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## Benchmarking Developing Asia's Manufacturing Sector

Jesus Felipe and Gemma Estrada

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# **BENCHMARKING DEVELOPING ASIA'S MANUFACTURING SECTOR**

**JESUS FELIPE AND GEMMA ESTRADA**

**SEPTEMBER 2007**

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## **FOREWORD**

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## CONTENTS

Abstract	vii
I. Introduction	1
II. Structural Transformation in Developing Asia's Manufacturing Sector	2
III. How Large is Developing Asia's Manufacturing Sector? A Logistic Regression	11
IV. Conclusions	18
Appendix	20
References	26



## **ABSTRACT**

This paper documents the transformation of developing Asia's manufacturing sector during the last three decades and benchmarks its share in GDP with respect to the international regression line by estimating a logistic regression.



## **I. INTRODUCTION**

In a recent paper, Rodrik (2006) has revived the long-standing but perhaps forgotten argument that rapid growth is associated first and foremost with the expansion of the industrial sector. While this idea was part of the toolkit of the development economists of the “old” school (Rodrik cites Lewis 1954), Rodrik argues that it is somewhat paradoxical that recent thinking on policy reforms pays scant attention to structural transformation and industrial development. Many economists see the development of a modern industrial sector as the key for propelling the structural transformation of an economy. Modern development textbooks (e.g., Ros 2000, Ghatak 2003, Thirlwall 2006) emphasize the special role that industry (in particular the manufacturing sector) plays in the development process.

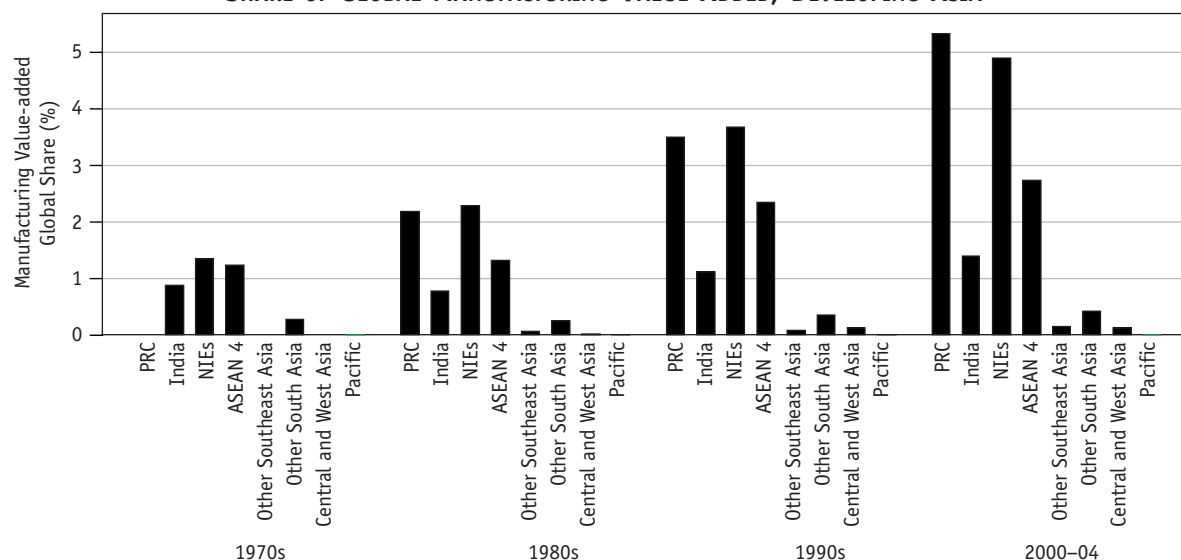
The role attributed to manufacturing in the process of take-off and subsequent catch-up is usually a key element of sectoral studies of growth (Kaldor 1966 and 1967; see Felipe et al. 2007). It is no surprise, therefore, that economists and policymakers worry about swings in manufacturing. Though economies like Australia, Canada, New Zealand, the Scandinavian countries, and others relied heavily on the primary sector for their development, they all experienced periods of strong industrial growth and diversification as essential components of their sustained economic growth. Rodrik (2006) has argued that sustained growth requires a dynamic industrial base. One can, therefore, speak of the “logic of industrialization” (Nixson 1990, 313) and understand why many developing countries have adopted strategies toward rapid industrialization, often starting with industries that use relatively simple technologies, and that have the potential to be labor-intensive thus absorbing labor, such as textiles. The experience of the industrial economies appears to show that establishing a broad and robust domestic industrial base holds the key to successful development, and the reason that industrialization matters lies in the potential for strong productivity and income growth of the sector. This potential is associated also with a strong investment drive in the sector, rapidly rising productivity, and a growing share of the sector in total output and employment. The presence of scale economies associated with the secondary sector, gains from specialization and learning, as well as favorable global market conditions, imply that the creation of leading industrial subsectors, along with related technological and social capabilities, remains a key policy challenge.

The objective of this paper is to provide an analysis of developing Asia’s manufacturing sector during the last three decades, benchmarking it with respect to the international regression line by estimating a logistic regression. The rest is structured as follows. In Section II we briefly discuss the transformation of developing Asia’s manufacturing sector during the last three decades. Section III benchmarks the sector by estimating a regression based on the logistic pattern of growth. The final section summarizes the main findings.

## II. STRUCTURAL TRANSFORMATION IN DEVELOPING ASIA'S MANUFACTURING SECTOR

During the last three decades, most economies in developing Asia have undergone massive structural change, in particular in terms of changes in both output and employment sectoral shares. The rise in developing Asia's share in world manufacturing value-added during the last few decades has been significant (Figure 1). In particular, the joint share of the People's Republic of China (PRC), the newly industrialized economies (NIEs)<sup>1</sup>, and ASEAN-4<sup>2</sup> has more than doubled since the 1980s, representing in 2000–2004 close to 14% of the world total. This increase has been due, obviously, to a much faster growth of manufactured value-added in this region—8–10% per annum since the 1970s—compared to the rest of the world. In context, though, the share of the PRC (the highest among all developing economies) is just over 5% of the world's manufacturing value-added, significantly less than the shares of Japan or the United States (more than 20% each), while the share of India has barely increased. Growth in manufacturing value-added has been substantially higher than that of gross domestic product (GDP) in many economies in developing Asia, including India; the NIEs (except Hong Kong, China, which registered a shrinkage); ASEAN-4 (except the Philippines, which also registered a decrease); as well as the economies under Other Southeast Asia<sup>3</sup> and Other South Asia.<sup>4</sup> In the PRC, however, manufacturing growth was slightly below that of GDP. Several of the ex-Soviet republics (Armenia, Azerbaijan, Kyrgyz Republic, Tajikistan) registered contraction in manufacturing value-added after the breakup of the Soviet Union.

FIGURE 1  
SHARE OF GLOBAL MANUFACTURING VALUE ADDED, DEVELOPING ASIA



Note: ASEAN-4 includes Indonesia, Malaysia, Philippines, and Thailand. Central and West Asia covers Armenia, Azerbaijan, Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan, Turkmenistan, and Uzbekistan. NIEs consist of Hong Kong, China; Republic of Korea (henceforth Korea); Singapore; and Taipei, China. Other Southeast Asia comprises Cambodia, Lao People's Democratic Republic, Myanmar, and Viet Nam. Other South Asia covers Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka. Pacific includes Fiji, Kiribati, Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Timor-Leste, Tonga, and Vanuatu.

Sources: Authors' estimates based on data from *World Development Indicators Online* (World Bank 2006) and the Directorate General of Budget, Accounting and Statistics (2006).

<sup>1</sup> The NIEs are Hong Kong, China; Republic of Korea; Singapore; and Taipei, China.

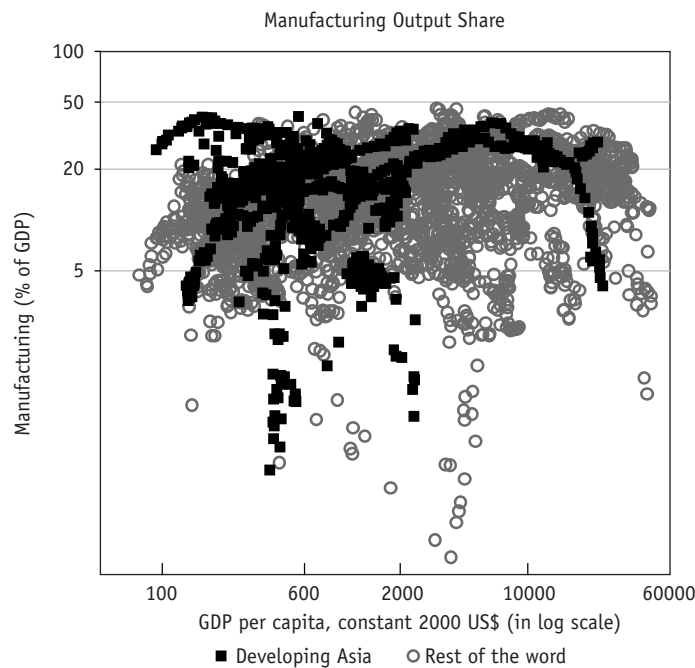
<sup>2</sup> ASEAN-4 includes Indonesia, Malaysia, Philippines, and Thailand.

<sup>3</sup> Other Southeast Asia comprises Cambodia, Lao People's Democratic Republic, Myanmar, and Viet Nam.

<sup>4</sup> Other South Asia covers Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka.

Figure 2 shows the scatter plot of the output share of manufacturing in output vis-à-vis income per capita, pooling data since 1970 for the whole world. The figure shows that as economies' income per capita increases, so does the share of output in manufacturing, although there seems to be a point beyond which the share starts declining. The figure also shows a wide dispersion in this share for a given income per capita, from very low shares up to 50%.

**FIGURE 2**  
**MANUFACTURING OUTPUT AND EMPLOYMENT SHARES VERSUS PER CAPITA GDP,**  
**ALL ECONOMIES (LOGARITHMIC SCALE)**



Source: *World Development Indicators Online* (World Bank 2006).

Tables 1 and 2 show decadal averages of the manufacturing share in output and employment. The NIEs have undergone severe deindustrialization as manufacturing has lost significant weight in total output between the 1970s and 2000–2004. In terms of manufacturing employment, all four NIEs have clearly deindustrialized, especially Hong Kong, China, where the share decreased by about 25 percentage points in two decades. The declines in the other three economies are significant but smaller. These developments should not be interpreted as “failure” of these economies, but as results of the natural and dynamic process of development, i.e., the transition to service-led economies. Rowthorn and Ramaswamy (1997 and 1999) have noted that this group of economies is going through a process similar to that of countries of the Organisation for Economic Co-operation and Development (OECD), although it must be noted that it is a process affecting Taipei, China but especially Hong Kong, China, and to a much lesser extent, Korea and Singapore. This is the result of transferring production facilities to the PRC. In Korea and Singapore, the share of manufacturing has remained at about 27% since the 1980s.

India's manufacturing output share has remained stable at about 15–16% since the 1970s, while the share of manufacturing employment has been at around 11% during the periods under consideration. The ASEAN-4 countries (except the Philippines), Cambodia, and Lao PDR have increased their manufacturing shares significantly, both in terms of output and employment. Although Indonesia, Malaysia, and Thailand are cases of what can be labeled as “successful industrialization”, this must be qualified with the following two observations. First, other than Singapore; Korea; Taipei, China; Malaysia; and Kyrgyz Republic, none of the other economies in Table 2 in 2000–2004 had a share of employment in manufacturing as high as that of the OECD average. Second, in terms of labor productivity, there is still a large differential between most developing Asian economies and the OECD average. Indeed, it appears that many economies across developing Asia have industrialized at low levels of productivity (Figure 3). This could be due to two reasons: (i) the product mix of new employment has been toward relatively low-productivity industries; and/or (ii) the increase in employment has taken place in low-productivity techniques.

**TABLE 1**  
**DEVELOPING ASIA MANUFACTURING OUTPUT SHARES BY DECADE**

	1970s	1980s	1990s	2000–04
PRC	37.27	36.26	32.90 <sup>h</sup>	34.50 <sup>i</sup>
India	15.32	16.43	16.58	15.71
<b>NIEs</b>				
Hong Kong, China	–	21.18	9.43	4.32
Korea	21.61	27.51	27.14	27.82
Singapore	24.84 <sup>a</sup>	26.09	26.11	27.39
Taipei, China	32.43	34.95	27.11	22.80
<b>ASEAN-4</b>				
Indonesia	10.42	15.35	23.72	29.04
Malaysia	16.82	20.42	27.05	31.21
Philippines	25.72	25.03	23.29	22.94
Thailand	18.98	23.32	29.55	34.00
<b>Other Southeast Asia</b>				
Cambodia	–	–	11.08	19.40
Lao PDR	–	9.27 <sup>d</sup>	14.20	18.67
Myanmar	9.64	9.07	6.90	8.49 <sup>m</sup>
Viet Nam	–	19.69 <sup>e</sup>	15.23	19.94
<b>Other South Asia</b>				
Bangladesh	–	13.76	14.87	15.73
Bhutan	–	5.29	10.39	7.79 <sup>m</sup>
Maldives	–	–	–	–
Nepal	4.11	5.24	8.77	8.85
Pakistan	15.89	15.98	16.44	15.99
Sri Lanka	19.02	15.39	15.68	15.90

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**TABLE 1. CONTINUED.**

	1970s	1980s	1990s	2000–04
<b>Central and West Asia</b>				
Armenia	–	–	27.56	22.68
Azerbaijan	–	–	14.08	7.87
Kazakhstan	–	–	13.30 <sup>i</sup>	16.33
Kyrgyz	–	–	20.04	16.19
Mongolia	–	31.04	18.70	6.37
Tajikistan	–	27.70 <sup>e</sup>	25.43	32.35
Turkmenistan	–	–	26.30 <sup>j</sup>	15.47 <sup>m</sup>
Uzbekistan	–	25.06 <sup>f</sup>	11.96 <sup>j</sup>	9.40
<b>Pacific Islands</b>				
Fiji	11.79	10.59	14.44	15.02 <sup>n</sup>
Kiribati	1.62 <sup>b</sup>	1.16	0.98	0.89 <sup>n</sup>
Marshall Islands	–	–	1.63	4.54 <sup>o</sup>
Micronesia	–	0.40 <sup>g</sup>	–	–
Papua New Guinea	7.26	10.06	8.89	8.50 <sup>m</sup>
Palau	–	–	0.97	1.19 <sup>n</sup>
Samoa	–	–	17.10 <sup>j</sup>	15.37
Timor-Leste	–	–	2.78 <sup>k</sup>	3.29
Tonga	6.63 <sup>a</sup>	5.42	4.85	4.61
Vanuatu	3.90 <sup>c</sup>	4.45	4.88	4.21 <sup>o</sup>

<sup>a</sup> Refers to 1975–79 average.

<sup>b</sup> Refers to 1978–79 average.

<sup>c</sup> Refers to 1979.

<sup>d</sup> Refers to 1989.

<sup>e</sup> Refers to 1985–89 average.

<sup>f</sup> Refers to 1987–89 average.

<sup>g</sup> Refers to 1983.

<sup>h</sup> Refers to 1990–92 average.

<sup>i</sup> Refers to 1992–99 average.

<sup>j</sup> Refers to 1994–99 average.

<sup>k</sup> Refers to 1999.

<sup>l</sup> Refers to 2000.

<sup>m</sup> Refers to 2000–03 average.

<sup>n</sup> Refers to 2000–02 average.

<sup>o</sup> Refers to 2000–01 average.

Note: – means data not available.

Sources of basic data: *World Development Indicators* (World Bank 2006); Directorate General of Budget, Accounting and Statistics, Taipei, China (various years).

**TABLE 2**  
**DEVELOPING ASIA MANUFACTURING EMPLOYMENT SHARES BY DECADE**

	MANUFACTURING AS PERCENT OF TOTAL EMPLOYMENT		
	1980s	1990s	2000–04
PRC	15.11 <sup>b</sup>	13.47	11.16 <sup>g</sup>
India	11.05 <sup>a</sup>	10.92 <sup>a</sup>	11.22 <sup>a</sup>
<b>NIEs</b>			
Hong Kong, China	35.89	19.02	10.20 <sup>h</sup>
Singapore	27.91	24.53	18.31 <sup>i</sup>
South Korea	23.93	23.40	19.44
Taipei,China	33.41	28.66	27.40
<b>ASEAN-4</b>			
Indonesia	9.68 <sup>c</sup>	11.73	13.15 <sup>g</sup>
Malaysia	15.95	22.59	21.94
Philippines	9.93	10.06	9.65
Thailand	8.87	12.33	14.58
<b>Other</b>			
Azerbaijan		9.36 <sup>e</sup>	5.44 <sup>g</sup>
Kyrgyz		20.11	19.19
Pakistan	13.66	10.99	12.66
Viet Nam		8.32 <sup>f</sup>	10.33
<b>OECD</b>	21.58 <sup>d</sup>	19.20 <sup>d</sup>	16.89 <sup>d</sup>

Note:

<sup>a</sup> For India, the figure for each decade refers only to a single year, as follows: 1983, 1993/94, 1999/00.

<sup>b</sup> Refers to the period 1987–89.

<sup>c</sup> Refers to the average for the years 1980, 1982, 1985, and 1989.

<sup>d</sup> For OECD, the number of countries covered each decade are: 18 for the 1980s, 20 for the 1990s, 21 for 2000/04.

<sup>e</sup> Refers to the period 1992–99.

<sup>f</sup> Refers to the period 1996–99.

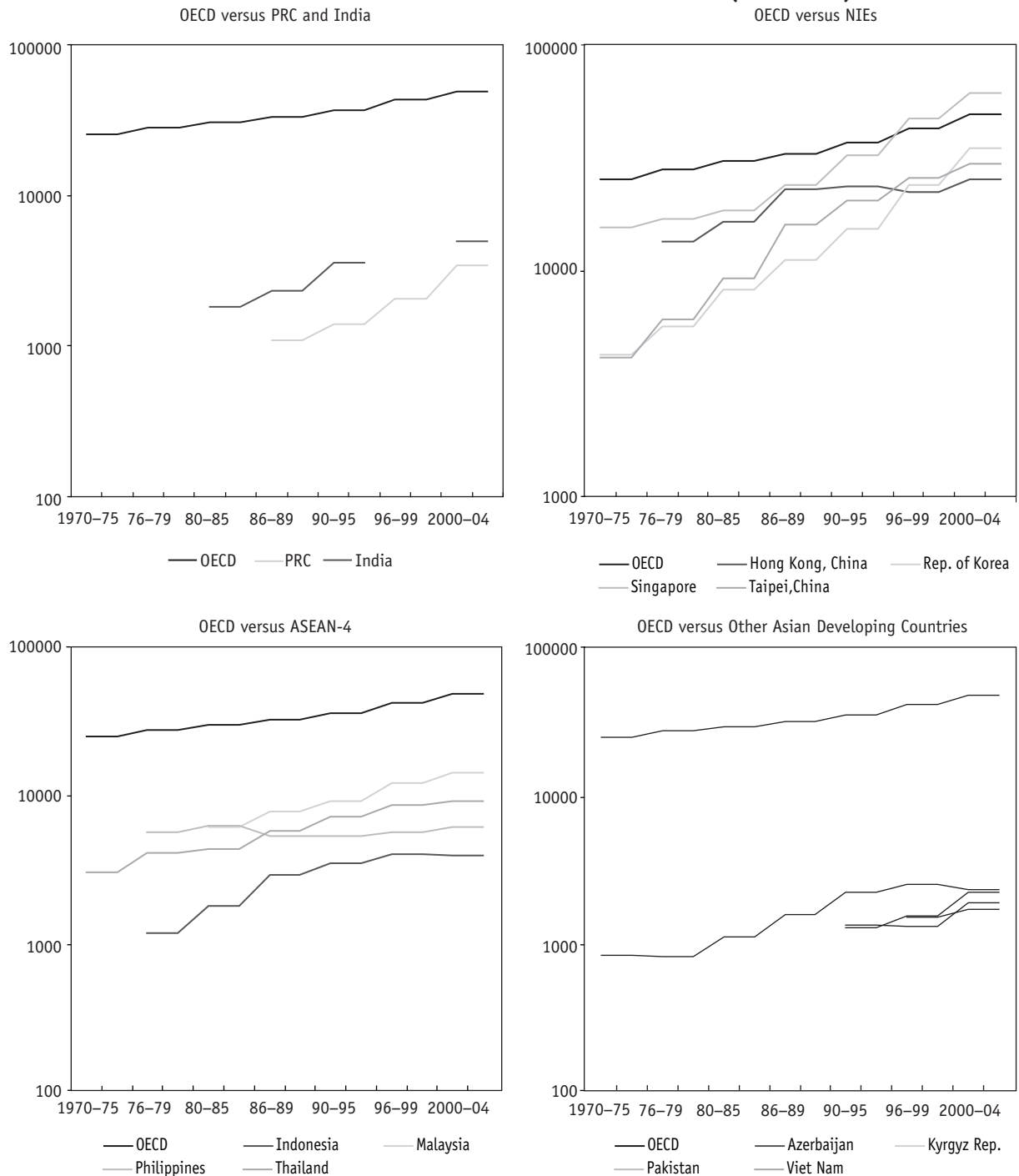
<sup>g</sup> Refers to the period 2000–02.

<sup>h</sup> Refers to the period 2000–01.

<sup>i</sup> Refers to the period 2001–03.

Sources: LABORSTA (International Labour Statistics Organization 2006); Directorate General of Budget, Accounting and Statistics, Taipei,China (various years); Anant et al. (2006).

**FIGURE 3**  
**MANUFACTURING LABOR PRODUCTIVITY, LOGARITHMIC SCALE (US \$2000)**



Note: The 1980-85, 1986-89, 1990-95, and 2000-04 data for India refer only to 1983, 1988, 1994, and 2000 figures, respectively. The 2000-04 figures for PRC, Indonesia, Kyrgyz, and Pakistan refer only to 2000-02. The 1986-89 figure for Indonesia pertains only to 1989. The 1976-79 figure for the Philippines refers only to 1978. The 1970-75 figure for Pakistan refers only to 1973-75.

Source: Authors' calculations.

Developing Asia's increased share in world manufacturing value-added has been accompanied by a significant degree of structural transformation within manufacturing. Table 3 shows the structure of manufacturing output of developing Asia by decadal averages (except latest subperiod). In the 1970s, food and beverages; textiles; and apparel, leather, and footwear accounted for about 39% of total manufacturing, while electrical and nonelectrical machinery and transport equipment accounted for about 17%. By 2000–2003, the former three accounted for a substantially lower 22% while the latter three accounted for about 34%. This shows a very clear change (upgrade) in the structure of manufacturing production. It also shows that the production structure has become slightly more diversified, especially compared to the 1970s. Appendix Table 1 shows this information disaggregated by economy.

**TABLE 3**  
**MANUFACTURING STRUCTURE BY DECADE, DEVELOPING ASIA**  
**(PERCENT OF TOTAL MANUFACTURING)**

TYPE	1970s	1980s	1990s	2000–2003
Food and beverages	19.40	14.14	12.45	12.55
Textiles	14.77	11.02	7.11	5.84
Apparel, leather, and footwear	5.27	4.89	4.74	4.20
Wood and wood products	3.01	2.10	2.01	1.82
Paper and paper products	2.20	2.10	2.09	2.28
Printing and publishing	2.11	1.95	2.58	1.89
Industrial chemicals	9.41	10.19	10.21	11.45
Petroleum and coal products	4.90	4.73	4.07	3.57
Rubber and plastic products	4.55	4.84	4.38	3.85
Nonmetal mineral products	4.46	5.42	5.34	4.60
Basic metals	5.86	7.75	7.60	7.71
Metal products	3.43	4.24	4.23	3.42
Nonelectrical machinery	3.88	8.32	8.58	8.66
Electrical machinery	8.07	9.43	13.69	16.57
Transport equipment	5.74	5.49	8.28	9.26
Others	2.94	3.39	2.62	2.33
Total	100.00	100.00	100.00	100.00

Source: Authors' computations based on data from INDSTAT (2005).

If we group the different branches of the manufacturing sector according to the level of technology<sup>5</sup> (Table 4), we can see that developing Asia's shares in the four categories have increased substantially between the 1970s and 2000/03: from 4.86% to 12.75% in low technology; from 2.51% to 8.42% in medium technology and low economies of scale; from 2.14% to 11.34% in medium technology and medium economies of scale; and from 2.19% to 11.33% in high technology. It is

<sup>5</sup> This was done by dividing all manufacturing branches into four groups according to level of technology and scale. Group 1 corresponds to the manufacturing branches with the lowest technology and scale economies, e.g., food and beverages, tobacco, wearing apparel, leather products. Group 2 consists of plastic and rubber products, paper, among others. Group 3 consists of iron and steel, nonmineral products, among others. Group 4 consists of products with the highest technology and scale economies, such as electrical and nonelectrical machinery, industrial chemicals, professional equipment, transport equipment, among others.

also worth noting that the PRC's shares have increased in all four categories. On the other hand, the shares of the NIES and ASEAN-4 increased until the 1990s, but decreased in 2000–2003.

**TABLE 4**  
**SHARE OF WORLD MANUFACTURING BY TYPE OF TECHNOLOGY AND DECADE**

GROUP	N	1970s	N	1980s	N	1990s	N	2000/03
<b>1. Low economies of scale/low technology</b>								
<b>World</b>								
Developing Asia	14	4.86	19	10.40	17	12.26	11	12.75
OECD	22	81.91	23	75.73	23	73.40	17	78.40
LAC	20	4.35	22	5.11	21	7.41	8	3.08
SSA	31	1.80	31	1.82	23	1.08	5	0.12
Rest of the World	20	7.08	30	6.94	33	5.85	25	5.66
Total	107	100.00	125	100.00	117	100.00	66	100.00
<b>Developing Asia</b>								
PRC			1	3.63	1	3.78	1	6.74
India	1	0.77	1	0.69	1	0.68	1	0.91
NIEs	4	2.31	4	3.66	4	4.28	3	3.26
ASEAN-4	4	1.42	4	1.97	4	2.97	2	1.51
Other Southeast Asia	0	0.00	1	0.01	1	0.02	2	0.17
Other South Asia	3	0.32	5	0.41	4	0.51	2	0.16
Central and West					1	0.02		
Pacific Islands	2	0.03	3	0.04	1	0.01		
Total	14	4.86	19	10.40	17	12.26	11	12.75
<b>2. Low economies/medium technology</b>								
<b>World</b>								
Developing Asia	14	2.51	19	6.08	17	8.23	11	8.42
OECD	22	91.58	23	88.27	23	84.97	17	86.56
LAC	20	1.88	22	2.13	21	3.81	8	1.65
SSA	30	0.97	31	0.93	23	0.51	5	0.07
Rest of the World	20	3.07	30	2.59	33	2.49	25	3.30
Total	106	100.00	125	100.00	117	100.00	66	100.00
<b>Developing Asia</b>								
PRC			1	1.91	1	1.87	1	3.47
India	1	0.35	1	0.31	1	0.34	1	0.53
NIEs	4	1.62	4	2.87	4	3.82	3	3.35
ASEAN-4	4	0.47	4	0.92	4	2.10	2	0.99
Other Southeast Asia			1	0.01	1	0.01	2	0.04
Other South Asia	3	0.06	5	0.06	4	0.09	2	0.04
Central and West					1	0.00		
Pacific Islands	2	0.01	3	0.01	1	0.00		
Total	14	2.51	19	6.08	17	8.23	11	8.42

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TABLE 4. CONTINUED.

GROUP	N	1970s	N	1980s	N	1990s	N	2000/03
<b>3. Medium economies/medium technology</b>								
<b>World</b>								
Developing Asia	14	2.14	19	7.77	17	10.82	11	11.34
OECD	22	88.70	23	81.84	23	77.79	17	80.96
LAC	19	2.30	22	3.35	21	5.23	8	2.01
SSA	29	1.37	30	1.34	23	0.76	4	0.03
Rest of the World	20	5.49	29	5.70	33	5.40	25	5.66
Total	104	100.00	123	100.00	117	100.00	65	100.00
<b>Developing Asia</b>								
PRC			1	3.64	1	3.95	1	6.20
India	1	0.60	1	0.69	1	0.74	1	0.90
NIEs	4	1.06	4	2.47	4	4.55	3	3.58
ASEAN-4	4	0.42	4	0.82	4	1.43	2	0.59
Other Southeast Asia			1	0.01	1	0.01	2	0.06
Other South Asia	3	0.06	5	0.13	4	0.14	2	0.02
Central and West					1	0.00		
Pacific Islands	2	0.01	3	0.01	1	0.00		
Total	14	2.14	19	7.77	17	10.82	11	11.34
<b>4. Medium or strong economies/medium or strong technology</b>								
<b>World</b>								
Developing Asia	14	2.19	18	6.07	17	9.41	11	11.33
OECD	22	90.90	23	86.76	23	81.96	17	82.68
LAC	20	1.56	22	2.36	21	4.62	8	1.39
SSA	30	0.71	31	0.77	23	0.36	4	0.01
Rest of the World	20	4.64	30	4.04	33	3.64	25	4.58
Total	106	100.00	124	100.00	117	100.00	65	100.00
<b>Developing Asia</b>								
PRC			1	2.51	1	2.57	1	4.89
India	1	0.55	1	0.55	1	0.59	1	0.69
NIEs	4	1.21	4	2.38	4	4.74	3	4.78
ASEAN-4	4	0.35	4	0.54	4	1.42	2	0.93
Other Southeast Asia					1	0.01	2	0.02
Other South Asia	3	0.07	5	0.09	4	0.09	2	0.01
Central and West					1	0.00		
Pacific Islands	2	0.01	3	0.00	1	0.00		
Total	14	2.19	18	6.07	17	9.41	11	11.33

Note: N denotes number of economies. LAC means Latin America and Caribbean; SSA means Sub-Saharan Africa. ASEAN-4 includes Indonesia, Malaysia, Philippines, and Thailand. CWA denotes Central and West Asia covering Armenia, Azerbaijan, Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan, Turkmenistan, and Uzbekistan. NIEs consist of Hong Kong, China; Korea; Singapore; and Taipei, China. Other Southeast Asia comprises Cambodia, Lao PDR, Myanmar, and Viet Nam. Other South Asia covers Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka. Pacific includes Fiji, Kiribati, Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Timor-Leste, Tonga, and Vanuatu.

Source: Authors' computation based on data from INDSTAT (UNIDO 2005).

ADB (2007) provides evidence that the manufacturing sectors in a number of Asian economies, especially Korea; Malaysia; Singapore; and Taipei, China, have undergone important transformations and shifted their manufacturing output to more technology- and scale-intensive subsectors. This upward shift is an important component of what structural change is about, as the production of more sophisticated manufactured products leads to faster growth by enlarging the potential for catch-up. In the PRC and India, the shift to more technology- and scale-intensive subsectors is taking place more slowly, while in most other Asian countries the evidence is lacking.

Summing up, the two most significant features of the transformation of developing Asia's manufacturing sector are, first, its increasing share in world total manufacturing output; and second, its technological upgrade, as reflected in the increasing production of more technologically advanced products.

### III. HOW LARGE IS DEVELOPING ASIA'S MANUFACTURING SECTOR? A LOGISTIC REGRESSION

In order to benchmark developing Asia's manufacturing sector we have to compare the actual share with that given an economy's control variables. Which are the latter? The theory underlying the logistic pattern of growth model (Chenery 1960 and 1971, Kuznets 1966, Chenery and Taylor 1968, Chenery and Sirquin 1975) indicates that the most important variable is, not surprisingly, income per capita. This is the result of Engel's law, namely, the empirical observation that the proportion of consumer expenditure on foodstuffs, the principal product of the agricultural sector, declines as per capita income rises, i.e., the income elasticity of demand for food is less than unity. Hence, there is a decline in the agricultural share, which in turn leads to a decline in the sector's share of the labor force in the course of economic development. And as the income elasticity of demand for manufactures tends to be relatively high in developing countries and relatively lower in the rich countries, the share of manufacturing in output and employment rises at first and falls later on.

To this purpose, we estimate econometrically the elasticity of the manufacturing share with respect to income per capita by hypothesizing the relationship  $S_i = e^{a_1} y^{a_2}$  between the manufacturing output share ( $S_i$ ) and income per capita ( $y$ ). This relationship can be estimated econometrically by taking logarithms as  $\ln S_i = a_1 + a_2 \ln y$ . The elasticity is given by the estimate of  $a_2$ . However, given the possibility of a hump-shaped relationship between both variables, we hypothesize the nonlinear relationship  $S_i = e^{a_1} y^{a_2 + a_3 \ln y}$ , which can also be estimated by taking logarithms. The income elasticity is then given by  $\eta_i = a_2 + 2a_3 \ln y$ , which varies with  $y$ . The regression also includes two additional regressors. First we introduce population, a proxy market size. Moreover, the change in the size of population also reflects the change in the actual or potential labor supply. Second, as many Asian economies have followed an export-oriented development path, export performance, which depends largely on the expansion of the overseas market, is an important factor affecting the changing share of the secondary sector in total product. For this reason, we estimate the regression for the manufacturing sector including the trade ratio in GDP ( $Tr$ ).<sup>6</sup> Hence we estimate:

<sup>6</sup> The investment ratio was also included as an additional variable as increases in investment favors the expansion of the secondary sector. Also, the rate of capital formation is an important variable that influences the composition of demand. The majority of investment expenditure involves the purchase of manufactured goods such as prefabricated buildings, construction materials, and producer durables. For these reasons, a high rate of investment should be reflected in a high share of a manufacturing in both output and employment. Results were not satisfactory and hence, the investment ratio was dropped.

$$\ln S_{MA} = a_1 + a_2 \ln y + a_3 (\ln y)^2 + a_4 \ln(Tr) + a_5 \ln(P) + u \quad (1)$$

where  $S_{MA}$  is the manufacturing share in GDP;  $u$  is the error term;  $\eta_{MA} = (a_2 + 2a_3 \ln y^*)$  is the estimated elasticity of the share with respect to income per capita at each income per capita ( $y^*$  is actual income per capita); and the symbol  $\wedge$  denotes the estimated coefficient. Regression (1) is estimated with cross-sectional data using ordinary least squares.<sup>7</sup>

Point elasticities for 1975, 1985, 1995, and 2000 are shown in Table 5.<sup>8</sup> A one percentage point in income per capita leads, on average, to a less-than-one percentage point increase in output and employment shares in industry. This elasticity increased between 1975 and 1985, but then decreased for 1995 and 2000. Moreover, since the relationship between the logarithm of the manufacturing share and the logarithm of income per capita is nonlinear (a hump-shaped relationship), the actual elasticity varies with income per capita. The hump-shaped relationship implies that the elasticity of the manufacturing share is relatively high (positive, i.e., the share increases as income per capita increases) when an economy is poor and then falls as the economy becomes rich (becomes negative, i.e., the share decreases as income per capita increases). The range is shown in brackets.<sup>9</sup> In 1975, the elasticities varied between 0.58 for the poor economies and -0.36 for the rich economies. On the other hand, in 2000, the elasticities varied between 0.36 for the poor economies and -0.11 for the rich economies. The five economies with the lowest and highest elasticities are shown in the bottom half of Table 5.

Figure 4 graphs the complete range of income elasticities for 1975, 1985, 1995, and 2000 vis-à-vis income per capita. As noted above, the elasticities increased between 1975 and 1985 (i.e., the curves shifted upward), but then decreased in 1995 and 2000 (i.e., the curves shifted downward). The bottom half of Figure 4 provides the economies with the highest and lowest elasticities each year.

The regression results also allow us to calculate the turning point, that is, the point at which elasticity turns from positive to negative (i.e., the manufacturing share becomes highest, at which point the income elasticity is zero). This occurs at \$9,998 (dollars of 2000). Since the population and trade variables are statistically significant in the regression, we have graphed the predicted line for 2000 in Figure 5 for two different populations, 50 and 100 million, as well as for two different trade ratios, 30% and 100%. Results indicate that population size matters: doubling population from 50 to 100 million increases the manufacturing share by about 2 percentage points

<sup>7</sup> Early formal empirical work on the logistic pattern dates back to the work of Chenery (1960), Kuznets (1966 and 1971), Chenery and Taylor (1968), Chenery and Syrquin (1975), among others. Chenery argued that it was justifiable to interpret cross-sectional results as normal growth functions (Chenery 1960, 635). Kuznets, on the other hand, argued that cross-sectional results could not be used to infer time-series patterns (Kuznets 1966, 436). The issue is crucial as it boils down to the correct interpretation of the patterns of development: cross-sections are snapshots at one point in time that help situate a country's performance vis-à-vis that of other countries.

However, "development patterns" refer to the structural changes that have occurred within a relative long span. Moreover, patterns will be relevant (in the sense of helping devise policies that can foster growth) if they appear in countries' experience over time and if understanding them guides policy formation. Jameson (1982) took up the issue and tested the growth patterns hypothesis with data for 89 developing countries, finding that the time series estimates violated the expected results: 45% of the sample countries deviated from the expected pattern (either the slope of the primary or of the secondary sectors had incorrect sign). He concluded that "time-series for countries in the postwar [...] cannot be used as evidence favoring the existence of patterns of development [...] Kuznets' suggestion was correct and claims of patterns of behavior must be confined to cross-section data" (Jameson 1982, 432).

<sup>8</sup> The point elasticity is calculated as  $\eta_{MA} = (a_2 + 2a_3 \ln \bar{y}^*)$  using the average income per capita ( $\bar{y}^*$ ) of all economies.

<sup>9</sup> The range shows the smallest and highest elasticities calculated as  $\eta_{MA} = (a_2 + 2a_3 \ln y^*)$  using the income per capita of each economy.

for low income per capita, and by about 3 percentage points at high income per capita. Moreover, openness also matters: increasing the trade ratio from 30% to 100% increases the manufacturing share by 6 percentage points for low income per capita, and by about 8 percentage points for high income per capita. The results also indicate that the maximum income per capita corresponds to a manufacturing share of between 19% and 27% (depending on the population and trade share combinations).

Actual and predicted shares (i.e., where the latter is each economy's expected share given its income per capita, population, and trade ratio) for developing Asia are shown in Table 6. Economies can be divided into three groups, depending on whether (i) the actual share is higher than the predicted one; (ii) the actual share is lower than the predicted; or (iii) the predicted and actual shares are about the same and the economy is on or very close to the regression line.

In the first group of economies we find PRC; the NIEs except Hong Kong, China; the ASEAN-4 except the Philippines; Cambodia; Lao People's Democratic Republic; Armenia; Kyrgyz Republic; Tajikistan; Fiji; and Samoa. The PRC and the NIEs's very high manufacturing shares are the result of explicit industrialization policies as the basis for their development (see Wang and Li 1995 on the PRC). Although declining with respect to the average of the 1980s, the share of the manufacturing subsector in total output in the PRC has been traditionally much higher than anywhere else. It still accounts for about 34.5% of total output, only matched in developing Asia by Malaysia, Thailand, and Tajikistan. The share of manufacturing employment, on the other hand, has declined from about 15% in the 1980s to 11% at present.

**TABLE 5**  
**ESTIMATES OF INCOME ELASTICITIES OF MANUFACTURING OUTPUT**

	POINT ESTIMATE ELASTICITY	ELASTICITY RANGE
1975	0.158 (3.58)***	[-0.362, 0.581]
R-squared	0.22	
Number of economies	89	
1985	0.168 (5.36)***	[-0.026, 0.376]
R-squared	0.41	
Number of economies	120	
1995	0.114 (4.72)***	[-0.129, 0.335]
R-squared	0.37	
Number of economies	158	
2000	0.128 (4.45)***	[-0.116, 0.367]
Number of economies	161	
R-squared	0.33	
Turning Point	\$9,998	

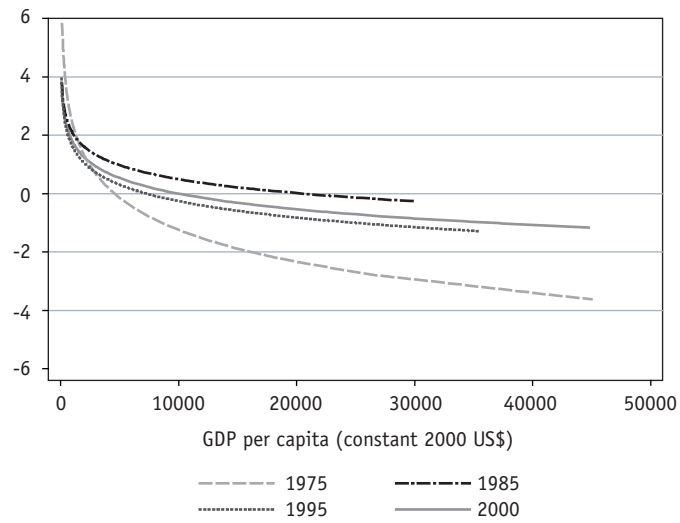
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TABLE 5. *CONTINUED.*

FIVE ECONOMIES WITH HIGHEST INCOME ELASTICITY			FIVE ECONOMIES WITH LOWEST INCOME ELASTICITY	
	WORLD	ASIA	WORLD	ASIA
1975	Burundi (0.58) Nepal (0.55) PRC (0.54) Malawi (0.54) Burkina Faso (0.51)	Nepal (0.55) PRC (0.54) India (0.48) Pakistan (0.44) Indonesia (0.43)	United Arab Emirates (−0.36) Kuwait (−0.27) Japan (−0.23) US (−0.23) Denmark (−0.22)	Korea (0.09) Fiji (0.16) Malaysia (0.19) Philippines (0.26) Papua New Guinea (0.31)
1985	Ethiopia (0.37) Burundi (0.34) Malawi (0.33) Nepal (0.33) Uganda (0.33)	Nepal (0.33) Bangladesh (0.30) India (0.30) PRC (0.29) Bhutan (0.28)	United Arab Emirates (−0.02) Switzerland (−0.02) Japan (−0.02) Norway (−0.01) US (−0.01)	Hong Kong, China (0.03) Singapore (0.04) Taipei, China (0.08) Korea (0.10) Malaysia (0.16)
1995	Burundi (0.33) Malawi (0.32) Niger (0.31) Mozambique (0.31) Tajikistan (0.30)	Tajikistan (0.30) Nepal (0.29) Cambodia (0.28) Kyrgyz (0.28) Lao PDR (0.26)	Japan (−0.13) Luxembourg (−0.12) Norway (−0.12) Switzerland (−0.12) US (−0.11)	Hong Kong, China (−0.09) Singapore (−0.08) Taipei, China (−0.03) Korea (−0.02) Malaysia (0.06)
2000	Congo Democratic Republic (0.36) Sierra Leone (0.33) Malawi (0.32) Niger (0.32) Guinea-Bissau (0.32)	Tajikistan (0.32) Nepal (0.29) Kyrgyz (0.27) Cambodia (0.27) Lao PDR (0.26)	Luxembourg (−0.11) Japan (−0.10) Norway (−0.10) US (−0.10) Switzerland (−0.09)	Hong Kong, China (−0.07) Singapore (−0.06) Taipei, China (−0.03) Korea (0) Malaysia (0.07)

Source: Authors' estimates.

**FIGURE 4**  
**INCOME ELASTICITIES OF MANUFACTURING OUTPUT**

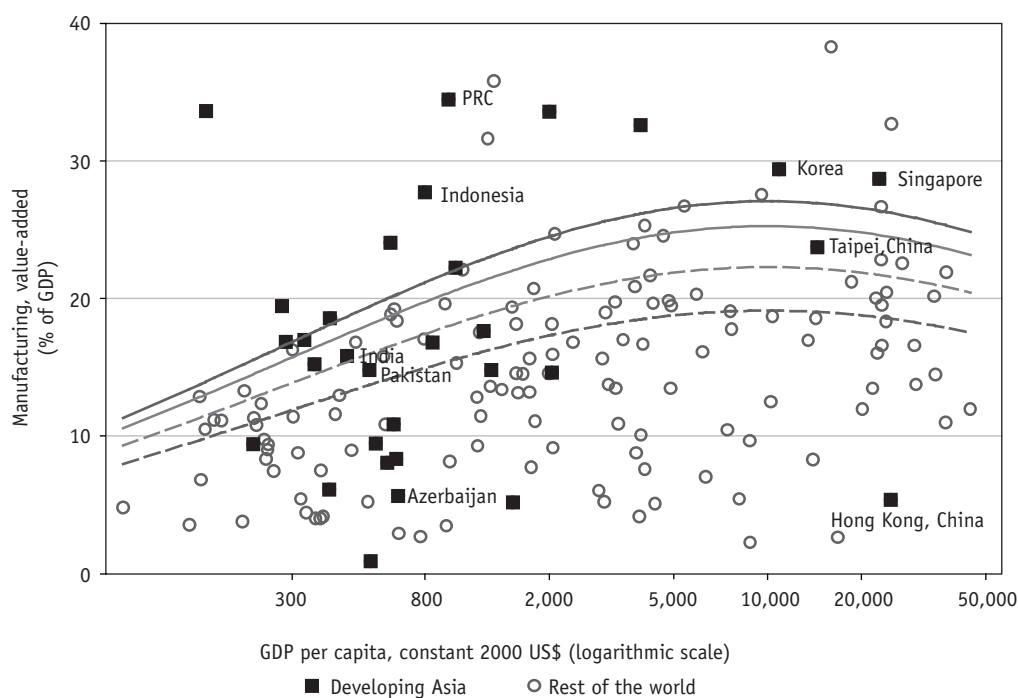


Note:  $y^*$  is actual income per capita. Elasticities were computed using the following equations:

$$\begin{aligned} \varepsilon_{75} &= 1.333 + (2 \times (-0.079)) \ln y^* ; & \varepsilon_{85} &= 0.684 + (2 \times (-0.034)) \ln y^* \\ \varepsilon_{95} &= 0.721 + (2 \times (-0.041)) \ln y^* ; & \varepsilon_{02} &= 0.711 + (2 \times (-0.039)) \ln y^* \end{aligned}$$

Source: Authors' estimates.

FIGURE 5  
FITTED REGRESSION LINE OF MANUFACTURING OUTPUT  
SHARES VERSUS GDP PER CAPITA, 2000



Note:

1. The dashed lines refer to the prediction for varying populations (lower line is for 50 million while upper line is for 100 million), for a trade ratio of 78%.
2. The continuous lines refer to the prediction for varying trade openness (lower line refers to an openness of 30% while the upper line is for 100%) for a population of 100 million.
3. Estimated regression:

$$\ln S_i = -4.628 + 0.710 \ln y - 0.039 (\ln y)^2 + 0.289 Tr + 0.180 \ln P$$

$$t\text{-stat: } (-4.05)^{**} \quad (2.97)^{**} \quad (-2.55)^{**} \quad (2.76)^{***} \quad (5.92)^{***}$$

where  $S_i$  = manufacturing output share;  $y$  = GDP per capita;  $P$  = Population; and  $Tr$  = Trade ratio.

“\*\*\*” and “\*\*” mean significant at 1% and 5%, respectively.

4. Predicted manufacturing output shares at various income levels for varying trade ratio and population:

INCOME PER CAPITA (\$)	AVERAGE OPENNESS (78% OF GDP)		POPULATION: 100 MILLION
	POPULATION: 50 MILLION	POPULATION: 100 MILLION	TRADE RATIO: 30%
500	15.777	17.879	13.536
1,000	18.178	20.601	15.597
5,000	21.894	24.812	18.785
10,000	22.304	25.276	19.136
15,000	22.163	25.116	19.015
20,000	21.894	24.812	18.785
25,000	21.593	24.470	18.526

Source: Authors' estimates.

**TABLE 6**  
**PREDICTED VERSUS ACTUAL MANUFACTURING OUTPUT SHARES, 2000**

	PREDICTED	ACTUAL
PRC	27.31	34.50
India	19.55	15.85
<b>NIEs</b>		
Hong Kong, China	21.72	5.39
Korea	22.04	29.42
Singapore	21.68	28.73
Taipei, China	20.82	23.76
<b>ASEAN-4</b>		
Indonesia	21.90	27.75
Malaysia	25.51	32.60
Philippines	21.53	22.23
Thailand	23.93	33.59
<b>Other Southeast Asia</b>		
Cambodia	11.84	16.86
Lao PDR	8.95	17.00
Viet Nam	17.96	18.56
<b>Other South Asia</b>		
Bangladesh	13.54	15.23
Bhutan	7.75	8.06
Nepal	10.18	9.44
Pakistan	14.31	14.81
Sri Lanka	15.37	16.83
<b>Central and West Asia</b>		
Armenia	9.83	24.07
Azerbaijan	11.99	5.64
Kazakhstan	16.48	17.66
Kyrgyz	9.29	19.46
Mongolia	9.92	6.13
Tajikistan	9.86	33.66
Turkmenistan	13.67	10.85
Uzbekistan	12.20	9.44
<b>Pacific Islands</b>		
Fiji	10.98	14.62
Kiribati	5.05	0.90
Papua New Guinea	13.00	8.36
Samoa	7.16	14.82
Tonga	5.99	5.16

Source: Authors' estimates.

In the second group we find India; Hong Kong, China; Azerbaijan; Mongolia; Turkmenistan; Uzbekistan; Kiribati; and Papua New Guinea. The case of Hong Kong, China was already discussed above: this economy has undergone deindustrialization as a result of the transfer of manufacturing plants to the PRC. Today it is one of the most service-oriented economies in the world. The other interesting case in this group is India. Why is India's manufacturing share in GDP about 4 percentage points lower than what it *should* be (i.e., India's manufacturing base is relatively small by international standards, after controlling for income per capita, population size, and openness to trade)? Economists have not been able to agree on the causes, or resolve the issue empirically. A review of the literature indicates that a combination of factors, which includes the reservation policy (as of January 2007, the manufacture of 237 items was reserved for small and medium-size companies); the "license-permit Raj" (which lasted until 1991 and was responsible for India's large administrative machinery); and the somewhat restrictive labor laws (although this is very controversial and unsettled), combined with lack of adequate physical, social, and regulatory infrastructure, are responsible for the relative underperformance of the sector.<sup>10</sup>

Finally, the rest of the economies (i.e., Philippines, Viet Nam, Other South Asia, Kazakhstan, and Tonga) are in the third group. In the case of the Philippines, although the share is well predicted (and therefore it is not low when benchmarked), it is important to note that this country had the highest manufacturing output share among the ASEAN-4 in the 1970s, but by 2000–04 the share had decreased by about three percentage points and was the lowest in the group. Its industrialization policies have been a failure with the result that its actual manufacturing share is much lower than that of Indonesia and, especially, Malaysia and Thailand. So what are the reasons for the lack of industrialization? This is a tricky question given that in the 1950s a sophisticated manufacturing sector emerged, bolstered by protection and a well-developed human capital base. As in the case of India, several reasons account for the poor performance of the sector: an uncompetitive cost structure, fast liberalization and poor infrastructure, and distributive conflicts and dysfunctional institutions that have prevented the development of the appropriate institutional prerequisites for sustained growth.<sup>11</sup>

#### IV. CONCLUSIONS

This paper has, first, described the changes in developing Asia's manufacturing sector during the last three decades. Second, it has used a logistic regression in order to benchmark economies' share of manufacturing output in GDP with respect to the international regression line. The most salient conclusions are as follows:

- (i) The share of developing Asia in world manufacturing output has increased significantly since the 1970s. However, the increase is concentrated in a number of economies, mostly the NIEs, PRC, Indonesia, Malaysia, and Thailand.
- (ii) The NIEs have started experiencing a deindustrialization process, very clear in the case of Hong Kong, China (in terms of both output and employment shares). This is the result of maturation of this economy and the transfer of production facilities to the PRC.

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<sup>10</sup> See, for example, Lewis (2004, chapter 8); Besley and Burgess (2004); Kochhar et al. (2006); Roy (2004); Deshpande (2004); and Anant et al. (2006).

<sup>11</sup> See, for example, ADB (2005), Aldaba et al. (2005), Hill (2003), Ofreneo (2003), and Prichett (2003).

- (iii) There has been an important upgrading as the share of more technologically advanced manufactures has increased.
- (iv) Nevertheless, the productivity levels of most economies across developing Asia are still very far from those of the OECD. The exception is the NIEs.
- (v) The PRC; NIEs (except Hong Kong, China); ASEAN-4 (except the Philippines); Cambodia; Lao PDR; Armenia; Kyrgyz Republic; Tajikistan; Fiji; and Samoa have actual manufacturing shares significantly higher than those predicted by a logistic regression that controls for income per capita, trade share, and population.
- (vi) India is the most significant case of a country with an actual manufacturing share lower (by four percentage points) than what corresponds given its income per capita, trade share, and population. The actual manufacturing share of Hong Kong, China is very low due to the transfer of manufacturing activities to the PRC. The Philippines's predicted share is very close to its actual share, but it is significantly lower than that of the other ASEAN-4 economies.
- (viii) In the logistic regression, the trade share and population variables are statistically significant. Doubling population from 50 to 100 million increases the manufacturing share by about 2 percentage points for low income per capita and by about 3 percentage points at high income per capita. And increasing the trade ratio from 30% to 100% increases the manufacturing share by 6 percentage points for low income per capita and by about 8 percentage points for high income per capita. The results also indicate that the maximum income per capita, about \$10,000 (in 2000), corresponds to a manufacturing share between 19% and 27% (depending on the population and trade share combinations).

## APPENDIX

### SHARE OF MANUFACTURING SUBSECTOR

DMC	FOOD AND BEVERAGES	TEXTILES	APPAREL, LEATHER, AND FOOTWEAR	WOOD AND WOOD PRODUCTS	PAPER AND PAPER PRODUCTS	PRINTING AND PUBLISHING	INDUSTRIAL CHEMICALS
<b>1970s</b>							
PRC	–	–	–	–	–	–	–
India	11.19	20.53	0.99	0.68	2.57	2.03	14.79
<b>NIEs</b>							
Hong Kong, China	5.18	17.96	26.60	1.93	1.27	3.70	1.66
Korea, Rep. of	18.41	14.43	5.76	2.81	2.17	2.03	9.45
Singapore	6.87	2.59	3.77	4.19	1.06	3.66	5.02
Taipei,China	16.42	7.98	5.05	3.27	2.14	5.26	6.28
<b>ASEAN-4</b>							
Indonesia	39.41	14.68	1.50	3.77	1.61	1.55	11.21
Malaysia	25.06	5.38	1.52	12.66	0.85	4.32	6.28
Philippines	37.22	7.56	2.69	4.46	3.85	1.46	12.30
Thailand	41.63	15.63	0.59	3.61	1.47	1.41	5.26
<b>Other Southeast Asia</b>							
Myanmar	–	–	–	–	–	–	–
Viet Nam	–	–	–	–	–	–	–
<b>Other South Asia</b>							
Bangladesh	31.44	37.26	1.64	0.30	2.27	0.68	13.59
Bhutan	–	–	–	–	–	–	–
Nepal	–	–	–	–	–	–	–
Pakistan	30.45	27.78	2.04	0.26	1.61	1.22	11.20
Sri Lanka	28.06	13.86	6.66	1.78	3.59	0.84	8.80
<b>Pacific Islands</b>							
Cook Islands							
Fiji	63.14	0.00	2.03	8.64	1.74	3.25	2.57
Papua New Guinea	36.90	0.17	0.59	15.86	1.14	3.29	5.23
Tonga	–	–	–	–	–	–	–
<b>1980s</b>							
PRC	12.36	12.33	3.07	1.45	2.05	1.18	11.45
India	11.81	14.18	1.40	0.53	1.81	1.88	14.82
<b>NIEs</b>							
Hong Kong, China	5.52	14.77	24.59	1.29	1.67	4.93	1.61
Korea, Rep. of	13.13	10.35	5.88	1.58	2.26	2.29	8.78
Singapore	5.32	0.84	3.36	1.99	1.45	4.15	9.12
Taipei,China	10.95	7.66	6.79	2.83	2.72	3.08	7.86

## IN DEVELOPING ASIA, BY DECADE

PETROLEUM AND COAL PRODUCTS	RUBBER AND PLASTIC PRODUCTS	NONMETAL MINERAL PRODUCTS	BASIC METALS	METAL PRODUCTS	NON- ELECTRICAL MACHINERY	ELECTRICAL MACHINERY	TRANSPORT EQUIPMENT	OTHERS	TOTAL
–									
2.60	2.46	3.80	11.78	3.16	7.67	7.23	7.38	1.14	100.00
0.00	9.22	0.94	1.15	7.50	2.19	11.41	2.60	6.68	100.00
5.51	4.28	5.29	6.62	3.05	3.26	8.17	5.96	2.80	100.00
16.79	3.60	2.97	2.03	4.84	7.53	19.00	12.70	3.39	100.00
5.19	4.76	5.20	4.20	4.77	9.50	9.04	4.91	6.02	100.00
0.00	4.42	6.84	0.71	3.37	1.46	4.10	4.98	0.39	100.00
3.09	12.23	4.93	2.94	3.79	2.86	9.74	3.29	1.08	100.00
7.65	3.26	4.39	3.47	2.51	1.35	3.11	4.08	0.65	100.00
6.29	2.94	7.93	2.42	3.01	0.71	2.06	4.63	0.39	100.00
–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	
0.43	0.50	1.80	3.85	1.22	0.57	2.05	1.38	1.03	100.00
–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	
5.27	1.80	4.43	3.06	1.62	1.84	3.31	2.99	1.11	100.00
5.36	6.31	8.48	1.59	4.01	3.29	4.29	1.83	1.24	100.00
0.00	1.98	5.26	0.00	5.68	1.44	0.89	3.01	0.37	100.00
0.00	0.75	2.61	0.39	5.79	8.27	2.06	13.67	3.28	100.00
–	–	–	–	–	–	–	–	–	
4.79	3.69	6.89	9.54	4.36	13.81	5.94	3.88	3.20	100.00
3.85	3.17	4.80	12.18	2.88	8.50	8.41	8.50	1.32	100.00
0.02	8.46	1.01	0.69	7.02	4.05	13.74	2.36	8.26	100.00
3.95	5.31	4.66	7.59	4.44	5.32	12.95	8.23	3.26	100.00
9.46	2.69	2.29	1.43	6.11	10.01	29.95	8.92	2.92	100.00
6.41	7.37	3.77	5.92	4.30	5.82	12.47	6.00	6.04	100.00

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APPENDIX. CONTINUED.

DMC	FOOD AND BEVERAGES	TEXTILES	APPAREL, LEATHER, AND FOOTWEAR	WOOD AND WOOD PRODUCTS	PAPER AND PAPER PRODUCTS	PRINTING AND PUBLISHING	INDUSTRIAL CHEMICALS
<b>ASEAN-4</b>							
Indonesia	26.90	11.40	2.45	10.71	1.71	1.56	11.09
Malaysia	20.23	3.67	2.48	7.81	1.28	3.67	11.72
Philippines	35.76	5.44	5.27	4.32	2.69	1.39	11.46
Thailand	33.40	10.37	3.03	1.94	1.56	7.13	5.83
<b>Other Southeast Asia</b>							
Myanmar	34.13	0.00	0.00	15.65	0.00	0.00	0.00
Viet Nam	–	–	–	–	–	–	–
<b>Other South Asia</b>							
Bangladesh	23.96	31.36	4.96	0.87	2.50	1.13	17.46
Bhutan	19.64	5.27	0.00	19.85	0.29	1.09	22.86
Nepal	41.30	15.96	8.10	2.48	1.13	0.94	6.05
Pakistan	30.94	18.14	2.37	0.39	1.15	1.06	14.29
Sri Lanka	49.60	7.84	9.30	1.60	1.98	1.52	4.36
<b>Pacific Islands</b>							
Cook Islands	10.95	7.66	6.79	2.83	2.72	3.08	7.86
Fiji	59.99	3.03	1.67	8.30	2.15	4.18	4.45
Papua New Guinea	52.67	0.13	0.59	17.35	1.22	2.71	3.20
Tonga	69.24	0.00	4.01	8.66	0.69	3.17	1.61
<b>1990s</b>							
PRC	14.66	8.02	4.48	1.31	1.95	1.14	11.44
India	12.08	9.97	2.79	0.39	1.80	1.58	19.14
<b>NIEs</b>							
Hong Kong, China	10.44	13.06	16.00	0.52	2.20	11.43	2.36
Korea, Rep. of	9.34	6.01	4.52	1.86	2.29	2.52	8.89
Singapore	3.70	0.33	1.31	0.93	1.34	4.51	10.03
Taipei, China	9.22	6.43	3.89	1.96	2.20	1.32	9.04
<b>ASEAN-4</b>							
Indonesia	20.05	10.29	7.11	8.77	3.92	1.81	9.83
Malaysia	9.75	3.01	2.16	6.95	1.59	2.63	9.31
Philippines	33.25	3.39	6.30	1.92	2.01	1.54	13.09
Thailand	15.52	9.24	7.32	1.56	1.09	15.42	2.31
<b>Other Southeast Asia</b>							
Myanmar	36.20	0.00	1.39	9.96	0.00	0.00	23.28
Viet Nam	–	–	–	–	–	–	–

PETROLEUM AND COAL PRODUCTS	RUBBER AND PLASTIC PRODUCTS	NONMETAL MINERAL PRODUCTS	BASIC METALS	METAL PRODUCTS	NON- ELECTRICAL MACHINERY	ELECTRICAL MACHINERY	TRANSPORT EQUIPMENT	OTHERS	TOTAL
0.00	5.37	5.20	7.26	4.68	1.19	3.45	6.57	0.46	100.00
2.76	8.68	6.40	3.60	3.38	2.80	15.81	4.12	1.59	100.00
10.10	3.35	3.26	4.64	1.96	1.22	5.69	2.48	0.96	100.00
5.52	6.31	7.50	3.96	2.64	0.27	4.85	4.38	1.30	100.00
0.00	19.13	4.68	19.64	1.89	0.00	0.00	0.00	4.88	100.00
-	-	-	-	-	-	-	-	-	
4.38	0.57	2.00	3.53	1.40	1.30	2.42	1.41	0.77	100.00
0.00	2.49	27.99	0.00	0.51	0.00	0.00	0.00	0.00	
0.00	2.21	13.00	3.02	2.83	0.00	2.24	0.00	0.75	100.00
6.01	1.80	7.75	6.20	1.06	2.14	3.26	2.89	0.55	100.00
5.74	5.06	6.46	0.85	1.50	0.92	1.12	0.69	1.46	100.00
6.41	7.37	3.77	5.92	4.30	5.82	12.47	6.00	6.04	100.00
0.00	2.41	4.58	0.00	4.97	0.86	0.28	2.43	0.71	100.00
0.00	0.97	3.18	0.55	7.37	5.22	0.53	4.29	0.00	100.00
0.00	0.00	5.36	0.00	5.12	0.00	0.66	0.87	0.61	100.00
3.62	3.43	7.34	10.24	3.34	9.19	10.35	6.35	3.15	100.00
4.49	3.28	4.66	12.17	2.52	7.39	7.30	8.69	1.75	100.00
0.10	3.90	1.87	0.87	5.08	8.97	12.25	3.72	7.24	100.00
3.58	4.78	4.73	6.89	5.00	8.93	16.85	11.68	2.11	100.00
5.82	2.97	1.93	0.67	6.29	27.32	22.92	7.05	2.86	100.00
7.21	7.11	4.53	7.06	6.74	4.79	17.35	7.61	3.54	100.00
0.13	4.48	2.91	7.60	3.74	1.55	6.09	10.64	1.08	100.00
2.69	7.93	5.26	3.08	4.02	5.07	29.41	5.15	1.99	100.00
7.58	3.39	4.40	5.07	1.72	1.34	10.06	3.68	1.26	100.00
8.89	2.99	6.00	3.00	2.06	10.96	6.69	5.16	1.80	100.00
0.00	5.99	8.20	9.92	0.35	0.00	0.00	0.00	4.74	100.00
-	-	-	-	-	-	-	-	-	

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APPENDIX. CONTINUED.

DMC	FOOD AND BEVERAGES	TEXTILES	APPAREL, LEATHER, AND FOOTWEAR	WOOD AND WOOD PRODUCTS	PAPER AND PAPER PRODUCTS	PRINTING AND PUBLISHING	INDUSTRIAL CHEMICALS
<b>Other South Asia</b>							
Bangladesh	25.08	16.72	21.60	0.76	1.75	2.11	12.81
Bhutan	–	–	–	–	–	–	–
Nepal	32.26	26.25	11.07	2.62	1.14	0.97	4.80
Pakistan	22.89	25.06	2.80	0.37	1.54	2.00	15.50
Sri Lanka	40.00	8.87	20.25	0.99	1.40	1.13	5.26
<b>Central and West Asia +</b>							
Mongolia	36.80	17.58	21.14	4.28	0.00	1.59	1.14
<b>Pacific Islands</b>							
Cook Islands	9.22	6.43	3.89	1.96	2.20	1.32	9.04
Fiji	48.73	12.67	0.96	10.44	3.37	5.76	5.41
Papua New Guinea	–	–	–	–	–	–	–
Tonga	–	–	–	–	–	–	–
<b>2000–03</b>							
PRC	14.30	6.25	4.73	1.35	2.16	1.07	11.59
India	13.22	9.01	2.78	0.52	2.33	1.53	20.77
<b>NIEs</b>							
Hong Kong, China	9.31	11.19	8.89	0.19	1.29	19.87	3.68
Korea, Rep. of	8.19	4.81	3.12	1.44	2.25	2.47	9.53
Singapore	2.34	0.18	0.76	0.70	0.78	3.54	17.35
Taipei, China	–	–	–	–	–	–	–
<b>ASEAN-4</b>							
Indonesia	21.25	8.84	7.17	8.67	5.51	1.53	11.01
Malaysia	8.39	2.18	1.75	5.75	2.11	1.99	8.08
Philippines	–	–	–	–	–	–	–
Thailand	–	–	–	–	–	–	–
<b>Other Southeast Asia</b>							
Myanmar	59.85	0.00	1.25	0.89	0.00	0.00	0.00
Viet Nam	30.19	4.55	16.42	2.36	1.75	2.21	6.26
<b>Other South Asia</b>							
Bangladesh	–	–	–	–	–	–	–
Bhutan	–	–	–	–	–	–	–
Nepal	45.42	10.48	8.78	1.50	1.46	2.12	10.40
Pakistan	–	–	–	–	–	–	–
Sri Lanka	38.57	10.48	20.81	0.64	1.95	0.68	3.76

Note: – means data not available.

Source: Author's calculations based on data from INDSTAT (UNIDO 2005).

PETROLEUM AND COAL PRODUCTS	RUBBER AND PLASTIC PRODUCTS	NONMETAL MINERAL PRODUCTS	BASIC METALS	METAL PRODUCTS	NON- ELECTRICAL MACHINERY	ELECTRICAL MACHINERY	TRANSPORT EQUIPMENT	OTHERS	TOTAL
0.51	0.54	4.92	2.86	1.20	0.33	4.04	4.27	0.50	100.00
-	-	-	-	-	-	-	-	-	-
0.03	2.56	9.92	2.39	3.61	0.01	1.82	0.00	0.54	100.00
3.26	1.42	7.76	5.13	0.81	2.09	5.43	3.05	0.88	100.00
1.56	6.41	4.49	0.95	1.05	1.63	1.39	1.98	2.63	100.00
0.00	0.00	3.98	0.15	2.41	0.00	0.64	0.00	10.29	100.00
7.21	7.11	4.53	7.06	6.74	4.79	17.35	7.61	3.54	100.00
0.00	2.33	3.70	0.00	3.66	0.99	0.00	1.07	0.92	100.00
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
3.95	3.57	5.48	9.40	3.20	7.34	15.63	7.59	2.38	100.00
5.61	3.63	5.68	10.19	2.66	6.81	5.87	7.18	2.20	100.00
0.00	1.78	3.00	1.09	2.62	5.57	19.54	5.36	6.63	100.00
2.48	4.17	4.00	6.48	4.06	11.28	19.76	14.06	1.91	100.00
4.20	2.86	1.03	0.29	5.37	21.95	26.08	8.16	4.42	100.00
-	-	-	-	-	-	-	-	-	-
0.09	4.45	0.04	4.68	2.50	2.90	8.30	11.93	1.15	100.00
8.63	6.96	4.91	2.64	3.17	9.10	27.11	4.98	2.25	100.00
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
0.00	6.54	0.37	12.20	2.80	5.07	3.16	5.71	2.15	100.00
0.41	3.42	10.57	2.17	2.62	2.37	5.81	6.92	1.97	100.00
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
0.00	3.98	6.43	2.26	5.23	0.07	1.57	0.07	0.21	100.00
-	-	-	-	-	-	-	-	-	-
3.11	7.12	4.30	0.21	0.75	1.71	1.64	2.29	1.96	100.00

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