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A Cross-Country Study on the Role of the Service Sector*

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This paper examines the growth of the Service, Manufacturing, Agricultural and Other Industrial Sectors at various levels of development, using the technique developed by Chenery and Taylor. We do not find any evidence, from available cross-country data, that the service sector will "take-off" at Advanced Stage of economic development as conventionally believed.

I. Introduction

The present paper examines structural change of the economy at different stages of development, particularly those occurred in the agricultural, manufacturing and service sectors. The 1970s had witnessed the phenomenon of "deindustrialization" in which the manufacturing sector declines, both in absolu and relative terms, in many developed countries. This phenomenon co-exists with an apparent expansion of the service sector (see Gershungy and Miles (1983), Fuchs (1965), etc.).

The purpose of the present study is to carry out a cross-sectoral investigation of structure changes occurring in these sectors. We follow the regression technique developed by Chenery (1979), Chenery and Taylor (1968), Chenery and Syrquin (1975) and recently by Gemmell (1982). These works basically argued that the employment growth of sectors varies ultimately with the "level of development" which can be approximated

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by the per capita income and population size.

The present study generally supports the patterns of development of the agricultural sector, manufacturing sector and service sector as suggested in the theoretical literature. Contrary to the conventional wisdom (see Gemmell (1982)), we do not observe, however, that the leading service sector "takes-off" (growing at faster rates) at the Advanced Stage of development.

Section II of this study critically surveys the existing literature on structural change. Section III discusses the selection of data followed by regression analysis in Section IV. Section V concludes with a comparison of Gemmell's (1982) result and ours.

II. Conventional Theory of Structural Change

In the literature, quite a few pieces of work were written on the growth of the service sector and its relationship with manufacturing and agricultural sectors. For example, Clark (1957) and Fisher (1939) had long predicted that countries could be expected to follow a sequence of primary, secondary and tertiary production in the course of development. The primary sector produces basic good; and the growth potential of this sector is somewhat limited. The secondary sector (manufacturing) produces durable goods for intermediate needs. The tertiary (service) sector produces luxury goods and intermediate inputs, in forms of various services. The potential of development of service industries in modern society is claimed to be very good.

There are three explanations for this conjecture in the literature. The first one is the "Engel's Law" type of explanation, based on income elastic demands for services. As the economy develops, higher income per capita induces a much higher proportional demand for services. The second explanation bases on the productivity differences between the service sector and other industrial sectors. The lower rate of increase in labour productivity in the service sector relative to manufacturing induces a rise in the price of services relative to other goods. This would further induce a continuous transfer of labour to the service sector. The third explanation is based on the provision of services as intermediate inputs to the manufacturing sector. Due to the division of labour across industries as the economy developes, the growth of the service sector is generated from the increasing demand of the manufacturing sector for more specialized intermediate service inputs.

In the Early Stage of economic development, the informal sector, unique to most less developed countries, begins to grow as a result of the rapid rural-urban migration. The informal sector absorbs the new urban migrants and provides small-scale services mainly catering to the needs to low-income groups. Hence, the employment in the service sector is larger than the employment in the embryonic manufacturing sector.

At the Intermediate Stage of economic development, a network of interindustry linkages begins to develop. Outputs in the manufacturing sector rise rapidly. The employment in the service sector also rises partly through the increase in interindustry demand for services and partly through the increase in (final) consumption demand for service. Employment in the service sector rises at slower rate than those in the manufacturing sector.

At the Advanced Stage (or the "deindustrialization" stage) of development, the rate of employment growth of the manufacturing sector begins to fall while the rate of employment growth of the service sector begins to rise. The turning point is where the employment growth rate of the two sectors are identical. Beyond this point, the employment growth rate of the service sector begins to rise faster than the manufacturing sector. The main contribution of employment growth of the service sector must come from labours in the declining manufacturing sector. The decline of the manufacturing sector is consistent with the "product cycles" theory that the traditional "smokestack industries" begin to move to newly industrialized countries with lower labour costs. The employment share of social services tends to rise due to the (elastic) income induced demand for social services (the Engel's Law) and the "technological gap" between the manufacturing sector and service sector. Note that there are also factors that work against the expansion of employment in the service sector. The first one is, the decline in the manufacturing sector may lead to a decline in the service sector through the manufacturing-service linkage which becomes more important at the Advanced Stage. The second one is, the rise in the price of services from the "technological gap" may lead to a decrease in the demand for services through the price elasticity of demand. The net employment effect on the service sector is, in fact, unclear, contrary to the conventional claims.

III. The Data

In our empirical analysis, twenty-six countries are selected. The sample is selected to give a roughly equal number of countries in each of the following categories: the industrial market economies, the upper middle-income economies, the lower middle-income economies and the low-income economies. The selection is limited by availability of data from the International Labor Organization (ILO) Statistical Yearbook. Less developed countries with a small population (less than two million) are excluded. The oil exporting nations that have very small agricultural sector are also excluded.

Employment data used in our study is compiled from the ILO, Yearbook of Labour Statistics and from the Handbook of World Development Statistic (UN, 1983). The ILO started to collect employment data on the service sector as early as 1960 (for some countries 1963). The present study utilizes all the available data from 1960 to 1983. The average values of all these years were taken for our analysis. The period 1960 to 1983 is subdivided into two: the pre-oil shock period and the post-oil shock period. The data between 1972 to 1975 is deleted since it reflects structural changes from the oil shock.

IV. Regression Analysis

This section examines the profiles of the Agricultural sector, the Manufacturing sector, Other Industrial sectors and Service sector at different level of development. Following Chenery (1960), Chenery and Taylor (1968) and others, we use income per capita, Y, to approximate the level of development. The size of population, N, is used as a proxy for the size of domestic market.

Let us examine the employment, output, and the growth rates of employment and output of these sectors at various levels of development. Table 1 examines the employment growth rates of different sectors regressed against Y, and N. r^i $(i=s, m, o, a)$ are the employment growth of the service sector, manufacturing sector, other industrial sectors (mining, construction and electricity and gas) and agricultural sector respectively; r is the total employment growth rate in the economy. Table 2 examines employment share, A_i $(i=s, m, o, a)$, of different sectors at various level of development. The development of product share B_i and the product growth rate g_i $(i=s, m, o, a)$ are analyzed in Table 3 in the appendix. Though less clear cut, these product share regressions generally confirm the findings of the employment regressions (Chenery and Syrquin (1975) also observe this same property).

In the regression equations, dummy variables D_1 and D_2 distinguish pre-oil shock period (1960-1972) and post-oil shock period (1975-1983) respectively; D_5, D_6, D_7 and D_8 distinguish the structure of sample countries. According to Chenery and Syrquin (1975) and the updated study by

UNIDO (1980), countries can be grouped according to their policy orientations as follows (see Appendix for detail):

(1) the primary specialization countries ($D_5 = 1$, $D_6 = D_7 = D_8 = 0$);
(2) import substitution countries ($D_6 = 1$, $D_5 = D_7 = D_8 = 0$);
(3) balanced development countries ($D_7 = 1$, $D_5 = D_6 = D_8 = 0$); and
(4) industrial specializing countries ($D_8 = 1$, $D_5 = D_6 = D_7 = 0$)

In our regression analysis, many functional forms have been tested. Only the best fitted functional forms are reported. Double log functional form is not used because r^i and r sometimes take negative values.

The diagrams (Figures 1 to 5) are the simulated values of the regression equations of Tables 1 and 2. The vertical axis is the variable z which is a function of all the right hand side variables of the regression equations except the dummy variables. In other words, z is a function of only Y, N and the constant term. For example, take the first equation in Table 2. The z function is as follows: $z = 1.636 - 0.263\text{Ln}(Y) + 0.022(\text{Ln}(Y))^2$

Table 1

EMPLOYMENT GROWTH RATE REGRESSION

(1) $r^m - r^a = -2.297 + 0.773\ \text{Ln}(Y) - 0.058\ (\text{Ln}(Y))^2 + 0.028\ \text{Ln}(N)$
(2.22) (2.61) (2.68) (1.13)

$-0.347D_2 + 0.260D_5 - 0.008D_6 + 0.306D_8$
(7.32) (3.42) (0.10) (3.33)

$F = 11.87$ $R^2 = 0.65$

(2) $r^m - r^s = 0.094 + 7.909\text{x}10^{-5}Y - 5.153\text{x}10^{-8}\ Y^2 + 5.079\text{x}10^{12}\ Y^3$
(1.38) (0.86) (1.69) (1.98)

$-0.169D_2 + 0.125D_5 - 0.006D_6 + 0.25D_8$
(4.00) (1.91) (0.09) (0.31)

$F = 6.94$ $R^2 = 0.53$

(3) $r^s - r^a = -2.165 + 0.651\ \text{Ln}(Y) - 0.046\ (\text{Ln}(Y))^2 + 0.047\ \text{Ln}(N)$
(2.23) (2.34) (2.26) (2.03)

$-0.212D_2 + 0.147D_5 - 0.028D_6 + 0.317D_8$
(4.76) (2.06) (0.40) (3.69)

$F = 8.82$ $R^2 = 0.58$

Table 1 (continued)

(4) $r^m - r = 0.165 + 5.538\times10^{-5}Y - 4.17\times10^{-8} Y^2 + 3.983\times10^{-12} Y^3$
(2.82) (0.70) (1.59) (1.81)

$-0.174D_2 + 0.101D_5 - 0.039D_6 + 0.132D_8$
(4.79) (1.80) (0.72) (1.91)

$F = 7.83$ $R^2 = 0.56$

(5) $r^a - r = 1.585 - 0.458\, Ln(Y) + 0.031\, (Ln(Y))^2 - 0.035\, Ln(N)$
(2.00) (2.02) (1.87) (1.86)

$+ 0.193D_2 - 0.165D_5 - 0.016D_6 - 0.199D_8$
(5.32) (2.83) (0.27) (2.83)

$F = 7.81$ $R^2 = 0.55$

(6) $r^o - r = -2.68 + 0.811\, Ln(Y) - 0.061\, (Ln(Y))^2 + 0.0642\, Ln(N)$
(2.42) (2.55) (2.63) (2.42)

$-0.071D_2 - 0.0042D_5 - 0.157D_6 - 0.012D_8$
(1.44) (0.05) (1.92) (0.13)

$F = 2.11$ $R^2 = 0.25$

(7) $r^s - r = 0.058 + 1.192\times10^{-5}\, Y - 3.045\times10^{-9}\, Y^2$
(1.85) (0.59) (1.21)

$-0.0096D_2 - 0.0197D_5 - 0.036D_6 + 0.116D_8$
(0.45) (0.59) (1.08) (2.87)

$F = 4.60$ $R^2 = 0.38$

Notes: Numbers in brackets are t-values.
r^m, r^s, r^a, r^o and r are the employment growth rates of the manufacturing service, agricultural, other industrial sector and the entire economy respectively.

$-0.272Ln(N) + 0.031(Ln(N))^2$. Since z is a function of Y and N, instead of having N as a shifting parameter in the diagrams, we pick a constant value for N; we fix N at its sample mean. In other words, the (*) in the figures is the simulated value of z with respect to Y, holding the value of N constant at its mean value.[1] The alphabets in the diagrams are the "adjusted"

[1] We have also tried other simulations with the z function including only the Y variable and the constant term, and with data points adjusted by the dummy variables and by N. The simulated curves are very similar to those in the diagrams, with all the key features intact, and hence not reported.

Table 2

EMPLOYMENT SHARE REGRESSION

$$A_s = \underset{(3.06)}{1.636} - \underset{(1.61)}{0.263}\,Ln(Y) + \underset{(1.86)}{0.022}\,(Ln(Y))^2 - \underset{(4.16)}{0.272}\,Ln(N)$$

$$+ \underset{(3.58)}{0.031}\,(Ln(N))^2 + \underset{(2.20)}{0.053}D_2 - \underset{(0.58)}{0.022}D_5 + \underset{(3.75)}{0.148}D_6 + \underset{(1.28)}{0.060}D_8$$

$F = 9.03$ $\quad R^2 = 0.63$

$$A_a = -\underset{(0.16)}{0.134} + \underset{(0.34)}{0.090}\,Ln(Y) - \underset{(0.69)}{0.013}\,(Ln(Y))^2 + \underset{(2.87)}{0.304}\,Ln(N)$$

$$\underset{(2.81)}{0.040}\,(Ln(N))^2 - \underset{(1.14)}{0.044}D_2 - \underset{(1.52)}{0.095}D_5 - \underset{(3.17)}{0.202}D_6 - \underset{(1.20)}{0.090}D_8$$

$F = 6.55$ $\quad R^2 = 0.55$

$$A_m = \underset{(3.94)}{0.086} + \underset{(3.82)}{5.371\times10^{-5}}\,Y - \underset{(2.93)}{5.157\times10^{-9}}\,Y^2 + \underset{(2.17)}{0.00014}\,N + \underset{(0.27)}{0.0039}D_2$$

$$-\underset{(0.054)}{0.0012}D_5 + \underset{(2.99)}{0.070}D_6 + \underset{(1.55)}{0.0433}D_8$$

$F = 11.69$ $\quad R^2 = 0.65$

$$A^o = -\underset{(1.95)}{0.838} + \underset{(1.93)}{0.237}\,Ln(Y) - \underset{(1.76)}{0.016}\,(Ln(Y))^2 + \underset{(2.09)}{0.022}\,Ln(Y) - \underset{(0.202)}{0.004}D_2$$

$$+ \underset{(4.07)}{0.128}D_5 - \underset{(0.26)}{0.0082}D_6 - \underset{(0.37)}{0.014}D_8$$

$F = 4.40$ $\quad R^2 = 0.41$

Notes: Numbers in brackets are t-values.
A_s, A_a, A_m and A_o are employment shares the service, agricultural manufacturing and other industrial sector respectively.

data points (observed values). Because of the way z (or the stars in the Figures) is defined, the observed values of A_s must be adjusted by the dummy variables. This adjusted value simply equals $A_s - 0.053D_2 + 0.022D_5 - 0.148D_6 - 0.06D_8$. The advantage of this method is: It is now unnecessary to plot one equation for every dummy variable. Note that some of the t-values (in brackets) are low for coefficients of Y and the dummies. This is due to multicollinearity among these variables. An

F-test (not reported here) shows that the impact of the variable Y and higher orders of Y is statistically significant. From these regressions and simulations, the following features are observed:

(1) The employment share of the manufacturing sector rises with the level of development and peaks at a level between $4,500-$6,000 per capita (1970 constant US dollar). Then the employment share of the manufacturing sector starts to fall (see Figure 2). The product (GDP) share of the manufacturing sector also shows the same pattern.

(2) The decline of the manufacturing employment seems to peter out when per capita income reaches a moderately high level. In Figure 4, the curve of $r^m - r + 0.17D_5 - 0.1D_5 + 0.04D_6 - 0.13D_8$ turns surprisingly upwards when per capita income reaches the highest level, at around $8,000 per capital.

(3) The employment share in the service sector falls rapidly and then rises again slowly at (very) low level of per capita income (see Figure 1). This confirms the pattern of development in the Early Stage where the employment in the informal sector dominates the employment in the embryonic manufacturing sector. The employment in the informal sector goes down as employment in the manufacturing sector begins to grow. The employment share of services then rises again at a diminishing rate as the economy moves well into the Intermediate State of development.

(4) Figure 1 shows that, when per capita income is very high, service sector employment rises at a diminishing rate. Figure 5 also confirms this: $r^s - r + 0.01D_2 + 0.02D_5 + 0.04D_6 - 0.12D_8$ falls gradually at higher per capita income.

(5) The functional forms of the product share (GNP) and the product growth rate of services (see Table 3 in Appendix) also suggest that when per capita income is very high the product share of services tends to rise at a slower rate.

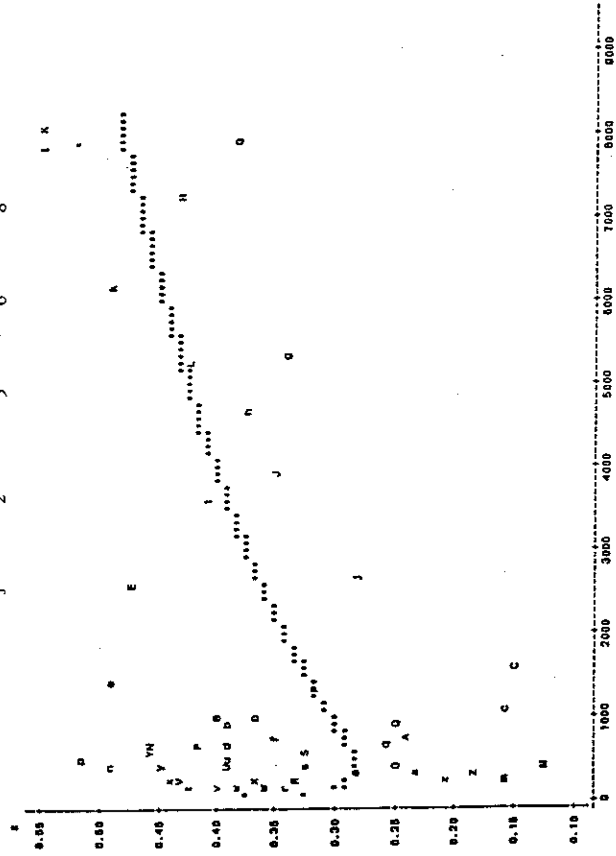
(6) Note that in Figure 5, when per capita income reaches the highest level, around $8,000, $r^s - r + 0.01D_2 + 0.02D_5 + 0.04D_6 - 0.12D_8$ is about -0.05. The data points G, I, and K suggest that $D_2 = 1$, $D_8 = 1$, $D_5 = D_6 = 0$ (see Appendix Table 4). Hence, $r^s - r$ must take a positive value of $+0.11$. That is, the service sector employment growth rate, though much slower at the highest income per capita, is still higher than the average employment growth rate.

(7) The estimation of relative growth rate between r^m and r^s is

Figure 1

Service Employment Share

$$z = A_5 - 0.05D_2 + 0.02D_5 - 0.15D_6 - 0.06D_8$$

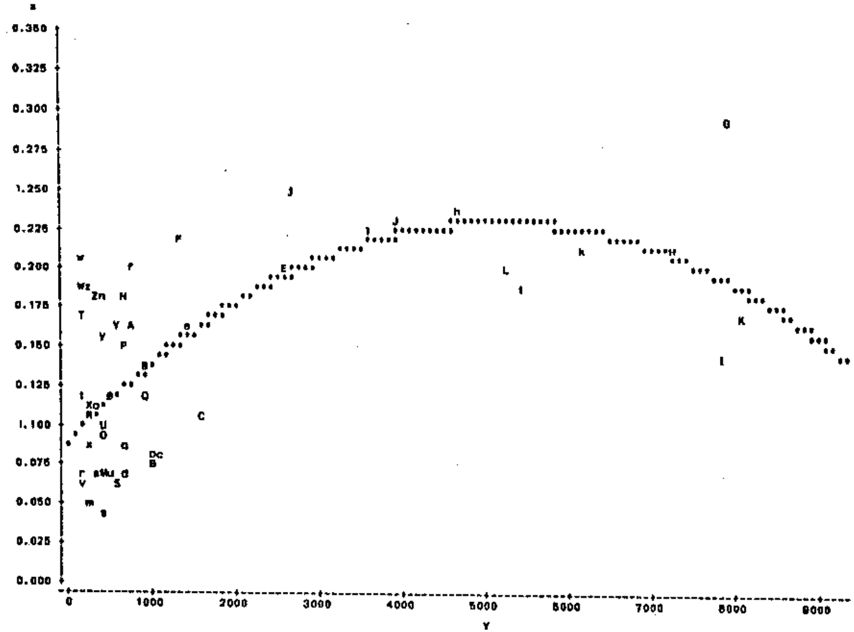


Note: See Table 2 for equation fitted; the alphabets denote country data points (See Appendix for detail).

Figure 2

Manufacturing Employment Share

$$z = A_m - 0.004D_2 + 0.001D_5 - 0.07D_6 - 0.04D_8$$

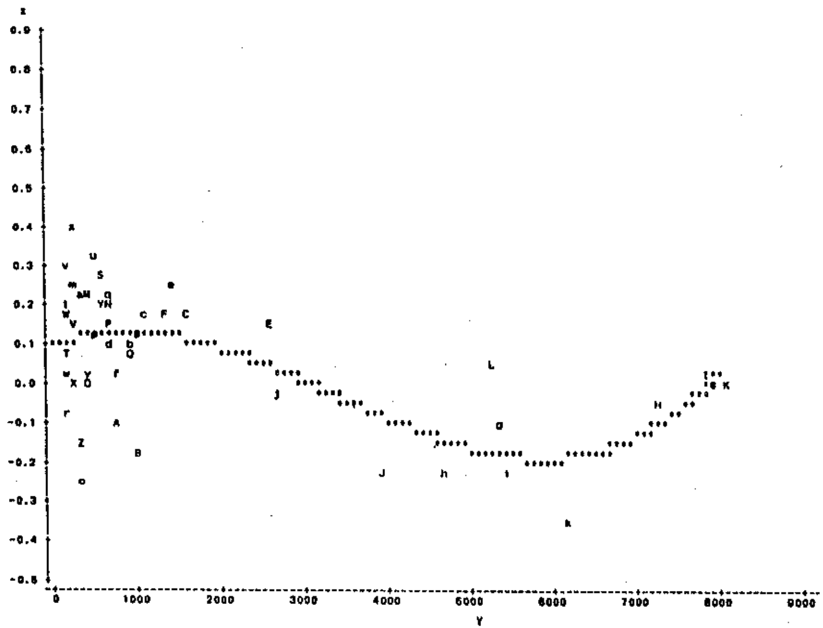


Note: See Table 2 for equation fitted; the alphabets denote country data points (See Appendix for detail).

Figure 3

Differential Employment Growth Rates ($r^m - r^s$)

$$z = r^m - r^s + 0.17D_2 - 0.13D_5 + 0.01D_6 - 0.03D_8$$

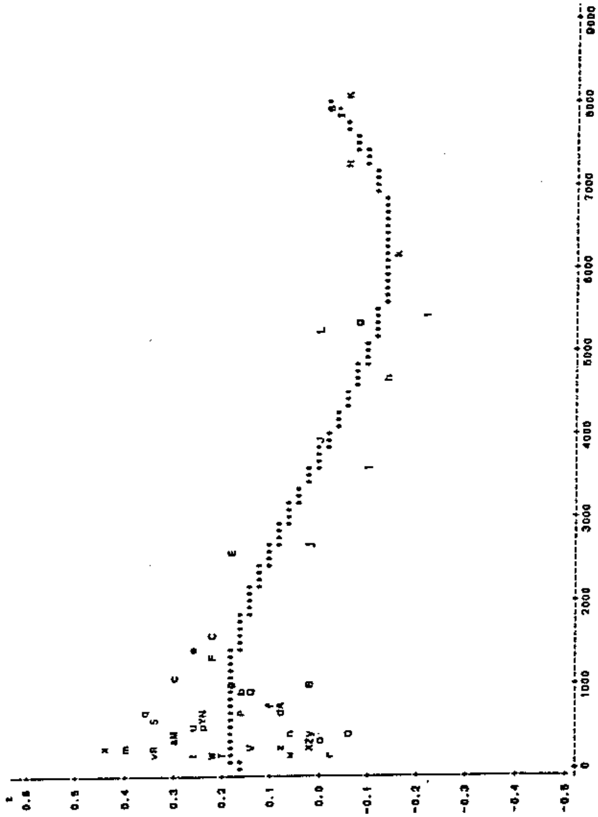


Note: See Table 1 for equation fitted; the alphabets denote country data points (See Appendix).

Figure 4

Differential Employment Growth Rates ($r^m - r$)

$z = r^m - r + 0.17D_2 - 0.10D_5 + 0.04D_6 - 0.32D_8$

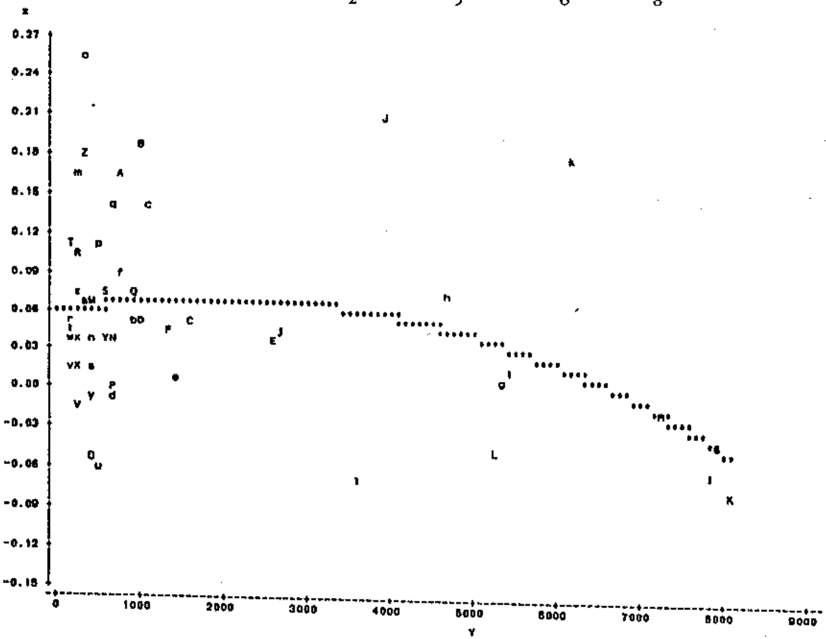


Note: See Table 1 for equation fitted; the alphabets denote country data points (See Appendix).

Figure 5

Differential Employment Growth Rates ($r^s - r$)

$z = r^s - r + 0.012D_2 + 0.02D_5 + 0.04D_6 - 0.12D_8$



Note: See Table 1 for equation fitted; the alphabets denote country data points (See Appendix).

presented in Figure 3. This curve gradually declines when Y is at the intermediate level and turns upward at higher level of Y. This means the employment growth of the manufacturing sector becomes stronger than that of the service sector at the Advanced Stage of development. A careful examination of $r^m - r$ and $r^s - r$ reveals that the value of $r^m - r$ is much larger than $r^s - r$. Thus, $r^m - r^s$ reflects mostly the dominating behavior of $r^m - r$.

(8) In Figure 3, when per capita income is at an intermediate level at around $2,700, r^m approximately equals r^s.[2] The manufacturing sector employment has declined to the same rate as the rising growth rate of the service sector. The Intermediate Stage of development must have finished and the Advanced Stage of economic development must have begun. The GDP growth rate regression in the Appendix suggests this turning point occurs at a slightly higher per capita income (g^m equals g^s at around $3,500).[3]

(9) The Agricultural sector is declining with the level of development either in terms of employment share or in terms of product share (see Tables 2 and 3). The differential growth rates of $r^m - r^a$, $r^s - r^a$ and $r^a - r$ (see Table 1), also confirm this trend.

(10) The Other Industrial sectors (mining, construction and electricity and gas) expand rapidly in the Early Stage of development. Then at the Intermediate Stage and the Advanced Stage, these sectors begin to decline. This pattern can be shown from the regression equations in Table 1 and 2. In the embryonic stage of development, the industrial sectors are important to provide an infrastructure for the economy. In subsequent stages of development, the importance of these sectors gradually diminishes.

V. Discussions and Conclusion

The development pattern of the manufacturing sector, agricultural sector and other industrial sectors in the present study, seems to conform with the conventional theoretical literature as discussed in Section II. The service sector however does not seem to "take-off" or to grow at a faster

[2] Country "j" (Italy 1960-1972) has a per capita income of around $2,700. This means $D_2 = 0$ $D_5 = D_6 = 0$, $D_8 = 1$. Hence, $r^m - r^s = -0.02 - 0.169D_2 + 0.125D_5 - 0.006D_6 + 0.25D_8$ equals zero approximately.

[3] Country "1" (France 1960-1972) has a per capita income of around $3,500. This means $D_2 = D_5 = D_6 = 0$, $D_8 = 1$. Hence, $g^m - g^s = -0.15 - 0.166D_2 + 0.045D_5 - 0.043D_6 + 0.147D_8 = 0.022$ equals zero approximately.

rate in the Advanced Stage of development. This sector is growing, but also at a slower rate. Although the employment growth rate of the service sector still leads the national average employment growth rate, this difference declines gradually when the economy reaches the Advanced Stage of development. One plausible explanation is the offsetting factors discussed earlier. When the manufacturing sector declines in the Advanced Stage, the service sector must be affected through the manufacturing-service linkage which are of growing importance at later stages. This is confirmed elsewhere in another paper of ours (1989) where we investigate the manufacturing-service linkages, using input-output tables of various countries. We found that at the "micro" level, the linkage effect of manufacturing sector is much larger than that of the service sector at the Advanced Stage of development. In additon, the "productivity gap" can result in a higher service price which can force the output of the service to decline through the price elasticity of demand. These findings suggest that the employment generating capacity of the service (manufacturing) sector is perhaps overstated (understated).

The present study partially contradicts some of the findings by Gemmell (1982) who suggested that the employment profile of the service sector must rise initially, at a diminishing rate, to a plateau which corresponds to the peak of the employment profile in manufacturing and then must rise, at an increasing rate (an upturn), at the last stage of development. He suggested a cubic regression equation of the following form:

$$(1) \qquad A_s = b_0 + b_1 Y + b_2 Y^2 + b_3 Y^3 + \text{Dummy variables}$$

where the positive coefficients, b_1, b_2, b_3, must carry the above signs, to give the profile Gemmell wanted. He also argued that the log-linear functional form used by Chenery-Taylor (1968). Chenery-Syrquin (1975) makes the service sector subsequently rises at a diminishing rate with no up-turn possibility as in the cubic form.

Instead of testing the model directly, Gemmell tested the implication of his hypothesis that there should be an ultimate trade-off between employment in the service sector and the manufacturing sector. He then regressed the employment of manufacturing sector as a function of employment in the service sector and found supports for the ultimate trade-off of employment between these sectors. Note that this trade-off is a necessary, but not a sufficient, condition for his hypothesis. This is why, although the test is cleverly designed, the test itself cannot distinguish the cubic function of Gemmell's or the log-linear function of Chenery's et al. which does not allow the possibility of an ultimate up-turn in the service sector. In other words, both functional forms give the same ultimate negative trade-off between manufacturing and service sector employment.

Whether or not the service sector employment profile turns up subsequently is an important policy question. The present study also tests the cubic functional form suggested by Gemmell, and finds:

$$(2)\qquad \underset{(7.12)}{A_s = 0.348} - \underset{(0.26)}{1.7\times10^{-5}Y} + \underset{(0.5)}{1.03\times10^{-8}Y^2} - \underset{(0.39)}{7.25\times10^{-13}Y^3}$$

$$+ \underset{(1.13)}{0.034D_2} + \underset{(0.12)}{0.006D_5} + \underset{(3.36)}{0.154D_6} + \underset{(0.65)}{0.037D_8}$$

$$F = 4.64 \qquad R^2 = 0.425$$

In equation (2), the t-staistics in brackets are low due to the usual multicolinearity between the Y's. However, the signs obtained in front of b_i's contradict those predicted by Gemmell. In fact, the negative sign in front of b_3Y^3 suggests that there should be a down-turn instead of an up-turn. However, this sign suggestion of a down-turn is weak due to the low t-statistics in the estimated coefficients. Several other functional forms are tried in our study; none of them shows any up-turn of the service sector at later stage of development. The best functional form, reported in Table 2 and simulated in Figure 1, is still the log-linear (with higher orders) equations form, with a considerably higher $F = 9.03$ and $R^2 = 0.63$. This log-linear function, together with other evidences from the r^s–r and r^m–r^s regressions (in Table 1 and Figures 3, 4 and 5), further suggests that the service sector employment rises, but at a diminishing rate, at the Advanced Stage of development.

Appendix

Table 3

GDP GROWTH RATE AND GDP SHARE REGRESSIONS

(1) $g^m - g^s = -1.69 + 0.656\,Ln(Y) - 0.0499\,(Ln(Y))^2 - 0.147\,Ln(N)$
(2.01) (2.56) (2.68) (1.43)

$+ 0.019\,(Ln(N))^2 - 0.166D_2 + 0.045D_5 - 0.043D_6 + 0.147D_8$
(1.38) (4.43) (0.74) (0.69) (2.01)

$F = 10.69$ $R^2 = 0.67$

(2) $g^m - g = -1.447 + 0.575\,Ln(Y) - 0.044\,(Ln(Y))^2 - 0.127\,Ln(N)$
(1.90) (2.47) (2.63) (1.36)

$+ 0.018\,(Ln(N))^2 - 0.154D_2 + 0.052D_5 - 0.049D_6 + 0.126D_8$
(1.49) (4.52) (0.95) (0.87) (1.91)

$F = 4.96$ $R^2 = 0.48$

(3) $g^s - g = 0.238 - 0.079\,Ln(Y) + 0.0053\,(Ln(Y))^2 + 0.018\,Ln(N)$
(0.62) (0.72) (0.66) (1.96)

$+ 0.012D_2 + 0.0075D_5 - 0.0062D_6 - 0.020D_8$
(0.70) (0.25) (0.22) (0.59)

$F = 1.19$ $R^2 = 0.16$

(4) $B_a = 1.999 - 0.410\,Ln(Y) + 0.022\,(Ln(Y))^2 - 0.018\,Ln(N)$
(4.57) (3.27) (2.44) (1.68)

$-0.012D_2 + 0.005D_5 + 0.028D_6 + 0.0019D_8$
(0.61) (0.15) (0.87) (0.05)

$F = 24.71$ $R^2 = 0.80$

(5) $B_m = 0.147 + 5.12 \times 10^{-5}\,Y - 4.914 \times 10^{-9}\,Y^2 = 0.018D_2$
(6.55) (3.54) (2.73) (1.20)

$-0.069D_5 + 0.010D_6 + 0.014D_8$
(2.88) (0.44) (0.48)

$F = 13.87$ $R^2 = 0.65$

(6) $B_o = -1.50 + 0.428\,Ln(Y) - 0.029\,(Ln(Y))^2 + 0.029\,Ln(Y)$
(3.83) (3.82) (3.56) (3.08)

Table 3 (continued)

$$-0.0095D_2 + 0.0992D_5 - 0.049D_6 - 0.008D_8$$
$$(0.53) \quad (3.45) \quad (1.71) \quad (0.23)$$

$F = 5.68$ $\quad R^2 = 0.48$

(7) B_s $= +0.694 - 0.094\,Ln(Y) + 0.01\,(Ln(Y))^2 - 0.021\,Ln(Y)$
$$(1.81) \quad (0.86) \quad (1.26) \quad (2.32)$$

$$= 0.013D_2 - 0.040D_5 + 0.020D_6 - 0.015D_8$$
$$(0.74) \quad (1.40) \quad (0.71) \quad (0.44)$$

$F = 7.22$ $\quad R^2 = 0.54$

Notes: Numbers in brackets are t-values.
g^i and B_i are respectively the GDP growth rate and GDP share of sector *i* manufacturing (*m*), service (*s*), agricultural (*a*) and other industrial (*o*) sectors.

Table 4

STRUCTURAL INDEX OF THE SAMPLE COUNTRIES

Countries	D_5	D_6	D_7	D_8
USA (K)	0	0	0	1
Japan (L)	0	0	0	1
Canada (I)	0	0	0	1
France (H)	0	0	0	1
Germany (G)	0	0	0	1
Italy (J)	0	0	0	1
Korea (A)	0	0	0	1
Chile (B)	0	1	0	0
Mexico (C)	0	1	0	0
Algeria (D)	1	0	0	0
Greece (E)	0	0	1	0
Brazil (F)	0	1	0	0
Thailand (M)	0	0	1	0
Columbia (N)	0	1	0	0
Philippines (O)	0	0	1	0
Ivory Coast (P)	1	0	0	0
Turkey (Q)	0	1	0	0
Indonesia (R)	1	0	0	0
Nigeria (S)	1	0	0	0
Morocco (Y)	0	0	1	0
Sri Lanka (Z)	1	0	0	0
Tanzania (T)	1	0	0	0
Ghana (U)	0	1	0	0
Kenya (V)	0	0	0	1
India (W)	1	0	0	0
Madagascar (X)	1	0	0	0

Notes: Primary specialization countries $D_5 = 1$, $D_6 = D_7 = D_8 = 0$
Import substitution countries $D_6 = 1$, $D_5 = D_7 = D_8 = 0$
Balanced development countries $D_7 = 1$, $D_5 = D_6 = D_8 = 0$
Industrial specializing countries $D_8 = 1$, $D_5 = D_6 = D_7 = 0$

The structural index is compiled from Chenery (1979) and from "World Industry Since 1960: Progress and Prospects" Special Issues of Industrial Development Survey for the Third General Conference, UNIDO (1980).

Alphabet in bracket beside each country corresponds to the country data point in Figures 1 to 5. Small letter and capital letter in the fitures distinguish pre-oil shock and post-oil shock data of that country.

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