



HOKKAIDO UNIVERSITY

Title	An Inquiry into Deindustrialisation:A Comparison between the UK and Japan
Author(s)	MATSUMOTO, Gentaro
Citation	ECONOMIC JOURNAL OF HOKKAIDO UNIVERSITY, 22, 91-130
Issue Date	1993
Doc URL	https://hdl.handle.net/2115/30496
Type	departmental bulletin paper
File Information	22_P91-130.pdf



An Inquiry into Deindustrialisation: A Comparison between the UK and Japan*

Gentaro MATSUMOTO

1. Introduction

Deindustrialisation seems to be a common phenomenon for advanced countries to some extent. In particular, in the UK a continuing decline in industrial competitiveness against other advanced countries is named the 'British disease'. The UK has lagged behind other advanced countries and there is a continuous transition of resources from manufacturing sectors to service producing sectors. The UK's economy has experienced deindustrialisation¹⁾ over the past decades. The peak of employment in UK manufacturing was 1966. After that time employment in the manufacturing sector has gradually declined. 'Between 1966 and 1977, nearly 1.9 million jobs were lost in manufacturing, while a further 2.2 million were lost between 1977 and 1987' (Bazen (1989), p.11). Employment in the manufacturing industries has declined to 5,097 thousand in 1988, which is under a quarter of the total employees.²⁾ Also the contribution of manufactures to the export surplus, and the UK's share of the world market in manufactures have declined. If the expansion of activity and employment elsewhere in the economy is not enough to absorb the labour flooding out from the manufacturing sector, deindustrialisation may lead to unemployment.

In contrast to the manufacturing sectors, a decline in the relative size of the UK's services has not happened. 'Services have not been so affected by the increasing import penetration which have become so evident with manufacturing' (Sargent (1979), p.103). We can easily see that this tendency also applies after 1979. The service sector in the UK has created new jobs and grown in contrast to the manufacturing sector. Not only transport and travel but also other services, which comprise financial services and a miscellany of others, have maintained their positive contribution to the UK's economy.³⁾ After examining the performance of foreign trade in manufacturing and services, Sargent supported 'the claim that the UK has been developing a comparative advantage in services' and suggested that 'the advantage may be more than marginal in its significance' (Sargent, p.106). For

* The author would like to thank Professor K. Cowling and J. Round of the University of Warwick, Y. Kobayashi of Hokkaido University, and I. Sakuma of Senshyu University for their valuable comments. The author is fully responsible for any errors and opinions.

the service industries, 'the marginal productivity of capital has held up better in relation to the average than has been the case for manufacturing'. Therefore, 'they still retain a capacity to absorb capital which manufacturing may have exhausted' (pp.115-6). Lastly, Sargent reaches this conclusion: 'consequently the rate of growth of employment in manufacturing should at least rise relatively to services, even though it remains smaller or negative. Deindustrialisation, in other words, will decelerate'. (p.116)

In general, deindustrialisation does not necessarily mean a decline of the international competitive power of manufactures. Deindustrialisation might allow the reallocation of resources from manufacturing sectors to service sectors so that service sectors could contribute to raising the quality of manufactures. Expansion of the service sector of the economy, which produces about three-fifths of the private sector output, might stimulate productivity in the manufacturing sector by means of coordinated investment and technical progress. Therefore, as Sargent mentioned, because of a comparative advantage in services in the future, it is 'possible that trade in services may benefit more than trade in goods from further liberalisation'? (Blackaby (1979), p.3) In this paper, I want to examine this problem from a different point of view.

Since the Second World War, Japan's economy has experienced considerable structural change. In the high economic growth era, Japan strengthened its international competitiveness through heavy and chemical industrialisation, by seeking to economies of scale. The expansion of the heavy and chemical industries meant that fewer resources were available for other sectors, generally for primary industry, which still employed around 50 percent of the labour force at the end of the War. The proportion of the labour force engaged in secondary industry, especially in manufacturing, has grown rapidly. Heavy and chemical industrialisation has been successfully established. Such modernisation of industrial structure has also necessarily resulted in a massive transformation in the structure of the manufacturing sector. The composition of Japanese exports has reflected the changing structure of production. For example, textiles and fiber, which was the most important export merchandise in the past, nowadays has become entirely insignificant. Instead, machinery products, including motor vehicles, are flooding the world. We can see a rapid structural change of Japan's economy not only across industries but also at the company level.

In addition, following the US and UK's economies, the greatest growth has been in the industries that produce services; they now employ around sixty per cent of the labour force. The largest relative expansion in the tertiary sector has occurred since the First Oil Crisis in 1973. Companies were forced to select new technology which could be expected to reduce energy and labour costs in order to increase productivity of their products and so to strengthen international

competitiveness. Changes in the allocation of inputs, materials and labour force, have resulted in changes of industrial structure and also changes in the interdependence of industries. The locomotive of Japan's economy has changed from the heavy and chemical industries to the processing and assembly industries. Deindustrialisation was the meaning of re-allocation of resources aiming at transition to a more service-oriented industrial structure. Japan's economy has gradually changed to a deindustrialised situation as the decade proceeded after the first oil crisis. In Japan, the term 'deindustrialisation' or the 'deindustrialised society' was thought of as a desired situation which could free workers from routine and hard jobs and open the way to creative jobs. They regarded the more service-oriented economy, such as that in the US and the UK, as advanced, at that time. It seems likely that Japan's manufactures have strengthened international competitiveness through deindustrialisation in contrast to the UK's experience so far.

In this paper, I attempt to understand the importance of interdependence between industries, particularly the manufacturing and service sectors. The main question I address is, to what extent has deindustrialisation benefited the UK's economy compared with Japan's? In doing so, I chiefly use the input-output analysis in order to clarify the change of interdependence between the above two sectors. In the next section, I will present an outline of an input-output system and some results from that. Secondly, I will explore the analytical framework by following Miyazawa (1963, 1975), which divided the original Leontief inverse into partial multipliers. In section IV, I deduce the other results from input-output analysis. My analysis is based on the specially compiled 27 sector input-output tables for the duration of one decade.⁴⁾ I must admit that the following analysis is nothing more than a sketch when two countries' performances are compared, because of the lack of a completely consistent correspondence of the data in real value, though I do believe that my analysis identifies some interesting characteristics in the process of deindustrialisation.

2. An Overview of Input-Output Analysis

The problem is whether the expansion of the service sector is sufficient to absorb the labour shed by old fashioned and basic industries such as mining, steel, and chemicals, given that private companies in a competitive market 'do not consider the social cost and benefits of their activities' (Curwen (1990), p.296). There might be a mismatch problem between unemployment and vacancies when industrial structure rapidly changes. Decision-making to allocate inputs for the modernisation of companies is decentralised to the level of individual establishments, and this decision-making causes the change in industrial structure. Also, change in economic performance as a whole is attributed to change of the industrial structure, which reflects technological change in the long-run. Therefore, industry-

level analysis, the well-known input-output analysis, makes it possible and useful to compare the different economic performances.

The basic formulation for the input-output system is

$$\mathbf{X} = \mathbf{A}^* \mathbf{X} + \mathbf{F} \quad (1)$$

where $\mathbf{X}$ is the vector of commodity output (gross domestic output vector), $\mathbf{A}^*$ is the input coefficient matrix ($n \times n$ matrix), and $\mathbf{F}$ the final demand vector. That is to say,

$$\mathbf{X} = (\mathbf{X}_1, \mathbf{X}_2, \dots, \mathbf{X}_j, \dots, \mathbf{X}_n)'$$

$a_{ij} = x_{ij}/X_j$: input coefficient of industry j with respect to product i , and x_{ij} is the amount bought by sector j from sector i ($i, j = 1, 2, \dots, n$),

$$\mathbf{A}^* = (a_{ij})$$

$$\mathbf{F} = (\mathbf{F}_1, \mathbf{F}_2, \dots, \mathbf{F}_j, \dots, \mathbf{F}_n)'$$

Equation (1) can be solved for $\mathbf{X}$ in terms of $\mathbf{F}$, where a_{ij} and $\mathbf{A}^*$ are based on domestic inputs (for example, the commodity-by-commodity domestic use matrix in Table 4 of *Input-output tables for the United Kingdom 1984* version). Solving (1) gives the well known Leontief equation,

$$\mathbf{X} = (\mathbf{I} - \mathbf{A}^*)^{-1} \mathbf{F} \quad (2)$$

where $\mathbf{I}$ is the identity (or unit) matrix of order $n \times n$ and matrix $(\mathbf{I} - \mathbf{A}^*)^{-1}$ is the Leontief inverse, each cell of which, b_{ij}^* , may be interpreted as the amount of gross output of the i -th sector's commodity, needed both directly and indirectly to produce one unit of j -th sector's commodity for final output. So this shows the ultimate total effect of final demand. The Leontief inverse

$$(\mathbf{I} - \mathbf{A}^*)^{-1} = \mathbf{B}^* = (b_{ij}^*) \quad (3)$$

can be called 'the Leontief matrix multiplier'. The value of b_{ij}^* shows the extent of interdependence between each sector. The column sum, $\sum_i b_{ij}^*$, indicates the amount of input directly or indirectly needed to produce one unit of product j .

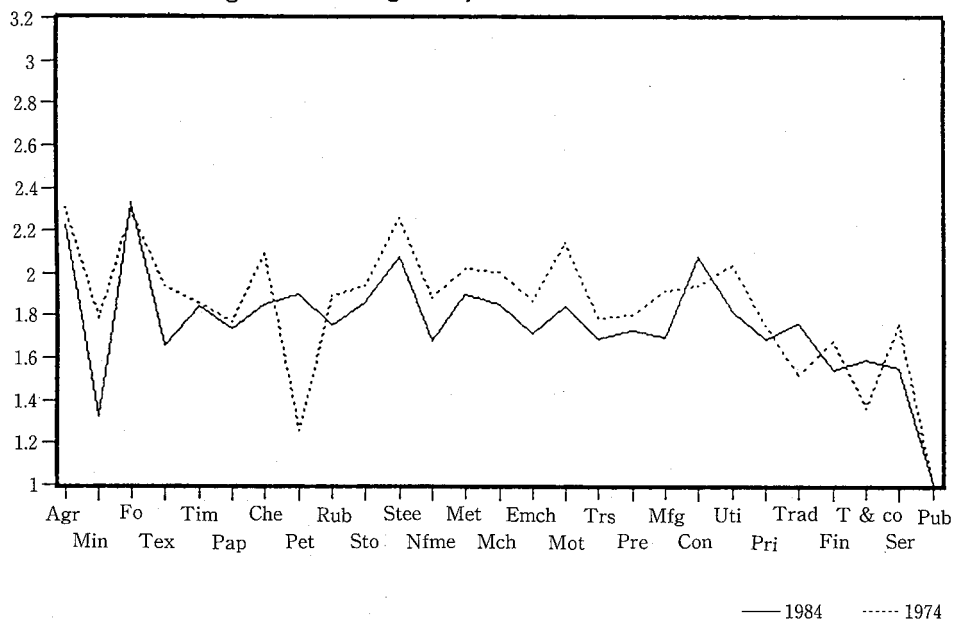
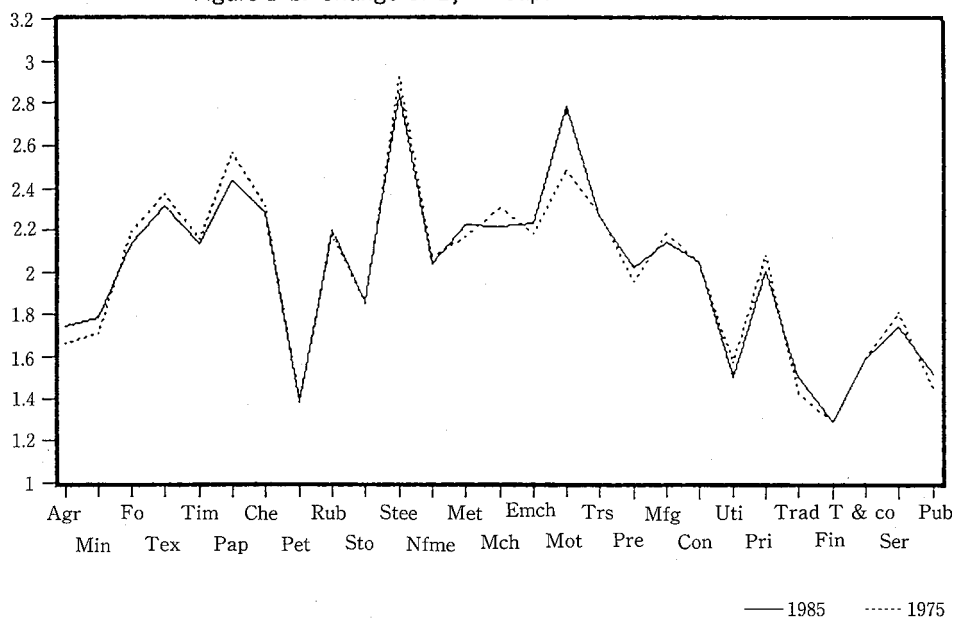
Table 1 summarises an outline of the coefficients of the Leontief inverse matrices and the market share of production in two countries.⁵⁾ Also, Figure 1 shows the movement of these coefficients in each industry. In Japan, the average value of $\sum_i b_{ij}^*$, the column sum of b_{ij}^* , slightly fell from 2.0097 in 1975 to 2.0093, by 0.021 per cent. In manufacturing sectors, rubber, electronic machinery, precision instruments, and motor vehicle industries increased their value of $\sum_i b_{ij}^*$, and these industries also increased their output share. In contrast to Japan's case, all industries in the UK's manufacturing sector experienced a decline in the value of $\sum_i b_{ij}^*$,

Table 1-a. Leontief Inverse Coefficient and Output Share: the UK

	$\sum_j b_{ij}^*$			Output Share		
	a 1974	b 1984	b - a	c 1974	d 1984	d - c
Agric	2.3053	2.2232	-0.0821	3.275%	2.764%	-0.511
Mining	1.7843	1.3226	-0.4617	1.462%	4.547%	3.086
Foods	2.2874	2.3334	0.0459	6.974%	6.206%	-0.768
Textiles	1.9457	1.6609	-0.2848	3.201%	1.816%	-1.385
Tim & Fur	1.8576	1.8439	-0.0137	1.312%	0.970%	-0.342
Paper	1.7710	1.7371	-0.0339	1.553%	1.135%	-0.418
Printing	1.7558	1.6931	-0.0626	4.215%	3.578%	-0.637
Chemical	2.0922	1.8508	-0.2415	2.925%	2.722%	-0.203
Petroleum	1.2558	1.8972	0.6414	1.753%	1.449%	-0.303
Rubber	1.8925	1.7578	-0.1347	1.344%	1.370%	0.026
Stone	1.9381	1.8605	-0.0776	2.346%	1.330%	-1.015
Steel	2.2595	2.0806	-0.1790	1.593%	0.900%	-0.694
Nonfer met	1.8867	1.6799	-0.2069	3.232%	2.156%	-1.076
Metal	2.0243	1.9039	-0.1203	4.413%	3.440%	-0.974
Machin	2.0045	1.8530	-0.1515	2.785%	2.762%	-0.023
Elec mach	1.8705	1.7109	-0.1596	2.516%	1.811%	-0.705
Mot veh	2.1409	1.8458	-0.2951	1.617%	1.528%	-0.089
Trsp eqpt	1.7848	1.6914	-0.0934	0.431%	0.388%	-0.043
Prec inst	1.8058	1.7332	-0.0726	0.453%	0.386%	-0.067
Oth mfg	1.9185	1.6957	-0.2228	8.916%	8.016%	-0.900
Construc	1.9382	2.0800	0.1418	2.617%	3.739%	1.122
Utilities	2.0364	1.8163	-0.2201	1.466%	1.667%	0.201
Trade	1.5177	1.7661	0.2484	10.110%	10.319%	0.209
Finance	1.6808	1.5476	-0.1332	5.446%	11.353%	5.907
Trs & comm	1.3614	1.5935	0.2321	7.796%	6.175%	-1.621
Service	1.7602	1.5486	-0.2116	6.666%	5.148%	-1.518
Pub ad	1.0000	1.0000	0.0000	9.582%	12.325%	2.744
Average	1.8473	1.7677	-0.0796			
Total	49.8759	47.7269	-2.1491	100%	100%	

Table 1-b. Leontief Inverse Coefficient and Output Share: Japan

	$\sum_i b_{ij}^*$			Output Share		
	a 1975	b 1985	b - a ΔB_j	c 1975	d 1985	d - c
Agric	1.6670	1.7449	0.0779	4.1158%	2.6452%	-1.4706
Mining	1.7171	1.7896	0.0725	0.4668%	0.2870%	-0.1798
Foods	2.1935	2.1402	-0.0534	6.3547%	5.5491%	-0.8056
Textiles	2.3756	2.3123	-0.0632	2.7810%	2.0040%	-0.7770
Tim & Fur	2.1624	2.1339	-0.0285	1.6614%	1.0305%	-0.6308
Paper	2.5639	2.4361	-0.1278	1.4620%	1.2549%	-0.2070
Chemical	2.3124	2.2820	-0.0304	3.4764%	3.4087%	-0.0676
Petroleum	1.3960	1.3780	-0.0180	2.9718%	2.3976%	-0.5742
Rubber	2.1784	2.2032	0.0248	1.2607%	1.6014%	0.3407
Stone	1.8536	1.8607	0.0072	1.5084%	1.2754%	-0.2330
Steel	2.9228	2.8396	-0.0832	5.9605%	4.0715%	-1.8890
Nonfer met	2.0749	2.0366	-0.0383	1.0808%	0.9384%	-0.1425
Metal	2.1707	2.2257	0.0550	1.8875%	1.7273%	-0.1603
Machin	2.3068	2.2146	-0.0922	3.1892%	3.4435%	0.2543
Elec mach	2.1870	2.2318	0.0448	3.0165%	5.5722%	2.5556
Mot veh	2.4824	2.7840	0.3016	3.1928%	4.3212%	1.1285
Trsp eqpt	2.2760	2.2698	-0.0062	1.2408%	0.7978%	-0.4430
Prec inst	1.9596	2.0197	0.0600	0.4858%	0.5875%	0.1018
Oth mfg	2.1828	2.1412	-0.0416	0.8567%	0.7890%	-0.0677
Construc	2.0473	2.0494	0.0021	10.1951%	8.3501%	-1.8450
Utilities	1.5742	1.5027	-0.0714	2.0515%	3.0534%	1.0019
Printing	2.0820	2.0029	-0.0790	1.1613%	1.2292%	0.0680
Trade	1.4226	1.5018	0.0792	9.2820%	9.1147%	-0.1673
Finance	1.2923	1.2942	0.0018	7.7575%	8.9223%	1.1648
Trs & comm	1.5995	1.5938	-0.0056	4.9599%	5.3246%	0.3647
Service	1.8133	1.7467	-0.0666	14.9728%	17.7609%	2.7881
Pub ad	1.4492	1.5163	0.0671	2.6504%	2.5426%	-0.1078
Average	2.0097	2.0093	-0.0004			
Total	54.2632	54.2518	-0.0114	100%	100%	

Figure 1-a. Change of B_j^* in the UKFigure 1-b. Change of B_j^* in Japan

except the petroleum refining industry, and the average of $\sum_j b_{ij}^*$ changed from 1.845 in 1974 to 1.767 in 1984, by -4.309 per cent. The only exception, the petroleum refining industry, experienced a loss of output share (-0.203 per cent point). In addition, the most heavily weighted industry in terms of output share (11.353 per cent in 1984, excluding public administration), the finance, insurance and real estate industry, which has rapidly grown by 5.907 per cent points during this period, has

experienced a decline in its value of $\sum_i b_{ij}^*$ from 1.681 to 1.548. Therefore, it is a matter of interest whether rapid expansion of the service industries, including finance, has contributed to an improvement in the UK economy by replacing the manufacturing sector, and whether also the service sector has stimulated an increase in quality and strengthened competitiveness of manufactures.

3. Internal Multiplier and External Multiplier

According to Miyazawa's partitioned multiplier model, the above inter-industry transaction and inter-dependence matrix allows further examination of the inter-relation between the physical goods production sector, mainly the manufacturing sector (The **P** sector, subscript p), and the service production sector (**S** sector, subscript s).⁶⁾ I intend to investigate the meaning of the changing industrial structure and deindustrialisation, by means of the partitioned input-output model. This framework will provide a rich basis for analysis of interdependence between manufacturing (physical goods production sector) and the service sector because it is capable of qualifying differences between different countries, differences which may cause important variations in economic performance.

In order to investigate the meaning of change in the industrial structure from this point of view, following Miyazawa (1963, 1975) and The Economic Planning Agency (1990), we divide the transaction matrix (x_{ij}) into four parts. Clearly, each part of transaction matrix (x_{ij}) shows the input of two grouped sectors, which are needed to produce their respective products. So, instead of the usual formulation of equation (1), we get the partitioned input-output system as follows, (where $n = r + s$),

$$\begin{pmatrix} X_1 \\ \cdot \\ X_r \\ \text{---} \\ X_s \\ \cdot \\ X_n \end{pmatrix} = \begin{pmatrix} a_{11} \dots a_{1r} & a_{1s} \dots a_{1n} \\ \cdot & \cdot & \cdot & \cdot \\ a_{r1} \dots a_{rr} & a_{rs} \dots a_{rn} \\ \text{---} & \text{---} & \text{---} & \text{---} \\ a_{s1} \dots a_{sr} & a_{ss} \dots a_{sn} \\ \cdot & \cdot & \cdot & \cdot \\ a_{n1} \dots a_{nr} & a_{ns} \dots a_{nn} \end{pmatrix} \begin{pmatrix} X_1 \\ \cdot \\ X_r \\ \text{---} \\ X_s \\ \cdot \\ X_n \end{pmatrix} + \begin{pmatrix} F_1 \\ \cdot \\ F_r \\ \text{---} \\ F_s \\ \cdot \\ F_n \end{pmatrix} \quad (1)'$$

That is to say, we divide the input coefficient matrix A^* into four parts as follows:

$$A^* = \begin{pmatrix} A & A_1 \\ S_1 & S \end{pmatrix} \quad (4)$$

A : physical input coefficient matrix ($r \times r$) in the goods-producing sector

S_1 : service input coefficient matrix ($s \times r$) in the goods-producing sector

A_1 : physical input coefficient matrix ($r \times s$) in the service sector

S : service input coefficient matrix ($s \times s$) in the service sector
Therefore, (1) or (1)' is rewritten as the following

$$\begin{pmatrix} X_p \\ X_s \end{pmatrix} = \begin{pmatrix} A & A_1 \\ S_1 & S \end{pmatrix} \begin{pmatrix} X_p \\ X_s \end{pmatrix} + \begin{pmatrix} F_p \\ F_s \end{pmatrix} \quad (5)$$

Solving the above equation, we get

$$X_p = (I - A)^{-1} A_1 X_s + (I - A)^{-1} F_p \quad (6 - a)$$

$$X_s = (I - S)^{-1} S_1 X_p + (I - S)^{-1} F_s \quad (6 - b)$$

Further, rearranging the above equations, we get

$$X_p = B_2 X_s + B F_p \quad (7 - a)$$

$$X_s = T_2 X_p + T F_s \quad (7 - b)$$

where

$B = (I - A)^{-1}$: the spreading effect in P sector's industries (the internal multiplier of P sector)

$B_1 = S_1 (I - A)^{-1}$: directly needed service input by the spreading effect in P sector

$B_2 = (I - A)^{-1} A_1$: the spreading effect in P sector induced by physical input in S sector's industries

$T = (I - S)^{-1}$: the spreading effect in S sector (the internal multiplier of S sector)

$T_1 = A_1 (I - S)^{-1}$: directly needed physical input by the spreading effect in S sector

$T_2 = (I - S)^{-1} S_1$: the spreading effect in S sector induced by service input in P sector.

The above four sub-multipliers, B_1 , B_2 , T_1 , and T_2 'reveal the coefficients of induced effects on output activities' and are called the "production-generating process in succession" (Miyazawa (1975), p.61). Furthermore, the external matrix multiplier of the S sector is shown as

$$(I - T_2 B_2)^{-1}$$

Then,

$$M = (I - T_2 B_2)^{-1} T: \text{the total spreading effect of } S \text{ sector}$$

Substituting X_p into X_s , the solution of our two-sector input-output model is given by:

$$\begin{pmatrix} \mathbf{X}_p \\ \mathbf{X}_s \end{pmatrix} = \begin{pmatrix} \mathbf{B} + \mathbf{B}_2\mathbf{M}\mathbf{B}_1 & \mathbf{B}_2\mathbf{M} \\ \mathbf{M}\mathbf{B}_1 & \mathbf{M} \end{pmatrix} \begin{pmatrix} \mathbf{F}_p \\ \mathbf{F}_s \end{pmatrix} \quad (8)$$

The above equation corresponds to the original system of equation (2). By decomposing 'the original Leontief inverse in terms of the combined effects of internal and external matrix multipliers and their induced sub-matrix-multiplier', we can clarify 'some inherent properties of the interaction between the **P** and **S** sectors' (Miyazawa, pp.62-3).

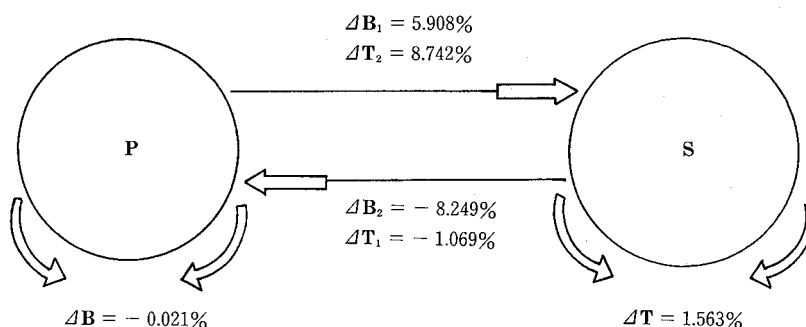
From the above partitioned system we can extract facts about the process of the changing industrial structure over the past decade.⁷⁾ The sum of elements of the Leontief inverse coefficients and the internal and external multipliers for each year are reported in Table 2. Those values indicate the extent of multiplier effects. I would like to stress the change of multiplier effects including the interdependence of

Table 2. Summary Table of Two-Sector Analysis

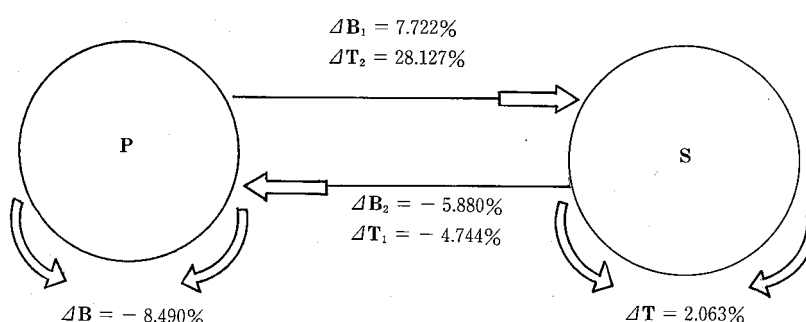
	UK		Change
	1974	1984	
Sum of $\mathbf{B}_j^*$ ($= \sum \sum b_{ij}^*$)	49.8759	47.7269	- 4.309%
Average of $\mathbf{B}_j^*$	1.8473	1.7677	
$\mathbf{B} = (\mathbf{I} - \mathbf{A})^{-1}$	34.4739	31.5470	- 8.490%
$\mathbf{B}_1 = \mathbf{S}_1 (\mathbf{I} - \mathbf{A})^{-1}$	4.0469	4.3594	7.722%
$\mathbf{B}_2 = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{A}_1$	1.0516	0.9897	- 5.880%
$\mathbf{T} = (\mathbf{I} - \mathbf{S})^{-1}$	7.4791	7.6334	2.063%
$\mathbf{T}_1 = \mathbf{A}_1 (\mathbf{I} - \mathbf{S})^{-1}$	0.8402	0.8003	- 4.744%
$\mathbf{T}_2 = (\mathbf{I} - \mathbf{S})^{-1} \mathbf{S}_1$	3.0911	3.9605	28.127%
$\mathbf{M} = (\mathbf{I} - \mathbf{T}_2\mathbf{B}_2)^{-1} \mathbf{T}$	7.6800	7.8526	2.247%
$\mathbf{B}_2\mathbf{M}$	1.3959	1.2963	- 7.136%
$\mathbf{M}\mathbf{B}_1$	5.2980	6.0060	13.262%
	Japan		Change
	1975	1985	
Sum of $\mathbf{B}_j^*$ ($= \sum \sum b_{ij}^*$)	54.2632	54.2518	- 0.021%
Average of $\mathbf{B}_j^*$	2.0097	2.0093	
$\mathbf{B} = (\mathbf{I} - \mathbf{A})^{-1}$	36.5406	36.0396	- 1.371%
$\mathbf{B}_1 = \mathbf{S}_1 (\mathbf{I} - \mathbf{A})^{-1}$	5.1341	5.4374	5.908%
$\mathbf{B}_2 = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{A}_1$	1.3505	1.2391	- 8.249%
$\mathbf{T} = (\mathbf{I} - \mathbf{S})^{-1}$	7.5245	7.6421	1.563%
$\mathbf{T}_1 = \mathbf{A}_1 (\mathbf{I} - \mathbf{S})^{-1}$	0.9919	0.9813	- 1.069%
$\mathbf{T}_2 = (\mathbf{I} - \mathbf{S})^{-1} \mathbf{S}_1$	3.847	4.1833	8.742%
$\mathbf{M} = (\mathbf{I} - \mathbf{T}_2\mathbf{B}_2)^{-1} \mathbf{T}$	7.8538	7.9731	1.519%
$\mathbf{B}_2\mathbf{M}$	1.2121	1.2391	2.228%
$\mathbf{M}\mathbf{B}_1$	6.6008	7.1587	8.452%

Figure 2. Change of Multiplier

a. Change of Multiplier: Japan 1975→1985



b. Change of Multiplier: the UK 1974→1984



sectors. Furthermore, Figure 2 presents an outline of the important features of these multipliers as the decade proceeded.

In Japan, basic industries, which had rapidly expanded in the high economic growth era, have been faced with difficulty in seeking greater expansion. Such mature industries are now forced to improve the quality of their products through inputting more service factors. On the other hand, growing industries in sector **P** (including rubber, electrical machinery, precision instruments, and motor vehicles), have increased physical input as well as improving quality. In sector **P** as a whole, the internal multiplier has been slightly reduced ($\Delta B = -1.371\%$), mainly because of technological change. However, the value of directly needed service input induced by physical production has been rising ($\Delta B_1 = 5.908\%$). Its value is quite larger than the change in B_2 , which shows the effect on sector **P**'s production induced by sector **S**'s increase in physical input; $\Delta B_2 = -8.249\%$. The value of T_1 , which is directly needed physical input induced by service production, has decreased by 1.069%, its value (the sum of elements of $T_1 = 0.9813$ in 1985) is much smaller than B_1 ($=5.4374$ in 1985). Despite expansion in service production, sector **P**'s effect on sector **S** is still dominant so we can say that the latter is largely dependent upon the

former activity.

On the other hand, the UK's change of industrial interaction is very different from that of Japan. The internal multiplier of the **P** sector shows a considerable fall ($\Delta \mathbf{B} = -8.490\%$). The main reason for that change might be recognised as the result of import penetration into the UK.⁸⁾ Although sector **S** has expanded its relative share of production to a greater extent than in Japan, the internal multiplier increased in value by a bit more than in Japan ($\Delta \mathbf{T} = 2.063\%$). The industry showing the greatest expansion, finance, did not increase its internal multiplier; the column sum of b_{ij} of the finance industry was reduced by 0.052 to 1.3497. In contrast with Japan, most industries in the **P** sector experienced a decline in the values of column sum of b_{ij} , except for the food and petroleum refining industries. The value of directly needed service input induced by physical production rose at 1.3 times Japan's ($\Delta \mathbf{B}_1 = 7.772\%$). However, the effect on input of sector **P**, which take place in sector **S** at the beginning of time and induce the production of sector **P**, $\mathbf{B}_2$, and $\mathbf{T}_1$, has declined. The UK's external multiplier of sector **S**, $(\mathbf{I} - \mathbf{T}_2\mathbf{B}_2)^{-1}$, increased by 0.261%, which is larger than Japan's change, 0.055%, and also change in the total spreading effect of sector **S**, $\mathbf{M} = (\mathbf{I} - \mathbf{T}_2\mathbf{B}_2)^{-1}\mathbf{T}$, is a bit larger than Japan's. However the value of $\mathbf{M}$ itself is still smaller than that for Japan. The reader might be able to deduce other useful and broad insight from the above numerical results.

With deindustrialisation successfully advanced, resource allocation will progress along with the production possibility curve and there will not be redundancy of resources. If not, the economy will be forced to stay within the area of the production possibility curve. From the above analysis, the external multiplier could improve the situation to stimulate productivity in other sectors. In Figure 3-a, the service sector's external effect through the multiplier will move situation H in the direction of G and vice-versa. In general, we can assume that the external multiplier effect will stimulate movement of the industrial structure to any point between **S** and **G** on the production possibility curve.

These movements should correspond with the firm's rational behaviour which individually aims to maximize profit through cost reduction. As Robinson (1958) insisted, we can assume that the marginal cost in the service section might more rapidly increase than in the production section of the representative firm which produces goods. Although this firm is obliged to the inevitably increasing cost in order to achieve further growth, it would be possible to avoid such cost increase by means of separating and externalizing the service section. Figure 3-b describes that behaviour. The curves pp and ss are the production opportunity curve and the service section's cost curve of the representative firm, respectively. Outputs of the two sections are measured in terms of the imputed prices. Externalizing the service section could shift the curve ss downward, thus making the firm seek greater economy of scale in goods-production. At the early stage of deindustrialisation,

Figure 3-a.

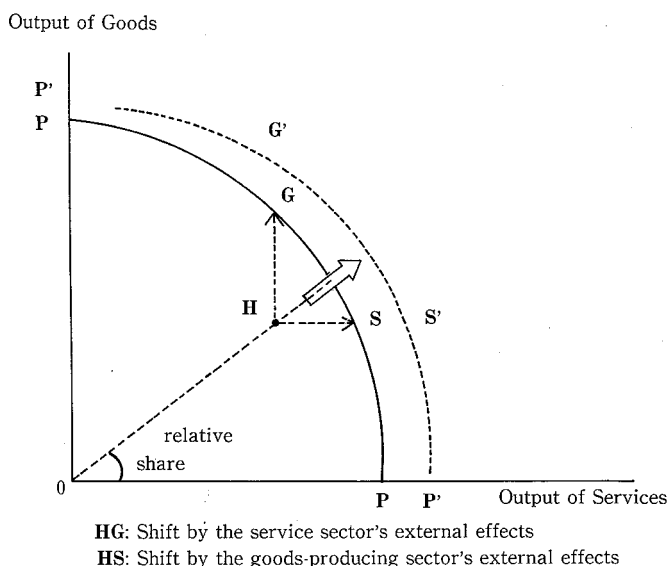
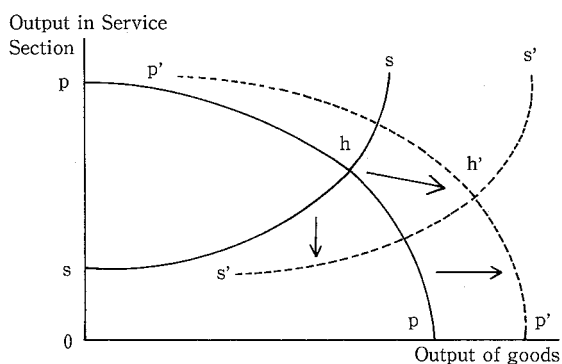


Figure 3-b.



many firms in manufacturing separated their service activity, transport, security service, trade, advertising, etc., aiming at cost reduction. As a follower of her predecessors, the US and the UK, Japan started to be in the position of an early stage of deindustrialisation after the First Oil Crisis. We can often see that these newly-born firms grew beyond the parent firms' demand, and we should remember that improvement of the external effect through a multiplier can be achieved by investment.⁹⁾

Furthermore, we can examine these changes by measuring the extent of the spreading of an activity in its own sector. Let us define 'the inside ratio of spreading' as

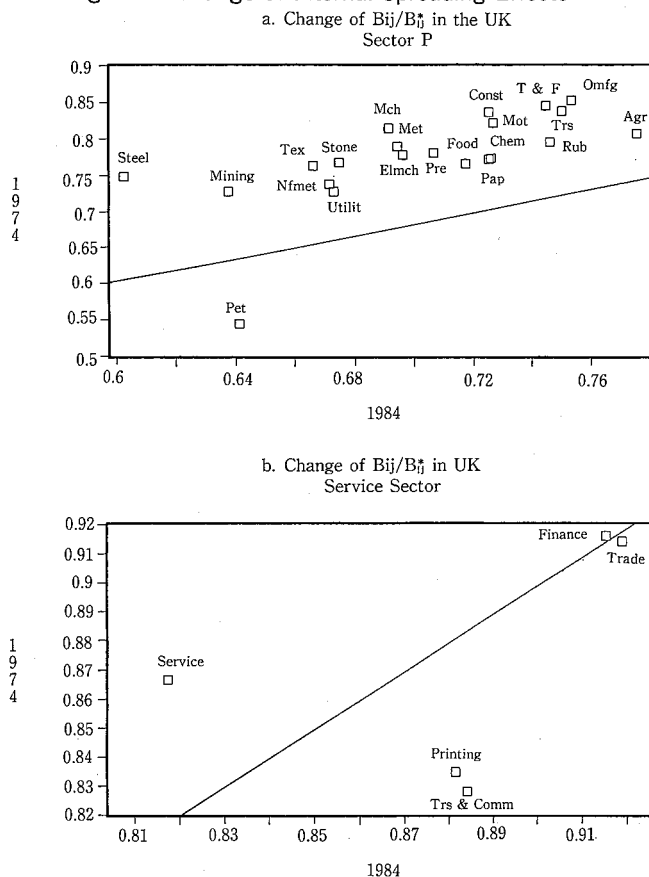
$$b_{ij}/b_{ij}^*$$

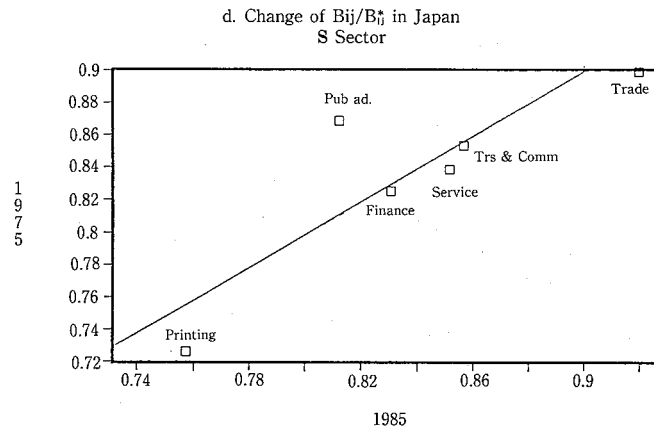
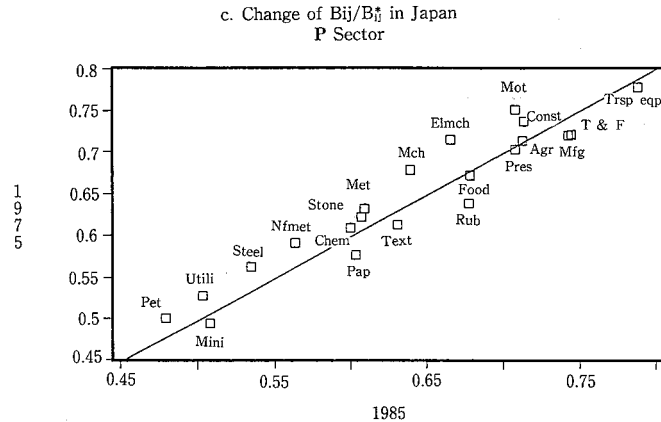
(9)

This is the ratio of the internal to the total multiple coefficient and shows the degree of production spreading within an industry.¹⁰⁾ So the value of $(1 - b_{ij}/b_{ij}^*)$ means the input ratio based on the other industries' demand originally induced by its own activity. Figure 4 illustrates the amount of change in the average column sum of this ratio. If the ratio is larger, there is a greater degree of interdependence within a sector. In the UK's sector **P**, all industries have reduced their ratios, except for the petroleum refining industry, corresponding to the decline of b_{ij}^* . In sector **S**, four out of six industries increased their ratios, but the finance and service industries could not.

In contrast, although nearly half the industries in Japan's sector **P** reduced their ratios, $\sum_i b_{ij}/\sum_i b_{ij}^*$, electronic machinery, motor vehicle, and precision instrument industries have increased the values of $\sum_i b_{ij}^*$ themselves. These industries have become the new locomotives in Japan since the first oil crisis. So we estimate that the rapid technological change in the manufacturing sector and a change of

Figure 4. Change of Internal Spreading Effects



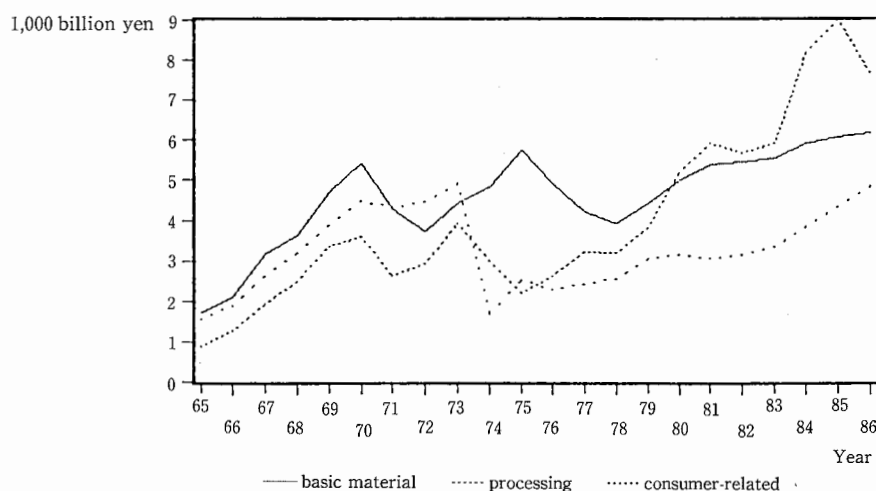


interdependence between sector **P** and sector **S** have occurred in Japan. These changes have certainly been accompanied by investment behaviour.¹¹⁾ In Figure 5, I report the trend of net investment in three classified manufacturing sectors (not including the service sectors): basic material industries, processing and assembly industries, and consumer-related industries. The reader can easily see the bigger growth of investment in Japan's manufacturing compared with the UK's. These trends correspond to the changes of b_{ij}^* and b_{ij} in the two countries.

In sector **S** of Japan, all six industries increased the inside ratio of spreading. This is reflected in the change of the internal multiplier of sector **S**.

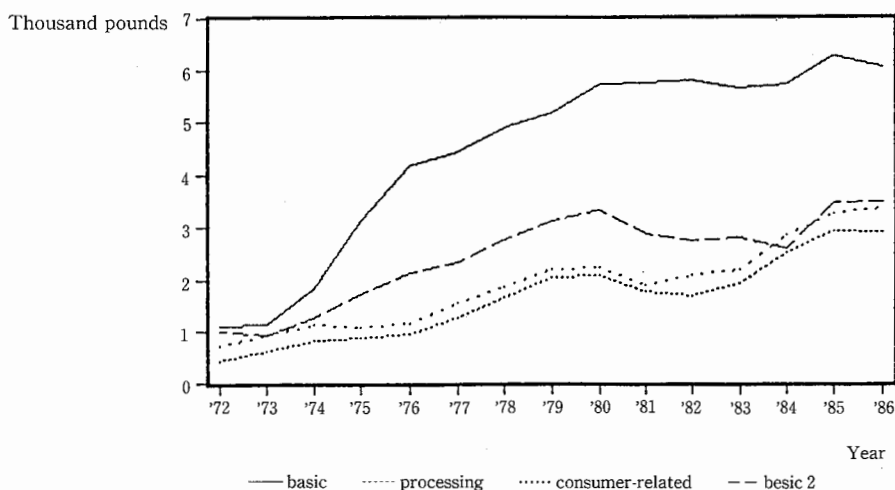
Figure 5. Investment Behaviour Divided into Three Industries

a. Not investment in three industrial sectors: Japan '65-'86 ('80 prices)



Source) Tushosangyo Tokei Nenkan, yearly. (Tushosangyo Chosakenkyukai)

b. Gross domestic fixed capital formation in three industrial sectors : '72-'86



Note) 'basic 2' is the graph of basic material industry which excludes Extraction of mineral oil and natural gas industry.

Source) The CSO Blue Book, yearly.

4. Factors Involved in Output Change

Change of total output at different times may be divided into three categories. One is due to technological change, which appears in changes in a_{ij} and the multipliers, another to the changes in final demand, which appear in changes of size and structure, and finally the cross effect of these changes. The first term may be

composed of technological changes in each sector and a residual part of change which reflects change in inter-sectoral dependence, changes of b_{ij} in the partitioned matrices $\mathbf{A}$ and $\mathbf{S}$, and others. Hence, from (2) and (3) we can formulate:

$$\begin{aligned}\Delta \mathbf{X} &= \Delta (\mathbf{I} - \mathbf{A})^{-1} \mathbf{F} + (\mathbf{I} - \mathbf{A})^{-1} \Delta \mathbf{F} + \Delta (\mathbf{I} - \mathbf{A})^{-1} \Delta \mathbf{F} \\ &= \Delta \mathbf{B}^* \mathbf{F} + \mathbf{B}^* \Delta \mathbf{F} + \Delta \mathbf{B}^* \Delta \mathbf{F}\end{aligned}\quad (10)$$

Furthermore, rewriting $\Delta \mathbf{B}^*$ in the two sector model by using the equation (8),

$$\begin{aligned}\Delta \mathbf{B}^* &= \begin{pmatrix} \Delta \mathbf{B} + \Delta \mathbf{B}_2 \mathbf{M} \mathbf{B}_1 & \Delta \mathbf{B}_2 \mathbf{M} \\ \Delta \mathbf{M} \mathbf{B}_1 & \Delta \mathbf{M} \end{pmatrix} \\ &= \begin{pmatrix} \Delta \mathbf{B} & \mathbf{0} \\ \mathbf{0} & \Delta \mathbf{T} \end{pmatrix} + \begin{pmatrix} \Delta \mathbf{B}_2 \mathbf{M} \mathbf{B}_1 & \Delta \mathbf{B}_2 \mathbf{M} \\ \Delta \mathbf{M} \mathbf{B}_1 & \Delta \mathbf{M} - \Delta \mathbf{T} \end{pmatrix}\end{aligned}\quad (11)$$

In the above equation, the first term extracts a degree of the internal multiplier change, $\Delta \mathbf{B}$ and $\Delta \mathbf{T}$ respectively, apart from the total change of the Leontief inverse coefficients. That is to say, $(\Delta \mathbf{B}$ and $\Delta \mathbf{T}) \cdot \mathbf{F}$ shows the separated internal effect of technical change on industrial output, including the effect of substitution of inputs, improvement of technology, and so on, from the residual effect of technical change. The latter captures the effect which one sector has upon the other, the change of the interdependence between sectors $\mathbf{P}$ and $\mathbf{S}$.

In Figure 6, we find a comparable set of results from calculating equation (11): $\Delta \mathbf{B} \cdot \mathbf{F}$, $\Delta \mathbf{T} \cdot \mathbf{F}$ and the residual terms, respectively.¹²⁾ An interesting contrast

Figure 6. Internal Effects of Technical Change and the Interdependence between Sectors

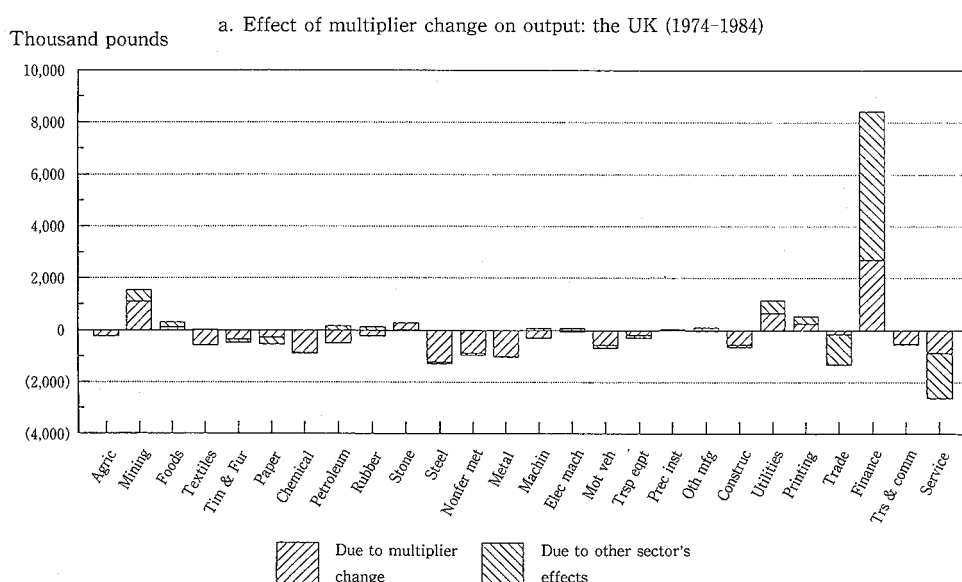
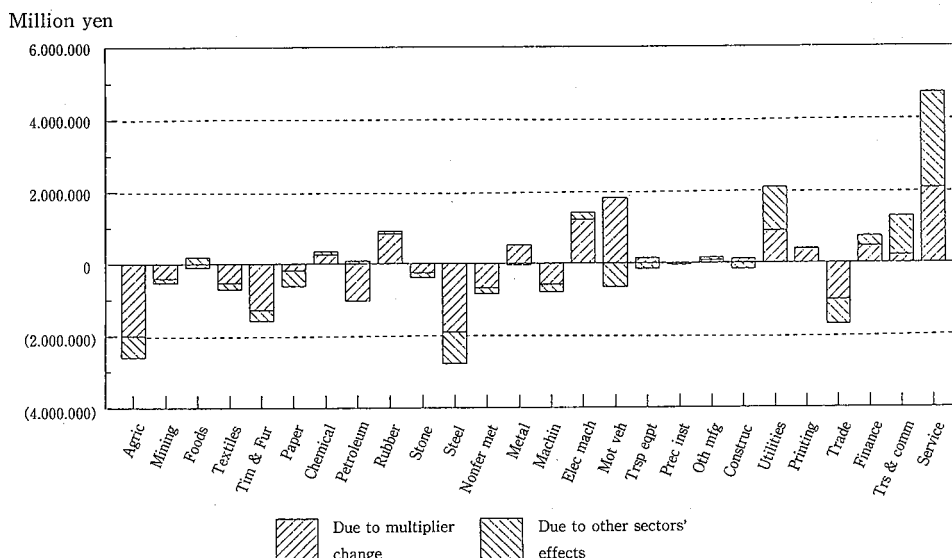


Figure 6. Internal Effects of Technical Change and the Interdependence between Sectors

b. Effect of multiplier change on output: Japan (1975-1985)



appears when we compare the respective cases of UK and Japan. In the UK, manufacturing industries decreased their output dependence upon change in the internal multiplier, and sector **S** did not positively contribute to the output of sector **P**'s industries. In sector **S**, the finance sector expanded its output largely due to sector **P**'s effect. Transportation and communication, and the service industries, both of which reduced their share of output by 1,621 and 1,528 per cent point respectively, decreased their output due to technical change. In the transportation and communication industry, imports as a proportion of input declined from 46.706% to 22.410%, but more than 90% of the reduction of $\Delta B^* \cdot F$ resulted from the effects of change in the internal multiplier $\Delta T \cdot F$. We can see that the service industry has been faced with the largest decline of $\Delta T \cdot F$ due to sector **P**'s effect.

In contrast, nearly half of the Japanese industries in sector **P** increased their $\Delta B \cdot F$ largely depending upon technical change within the sector. Relatively growing industries, rubber and plastics, motor vehicle, electronic machinery, and precision machinery also increased their internal interdependence to a much greater degree than their influence of **S** sector change. Except for trade, sector **S**'s industries increased their output according to the increase of internal multiplier, $\Delta T \cdot F$. Transportation and communication, and service industries have not only increased their output share but also strengthened the technical relationship within the sector. These comparable features correspond with the previous results.

5. Concluding Remarks

The UK economy has undergone a number of significant structural changes

over the past decades and it is widely accepted that the most important change is the increasing prominence of services relative to manufacturing (excluding the mineral oil processing industries). Should we regard such a relative decline of employment in the manufacturing industry as a result of productivity growth and the strengthening of competitiveness in the world markets? If so, the labour surplus of the manufacturing sector would stimulate a reallocation of resources and most of the labour leaving the manufacturing sector might be absorbed by other expanding sectors as Sargent (1979) insisted. If not, the economy should be inside the production opportunity curve and there might be a welfare loss.

It is true that the UK has developed a comparative advantage in services; nevertheless the relative expansion of service industries has, so far, not played the role which was expected by Sargent. According to my results, using Miyazawa's partitioned multiplier model, it is clear that not only the internal multiplier of the goods-producing sector has fallen but also that the external effect of the service sector's activity on improving manufactures has not been significant either.

As Bean (1990) mentioned, the discovery of North Sea oil stimulated the manufacturing production. Nevertheless, according to him, 'Manufacturing output has declined both absolutely and as a share of GDP since 1973, and the real exchange rate has appreciated. ... the two phenomena may be connected. A windfall of foreign exchange (in the form of oil) can be expected to lead to an expansion of the service sector and a decline in manufacturing.' (p.88) My analysis is consistent with Bean's view. Generally speaking, investment in the manufacturing sector seems to be lacking flexibility. It is widely accepted that Japan's high investment ratio has been a necessary factor for successful industrialisation. Japan's industrial policy has stimulated reinvestment for the purpose of converting and modernising Japanese industries, particularly manufacturing. In my view, Mrs. Thatcher's Tory government has been little concerned with reform of UK manufacturing. 'Successive ministers at the DTI have managed to avoid thinking seriously about science and technology policy for a decade. As the trade balance shows, a consequence of this neglect has been a steady decline in UK competitiveness.' (Geroski, 1990, p.35) These are interesting characteristics of the process of deindustrialisation which view is not present in the case of Japan.

Professor of Economics, Sapporo University

Data Appendix

The 1974, 1979, and 1984 *Input-output tables for the United Kingdom* (Central Statistical Office), classified into 96, 100, and 102 groups, and the 1975 and 1985 *Nippon Touitsubunrui Sangyou Renkanhyo (Integrated Classified Input-output Table for Japan)*, classified into 46

groups, published by the Ministry of International Trade and Industry, were used. I compiled special 27 sector input-output tables for this study. In doing so, I integrated the different number of industry sectors as carefully as I possibly could. However, unfortunately, it is impossible to compile a completely correspondent table. For instance, Japan's input-output table treats 'not elsewhere transaction' as a dependent sector in the tertiary sector, and this sector includes some residual in the aggregating process. So, in my 27 sector tables this transaction is involved in the service sector. In Miyazawa's original work, he treated this as a part of the goods producing sector. I calculated the Leontief inverse coefficient and all multipliers in line with Miyazawa's method; however, the following conclusions are not affected by such treatment at all. For example, regression equations between b_{ij}^* s of two types are the following:

$$\begin{aligned} 1975: Y &= -0.0138 + 1.0086X & R^2 &= 0.9986 & n &= 27 \\ &(-4.6030) (131.6152) \end{aligned}$$

$$\begin{aligned} 1985: Y &= -0.0063 + 1.0039X & R^2 &= 0.9998 & n &= 27 \\ &(-6.6433) (405.7364) \end{aligned}$$

where $Y = \sum_i b_{ij}^*$ s in Miyazawa's treatment and $X = \sum_i b_{ij}^*$ s in our treatment, and values in parentheses are t-value. Spearman's coefficient of rank correlations are very close to 1 in both cases. Furthermore, since I could not use the real valued I-0 tables for both countries, so it should be noticed that the values of multipliers may be subject to change in sectional relative price.

Finally, it must be noted that the UK's treatment of imports is different from Japan's tables. In Japan's I-0 table, imports are treated as competitive and/or substitutable with domestic products. On the other hand, in the UK's table it is assumed that there is no domestic counterpart to imports. The former treatment is called a competitive import and the latter a non-competitive import. I tried to compile the competitive import I-0 table of 1984 UK by integrating tables 4 and 6. Since some elements only slightly differ from the original, the Leontief inverse coefficients are closely correlated between the two types. Therefore, they do not materially affect the overall picture. Regression equations of the Leontief coefficients between non-competitive and competitive import systems in 1984 UK is:

$$\begin{aligned} Y &= 0.1764 + 0.8951X, & R^2 &= 0.9072, & n &= 27 \\ &(0.4749) (15.6331) \end{aligned}$$

where $Y = \sum_i b_{ij}^*$ s in the competitive import type and $X = \sum_i b_{ij}^*$ s in the non-competitive import type, and values in parentheses are t-value.

My classification system is shown in the following table:

List of Industries.

Industry	Abbreviation	
	(1)	(2)
1. Agriculture, Forestry & Fisheries	Agric	Agr
2. Mining	Mining	Min
3. Food & Kindred Products	Foods	Food
4. Textile Products	Textiles	Tex
5. Timber, Wood Products, and Furniture	Tim & Fur	T & F
6. Paper & Allied Products	Paper	Pap
7. Printing & Publishing	Printing	Prin
8. Chemical	Chemical	Chem
9. Petroleum Refinery & Coal Products	Petroleum	Pet
10. Rubber, Leather & Plastic Products	Rubber	Rub
11. Stone, Clay, & Glass	Stone	Sto
12. Iron & Steel	Steel	Steel
13. Non-ferrous Metals	Nonfer met	Nfmet
14. Metal Products	Metal	Met
15. Machinery	Machin	Mch
16. Electric Machinery	Elec mach	Elmch
17. Motor Vehicles & Equipment	Mot veh	Mot
18. Transportation Equipment (except motor)	Trsp eqpt	Trs
19. Precision Instruments	Prec inst	Prec
20. Other Manufacturing	Oth mfg	Omfg
21. Construction	Construc	Cons
22. Electric Utility, Gas & Water Supply	Utilities	Util
23. Wholesale & Retail Trade	Trade	Trad
24. Finance & Insurance	Finance	Fin
25. Transportation & Communication	Trs & comm	T & com
26. Service	Service	Serv
27. Public Administration	Pub ad	Pub

Note

- 1) As Bazen and Thirlwall insisted, the definition of 'deindustrialisation' is cause-free. I use the term referring to a trend of contraction in the manufacturing sector. For a definition of deindustrialisation, see Cairncross (1979) and Bazen and Thirlwall (1989).
- 2) Also the manufacturing share of gross domestic product has fallen from 34.10 per cent in 1969 to 22.62 per cent in 1985. 'Over this period activity shifted towards services, with private services rising from 38 per cent to 48 per cent of

GDP. Inevitably, concern has been expressed about contraction in the manufacturing industry reflected in deindustrialisation and its possible adverse effects upon the economy's investment and export' (Curwen, p.267)

- 3) See Sargent (1979) Table 5-2 and 5-3.
- 4) In this paper, I want to present not an explanation of deindustrialisation's cause, but what has happened in the process of deindustrialisation in the UK compared with Japan. In order to compare the two countries, the period after the First Oil Crisis was chosen.
- 5) The industry's shares of total output and gross added value are closely correlated. I am concerned with the side of production and not income, so in the following analysis, I use the total output share as the measure of a particular industry's relative position.
- 6) Round (1989) considered the framework of Miyazawa's method as based on an investigation of inter-regional analysis. He pointed out that our method, especially the ratio b_{ij}/b_{ij}^* , is closely related to M_3 in Pyatt and Round (1979).
- 7) In the following analysis, six industries compose sector S: printing and publishing, wholesale and retail trade, finance and insurance, transportation and communication, service, and public administration. The reason why I include the printing and publishing industry in sector S is that its product value is recognised not by the physical material itself but by the information it contains.
- 8) Stout (1979) has already mentioned that 'the UK has combined declining production growth and increasing import dependence' and it is 'quite different in the UK from that in Germany and France' (p.172).
- 9) See also note 11.
- 10) Professor J. Round kindly suggested these expressions.
- 11) Cowling (1986) pointed out 'the longer term impact of the retarding of domestic investment' on domestic productivity growth and 'a process of cumulative causation' (p.29). In addition, the surplus of the North Sea oil could be reinvested directly in domestic productive capital. 'Rather, the evidence seems to suggest that firms are discouraged from investing projects that might be profitable abroad because of their low expected rate of return. . . the bodies responsible for allocating government funds for industry seem to have been prone to capture by interest groups and the funds themselves channeled towards declining industries.' (Bean, p.87)
- 12) Table A-3 shows the results of calculating equation (11).

Table A-1-a. Internal Spreading Ratio: b_{ij}/b_{ii}^*

the UK: 1974 P sector

	Agric (%)	Mining (%)	Foods (%)	Textiles (%)	Tim & Fur (%)	Paper (%)	Chemical (%)	Petroleum (%)	Rubber (%)	Stone (%)	Steel (%)	Nonfer met (%)	Metal (%)	Machine (%)	Elec mach (%)	Mot veh (%)	Trsp eqpt (%)	Prec inst (%)	Oth mfg (%)	Construc (%)	Utilities (%)
Agric	99.78	20.81	99.09	74.48	94.64	70.09	79.77	34.09	78.38	48.26	20.50	25.60	28.35	30.69	29.28	37.60	31.23	35.36	84.14	61.10	17.02
Mining	87.28	99.88	85.95	88.65	90.25	93.42	94.14	78.60	91.85	97.73	99.24	95.72	97.58	96.10	93.69	96.79	96.03	92.72	92.69	97.41	99.40
Foods	97.91	9.04	99.48	48.54	67.40	64.20	79.08	36.84	56.09	28.52	12.29	15.98	20.22	16.29	16.71	21.35	16.72	20.43	59.27	34.59	10.05
Textiles	81.59	64.51	64.34	99.82	96.21	75.94	81.40	31.27	94.25	89.09	52.50	65.27	68.72	69.28	71.13	87.44	77.67	79.97	95.44	89.52	54.11
Tim & Fur	83.61	88.14	71.12	68.29	99.87	85.10	69.06	49.83	97.70	79.01	73.82	74.72	81.13	79.61	85.04	82.44	84.89	83.93	84.67	97.21	74.36
Paper	80.25	58.36	89.53	81.30	85.68	99.60	86.15	42.29	88.71	86.90	60.87	77.22	75.91	73.85	82.99	74.20	75.85	81.33	92.77	71.45	56.91
Chemical	96.58	86.37	92.40	97.28	93.83	96.23	99.70	94.93	98.29	92.79	87.34	90.65	90.34	90.05	91.59	91.96	90.70	91.91	96.89	94.38	87.04
Petroleum	84.68	90.25	85.07	87.45	89.88	89.06	94.01	99.74	88.52	93.02	89.03	82.96	86.25	84.98	82.74	88.44	88.87	83.73	86.05	87.10	96.31
Rubber	81.92	80.67	86.28	89.79	94.18	91.89	90.01	48.10	99.79	89.97	73.60	82.63	85.53	89.25	93.34	96.01	89.68	95.92	95.58	93.87	76.53
Stone	91.68	91.77	89.72	93.61	95.04	79.82	85.79	52.23	89.38	99.88	94.80	85.55	94.10	90.32	94.48	93.70	89.04	92.27	91.47	99.30	90.41
Steel	85.92	96.44	87.57	86.42	95.40	90.33	89.93	79.46	93.88	93.02	99.86	98.53	99.27	99.03	98.11	99.08	98.90	97.57	96.95	97.73	93.80
Nonfer met	77.11	88.24	78.03	76.04	88.45	86.10	89.11	51.45	87.65	83.56	95.58	99.88	97.82	96.65	97.71	96.80	97.46	97.32	95.33	96.94	91.93
Metal	90.28	91.50	93.60	92.51	95.97	93.37	95.33	92.97	95.09	92.64	97.18	98.06	99.82	98.41	97.64	98.85	98.41	97.89	97.20	97.66	95.25
Machin	92.95	97.49	89.45	92.15	94.10	93.72	90.12	82.34	91.40	94.74	96.95	94.70	97.13	99.88	96.15	96.22	98.69	94.00	98.32	98.03	95.77
Elec mach	61.10	90.69	51.54	55.71	79.65	60.46	63.13	35.38	61.90	71.26	84.82	78.40	88.49	97.19	99.85	96.74	98.15	98.81	84.25	92.30	94.30
Mot veh	41.68	43.08	40.74	42.25	56.71	31.86	27.73	10.47	31.47	56.56	71.80	45.72	66.98	83.10	45.58	99.78	80.50	37.87	66.41	68.29	38.58
Trsp eqpt	76.30	15.71	47.48	16.12	26.99	9.81	10.01	1.52	22.20	7.71	38.88	13.64	29.17	76.57	23.08	22.58	99.92	15.38	34.08	21.56	14.37
Prec inst	58.95	82.24	58.60	74.63	81.56	70.43	72.63	61.20	78.93	76.59	89.36	85.69	93.35	96.36	97.08	94.54	97.14	99.99	87.77	87.76	90.70
Oth mfg	52.21	47.55	56.43	84.93	93.12	69.73	72.09	35.39	92.09	68.88	61.70	82.99	78.60	76.41	86.14	89.70	80.60	90.49	99.95	84.41	59.82
Construc	88.32	91.12	73.94	64.85	71.32	66.02	61.21	45.35	61.40	68.91	78.92	66.87	87.91	79.35	64.18	73.60	78.24	66.88	65.13	99.78	92.18
Utilities	83.74	92.46	80.82	86.99	84.38	89.45	92.98	78.96	89.80	92.54	93.03	88.47	89.83	86.94	85.06	88.99	90.47	86.09	87.54	85.44	99.61
Average	80.66	72.68	77.20	76.28	84.51	76.51	77.30	54.40	79.56	76.74	74.86	73.77	78.88	81.44	77.69	82.23	83.77	78.09	85.33	83.61	72.78

Table A-1-b. Internal Spreading Ratio: b_{ij}/b_{ij}^*

UK: 1984 P sector

	Agric (%)	Mining (%)	Foods (%)	Textiles (%)	Tim & Fur (%)	Paper (%)	Chemical (%)	Petroleum (%)	Rubber (%)	Stone (%)	Steel (%)	Nonfer met (%)	Metal (%)	Machine (%)	Elec mach (%)	Mot veh (%)	Trsp eqpt (%)	Prec inst (%)	Oth mfg (%)	Construc (%)	Utilities (%)
Agric	99.81	33.74	99.54	89.84	97.75	89.59	86.06	49.07	93.55	48.23	17.80	37.87	42.32	37.35	43.58	46.09	36.07	45.29	73.68	53.01	31.96
Mining	87.62	99.79	79.80	78.80	72.19	84.85	94.64	99.61	85.37	90.89	94.26	90.42	85.05	76.82	74.55	80.23	81.00	71.65	71.36	83.99	99.06
Foods	97.68	34.72	99.69	70.37	82.80	82.05	86.20	55.16	94.21	47.11	18.44	36.37	34.10	37.44	43.78	43.51	31.97	42.21	68.15	30.89	36.16
Textiles	82.75	50.50	62.68	99.86	92.60	72.81	61.48	38.30	87.27	64.66	18.19	46.90	44.42	36.46	39.19	84.52	82.91	66.41	92.56	75.31	39.11
Tim & Fur	79.17	71.41	62.71	32.91	99.91	85.49	54.15	55.88	67.27	81.13	39.60	63.77	82.27	73.13	77.65	79.65	70.34	79.78	89.37	96.09	40.15
Paper	84.76	50.01	92.51	86.11	87.13	99.72	90.01	47.67	91.68	84.89	60.29	74.91	78.97	72.35	82.65	75.60	82.52	83.69	93.84	63.18	59.26
Chemical	97.46	79.67	93.94	95.74	93.34	95.03	99.81	93.23	98.43	90.40	87.60	91.62	88.20	83.71	87.32	88.39	88.84	88.49	93.18	87.31	83.11
Petroleum	88.20	54.11	75.10	69.21	60.72	70.71	94.34	99.72	80.38	70.25	65.03	66.81	61.76	54.61	53.78	59.55	67.37	51.26	54.15	73.88	98.16
Rubber	83.72	67.28	87.38	86.18	93.06	86.31	89.39	67.44	99.78	55.55	50.79	72.03	79.90	83.37	89.77	93.29	84.85	93.36	95.54	78.83	73.02
Stone	89.85	70.93	92.11	63.71	93.08	62.47	85.33	61.19	91.67	99.89	91.38	86.75	93.55	87.28	90.06	94.39	93.08	87.90	74.36	99.20	71.88
Steel	81.10	96.43	86.20	77.94	94.75	78.99	88.60	94.03	94.23	87.47	99.88	98.32	99.22	98.45	97.13	98.47	97.66	97.08	95.10	96.12	92.40
Nonfer met	74.58	77.05	70.36	60.50	84.95	58.86	86.65	71.01	79.92	62.50	91.87	99.89	97.60	95.02	96.88	95.50	95.93	95.44	97.36	90.92	87.15
Metal	89.72	93.24	94.91	86.73	94.08	86.99	95.38	92.75	94.46	88.00	92.98	88.99	99.80	97.51	96.27	97.82	97.04	96.36	94.03	95.41	92.22
Machin	85.38	98.35	88.23	90.96	85.86	93.14	89.78	96.91	91.11	93.89	91.79	92.96	92.84	99.79	94.49	93.87	97.33	91.89	87.32	92.68	94.10
Elec mach	49.62	75.61	49.69	59.93	73.45	65.74	60.53	67.52	54.41	57.61	72.98	79.63	77.77	94.54	99.82	93.71	96.28	97.71	72.57	62.21	91.13
Mot veh	59.57	30.30	46.80	17.61	39.60	27.84	17.06	21.28	25.08	51.98	22.73	22.20	56.15	58.57	31.89	99.76	47.23	30.08	17.33	39.65	42.61
Trsp eqpt	81.38	95.39	54.25	24.05	23.33	25.35	50.51	92.38	36.24	29.52	45.77	32.59	33.56	58.81	52.85	26.85	99.96	38.30	18.91	30.75	85.87
Prec inst	39.28	62.50	40.52	70.23	58.23	84.35	78.60	50.49	78.75	73.57	74.06	96.26	81.16	87.87	93.45	66.29	90.93	99.97	78.11	50.96	68.83
Oth mfg	25.22	0.22	11.22	8.13	3.93	22.17	1.09	0.18	1.64	0.80	0.49	0.73	2.80	0.80	1.42	0.74	1.12	17.22	99.85	47.97	0.36
Construc	66.86	13.76	53.00	47.10	55.23	44.99	23.58	8.04	33.46	48.57	40.24	41.81	41.25	40.49	38.49	25.65	49.10	33.19	38.57	99.49	26.57
Utilities	84.05	83.99	82.39	82.75	77.83	89.07	90.96	84.16	88.09	90.12	89.29	89.48	84.84	77.46	76.71	82.16	83.95	76.55	76.82	75.15	99.62
Average	77.51	63.76	72.52	66.60	74.47	71.74	72.58	64.10	74.62	67.48	60.26	67.16	69.41	69.14	69.61	72.67	75.02	70.66	75.34	72.52	67.27

Table A-1-c. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Japan: 1975 P sector

	Agric (%)	Mining (%)	Foods (%)	Textiles (%)	Tim & Fur (%)	Paper (%)	Chemical (%)	Petroleum (%)	Rubber (%)	Stone (%)	Steel (%)	Nonfer met (%)	Metal (%)	Machine (%)	Elec mach (%)	Mot veh (%)	Trsp eqpt (%)	Prec inst (%)	Oth mfg (%)	Construc (%)	Utilities (%)
Agric	99.79	37.64	99.15	95.87	98.71	88.84	68.05	40.19	81.35	49.33	29.58	36.36	32.92	33.90	57.05	41.06	46.82	41.67	91.92	84.54	30.91
Mining	86.62	99.87	78.30	75.57	78.38	82.29	92.50	99.56	86.29	96.54	97.46	97.31	93.08	89.77	86.36	89.54	88.42	85.52	86.51	91.12	98.23
Foods	97.52	7.26	99.64	75.76	87.11	57.35	72.55	11.08	56.82	20.58	8.76	12.17	8.96	9.24	17.27	16.38	15.96	17.52	87.60	34.72	6.71
Textiles	90.42	49.23	76.92	99.86	91.22	67.75	60.19	43.55	95.31	74.37	47.23	69.45	68.73	61.30	70.58	77.15	81.52	89.37	97.66	88.05	57.14
Tim & Fur	72.72	51.71	77.10	72.45	99.80	95.59	68.07	40.00	67.86	79.04	68.30	72.13	71.63	73.15	89.68	66.88	81.50	69.09	96.69	97.37	71.62
Paper	81.31	11.30	81.29	78.90	79.34	97.45	84.97	17.12	81.16	81.96	34.66	52.71	52.44	46.07	70.12	51.00	43.44	56.29	89.00	59.72	19.62
Chemical	94.10	53.22	88.46	95.49	90.66	81.79	99.28	69.08	98.03	81.64	74.57	82.68	72.10	73.82	82.78	87.11	85.51	75.45	90.85	76.53	61.57
Petroleum	88.41	92.45	78.17	75.40	77.41	79.29	92.88	99.67	86.29	90.40	96.77	85.85	90.97	86.40	78.97	85.28	85.80	78.34	76.31	84.40	97.40
Rubber	85.95	55.54	88.30	85.88	93.03	66.86	89.08	79.56	99.79	68.88	63.63	64.78	74.46	91.84	94.66	96.95	93.04	92.36	96.91	88.67	52.19
Stone	85.99	38.50	92.79	59.21	84.59	64.52	86.47	70.03	90.70	99.88	93.30	89.93	91.94	92.29	92.94	92.93	85.40	90.67	82.91	98.59	78.04
Steel	69.47	77.61	72.02	49.34	91.35	58.14	51.40	69.17	70.14	88.20	99.81	81.66	99.22	98.78	96.21	98.50	98.65	96.47	90.88	96.83	61.33
Nonfer met	69.85	57.79	79.32	65.47	86.47	54.15	88.34	59.97	82.57	83.76	96.52	99.93	98.72	97.55	98.91	98.64	96.50	98.72	97.12	96.63	67.79
Metal	85.99	90.04	91.41	77.64	94.81	76.66	82.49	89.65	86.06	76.34	74.48	74.91	99.86	95.26	93.19	93.63	95.37	84.84	88.57	98.24	80.65
Machin	28.41	58.37	22.41	7.80	48.17	12.22	8.47	37.17	9.76	59.16	56.55	62.62	78.84	99.81	91.80	96.19	96.26	94.31	44.20	83.08	24.28
Elec mach	39.34	45.55	19.04	9.29	43.11	11.86	8.22	25.76	37.63	17.09	16.85	36.67	64.46	97.02	99.85	97.93	96.88	91.48	38.71	90.68	29.40
Mot veh	1.66	0.01	0.42	0.09	0.28	0.04	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	99.78	61.19	0.00	0.04	0.02	0.00
Trsp eqpt	84.98	3.21	56.86	19.05	43.00	9.82	3.43	1.95	5.39	1.74	0.70	1.00	0.69	0.86	2.21	1.05	99.86	1.32	11.01	6.33	1.02
Prec inst	30.47	15.64	15.73	31.74	23.02	31.15	25.95	19.49	17.74	30.01	21.03	21.04	27.20	95.51	88.05	94.33	93.66	99.97	22.77	35.38	36.10
Oth mfg	83.88	70.83	75.47	93.26	82.51	47.61	57.22	53.83	59.96	65.79	51.73	53.00	63.13	59.88	67.00	67.84	64.06	96.02	99.93	55.07	49.31
Construc	45.71	37.96	41.35	35.53	39.58	38.84	49.28	41.98	39.70	51.04	54.74	50.17	47.03	37.16	40.03	37.20	40.73	36.18	40.50	99.50	84.04
Utilities	74.58	82.20	77.52	82.99	81.04	89.78	90.79	81.22	87.51	90.85	94.29	95.01	89.85	84.93	83.28	87.43	82.81	81.87	82.25	81.65	99.66
Average	71.29	49.33	67.22	61.27	72.07	57.71	60.94	50.00	63.81	62.22	56.24	59.02	63.15	67.83	71.47	75.09	77.78	70.35	72.02	73.67	52.72

Table A-1-d. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Japan: 1985 P sector

	Agric (%)	Mining (%)	Foods (%)	Textiles (%)	Tim & Fur (%)	Paper (%)	Chemical (%)	Petroleum (%)	Rubber (%)	Stone (%)	Steel (%)	Nonfer met (%)	Metal (%)	Machine (%)	Elec mach (%)	Mot veh (%)	Trsp eqpt (%)	Prec inst (%)	Oth mfg (%)	Construc (%)	Utilities (%)
Agric	99.84	41.34	99.26	95.80	98.68	85.62	67.38	24.88	81.98	45.26	23.90	28.83	25.21	19.80	32.90	31.95	47.47	40.78	91.92	76.11	21.44
Mining	85.26	99.90	77.69	80.22	78.82	87.01	92.87	99.54	85.99	96.01	95.34	96.20	90.19	83.74	80.08	81.91	86.59	78.95	81.12	88.33	97.83
Foods	97.36	6.16	99.62	71.60	82.18	51.12	64.78	5.93	46.75	17.77	5.41	9.34	5.93	4.86	8.86	9.64	13.11	17.82	85.77	19.12	3.32
Textiles	91.85	60.33	79.60	99.88	92.82	76.11	57.11	49.83	95.43	72.63	47.71	74.21	65.29	60.67	69.61	78.14	81.72	76.86	94.94	83.68	56.15
Tim & Fur	69.84	57.94	71.89	67.69	99.85	95.49	61.83	38.00	62.42	83.03	66.64	64.89	69.46	55.88	75.83	57.46	84.61	68.87	96.38	96.59	67.88
Paper	84.89	10.47	84.89	77.98	83.42	98.15	83.29	10.27	75.94	77.21	20.73	29.09	47.31	38.45	63.77	41.88	42.34	68.80	88.58	59.10	18.48
Chemical	94.15	53.19	87.85	95.50	90.84	86.38	99.29	64.02	97.91	83.02	72.13	84.77	74.10	72.26	83.31	85.52	87.40	83.08	93.70	72.85	56.33
Petroleum	86.70	90.21	76.18	79.02	73.82	85.92	92.89	99.64	84.27	87.73	92.18	81.01	84.53	75.00	70.35	73.62	80.40	66.74	74.61	79.92	94.48
Rubber	89.98	64.93	91.79	86.92	89.56	88.59	88.56	69.89	99.79	69.83	60.84	63.41	77.29	90.14	94.23	96.71	93.97	95.98	97.74	89.97	84.47
Stone	84.73	43.99	92.79	66.17	93.77	68.09	88.32	75.48	91.42	99.90	93.26	89.30	90.67	91.79	93.86	92.49	89.68	95.73	91.85	98.63	77.60
Steel	73.37	86.04	84.53	64.54	96.56	67.52	75.35	75.90	85.48	90.68	99.87	83.37	99.51	99.01	96.63	98.39	99.22	96.13	92.44	97.76	68.32
Nonfer met	75.64	67.87	86.55	78.63	93.44	67.33	91.67	66.48	90.81	87.75	97.13	99.96	99.19	97.86	98.78	98.49	98.14	98.90	98.58	96.44	63.01
Metal	84.52	90.49	94.14	80.53	96.40	75.52	90.37	87.79	92.07	80.78	76.66	78.12	99.86	96.43	95.02	92.52	95.98	94.30	93.24	98.43	77.28
Machin	28.56	57.66	25.27	12.00	77.54	22.42	11.56	34.71	73.85	57.31	38.79	42.70	64.08	99.82	88.30	90.61	96.67	89.39	47.81	81.75	21.49
Elec mach	41.14	27.77	23.01	21.86	47.04	13.09	10.86	16.80	48.39	16.32	15.61	34.10	77.30	96.54	99.82	97.76	96.95	97.72	89.06	88.72	22.32
Mot veh	8.34	0.03	1.89	0.34	1.07	0.10	0.03	0.02	0.07	0.02	0.01	0.01	0.01	0.00	0.01	99.83	93.55	0.01	0.16	0.05	0.00
Trsp eqpt	81.77	2.69	51.02	16.35	36.02	3.80	2.52	0.93	4.28	0.93	0.25	0.30	0.33	0.30	0.72	0.62	99.90	0.76	8.75	3.04	0.56
Prec inst	19.41	6.95	6.69	6.90	15.61	9.96	9.36	4.61	17.02	12.51	4.79	6.69	10.71	93.84	75.33	66.12	66.75	99.97	11.23	15.53	3.88
Oth mfg	74.39	77.45	60.52	96.35	90.05	41.20	23.08	54.90	49.21	56.45	48.84	60.52	54.23	39.25	45.44	54.29	59.07	96.73	99.93	76.29	37.47
Construc	50.57	42.72	49.60	41.77	44.30	55.45	58.59	47.37	50.31	51.46	71.14	64.74	55.62	42.73	42.58	55.16	55.44	38.60	41.53	99.49	85.28
Utilities	72.97	79.75	78.69	84.93	82.09	88.03	90.20	79.32	88.51	88.07	91.80	92.78	88.04	83.84	81.49	82.49	85.86	79.55	79.89	76.29	99.45
Average	71.20	50.85	67.78	63.09	74.47	60.33	60.00	47.92	67.71	60.70	53.48	56.40	60.90	63.91	66.52	70.74	78.80	70.75	74.25	71.34	50.33

Table A-1-e. Internal Spreading Ratio: b_{ij}/b_{ij}^*

the UK: 1974 S sector

	Printing (%)	Trade (%)	Finance (%)	Trs & Comm (%)	Service (%)	Pub ad (%)
Printing	99.73	95.50	97.02	88.21	89.00	
Trade	71.63	99.07	79.77	59.24	75.35	
Finance	83.09	89.89	99.49	87.02	89.28	
Trs & Comm	78.79	94.98	90.03	99.30	80.65	
Service	84.18	77.67	91.71	80.37	98.97	
Pub ad						100.00
Average	83.48	91.42	91.61	82.83	86.65	

Table A-1-f. Internal Spreading Ratio: b_{ij}/b_{ij}^*

the UK: 1984 S sector

	Printing (%)	Trade (%)	Finance (%)	Trs & Comm (%)	Service (%)	Pub ad (%)
Printing	99.76	91.43	96.39	93.72	87.98	
Trade	78.22	99.02	73.41	82.10	60.05	
Finance	88.25	87.41	98.69	77.29	79.08	
Trs & Comm	89.15	89.42	91.90	99.11	81.84	
Service	85.35	92.08	97.25	89.83	99.76	
Pub ad						100.00
Average	88.15	91.87	91.53	88.41	81.74	

Table A-1-g. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Japan: 1975 S sector

	Printing (%)	Trade (%)	Finance (%)	Trs & Comm (%)	Service (%)	Pub ad (%)
Printing	97.60	75.83	89.56	81.77	86.46	90.28
Trade	69.62	99.45	51.97	70.44	78.92	67.28
Finance	60.22	94.12	99.51	86.26	67.69	93.09
Trs & Comm	64.23	90.15	77.93	99.42	74.92	89.46
Service	72.00	89.94	88.28	87.05	97.75	81.31
Pub ad	72.00	89.94	88.28	87.05	97.75	99.99
Average	72.61	89.90	82.59	85.33	83.92	86.90

Table A-1-h. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Japan: 1985 S sector

	Printing (%)	Trade (%)	Finance (%)	Trs & Comm (%)	Service (%)	Pub ad (%)
Printing	98.30	84.69	92.28	84.98	90.74	92.47
Trade	68.33	99.43	51.73	66.86	73.68	65.24
Finance	68.55	95.17	99.57	87.12	75.89	59.07
Trs & Comm	64.39	90.61	78.59	99.32	75.39	83.59
Service	77.36	90.96	88.04	87.89	97.67	87.00
Pub ad	77.36	90.96	88.04	87.89	97.67	100.00
Average	75.71	91.97	83.04	85.68	85.17	81.23

Table A-2-a. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Average the UK: P sector

	1974 (%)	1984 (%)	Change (%)
Agric	80.660	77.513	-0.031
Mining	72.682	63.762	-0.089
Foods	77.199	72.524	-0.047
Textiles	76.277	66.603	-0.097
Tim & Fur	84.507	74.467	-0.100
Paper	76.505	71.738	-0.048
Chemical	77.304	72.577	-0.047
Petroleum	54.400	64.096	0.097
Rubber	79.561	74.619	-0.049
Stone	76.742	67.478	-0.093
Steel	74.860	60.260	-0.146
Nonfer met	73.774	67.156	-0.066
Metal	78.880	69.407	-0.095
Machin	81.442	69.136	-0.123
Elec mach	77.695	69.606	-0.081
Mot veh	82.229	72.668	-0.096
Trsp eqpt	83.771	75.022	-0.087
Prec inst	78.088	70.659	-0.074
Oth mfg	85.329	75.341	-0.100
Construc	83.612	72.523	-0.111
Utilities	72.783	67.272	-0.055

Internal Spreading Ratio: b_{ij}/b_{ij}^*

Average the UK: S sector

	1974 (%)	1984 (%)	Change (%)
Printing	83.484	88.146	0.047
Trade	91.424	91.874	0.004
Finance	91.605	91.527	-0.001
Trs & Comm	82.828	88.408	0.056
Service	86.648	81.743	-0.049

Table A-2-b. Internal Spreading Ratio: b_{ij}/b_{ij}^*

Average Japan: P sector

	1985 (%)	1975 (%)	Change (%)
Agric	71.20	71.29	-0.0009
Mining	50.85	49.33	0.0152
Foods	67.78	67.22	0.0056
Textiles	63.09	61.27	0.0183
Tim & Fur	74.47	72.07	0.0240
Paper	60.33	57.71	0.0261
Chemical	60.00	60.94	-0.0094
Petroleum	47.92	50.00	-0.0208
Rubber	67.71	63.81	0.0390
Stone	60.70	62.22	-0.0152
Steel	53.48	56.24	-0.0276
Nonfer met	56.40	59.02	-0.0262
Metal	60.90	63.15	-0.0226
Machin	63.91	67.83	-0.0392
Elec mach	66.52	71.47	-0.0495
Mot veh	70.74	75.09	-0.0434
Trsp eqpt	78.80	77.78	0.0102
Prec inst	70.75	70.35	0.0039
Oth mfg	74.25	72.02	0.0223
Construc	71.34	73.67	-0.0233
Utilities	50.33	52.72	-0.0238

Internal Spreading Ratio: b_{ij}/b_{ij}^*

Average Japan: S sector

	1985 (%)	1975 (%)	Change (%)
Printing	75.71	72.61	0.0310
Trade	91.97	89.90	0.0207
Finance	83.04	82.59	0.0045
Trs & Comm	85.68	85.33	0.0035
Service	85.17	83.92	0.0125
Pub ad	81.23	86.90	-0.0567

Table A-3-a. Effects of Internal Multiplier Change on Outputs
the UK: Thousand Pounds

	$\Delta B \times F(74)$ a	$(\Delta B, \Delta T)F$ b	Residual a-b	Change b/a(%)
Agric	-226.7	-215.8	-10.8	95.21
Mining	1536.8	1097.1	439.6	71.39
Foods	305.9	114.1	191.8	37.31
Textiles	-532.3	-569.8	37.6	107.06
Tim & Fur	-480.0	-347.6	-132.4	72.41
Paper	-537.3	-283.5	-253.8	52.76
Chemical	-897.4	-860.1	-37.3	95.84
Petroleum	-334.0	-490.5	156.5	146.87
Rubber	-107.8	-224.4	116.6	208.22
Stone	237.1	267.1	-30.1	112.68
Steel	-1292.0	-1226.2	-65.8	94.91
Nonfer met	-953.8	-874.0	-79.8	91.64
Metal	-1027.6	-1008.2	-19.4	98.11
Machin	-206.1	-288.3	82.2	139.90
Elec mach	14.4	-62.0	76.3	-430.32
Mot veh	-669.5	-563.9	-105.6	84.23
Trsp eqpt	-295.1	-184.5	-110.6	62.52
Prec inst	47.4	26.4	21.0	55.60
Oth mfg	68.9	-33.3	102.2	-48.37
Construc	-639.1	-546.4	-92.7	85.50
Utilities	1139.4	643.5	495.9	56.48
Total in P	-4848.8	-5630.3	781.5	116.12
Printing	532.1	240.6	291.4	45.23
Trade	-1326.2	-147.8	-1178.4	11.14
Finance	8425.1	2698.0	5727.1	32.02
Trs & Comm	-546.7	-501.4	-45.3	91.72
Service	-2623.0	-876.2	-1746.8	33.40
Pub ad	0.0	0.0	0.0	0.00
Total in S	4461.2	1413.3	3048.0	31.68
Total	-5236.4	-9847.4	3829.5	188.06

Note) First column corresponds to the first term of equation (10) and second column is a product of the first term of equation (11) on p.109 and final demand in 1974.

Table A-3-b. Effect of Internal Multiplier Change on Outputs

Japan: Million Yen

	$\Delta B \times F(75)$ a	$(\Delta B, \Delta T)F$ b	Residual a-b	Change b/a(%)
Agric	-2610233	-2003544	-606688	76.76
Mining	-537824	-420106	-117718	78.11
Foods	75215	-108564	183780	-144.34
Textiles	-717264	-535843	-181421	74.71
Tim & Fur	-1577500	-1280769	-296731	81.19
Paper	-632531	-190371	-442160	30.10
Chemical	338222	247411	90811	73.15
Petroleum	-957340	-1033508	76168	107.96
Rubber	906199	833106	73093	91.93
Stone	-405229	-262414	-142815	64.76
Steel	-2786893	-1901849	-885044	68.24
Nonfer met	-848783	-680002	-168780	80.12
Metal	459250	514430	-55179	112.02
Machin	-801526	-590057	-211469	73.62
Elec mach	1419040	1218168	200872	85.84
Mot veh	1162248	1828062	-665815	157.29
Trsp eqpt	-28142	138493	-166635	-492.12
Prec inst	-54258	-57574	3315	106.11
Oth mfg	140980	70930	70050	50.31
Construc	-72537	104348	-176886	-143.85
Utilitites	2111242	898828	1212414	42.57
Total	-5417663	-3210825	-2206838	59.27
Printing	399472	370367	29105	92.71
Trade	-1698202	-1026177	-672025	60.43
Finance	745141	461898	283242	61.99
Trs & Comm	1299328	206406	1092922	15.89
Service	4718326	2085000	2633326	44.19
Pub ad	-101747	-85292	-16455	83.83
Total	5362317	2012202	3350115	37.52
Sum	-55346	-1198623	1143278	2165.71

(Note) See note of Table A-3-a. Final demand is the amount for 1975.

Table A-4-a. Decomposition of Factors in Output Change

the UK: Thousand Pounds

	$\Delta B \times F(74)$ a	$B(74) \times \Delta F$ b	$\Delta B \times \Delta F$ c	Total d	Change (a+c)/d(%)
Agric	-226.7	10560.4	-499.0	9834.8	-7.38
Mining	1536.8	17721.0	3258.7	22516.5	21.30
Foods	305.9	21796.1	592.1	22694.1	3.96
Textiles	-532.3	6014.1	-710.6	4771.2	-26.05
Tim & Fur	-480.0	4935.2	-1259.3	3195.9	-54.42
Paper	-537.3	5550.9	-1309.8	3703.7	-49.87
Chemical	-897.4	15640.7	-1970.9	12772.4	-22.46
Petroleum	-334.0	11447.5	-941.6	10172.0	-12.54
Rubber	-107.8	5492.4	-284.5	5100.1	-7.69
Stone	237.1	4708.6	380.9	5326.6	11.60
Steel	-1292.0	7655.3	-2871.7	3491.6	-119.25
Nonfer met	-953.8	5444.4	-2140.7	2349.9	-131.69
Metal	-1027.6	9828.5	-2222.8	6578.2	-49.41
Machin	-206.1	12435.7	-533.7	11695.9	-6.33
Elec mach	14.4	10739.5	-139.4	10614.5	-1.18
Mot veh	-669.5	7892.6	-1377.3	5845.7	-35.01
Trsp eqpt	-295.1	6579.8	-535.0	5749.6	-14.44
Prec inst	47.4	1273.5	104.2	1425.1	10.64
Oth mfg	68.9	1117.9	195.7	1382.4	19.14
Construc	-639.1	32245.0	-2142.5	29463.4	-9.44
Utilities	1139.4	12760.2	2330.4	16230.1	21.38
Total in P	-4848.8	211839.5	-12077.0	194913.6	-8.68
Printing	532.1	5289.3	930.2	6751.6	21.66
Trade	-1326.2	44835.4	-3376.4	40132.9	-11.72
Finance	8425.1	26153.3	18737.0	53315.4	50.95
Trs & Comm	-546.7	23967.4	-2219.0	21201.7	-13.04
Service	-2623.0	26631.1	-6605.1	17402.9	-53.03
Pub ad	0.0	51962.0	0.0	51962.0	0.00
Total in S	4461.2	178838.5	7466.7	190766.5	6.25
Total	-5236.4	602517.4	-16687.4	385680.1	-5.68

Note) These figures correspond to the terms of equation (10) on p.109, respectively.

Table A-4-b. Decomposition of Factors in Output Change

Japan: Million yen

	$\Delta B \times F(75)$ a	$B(75) \times \Delta F$ b	$\Delta B \times \Delta F$ c	Total d	Change (a+c)/d(%)
Agric	-2610233	9295339	-2265183	4419923	-110.31
Mining	-537824	1475132	-523580	413728	-256.55
Foods	75215	16468531	108221	16651967	1.10
Textiles	-717264	5739513	-582516	4439734	-29.28
Tim & Fur	-1577500	4588170	-1476324	1534346	-199.03
Paper	-632531	5072622	-754506	3685585	-37.63
Chemical	338222	10828616	445528	11612366	6.75
Petroleum	-957340	8475341	-1055212	6462789	-31.14
Rubber	906199	4850792	904532	6661523	27.18
Stone	-405229	4459595	-381786	3672579	-21.43
Steel	-2786893	14560007	-3757242	8015872	-81.64
Nonfer met	-848783	4996652	-1352194	2795675	-78.73
Metal	459250	4572730	444393	5476373	16.50
Machin	-801526	14751437	-1174442	12775469	-15.47
Elec mach	1419040	23314478	2881514	27615032	15.57
Mot veh	1162248	15571945	1918294	18652487	16.52
Trsp eqpt	-28142	1536090	-173363	1334585	-15.10
Prec inst	-54258	2492418	-69437	2368723	-5.22
Oth mfg	140980	2276608	101743	2519330	9.63
Construc	-72537	23273064	-191299	23009228	-1.15
Utilities	2111242	9492203	2238481	13841926	31.42
Total	-5417663	188091281	-4714378	177959240	-5.69
Printing	399472	3585350	501877	4486699	20.09
Trade	-1698202	34773750	-1980896	31094652	-11.83
Finance	745141	33051969	942601	34739710	4.86
Trs & Comm	1299328	17173917	1189036	19662281	12.66
Service	4718326	60649205	5306203	70673734	14.18
Pub ad	-101747	8706983	-128999	8476237	-2.72
Total	5362317	157941174	5829822	169133313	6.62
Sum	-55346	346032455	1115444	347092553	0.31

Note) See note of Table A-4-a.

Table A-5. Changes Import Ratio, Share, Physical Input Ratio, and Bj and Tj.

	Import Penetration Ratio of Intermediate Goods and Services: the UK				Share of Output			Change of Physical Input Ratio	Change of B _j , T _j
	1974 (%)	1979 (%)	1984 (%)	'84-'74 (%point)	1974 (%)	1984 (%)	'84-'74 (%point)		
Agric	5.93	6.83	10.62	4.69	3.28	2.76	-0.51	-0.04	-0.1101
Mining	14.22	11.00	22.29	8.08	1.46	4.55	3.09	-0.17	-0.2962
Foods	23.65	16.93	16.51	-7.14	6.97	6.21	-0.77	0.02	0.0171
Textiles	24.95	29.71	39.17	14.22	3.20	1.82	-1.38	-0.12	-0.2536
Tim & Fur	32.46	31.22	29.59	-2.87	1.31	0.97	-0.34	-0.05	-0.1088
Paper	38.73	32.40	37.12	-1.61	1.55	1.13	-0.42	-0.04	-0.0888
Chemical	25.01	24.61	30.55	5.54	4.21	3.58	-0.64	-0.09	-0.1693
Petroleum	81.84	65.24	32.77	-49.07	2.92	2.72	-0.20	0.48	0.6008
Rubber	25.63	31.23	33.18	7.55	1.75	1.45	-0.30	-0.06	-0.1230
Stone	11.23	13.55	12.35	1.12	1.34	1.37	0.03	-0.08	-0.1401
Steel	14.93	15.38	18.43	3.50	2.35	1.33	-1.02	-0.11	-0.2504
Nonfer met	39.85	50.03	43.70	3.85	1.59	0.90	-0.69	-0.11	-0.2222
Metal	17.19	15.09	17.84	0.65	3.23	2.16	-1.08	-0.08	-0.2016
Machin	14.94	17.44	19.30	4.37	4.41	3.44	-0.97	-0.10	-0.2354
Elec mach	22.04	26.75	28.92	6.88	2.79	2.76	-0.02	-0.08	-0.1792
Mot veh	13.55	18.36	30.31	16.76	2.52	1.81	-0.71	-0.17	-0.3784
Trsp eqpt	23.91	31.56	33.32	9.41	1.62	1.53	-0.09	-0.09	-0.1940
Prec inst	21.91	23.09	21.30	-0.60	0.43	0.39	-0.04	-0.06	-0.1454
Oth mfg	28.54	52.18	35.33	6.79	0.45	0.39	-0.07	-0.14	-0.2684
Construc	7.04	9.13	6.72	-0.32	8.92	8.02	-0.90	-0.02	-0.0879
Utilities	5.32	10.33	26.24	20.92	2.62	3.74	1.12	-0.07	-0.0920
Printing	20.12	15.59	21.07	0.95	1.47	1.67	0.20	0.08	0.0890
Trade	3.28	5.14	3.80	0.53	10.11	10.32	0.21	0.07	0.1134
Finance	3.04	1.98	5.68	2.64	5.45	11.35	5.91	-0.03	-0.0518
Trs & Comm	46.71	32.91	22.41	-24.30	7.80	6.18	-1.62	0.04	0.1207
Service	4.47	7.31	10.15	5.68	6.67	5.15	-1.52	-0.03	-0.1171

Table A-6. External Multiplier

a. $B_1 = S_1(I-A)^{-1}$: the UK

	1974	1979	1984	'84-'74(%)
Agric	0.2280	0.2431	0.2407	0.0127
Mining	0.2033	0.1137	0.0976	-0.1056
Foods	0.2527	0.2592	0.2651	0.0124
Textiles	0.1881	0.6005	0.1639	-0.0242
Tim & Fur	0.1665	0.2012	0.2217	0.0552
Paper	0.1794	0.2227	0.2089	0.0294
Chemical	0.2461	0.2297	0.1987	-0.0474
Petroleum	0.0929	0.0431	0.1111	0.0183
Rubber	0.1955	0.1870	0.1860	-0.0095
Stone	0.2523	0.2387	0.2822	0.0299
Steel	0.2465	0.3162	0.2721	0.0255
Nonfer met	0.1945	0.2037	0.1947	0.0002
Metal	0.2039	0.2317	0.2433	0.0394
Machin	0.1935	0.2176	0.2368	0.0433
Elec mach	0.1951	0.1919	0.2033	0.0082
Mot veh	0.1831	0.2258	0.2237	0.0406
Trsp eqpt	0.1211	0.1505	0.1794	0.0583
Prec inst	0.1706	0.1706	0.2116	0.0411
Oth mfg	0.1911	0.1627	0.2140	0.0229
Construc	0.1287	0.1486	0.2696	0.1409
Utilities	0.2141	0.1431	0.1349	-0.0792
Total	4.0469	4.5013	4.3594	7.722

b. $B_2 = (I-A)^{-1}A_1$: the UK

	1974	1979	1984	'84-'74(%)
Prining	0.2661	0.2295	0.1447	-0.1213
Trade	0.1588	0.2624	0.2544	0.0956
Finance	0.1598	0.1809	0.1070	-0.0529
Trs & Comm	0.1668	0.2006	0.2352	0.0683
Service	0.3000	0.2782	0.2484	-0.0516
Pub ad	0	0	0	
Total	1.0516	1.1517	0.9897	-5.880

Table A-6. External Multiplier

c. $T_2 = (I - S)^{-1} S_1$: the UK

	1974	1979	1984	'84-'74(%)
Agric	0.1425	0.1588	0.1721	20.769
Mining	0.1903	0.1051	0.1003	-47.276
Foods	0.1839	0.1663	0.1909	3.774
Textiles	0.1424	0.1342	0.1567	10.051
Tim & Fur	0.1267	0.1557	0.2040	61.086
Paper	0.1518	0.1987	0.2070	36.307
Chemical	0.1992	0.1762	0.1840	-7.602
Petroleum	0.0970	0.0115	0.0690	-28.877
Rubber	0.1556	0.1424	0.1687	8.423
Stone	0.2296	0.2160	0.2959	28.847
Steel	0.1645	0.2525	0.2405	46.221
Nonfer met	0.1546	0.2061	0.1930	24.875
Metal	0.1479	0.1772	0.2232	50.883
Machin	0.1397	0.1757	0.2230	59.586
Elec mach	0.1626	0.1607	0.1989	22.326
Mot veh	0.1065	0.1527	0.2059	93.346
Trsp eqpt	0.0750	0.1036	0.1655	120.805
Prec inst	0.1348	0.1377	0.2080	54.300
Oth mfg	0.1471	0.1427	0.2211	50.289
Construc	0.0658	0.0872	0.2165	228.871
Utilities	0.1735	0.0952	0.1161	-33.044
Total	3.0911	3.1558	3.9605	28.127

d. $T_1 = A_1(I - S)^{-1}$: the UK

	1974	1979	1984	'84-'74(%)
Printing	0.2245	0.1984	0.1431	-0.0814
Trade	0.1299	0.1550	0.2041	0.0743
Finance	0.1460	0.1441	0.1052	-0.0408
Trs & Comm	0.1267	0.1548	0.1823	0.0556
Service	0.2131	0.1591	0.1656	-0.0475
Pub ad	0	0	0	
Total	0.8402	0.8114	0.8003	-4.744

Table A-6. External Multiplier

e. $B_1 = S_1(I-A)^{-1}$: Japan

	1985	1975	Change(%)
Agric	0.1796	0.1428	0.0368
Mining	0.3484	0.3018	0.0466
Foods	0.2298	0.2181	0.0118
Textiles	0.3046	0.2994	0.0053
Tim & Fur	0.2639	0.2526	0.0114
Paper	0.3372	0.3445	-0.0074
Chemical	0.2857	0.2992	-0.0135
Petroleum	0.1210	0.1174	0.0036
Rubber	0.2538	0.2606	-0.0068
Stone	0.2753	0.2564	0.0189
Steel	0.2748	0.2226	0.0522
Nonfer met	0.2296	0.2444	-0.0148
Metal	0.2501	0.2203	0.0298
Machin	0.2706	0.2434	0.0272
Elec mach	0.2864	0.2640	0.0224
Mot veh	0.2871	0.2428	0.0443
Trsp eqpt	0.2506	0.2638	-0.0132
Prec inst	0.2494	0.2344	0.0151
Oth mfg	0.2705	0.2788	-0.0082
Construc	0.2824	0.2523	0.0301
Utilities	0.1865	0.1746	0.0119
Total	5.4374	5.1341	5.9075

f. $B_2 = (I-A)^{-1}A_1$: Japan

	1985	1975	Change(%)
Printing	0.3840	0.4409	-0.0570
Trade	0.0925	0.0948	-0.0022
Finance	0.0749	0.0997	-0.0248
Trs & Comm	0.1717	0.1795	-0.0078
Service	0.3270	0.3973	-0.0704
Pub ad	0.1890	0.1384	0.0507
Total	1.2391	1.3505	-8.2531

Table A-6. External Multiplier

g. $T_1 = A_1(I-S)^{-1}$: Japan

	1985	1975	Change(%)
Printing	0.2713	0.2946	-0.0233
Trade	0.0983	0.0898	0.0085
Finance	0.0679	0.0809	-0.0129
Trs & Comm	0.1586	0.1590	-0.0004
Service	0.2304	0.2583	-0.0279
Pub ad	0.1548	0.1093	0.0455
Total	0.9813	0.9919	-1.0689

h. $T_2 = (I-S)^{-1}S_1$: Japan

	1985	1975	Change
Agric	0.1471	0.1088	0.0383
Mining	0.3985	0.3388	0.0598
Foods	0.1650	0.1534	0.0116
Textiles	0.2165	0.1961	0.0204
Tim & Fur	0.2041	0.1949	0.0092
Paper	0.2454	0.2307	0.0147
Chemical	0.2026	0.2105	-0.0079
Petroleum	0.1065	0.0933	0.0132
Rubber	0.1677	0.1749	-0.0072
Stone	0.2573	0.2333	0.0240
Steel	0.1394	0.0978	0.0417
Nonfer met	0.1689	0.1758	-0.0069
Metal	0.1868	0.1700	0.0168
Machin	0.2040	0.1688	0.0351
Elec mach	0.2122	0.1953	0.0170
Mot veh	0.1499	0.1371	0.0127
Trsp eqpt	0.1660	0.1953	-0.0293
Prec inst	0.1951	0.1899	0.0052
Oth mfg	0.2090	0.2114	-0.0024
Construc	0.2466	0.2042	0.0425
Utilities	0.1946	0.1667	0.0279
Total	4.1833	3.8470	8.7443

References

- Amin, A. and J.B. Goddard (eds.) (1986). *Technological change, industrial restructuring, and regional development*, London, Allen & Unwin Ltd.
- Bazen, Stephen and Tony Thirlwall (1989). *Deindustrialization*, Oxford, Heinemann Educational.
- Bean, Charles (1990). 'The Impact of North Sea Oil' in R. Dornbusch and R. Layard (eds.) (1990).
- Blackaby, Frank (ed.) (1979) *De-industrialisation*, Oxford, Heinemann Educational.
- Cairncross, Alec (1979). 'What is De-industrialisation?' in Blackaby, F. (ed.) (1979).
- Cowling, Keith (1986). 'The internationalization of production and deindustrialization' in Amin, A. and J.B. Goddard (eds.) (1986)
- Cowling, Keith and Roger Sugden (eds.) (1990). *A new economic policy for Britain*, Manchester, Manchester University Press.
- Curwen, Peter (ed.) (1990). *Understanding the UK Economy*, London, Macmillan.
- Dornbush, Rudiger and Richard Layard (eds.) (1990), *The Performance of the British Economy*, Oxford, Oxford University Press.
- Economic Planning Agency (1990). *Nihonkeizai no Genkyo (A current affairs of Japan economy)*, Tokyo, Okurashoinsatsukyoku.
- Geroski, P.A. (1990). 'Encouraging investment in science and technology' in Cowling, K. and R. Sugden (eds.) (1990).
- Miller, Ronald E., K.R. Polenske, and A.Z. Rose (eds.) (1989). *Frontiers of Input-Output analysis*, Oxford, Oxford University Press.
- Miyazawa, Kenichi (1963). *Keizaikouzo no Renkanbunseki*, Tokyo, Shunjusha.
- Miyazawa, Kenichi (1975). *Input-Output Analysis and the Structure of Income Distribution*. Berlin, Springer-Verlag.
- Pyatt, Graham and J.I. Round (1979). 'Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework', *Economic Journal*, Vol.89, 850-873, December.
- Robinson, E.A.G. (1958). *The Structure of Competitive Industry*, Cambridge, Cambridge University Press.
- Round, Jeffery I. (1989). 'Decomposition of Input-Output and Economy-Wide Multipliers in a Regional Setting', in Miller, Ronald E., K.R. Polenske, and A.Z. Rose (eds.) (1989)
- Sargent, J.R. (1979). 'UK Performance in Services', in Blackaby (ed.) (1979).
- Stout, D.K. (1979). 'De-industrialisation and Industrial Policy', in Blackaby (ed.) (1979).