

A TEST OF THE DUAL-INDUSTRIAL GROWTH HYPOTHESIS: THE CASE OF THE PHILIPPINES AND THAILAND

HISASHI YOKOYAMA
SHIGERU ITOGA

A. *Introduction*

In the article of this journal published in December 1987, Ohno and Imaoka described the experience of industrial growth of the Republic of Korea and Taiwan as dual-industrial growth, saying that both labor-intensive and capital-intensive industries expanded simultaneously [4].¹ Following their hypothetical framework, we examined whether we could find the same pattern of growth in the Philippines and Thailand, which have also expanded their manufacturing sectors and have attained rapid economic growth in the 1960s and the 1970s. We divide this general hypothesis into following five separate hypotheses.

Hypothesis 1: there are two industry groups which contributed to the manufacturing sector's rapid growth; labor-intensive industries and capital-intensive industries.

Hypothesis 2: the labor-intensive industries are exporting.

Hypothesis 3: the capital-intensive industries are import-substituting.

Hypothesis 4: the capital-intensive industries are the suppliers of intermediate goods.

Hypothesis 5: the capital-intensive industries enjoy the economies of scale.

After examination of these hypotheses, we will conclude that in the two countries we cannot find the same pattern as in Korea and Taiwan and that the primary sector is still important in these Southeast Asian countries.

B. *A Test of Hypothesis 1*

Tables I and II show the features of each manufacturing industry in both countries, representing the main economic variables considered to be essential for the dual-industrial growth hypothesis. From these tables, we pick the upper half of the industries considering average annual rates of growth or average rates of contribution to the growth of the manufacturing sector. In Table III, we rearrange these industries in the order of capital-labor ratio to classify them into two groups, namely, capital-intensive and labor-intensive. We can find that both capital-intensive and labor-intensive groups contribute a lot.

The original version of this paper is Hisashi Yokoyama and Shigeru Itoga, "Firipin Tai no kōgyō hatten" [Industrial development in the Philippines and Thailand], in [3, Chapter 5].

¹ Regarding this hypothesis, see also [1] [2].

TABLE I
INDICES OF MANUFACTURING INDUSTRIES IN THE PHILIPPINES

Industry	K/L ^a	INT ^b		Import Ratio ^c			Export Ratio ^d			GR ^e	CR ^f
		1974	1977	1969	1974	1969-74	1969	1974	1969-74		
		(%)									
Food	30.83	18.33	6.54	6.94	0.40	10.64	24.01	13.37	7.86	42.02	
Beverages	16.02	12.79	2.43	1.29	-1.14	1.14	1.28	0.14	3.56	2.08	
Tobacco	11.71	16.94	8.40	0.32	-8.08	5.02	1.02	-4.00	3.32	2.93	
Textile	27.54	38.57	40.61	24.27	-16.34	0.89	4.70	3.81	3.84	3.10	
Apparel	3.57	7.40	3.20	0.55	-2.65	18.22	9.26	-8.96	7.03	5.32	
Leather	6.37	75.17	4.43	10.00	5.57	0.01	10.11	10.10	4.07	0.22	
Wood	14.21	69.31	1.71	0.10	-1.61	31.38	27.43	-3.95	1.81	1.20	
Furniture	4.15	26.78	1.91	3.77	1.86	3.85	33.13	29.28	4.53	0.46	
Paper	101.98	66.05	34.73	26.13	-8.60	1.08	2.10	1.02	-2.86	-0.64	
Printing	15.11	49.18	14.01	10.97	-3.04	1.61	0.59	-1.02	3.48	0.98	
Chemical	32.18	55.61	36.02	48.75	12.73	1.63	1.07	-0.56	8.32	10.52	
Petroleum	768.82	47.39	6.87	6.86	-0.01	6.62	1.11	-5.51	3.86	3.87	
Rubber	25.75	40.40	13.02	15.40	2.38	1.19	0.84	-0.35	6.12	1.30	
Nonmetallic mineral	74.18	77.14	12.86	14.50	1.64	1.19	12.96	11.77	1.59	0.76	
Basic metal	36.59	62.80	54.31	52.95	-1.36	3.98	3.25	-0.73	8.41	4.24	

TABLE I (Continued)

Industry	K/L ^a	INT ^b		Import Ratio ^e			Export Ratio ^d			GR ^o 1967-82	CR ^f 1967-82
		1974	1977	1969	1974	1969-74	1969	1974	1969-74		
Metal products	13.00	38.49	27.92	27.67	-0.25	0.46	0.40	-0.06	8.17	5.09	
Machinery	12.42	4.65	84.02	84.72	0.70	0.29	0.64	0.35	11.90	4.37	
Electrical machinery	12.19	18.20	52.82	45.86	-6.96	1.22	0.92	-0.30	12.00	8.21	
Transport equipment	30.70	6.48	57.27	59.08	1.81	0.92	0.14	-0.78	3.85	2.60	
Others	7.81	33.62	34.22	32.60	-1.62	8.36	4.44	-3.92	6.75	1.36	

Sources: The Philippines, National Census and Statistics Office, *1977 Annual Survey of Establishments (Final Report): Manufacturing (1982)*; idem, *Interindustry Accounts of the Philippines*, 1969 and 1974 editions; the Philippines, National Economic and Development Authority, *National Income Accounts*, various issues.

^a Capital-labor ratio = book value of fixed assets + average number of persons engaged. The unit is 1,000 pesos/person.

^b Intermediate supply ratio = total intermediate supply / (total output + import - export) × 100.

^c Import ratio = import / (total output + import - export) × 100.

^d Export ratio = export / (total output + import - export) × 100.

^e Average growth rate of gross value added.

^f Ratio of contribution to growth of gross value added.

TABLE II
INDICES OF MANUFACTURING INDUSTRIES IN THAILAND

	<i>K/L</i>	<i>INT</i>	Import Ratio	Export Ratio	<i>GR</i>	<i>CR</i>
	1977	1975	1975	1975	1969-83	1969-83
Food	192.74	19.54	2.52	20.25	6.2	11.9
Beverages	36.95	44.00	3.97	0.80	8.5	8.0
Tobacco	112.67	19.60	12.93	6.81	4.7	4.0
Textile	125.77	58.59	10.57	7.05	14.8	16.4
Apparel	21.87	14.55	1.12	10.62	17.0	14.4
Leather	8.64	34.23	4.66	7.43	-4.8	-0.86
Wood	47.87	70.12	3.09	20.73	5.8	0.62
Furniture	46.55	14.54	0.27	5.38	8.1	0.61
Paper	240.15	74.38	24.98	3.70	4.9	1.0
Printing	46.46	42.99	12.86	1.69	19.2	3.6
Chemical	150.11	61.21	46.51	3.36	25.4	11.4
Petroleum	2,086.17	81.36	15.83	4.63	6.0	3.5
Rubber	142.36	41.86	8.59	41.65	2.4	0.85
Nonmetallic mineral	226.40	77.80	15.39	9.11	9.8	5.8
Basic metal	204.47	81.55	42.12	22.99	2.5	0.28
Metal products	47.79	57.39	43.29	5.67	1.3	0.20
Machinery	67.64	33.70	73.14	5.79	9.5	2.0
Electrical machinery	33.12	33.05	58.66	11.83	11.9	2.1
Transport equipment	114.33	31.78	38.12	4.64	11.7	10.1
Others	24.65	12.39	33.00	25.30	13.1	3.7

Sources: Thailand, National Statistical Office, *Report of the 1978 Industrial Census, Whole Kingdom*, n.d.; Thailand, National Economic and Social Development Board, *National Income of Thailand*, various issues; National Economic and Social Development Board, Institute of Developing Economies, and National Statistical Office, *Basic Input-Output Table of Thailand, 1975* (Tokyo: Institute of Developing Economies, 1980); idem, *Input-Output Table of Thailand for Analytical Uses, 1975* (Tokyo: Institute of Developing Economies, 1980).

Notes: 1. Column headings are the same as in Table I.

2. The unit of capital-labor ratio is 1,000 baht/person.

Looking at annual rates of growth, we can see that the two groups grow at almost the same high rates in each country. With respect to contribution ratio, we also find that the total ratio of the industries in Table III explains almost 90 per cent or more of the whole manufacturing sector's growth. In the Philippines the ratio of the capital-intensive group is higher, whereas in Thailand the ratio of the labor-intensive group is higher.

C. A Test of Hypotheses 2 and 3

In order to examine hypotheses 2 and 3, we pick the figures of export ratio and import ratio from Tables I and II and calculate the average figures for each group, as shown in Tables IV and V. In the case of the Philippines, we calculate also the change of these ratios between two periods to see the progress of export promotion and import substitution.

TABLE III
CAPITAL INTENSITY OF RAPIDLY GROWING MANUFACTURING INDUSTRIES

Philippines			Thailand		
Industry	Capital Intensity (P1,000/Person)	Orders among All Industries	Industry	Capital Intensity (Baht 1,000/Person)	Orders among All Industries
A. Capital-intensive group			A. Capital-intensive group		
Petroleum products	768.8	1	Nonmetallic mineral	226.4	3
Basic metal	36.6	4	Food	192.7	5
Chemical	32.2	5	Chemical	150.1	6
Food	30.8	6			
Average growth rate		7.1%	Average growth rate		13.8%
Contribution ratio		60.7%	Contribution ratio		29.1%
B. Labor-intensive group			B. Labor-intensive group		
Textile	27.5	8	Textile	125.8	8
Rubber	25.8	9	Transport equipment	114.3	9
Metal products	13.0	13	Tobacco	112.7	10
Machinery	12.4	14	Machinery	67.6	11
Electrical machinery	12.2	15	Printing	46.5	15
Tobacco	11.7	16	Beverages	37.0	16
Others	7.8	17	Electrical machinery	33.1	17
Furniture	4.2	19	Others	24.7	18
Apparel	3.6	20	Apparel	21.9	19
Average growth rate		7.1%	Average growth rate		12.3%
Contribution ratio		32.1%	Contribution ratio		64.3%

Sources: Same as Tables I and II.

Notes: Average growth rate is a simple average of each annual growth rate of the industries in the group. Contribution ratio is a ratio of the total contribution of the industries in the group over the whole manufacturing industries.

TABLE IV
AVERAGE EXPORT RATIO

	Philippines			Thailand
	1969	1974	1974/1969	1975
Capital-intensive group	5.72	7.36	1.64	10.91
Labor-intensive group	4.39	6.15	1.76	8.28

Source: Tables I and II.

Note: Figures are simple averages in each group.

Observing the export ratio of the two groups, hypothesis 2 is hard to accept. In both countries, this ratio of the capital-intensive group is slightly higher. The change of this ratio between the two periods in the Philippines does not show any significant difference between the two. This is mainly due to the contribution of the food sector, which is one of the resource based industries in both countries.

TABLE V
AVERAGE IMPORT RATIO

	Philippines			Thailand
	1969	1974	1974/1969	1975
Capital-intensive group	25.94	28.88	2.85	21.48
Labor-intensive group	29.57	26.13	-3.44	27.15

Source: Tables I and II.

Note: Figures are simple averages in each group.

TABLE VI
AVERAGE INTERMEDIATE SUPPLY RATIO

	Philippines		Thailand
	1969	1974	1975
Capital-intensive group	56.60	46.03	52.85
Labor-intensive group	27.65	25.01	32.29

Source: Tables I and II.

Note: Figures are simple averages in each group.

One way to understand this result might be through a different classification such as by the content of natural resources in place of labor intensity.²

Secondly, through looking at the import ratio, we cannot say clearly that hypothesis 3 is true. In particular, as is shown in the change between two periods in the Philippines, import substitution has made progress in the labor-intensive group, but not in the capital-intensive.

D. *A Test of Hypothesis 4*

Now we take a look at intermediate supply ratio³ in Table VI. We can see that this ratio is high enough in the capital-intensive group, except for the food industry, to accept this hypothesis. But we do not know from this index to which industries these capital-intensive industries supply their intermediate goods. On the other hand, in the labor-intensive group, this ratio is relatively low in most of the industries. This fact means that labor-intensive industries supply much more to the final demand sector (domestic demand and export). With the figures of export ratio above, we can further understand that labor-intensive industries depend relatively much more on domestic demand rather than on export.

² In the original version of this paper the natural resources embodied in exports and imports are estimated for ten countries including five ASEAN countries. Some of the results are also shown in [6] in this issue.

³ Intermediate supply ratio = total intermediate supply / (total output + import - export) × 100.

E. *A Test of Hypothesis 5*

Lastly we test the existence of economies of scale in the Philippine manufacturing industries in the 1970s.⁴ Suppose that there exists a certain production function in the whole manufacturing sector of the Philippines in the 1970s. The hypothesis 5 which we want to test is to prove that there exist economies of scale in capital-intensive industries, but not in other industries.

Suppose the production function in the following form:

$$Y = AL^{\alpha}K^{\beta},$$

where Y = value added, L = labor, K = capital stock. Adding a dummy variable for the capital-intensive industries, we have the following results:

$$\begin{aligned} \log Y_{it} = & 2.125 - 2.604D_k + (0.332 - 0.077D_k) \log L_{it} \\ & (3.45) \quad (-1.29) \quad (3.20) \quad (-0.48) \\ & + (0.576 + 0.295D_k) \log K_{it} + \sum_t d_t D_t. \\ & (7.59) \quad (2.09) \end{aligned}$$

$$R^2 = 0.794, \text{ Sample size} = 120,$$

where subscripts it means i th industry in t th period, D_k = dummy variable for capital-intensive industry (except food industry), D_t = dummy variable for t th period, figures in parentheses are t values for estimated parameters.

We can see that the coefficient of D_k for L is relatively small, while that for K is significantly big. This means that the production elasticities of labor are almost the same among the groups, but the capital-intensive group has a remarkably high elasticity of capital, which is 0.871.⁵ Further, we know that the sum of the elasticities is lower than 1 in the labor-intensive group but higher than 1 in the capital-intensive group. So we can say that there exist economies of scale in the latter group.

F. *Conclusion*

Thus far we have examined whether the dual-industrial growth pattern of manufacturing industries in Korea and Taiwan could be found in the Philippines and Thailand. From our results of the test we may conclude that we could not find such a pattern in the latter countries. One of the reasons is that in both countries the production and export of manufacturing industries depend largely

⁴ Sources are the Philippines, National Census and Statistics Office, *Annual Survey of Establishments: Manufacturing*, 1973-74 editions, 1976-77 editions, and 1979-80 editions, using the amount of value added, persons engaged (annual average), and book value of fixed capital (at the beginning of year). Deflator is taken from national accounts statistics.

⁵ We also estimated the production function of the capital-intensive group, using pooled data of three capital-intensive industries and got the following results:

$$\begin{aligned} \log Y_{it} = & 1.206 + 0.660 \log L_{it} + 0.475 \log K_{it} + \sum_j d_j D_j + \sum_t d_t D_t, \\ & (0.28) \quad (1.66) \quad (0.90) \end{aligned}$$

$$R^2 = 0.811, \text{ Sample size} = 18.$$

As is shown here, the sum of elasticities ($0.660 + 0.475 = 1.135$) is over 1. So we can say that there exist economies of scale in this case.

on processed primary-goods industries. Another reason may have something to do with the fact that most of the labor-intensive industries are import substituting.

From these facts we can suppose that the high growth rate of manufacturing industries might have been contributed to by three groups of industries, such as food processing industries based on their abundant natural resources, labor-intensive import-substituting industries, and also capital-intensive industries stimulated by the growth of the two cited groups. We can hardly neglect the agricultural sector which still has a large share in the structure of production and employment in both countries. Here we refer to the argument that in this period the productivity of the agricultural sector in these countries has increased rapidly and this has supported not only the growth of food processing industries but also through the expansion of consumption demand generated in the agricultural sector to import-substituting and labor-intensive industries.⁶ Thus one can easily imagine that agriculture and the two manufacturing groups create a demand for intermediate goods and investment goods through backward linkage effect and that to meet this demand, import-substituting and capital-intensive industries have expanded production, enjoying economies of scale. This aspect of interdependence between agriculture and the three groups of industries is a question that will be studied in the future.

⁶ On this argument, see Yokoyama [5].

REFERENCES

1. IMAOKA, H. "Chūshinkoku ni mukau ASEAN shokoku" [ASEAN countries toward middle-income countries], *ESP*, No. 107 (March 1981).
2. ————. "Kawaru chūshinkoku gurūpu (ge)" [Changing middle-income countries, II], *Nihon keizai shimbun*, September 23, 1981.
3. IMAOKA, H.; OHNO, K.; and YOKOYAMA, H., eds. *Chūshinkoku no kōgyō hatten* [Industrial development in middle-income countries], Kenkyu sōsho No. 337 (Tokyo: Institute of Developing Economies, 1985).
4. OHNO, K., and IMAOKA, H. "The Experience of Dual-Industrial Growth: Korea and Taiwan," *Developing Economies*, Vol. 25, No. 4 (December 1987).
5. YOKOYAMA, H. "Ajia jun-NICs no chōsen" [The challenge of Asian semi-NICs], *Ajia keizai*, Vol. 25, Nos. 5-6 (May-June 1984).
6. YOKOYAMA, H.; OHNO, K.; ITOGA, S.; and IMAOKA, H. "Factor Abundance in East and Southeast Asian Countries," *Developing Economies*, Vol. 27, No. 4 (December 1989).