TECHNICAL CHANGE AND FACTOR UTILIZATION: THE CASE OF TAIWAN, 1952-1980

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The rate of technical progress measures the rate of increase in output that is not caused by the increase in inputs but by the advancement in the efficiency of production. This concept has many other names. "Change in total factor productivity," "change in productive efficiency", "change in output per unit of input", "residual", etc. are the typical ones.

The purpose of the present study is to analyze the rates of technical change of the non-agricultural sectors in Taiwan for the period 1952-1980. During the last three decades, Taiwan economy grew very rapidly. But how has technical change contributed to this rapid growth? Has the contribution of technical progress played the same role in the different periods? How have the economy's leading industries behaved during the period? What role have the domestically produced and imported intermediate inputs played in the process of development? These are the main questions we would like to focus on in this study.

Two types of measure will be used. They are the value-added production function developed by Solow[1] and the gross production function inclusive of intermediates based on an input-output

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1. Robert M. Solow, "Technical Change and the Aggregate Production Function," *The Review of Economics and Statistics,* Vol 39 (Aug. 1957).

method.[2] The value-added production function is in the form of Equation (1) and the gross production function in the form of Equation (2):

$$(1) \quad Y = h(t)\, f(L,K)$$

$$(2) \quad X = H(t)\, F(L,K,x^d, x^m),$$

where

Y = value-added
L = labor
K = capital stock
X = gross output
x^d = domestically-produced intermediate inputs
x^m = imported intermediate inputs
t = time
$h(t)$ and $H(t)$ = technical change.

Although two types of production function are used, the same theoretical framework will be applied on them, namely:

(1) the production functions are assumed to exhibit constant returns to scale;
(2) the necessary conditions for a producer equilibrium hold, so that factors are paid the value of their marginal products; and
(3) quantities of output and input entering the production functions are identified with real products and real factor inputs.

Data used in the two measurements are different. For the value-added production function, the national income data are used. The manufacturing sector is to be examined only at the aggregate level and observations are yearly series for the period 1952-1980. For the gross production function, the input-output data deflated into

2. Evsey D. Domar, "On the Measurement of Technological Change," *Economic Journal,* Vol. 71 (1961); Mieko Nishimizu and Charles R. Hulten, "The Sources of Japanese Economic Growth: 1955-71," *The Review of Economics and Statistics,* Vol. 60 (Aug. 1978); Mitsuo Saito, *General Equilibrium and Price* (Tokyo: Sobunshia, 1975); Tsunehiko Watanabe, "A Note on Measuring Sector Input Productivity," *Review of Income and Wealth* Vol. (Dec. 1971).

stent domestic constant prices are used.[3] The measurements are ne for 46 disaggregated non-agricultural sectors, and observations e for the four years 1961, 1966, 1971 and 1976. Accordingly, the iod of observation by this approach is 1961-1976.

1. Technical Change Assessed by a Value-added Production Function, 1952-1980

In this section, technical changes in the non-agricultural, manufacturing, and services sectors of the Taiwan economy for the period 1952-1980 will be measured by a Solow type of production function. The production function in a Cobb-Douglas form can be written as

$$Y = A_o e^{gt} K^{\alpha} L^{1-\alpha} \quad (3)$$

where

Y = value-added (net of indirect taxes)

e = base of natural logarithm

g = the rate of technical change

t = year

K = capital

L = labor

α = capital share

The period of observation is divided into two sub-periods, 1952-61 and 1961-80.[4] The results (Table 1) show that the rates of technical

3. Among four tables used in this study, 1966 and 1971 are original tables and 1961 and 1976 are extension tables. The quality of the 1971 table is superior to that of 1966 as the census in 1966 is considered to be biased. All four tables are consistently deflated in 1971 domestic constant prices. Here, consistent means the elimination of the distortions caused by tariffs and import restriction, etc. $p_i^d \; x_{ij}^d$ are deflated first by nominal rates of protection at commodity level for each of the 58 sectors with some service sectors as exceptions. After this is done, domestic price indices at industry level are applied to deflate $p_i^d \; x_{ij}^d$ *and* $p_i^m \; x_{ij}^m$. Some service sectors and value-added terms are deflated by GDP deflator. In the deflation of price changes, 1971 is used as the base year; however, the 1971 table is also deflated by nominal rates of protection for consistency.

4. The reasons for using 1961 as the demarcation year are:

a) The second monetary reform was successfully achieved by 1961, as the

Table 1 – Rates of Technical Change and Their Contributions to the Growth Rates in the Non-agricultural, Manufacturing, and Service Sectors, 1952-1980.
(In Percent)

Sector and Period	Rates of Technical Change	Growth Rates of Value-added	Contributions by Technical Change to the Growth Rate
Non-agricultural Sector			
1951-1961	5.0	8.3	53
1961-1980	3.1	11.1	12
1961-1971	5.1	12.2	30
1971-1980	1.3	9.9	9
Manufacturing Sector			
1952-1961	6.5	12.1	42
1961-1980	3.4	14.4	7
1961-1971	6.4	18.1	20
1971-1980	1.1	10.5	7
Services Sector			
1951-1961	4.0	6.9	51
1961-1980	3.1	9.4	17
1961-1971	4.6	10.3	34
1971-1980	1.6	8.3	15

Sources: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *National Income of the Republic of China* (1980); Shirley W.Y. Kuo, "Labor Absorption in Taiwan, 1954-1971," *Economic Essays*, Vol. 7 (Taipei: National Taiwan University, Graduate Institute of Economics, November 1977); Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *Yearbook of Labor Statistics, Republic of China* (1980).

progress in the non-agricultural, manufacturing, and service sectors are all much higher in the first period than in the second. Their contributions to the growth of the respective sector were accordingly much higher in the first period than in the second. Technical progress explained approximately 50 percent of the growth in the first period, but explained only 12 percent of the non-agricultural, 17 percent of services, and 7 percent of manufacturing growth in the second period. It can be seen that the slowdown in the technical progress started in the 1960s, and took a change for the worse in the 1970s. In fact, the technical change in manufacturing registered a very meager rate of 1.1 percent for the period 1971-1980.

The slowdown in the rate of technical progress in the manufacturing sector deserves our attention. It is caused by the fact that during 1971-1980, the capital stock grew at a much higher rate than the value-added, 14.0 percent vs. 10.5 percent. At the same time, labor grew at 6.2 percent, thus making the weighted average of the growth rates of capital and labor very close to the growth rate of the value-added in manufacturing.

In short, the assessment by a Cobb-Douglas production function shows that the economic growth in the 1950s was largely attributable to technical progress. The contribution of technical change decreased in the 1960s. In 1971-1980, the high rate of manufacturing growth was largely attributable to the big amount of investment and rapid labor absorption, namely, more factor utilization than technical change.

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average annual rate of price inflation came down from 10.5 percent in 1952-1960 to 2.0 percent in 1961-1965 and 2.9 percent in 1966-1970.

b) In 1961, the multiple exchange rate was abandoned, and the simple exchange rate became effective.

c) The real wage rate, having remained nearly fixed, began to rise rapidly after 1961.

d) The rate of labor absorption into the non-agricultural sector, having kept pace with the increase in total population, started to exceed population growth rapidly after 1962.

e) The rate of investment in the manufacturing sector accelerated after 1961.

f) The average propensity to save out of Net National Product was increased from the percentage of 4.5 in 1951-1959 to 8.0 in 1963 and 12.0 thereafter. It can be referred that a fundamental change in saving capability occurred between 1960 and 1963.

Table 2 – Growth Rates of Capital Stock, Labor and Value-added in Manufacturing, 1952-1980. (In Percent)

Period	Growth Rates of Value-added	Growth Rates of Labor	Growth Rates of Capital Stock
1952-1961	12.1	2.7	8.7
1961-1980	14.4	6.6	14.8
1961-1971	18.1	7.0	15.3
1971-1980	10.5	6.2	14.6

Sources: Same as Table 1.
Note: Capital stock is referred to capital in use.

In order to have a clearer look on manufacturing, we shall use another approach in terms of a gross production function to assess the technical changes of manufacturing and manufacturing sub-industries for this later period.

2. Technical Change Assessed by a Gross Production Function, 1961-1976

A. The Model

In this section, the rates of technical change of the non-agricultural, manufacturing, and services sectors of the Taiwan economy over the period 1961-1976 are measured by a gross production function.

For the model, the following notations will be used:

n = the number of sectors in the input-output table

X = domestic production

x_{ij}^{d} = the amount of domestically produced input i that is used in the production of output j

x_{ij}^{m} = the amount of imported input i that is used in the production of output

L_j = the amount of labor used in the production of output j

K_j = the amount of capital used in the production of output j

a_{ij}^d = the value share of domestically produced input i in the jth industry's gross output

a_{ij}^m = the value share of imported input i in the jth industry's gross output

l_j = the labor income share in the jth industry's gross output

k_j = the capital income share in the jth industry gross output

T_j = the amount of indirect taxes paid by the jth industry

A_o = constant

g = the rate of technical change

t = year

p_j^d = the domestic price index of output j

p_j^m = the import price index of output j

A gross production function in a Cobb-Douglas form can be written as follows:

$$X_j = A_{oj}\, e^{g_j t} \prod_{i=1}^{n} x_{ij}^{d\,a_{ij}^d} \prod_{i=1}^{n} x_{ij}^{m\,a_{ij}^m} L_j^{l_j} K_j^{k_j}$$

$$\sum_{i=1}^{n} a_{ij}^d + \sum_{i=1}^{n} a_{ij}^m + l_j + k_j = 1 \qquad (j = 1, 2, \ldots, n) \tag{4}$$

or in logarithm form,

$$\ln X_j = \ln A_{oj} + g_j t + \sum_{i=1}^{n} a_{ij}^d + \ln x_{ij}^d + \sum_{i=1}^{n} a_{ij}^m \ln x_{ij}^m + l_j \ln L_j + k_j \ln K_j \qquad (j = 1, 2, \ldots, n) \tag{5}$$

where the term $\ln A_{oj} + g_j t$ measures the status of technology. Writing this technology term as a dependent variable $\ln G_j$, we have

equation (6) to express the status of technology of industry j in a particular year:

$$(6) \quad lnG_j = lnA_{oj} + g_j t = lnX_j - \sum_{i=1}^{n} a_{ij}^d \, lnx_{ij}^d - \sum_{i=1}^{n} a_{ij}^m \, lnx_{ij}^m - l_j \, lnL_j - k_j \, lnK_j \qquad (j = 1, 2, \ldots, 61)$$

Since no yearly time series of I-O data are available, we can only calculate the rate of technical change by a discrete comparison. The growth rate of any variable Q can be expressed as $\frac{\Delta Q}{Q}$ which is equal to ΔlnQ. Using g to denote the rate of technical change, we therefore have

$$(7) \quad \begin{aligned} g_j &= \Delta lnG_j \\ &= \Delta lnX_j - \sum_{i=1}^{n} a_{ij}^d \, lnx_{ij}^d - \sum_{i=1}^{n} a_{ij}^m lnx_{ij}^m \\ &\quad - l_j \, lnL_j - k_j \, lnK_j \end{aligned} \qquad (j = 1, 2, \ldots, 61)$$

Equation (7) is the one used to calculate the rate of technical change in this study.[5] The results obtained as combined twenty non-agricultural sector's observations, for $j = (12 - 57)$, are shown in Table 3.

5. The double deflation technique for an I-O table is still an uncultivated area. The approach applied in the double deflation of the four tables in the Taiwan case follows the design of Dr. Larry Westphal and the late Professor Watanabe. Although four years' X_{ij} .s in real terms were made and used for decomposition of sources study elsewhere (Shirley W.Y. Kuo, "Economic Growth and Structural Change in the Republic of China," World Bank, 1979, mimeo), an intensive analysis on their "residuals" may not be the most appropriate. Since a study of technology change is a study solely focusing on the change of residuals, any errors due to deflation may come up to a share, too big a weight in the change so as to obscure the true picture. Therefore, in this study the x_{ij} .s other than those of 1971 are estimated via equilibrium conditions of profit maximization as shown in equations (A1) and (A2).

$$(A1) \quad {}_{ij}^{d} = \frac{a_{ij}^d \, p_j^d \, (1 - t_j) \, X_j}{p_i^d}$$

(Number of Industry by I-0 Classification)	Industry	Rate of Technical Change	
		1961-71	1971-76
1. (12+13+14+15+16+17+18+19+20)	Food, beverage, tobacco	0.9	2.3
2. (21+22+23+24+25)	Textiles and footwear	2.6	1.7
3. (26+27+28)	Wood, furniture	2.8	2.1
4. (29)	Paper, printing, publishing	2.9	0.6
5. (30)	Leather	1.6	1.1
6. (31)	Rubber	3.4	−1.0
7. (32+33+34+36+37)	Chemicals	4.3	−0.2
8. (35)	Petroleum and coal products	0.4	1.7
9. (38+39)	Non-metallic mineral products	3.4	2.2
10. (40)	Basic metal	2.2	0.9
11. (41+42+43)	Metal products	2.5	1.5
12. (44)	Machinery	4.7	1.4
13. (45+46+47)	Electrical machinery	6.0	5.0
14. (48)	Transportation equipment	3.6	1.4
15. (49)	Miscellaneous Manufactures	8.1	3.6
16. (50)	Construction	2.4	0.3
17. (51+52+53)	Electricity, gas and city water	2.6	1.1
18. (56)	Wholesale and retail trade	1.1	2.9
19. (54+55)	Transportation, warehousing and communications	3.9	2.6
20. (57)	Services	4.1	0.6

Sources: Based on recompiled and deflated Input-Output Tables of 1961, 1966, 1971 and 1976.

As seen in Table 3, rates of technical change estimated by the gross production function show the same tendency as that estimated by the value-added production function: slower rates of technical change in 1971-1976 than in 1961-1971. Out of the twenty non-agricultural industries, only three industries had higher rates of technical change in 1971-1976. They are food-beverage-tobacco, petroleum-coal products, and wholesale-retail trade. Chemical industry has a negative rate of technological change possibly due to heavy investment in petrochemical industry both in the public and private sectors for the production of high-valued, new petrochemical products, yet time-lagging products. The deterioration in technical progress during 1971-1976 in the machinery, electrical machinery and transport equipment is noteworthy, for those industries have been the leading industries in manufacturing.

In Table 4, the rates of technical change are aggregated into the non-agricultural, manufacturing, and service sectors. In this aggregation, domestic productions X_j are used as weights. These aggregated magnitudes show the following characteristics:

1) The rates of technical progress in all sectors were higher in 1961-1971 than in 1971-1976.

$$(A2) \qquad x_{ij}^{m} = \frac{a_{ij}^{m}\, p_j^{d}\, (1-t_j)\, X_j}{p_i^{m}}$$

where

$$t_j = \frac{T_j}{\sum_{i=1}^{n} p_i^{d}\, x_{ij}^{d} + \sum_{i=1}^{n} p_i^{m}\, x_{ij}^{m} + W_j + R_j + T_j}$$

T_j = indirect taxes paid by industry j

W_j = compensation for labor used in industry j

R_j = compensation for capital used in industry j

In the calculation, 1971 data of a_{ij}^{d}, a_{im}, z_j, k_j and t_j are used. In the calculation of these out elasticities, indirect taxes are excluded. Other variables X_j, L_j, K_j, p_j^{d}, p_i^{d}, and p_i^{m} are the respective calculation year's figures. Changes the 1961-1971 are measured based on the observations of 1961-1966 and 1966-1971.

3) The service sector had a higher technical progress than manufacturing in 1961-1971, but the order was reversed in 1971-1976.

4) Heavy manufacturing always had a higher technical progress than light manufacturing. The difference, however, was much greater in 1961-1971. This was similar to Japan's case in the period 1955-1963. The United States also had a higher technical progress in the heavy industry than light industry in 1946-1957, although the difference between heavy and light industries was smaller than the cases of Japan in 1955-1963 and Taiwan in 1961-1971. (See Table 4 and 5).

Regarding the deterioration of technical progress in 1971-1976, a few points should be noted. First, during this period, capital increased at a very high annual rate of 16.2 percent. It is our general understanding that rapid capital investment will increase productivity. However, the situation was the other way. One possible reason is that much capital was invested in the heavy industry during this period – the typical ones were electricity (particularly in nuclear power), steel mill, shipyard and petrochemical industries. It is probable that investment was already done but outputs had not yet been fully produced. In other words, during this period, production in heavy industries might greatly lag behind investment.

Second, in 1974 and 1975, the Taiwan economy experienced a serious recession due to the oil crisis and worldwide recession. The growth rates of the value added in these two years were 1.1 percent and 4.2 percent, respectively, dropping from the previous 12.8 percent in 1973. However, the number of employed did not decrease very much because the decline in demand was mostly adjusted through hours of work and wage change rather than through the number of workers. Thus, the growth rate of labor shown in the statistics was not as much affected by the recession.

Third, there was a significant deterioration in the speed of development of leading industries in 1971-1976. By leading industries, we mean the six manufacturing industries which ranked in the top six as judged by the growth rates of gross output, exports and employment during the 1960s. They were electrical machinery, transportation equipment, textiles, leather and miscellaneous manufacturing. The rates of technical change of these six industries all decreased in 1971-1976.

Among the six leading industries, the product share of leather was trivial, and the contents of miscellaneous manufacturing too sundry. Thus, only four industries, electrical machinery, machinery,

Table 4 – Rate of Technical Change in the Non-Agricultural Sectors of Taiwan, ROC. (Based on I-0 measurement.) In Percent

Sector	Rate of Technical Change	
	1961-71	1971-76
Non-agricultural sector	2.9	1.9
Industrial sector	2.8	1.9
Services sector	3.1	1.6
Manufacturing sector	2.9	2.1
Light manufacturing	2.1	2.0
Heavy manufacturing	4.1	2.3

Sources: Same as Table 3.

Note: Light manufacturing includes food, beverage and tobacco, textiles and footwear, wood and furniture, leather, basic metal, metal products, and miscellaneous manufactures. Heavy manufacturing includes paper, printing and publishing, rubber, chemicals, petroleum and coal products, non-metallic mineral products, machinery, electrical machinery, and transportation equipment.

Table 5 – Rates of Technical Change, Japan and the U.S. (Based on I-0 measurement,) In Percent

Sector	Japan (1955-1963)	U.S. (1946-1957)
	Gross Output	Value Added
Manufacturing sector	1.72	1.93
Light manufacturing	0.95	1.71
Heavy manufacturing	2.20	2.04
Services sector	4.07	–

Source: Mitsuo Saito, *General Equilibrium and Price* (Tokyo: Sobunshia, 1975) p. 88.

Note: The estimations are based on an Input-Output Model.

transportation equipment, and textiles will be taken up for further observations.

The growth rates of gross output, value added, and exports of these four leading industries are all smaller in 1971-1976 with no single exception (Table 6). We also notice the tremendously rapid expansion of electrical machinery industry in 1961-1971 and the slowdown of its expansion in 1971-1976. The relative rapidity of growth of these four leading industries can be measured by the ratio of the growth rate of each industry to the average growth rate of the manufacturing average. A significant decline in these relative growth rates in 1971-1976 shows a weakened leading force of the four leading industries in 1971-1976.

The relatively faster growth of the four industries in the 1960s increased significantly their shares of gross output and value added in manufacturing during 1961-1971, from 22.7 percent to 37.1 percent in the case of gross output, and from 22.9 percent to 41.3 percent in the case of value added, respectively. However, the relative deterioration in the growth of the four industries in the 1970s made their shares in manufacturing even smaller compared to those realized in 1971. The past success of manufacturing development in Taiwan was characterized by product cycles: first, food processing, then, textiles, and then, electrical machinery and transportation equipment as the leading industry. In the early period before 1971, textile industry successfully took the place of the declining food processing. However, the evidence shown in Table 7 seems to indicate that the three leading industries, electrical machinery, machinery, and transportation equipment, which emerged in the 1960s, were not able to satisfactorily replace the outgoing old industries (including textiles) in the 1970s. Since technical progress and rapid growth of output influence each other, the slowdown of the growth rates in the leading manufacturing industries acted unfavorably to the advancement of technology in the 1970s.

The inclusion of intermediate inputs in the assessment of technical change enables us to decompose the sources of output growth into the following five categories: technical change, domestically produced intermediate inputs, imported intermediate inputs, labor inputs, and capital input. Contributions by each category of these sources can be identified respectively through each term which appeared on the right hand side of equation (7). These contributions are summarized in Table 8.

Table 6 – Growth Rates of Gross Output, Value Added and Exports of the Four Leading Industries. (In Percent)

Industry	Growth Rates of Gross Output		Growth Rates of Value Added		Growth Rates of Exports	
	1961-1971	1971-1976	1961-1971	1971-1976	1961-1971	1971-1976
Textiles and footwear	28.9	17.0	19.7	7.2	33.3	22.9
Machinery	29.5	10.4	18.6	13.8	38.0	20.8
Electrical machinery	49.6	26.2	36.1	12.9	71.9	30.2
Transportation equipment	28.4	16.5	23.3	12.1	50.5	28.6
Manufacturing average	19.6	15.0	15.7	11.4	24.4	21.4

Sources: Gross output and Exports: based on the recompiled Input-Output data, at 1971 constant prices.
Value added: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *National Income of the Republic of China*, 1961, 1971 and 1976.

Table 7 – Changes in the Shares of Leading Industries in Manufacturing. (In Percent)

Industry	Shares of Gross Output				
	1952	1961	1971	1976	1980
Textiles and footwear	17.0	16.9	21.5	18.3	14.9
Machinery	1.5	1.9	2.8	2.9	2.6
Electrical machinery	0.7	1.8	9.4	10.3	11.5
Transportation equipment	0.7	2.1	3.4	4.0	6.2
Sum of the Above Four Industries	19.9	22.7	37.1	35.5	35.2

Sources: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *National Income of the Republic of China*, various years.

The main conclusions which emerge from Table 8 are:

1) The contributions by technical change to the output growth for the non-agricultural sector decreased from 18.5 percent in 1961-1971 to 15.0 percent in 1971-1976. The contributions by technical change to output growth for the manufacturing sector did not change much in the two periods, accounting for about 15 percent. However, for the service sector, the contributions to output growth by technical change decreased from 30 percent in 1961-1971 to 22 percent in 1971-1976.

2) Intermediate inputs were the dominant source of output growth, explaining about 60 percent for the non-agricultural sector and 70 percent for the manufacturing sector. The growth of the domestically produced intermediate inputs for the manufacturing use contributed about 45 percent of the manufacturing growth, while that of imported intermediate inputs, 25 percent in both periods.

3) The light manufacturing sub-sector showed a different pattern as compared with the heavy manufacturing sub-sector in that light manufacturing had a much larger contribution by domestically produced intermediate inputs than imported intermediate inputs, 52.7 percent vs. 21.5 percent in 1961-1971 and 51.1 percent vs. 18.2

Table 8 — Sources of Output Growth
(Percentage Distribution, 1961-76)

Sector	Due to Technical Progress	Due to Growth in Labor Input	Due to Growth in Capital Input	Due to Growth in Domestic Inter-mediates	Due to Growth in Imported Inter-mediates
			1961-1971		
Non-agricultural sector	18.5	9.5	12.1	39.5	20.4
Manufacturing sector	14.8	6.1	9.7	44.4	25.0
Light manufacturing	12.9	5.5	7.4	52.7	21.5
Heavy manufacturing	14.8	5.8	10.9	38.8	29.7
Services sector	29.8	23.1	17.3	23.1	6.7
			1971-1976		
Non-agricultural sector	15.0	11.0	16.5	38.6	18.9
Manufacturing sector	14.0	6.7	11.3	43.3	24.7
Light manufacturing	14.6	6.6	9.5	51.1	18.2
Heavy manufacturing	13.7	7.1	13.1	36.3	29.8
Services sector	21.6	31.1	36.5	8.1	2.7

Sources: Same as Table 3.

Note: In aggregation, the shares of gross output of the sub-industries in the 14 classification are used as weights.

percent in 1971-1976. On the other hand, the contributions of the domestic and imported intermediate inputs in heavy manufacturing were much closer, 38.8 percent vs. 29.7 percent in 1961-1971, and 36.3 percent vs. 29.8 percent in 1971-1976.

4) The contribution of the growth in capital input to the output growth in 1971-1976 was much larger than that in 1961-1971, accounting for 16.5 percent vs. 12.1 percent for the non-agricultural sector, 11.3 percent vs. 9.7 percent for the manufacturing sector, and 16.5 percent vs. 17.3 percent for the services sector. The larger contribution of capital growth in the services sector was attributable to the implementation of "the ten major projects", through which a larger amount of investment was made to transportation in 1974-1979.

From the above observations, we may conclude that the rates of technical change in the Taiwanese non-agricultural sectors were not the same for different periods. During the 1950s, technical progress explained about one half of the economic growth. However, it declined to about 20 percent in the 1960s and to around 15 percent in the 1970s. The high rate of economic growth in the 1970s was mostly attributable to the high rate of growth in capital and produced intermediate inputs. The implementation of the ten major projects through which a large amount of investment was made to infrastructure and heavy industries contributed greatly to this growth.

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