysis

Tables 7 and 8 present the results of the categorized growth-factor decomposition analysis, based on equation (6), for Vietnam from 1996-2000, Malaysia from 1987-1991, and Indonesia from 1990-1995. In these tables, the results are presented in an aggregated format in order to highlight the roles of inter-sectoral interdependence in the growth of output among the three sectors: the primary, secondary and tertiary sectors.

In Malaysia, 57.4% of total output growth was induced by the effects of demand changes in the secondary sector, which contributed 1.8% and 6.9% to the growth of the primary and tertiary sectors, respectively. On the other hand, in Indonesia, only 40.2% of total output growth was induced by the effects of demand changes in the secondary sector. However, the secondary sector contributed significantly to the growth of the primary sector. Its contribution to the growth of agriculture was 6.7% of total output growth, indicating that the secondary sector, especially the food, beverage and tobacco industry, had very strong backward linkages with agriculture. In contrast, in Malaysia, the secondary sector had strong backward linkages with the tertiary sector, especially trade. Its linkages with the primary sector were very weak.

The contribution of Vietnam's secondary sector to the country's output growth is in between the contribution of Malaysia and Indonesia's secondary sectors to their respective country's output growth. In Vietnam, 51.6% of total output growth was induced by the effects of demand changes in the secondary sector, which contributed 3.6% and 4.1% to the growth of the primary and tertiary sectors, respectively. Whereas Vietnam's secondary sector had stronger backward linkages with agriculture than Malaysia's, it had weaker linkages than Indonesia's. Vietnam's secondary sector contributed little to the growth of the tertiary sector.

In all three countries, the primary sector contributed very little to the output growth of the other two sectors. However, Vietnam's primary sector seems to have had relatively strong linkages with the tertiary sector, especially services. Unlike Vietnam

**Table 7: Sources of Output Growth
Categorized Growth Factor Decomposition Analysis
(as Percentage of Total Output Growth)**

Country	Sector	Primary	Secondary	Tertiary	Total
Vietnam	Primary	16.1	3.6	1.3	21.0
	Secondary	0.0	43.9	5.1	49.0
	Tertiary	2.0	4.1	23.8	29.9
	Total	18.2	51.6	30.2	100.0
Malaysia	Primary	2.7	1.8	1.3	5.8
	Secondary	0.5	48.7	4.2	53.3
	Tertiary	0.3	6.9	33.6	40.8
	Total	3.5	57.4	39.1	100.0
Indonesia	Primary	1.8	6.5	3.4	11.7
	Secondary	0.0	28.9	7.3	36.2
	Tertiary	0.2	4.8	47.0	52.0
	Total	2.0	40.2	57.8	100.0

**Table 8: Sources of Output Growth
Categorized Growth Factor Decomposition Analysis
(as Percentage of the Output Growth of Each Sector)**

Country	Sector	Primary	Secondary	Tertiary	Total
Vietnam	Primary	76.9	17.0	6.2	100
	Secondary	0.0	89.6	10.4	100
	Tertiary	6.8	13.8	79.4	100
	Total	18.2	51.6	30.2	100
Malaysia	Primary	46.4	31.2	22.4	100
	Secondary	0.9	91.3	7.8	100
	Tertiary	0.7	17.0	82.3	100
	Total	3.5	57.4	39.1	100
Indonesia	Primary	15.7	55.1	29.2	100
	Secondary	0.0	79.8	20.2	100
	Tertiary	0.3	9.3	90.4	100
	Total	2.0	40.2	57.8	100

and Malaysia, the tertiary sector played a prominent role in Indonesia. While its growth amounted to 52%, its demand effects brought about 57.8% of total growth, and its contribution to the primary and secondary sectors was 3.4% and 7.3%, respectively, of total growth. In Indonesia, the demand effects originating in the tertiary sector generated 57.8% of total output growth, which is much higher than 40.2% generated by the secondary sector's demand effects. In Vietnam, by contrast, only 30.2% of total output growth was induced by the tertiary sector's demand effects, which was much smaller than the 51.6% induced by the secondary sector's demand effects. Malaysia's tertiary sector's contribution to total output growth is in between Vietnam's and Indonesia's.

According to table 8, in all three countries, most of the growth of the secondary and tertiary sectors was induced by within-sector demand effects. In Vietnam, most of the primary sector's growth was also induced by within-sector demand effects. However, this is due to a large within-sector effect in mining, which experienced output growth driven by the expansion of within-sector export demand. On the other hand, 57% of agriculture's growth was brought about by demand effects from the secondary sector.

In Indonesia, agriculture's growth depended heavily on the secondary sector: 94% of agriculture's growth was brought about by the demand effects from the secondary sector. However, mining seems to have had very weak forward linkages with the secondary sector as its growth was not at all affected by demand effects from the secondary sector. On the other hand, in Malaysia, more than half of agriculture's growth was brought about by within-sector effects. However, unlike Indonesia and Vietnam, Malaysia's mining industry had very strong forward linkages with the secondary and tertiary sectors; only 30% of its growth was induced by within-sector effects.

Although Indonesia and Malaysia are far more industrialized than Vietnam, they also seem to have followed Petty-Clark's law of structural changes. There was a shift of output and demand from the primary to secondary sector in their respective periods. In these two countries, much of the primary sector's output growth was induced by the demand effects from the secondary and tertiary sectors, indicating that their primary sector had much stronger forward linkages with the secondary and tertiary sectors than Vietnam's. In Indonesia, the tertiary sector is found to have played a very important role in output growth, inducing not only its output growth but also the growth of the other sectors.

5 Summary of Findings and Concluding Remarks

Vietnam underwent a structural transformation from agricultural production towards non-agricultural production between 1996 and 2000. The manufacturing sector's contribution to total output and value-added increased by over five percentage points during this period. However, as the mining industry expanded at the same time, the primary sector's contribution to output continued to be significant.

Exports of textile and wearing apparel grew in relative importance, reflecting some positive results of the Vietnamese government's efforts to promote exports of labor-intensive products, in which Vietnam had comparative advantages. The overall export structure, however, remained heavily dependent on natural resources. Domestic production relied substantially on imported intermediate inputs, machinery, and equipment despite the government's intention to sustain its import substitution policies.

The major source of output growth from 1996-2000 in Vietnam was the expansion of exports, mainly in the mining industry and the textile and wearing apparel industry. While the effect of the secondary sector's export expansion remained modest, it is not altogether disappointing, given the adverse impact of the Asian crisis on the demand for and the competitiveness of Vietnamese exports during this period. However, the national growth's obvious and strong dependence on the export of mining products, par-

ticularly crude oil, should be a cause for concern given Vietnam's limited natural resources endowment. To maintain export expansion as the major driver of economic growth, Vietnam's export base will need to be diversified to include more processed products.

The effect of the decrease in import ratios, or import substitution, was the major source of output growth in several heavy industries such as the chemical products industry, the iron, steel and nonferrous metals industry, and the machinery and equipment industry, which enjoyed strong trade protection under the auspices of the government. These industries should nevertheless consider exploring other sources of growth since protection measures will be abolished when Vietnam fully complies with its obligations under the ASEAN Free Trade Area (AFTA) and when it joins the World Trade Organization (WTO) in the future.

According to the categorized growth factor decomposition analysis, the secondary sector played a key role in Vietnam's output growth; in fact, its demand effects induced more than half of total growth. As expected, the secondary sector had the greatest potential to induce growth in the other two sectors while concurrently generating its own growth – its combined contribution to the other sectors was about 8% of total output growth. Therefore, as Vietnam shifts away from primary production towards secondary production in the process of industrialization, it can expect to achieve higher growth levels. On the other hand, the tertiary sector's contribution was much smaller than the secondary sector's, but the tertiary sector contributed significantly to the growth of the secondary sector, indicating that the former had strong backward linkages with the latter.

Exports in the secondary sector played a significant role in inducing the growth of both primary and secondary sectors. Manufactured exports should thus be promoted as a potential catalyst of economic growth. In addition, stronger linkages between the primary sector, particularly the mining industry, and the secondary sector are expected to generate higher value-added for the economy through the processing of primary products.

The comparative country analysis revealed that although Indonesia from 1990-1995 and Malaysia from 1987-1991 were far ahead of Vietnam from 1996-2000 in terms of industrialization, both countries also underwent some similar structural changes. The decline in importance of agriculture was evidenced across all three countries, though from different levels and at different rates. Vietnam, however, remained the most agriculturally-based economy among the three. The secondary sector did expand its share in all three economies; however the Malaysian secondary sector had the largest share and, unsurprisingly, recorded the highest level of growth among the three countries. In contrast, the Indonesian secondary sector comprised the smallest share.

The industry composition of the secondary sector varied among the three countries. As expected, heavy industries had a much larger share than light industries in both output and value added in Malaysia, which was the most industrialized country among the three. Malaysia's heavy industries continued to expand due mainly to the rapid growth of the machinery and equipment industry. On the other hand, in Vietnam and Indonesia, which were both at earlier stages of industrialization, the importance of light industries outweighed heavy industries.

According to the categorized growth factor decomposition analysis, the contribu-

tion of Vietnam's secondary sector is in between Malaysia's and Indonesia's. In Malaysia, 57% of total output growth was induced by demand effects from the secondary sector, which contributed significantly to the growth of the tertiary sector. In contrast, the secondary sector induced only 40% of total growth in Indonesia, but it contributed significantly to the growth of agriculture, thus indicating that this sector, especially the food, beverage and tobacco industry, had very strong backward linkages with agriculture. Vietnam's secondary sector had stronger backward linkages with agriculture than Malaysia's but weaker than Indonesia's. Vietnam's secondary sector contributed relatively little to the output growth of the tertiary sector.

In sum, within only four years from 1996-2000, Vietnam had achieved substantial progress towards industrialization in the following ways: (1) the structure of production shifted away from agricultural towards non-agricultural activities; and (2) the secondary sector expanded substantially. As the secondary sector continues to expand during the industrialization process, it will lead to higher economic growth rates. Finally, as a sign of growing international competitiveness and the success of the open door policy, export expansion became the major source of output growth.

As the Vietnamese government continues its policy of rapid modernization and industrialization, policymakers should continue to strengthen export expansion through a more explicit export-oriented industrialization strategy and further diversification of the export structure to include more manufactured exports, particularly labor-intensive products. Given the importance of inter-sectoral interdependence in output growth, linkages between the three sectors of the economy should be strengthened so as to accelerate output growth and generate higher value-added.

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