International Transferability of the Japanese Production System : Japanese-affiliated Auto Plants in the U.S.A., the U.K., and Taiwan

公文, 溥 / KUMON, Hiroshi

(出版者 / Publisher)
法政大学比較経済研究所 / Institute of Comparative Economic Studies, Hosei University
(雑誌名 / Journal or Publication Title)
Journal of International Economic Studies
(巻 / Volume)
8
(開始ページ / Start Page)
59
(終了ページ / End Page)
78
(発行年 / Year)
1994-03
(URL)
https://doi.org/10.15002/00002116

Journal of International Economic Studies (1994), No.8, 59-78

International Transferability of the Japanese Production System: Japanese-affiliated Auto Plants in the U.S.A., the U.K., and Taiwan

Hiroshi Kumon
Professor of Economics
Faculty of Sociology, Hosei University

Abstract

This paper aims to explain the international transferability of the Japanese production system based on field research. Japanese-affiliated auto plants succeed in applying the Japanese system in the U.S.A., the U.K., and Taiwan, in spite of having different managerial environments from Japan. At the same time, interesting results are gained through using our internationalization model for Japanese multinational enterprises. There is a gap between a real application pattern of the system and an expectable application pattern which is assumable from local managerial environments. Although both the U.S.A. and the U.K. have similar characteristic features in their managerial environments, differing when compared with Taiwan, the plants located in the two developed countries display a different application pattern from each other. It is normal that the American plants show a different pattern from the Taiwanese plants. Interestingly, the British plants show a similar application pattern with Taiwanese plants on important items.

I. Introduction

The main purpose of this paper is to explain the international transferability of the Japanese production system, based on field research on Japanese-affiliated auto plants in the U.S.A., the U.K., and Taiwan. I had a chance to visit Japanese-affiliated auto plants in those three countries. Regarding the U.S.A. and Taiwan, I could research all Japanese-affiliated plants operating there, but in the U.K. I could visit only two plants, which had started operation. I could not visit the other two auto plants in the U.K., which were both under construction. Although I can't deny that findings on the incompleted two U.K. plants might possibly differ from my present results, after visiting the two plants, I am sure that the results acquired reveal the real situation anyway. I have also visited many Japanese-affiliated auto plants located in Canada, Korea, Malaysia, and Thailand as a member of the Japanese Multinational Enterprises Study Group (referred to as JMESG hereafter) or individually [1].

The reasons why I chose the U.S.A., the U.K., and Taiwan for this paper are as follows. First, Japanese auto makers put great importance on these three countries and the main auto makers have had subsidiaries there. Second, the three countries belong to North America, Europe, and Asia, and plants located there represent

more or less other Japanese-affiliated plants established in neighboring countries. As a matter of fact, I have noticed quite common characteristics between American plants and Canadian plants and between other Asian plants and Taiwanese plants. Of course, the three countries have their individual identities and Japanese plants there have some kind of uniqueness, however, those plants give a standard of judgement for the real state of Japanese plants located in neighboring countries.

The JMESG created a theoretical model for the study of Japanese multinationals which is named the "Application-Adaptation Dilemma Model". Japanese manufacturing firms possess a unique production system which we call the "Japanese Production System". Japanese apply it at local plants, because they need their manufacturing system in order to retain their competitive advantage abroad. They can display their advantage as Japanese firms by application of the system. On the other hand, they should adapt themselves to local managerial environments. They should employ local workers and adapt to local customs and institutions. However, if they adapt to local environments completely, they will loose their advantage, because they will not be different from indigenous local firms. So we thought that Japanese multinationals fall into a dilemma with the application of the Japanese production system, on one hand, and the adaptation, on the other hand. The Japanese production system originated from the Japanese culture, its history and managerial practices. It seems that it is not easy to apply it at local plants. Suppose that local plants become a kind of hybrid factory which mixes application with adaptation in some way, hybridism will be determined by such factors as, the corporate strategy and the congeniality of the local environments to the Japanese system. The JMESG's Application Adaptation Dilemma Model puts on an empirical number on these different factors allowing an easy comparison.

Following this introduction, "II. Profile of the Targeted Plants" explains the character of the Japanese-affiliated auto plants in the three countries. Regarding the scale of the plants, manufactured car models, and entry forms, both the plants in the U.S.A. and the U.K. have much in common, but the plants in Taiwan are different from them.

"III. An Analysis of the Rate of Application" shows elements of the Japanese production system and its internationalization model. The internationalization model is an analytical tool to point out the application situation at targeted plants. The analysis shows that the Japanese production system is applicable in the three countries at a rather high level and, in addition, each country has a different application pattern. After that, I will express the real situation of application by using contrasts to local managerial environments. Interestingly enough, there is a case where the real application pattern is different from the pattern which is foreseeable from the managerial environments. Both the U.S.A. and the U.K. have

(1) The JMESG, funded by the Toyota Foundation, conducted field research on Japanese-affiliated manufacturing plants (auto assembly, auto parts, home electronics, semiconductor) in North America in 1989. We published the results of the study as Abo, Tetsuo *et al.*, *Amerika ni Ikiru Nihonteki Seisan Shisutem: Genchi Kojyo no 'Tekiyo' to 'Tekio'*, Toyo Keizai Shinposha, 1991, (Abo *et al*, *Hybrid Factory*, The Oxford University Press, forthcoming in 1994). The group has conducted field research on the same kind of plants in Korea and Taiwan in 1992 and in Singapore, Malaysia, and Thailand in 1993, funding for which were provided by the Monbusho. This paper is based on my field research which I conducted both by myself and as a member of the group. I individually visited Japanese-affiliated auto plants in the U.S.A. in 1988 and 1989, in the U.K. in 1991 and 1992, and in Taiwan in 1990.

many similarities between their managerial environments. Taiwanese environments, however, are similar to Japan as an Asian country. The American plants' application pattern is contrastive to the Taiwanese plants, which is understandable from the environmental situation. However, the U.K. plants demonstrate similar patterns with Taiwan in some cases. The U.K. shows much more flexibility in taking on the Japanese system than the U.S.A.

Finally, in "V. Concluding Remarks" I would like to give a summary of the paper.

II. Profile of the Targeted Auto Plants

Here, I would like to examine the plants in the three countries regarding their plant scale, production models, and entry forms. The description will show that there are some similar characteristics in the the U.S.A. and the U.K. But Taiwanese plants are different from them (See Tables 1,2, and 3).

First, regarding plant scale, in the U.S.A. and the U.K. the plants are set up for high volume and equipped with state-of-the-art facilities. They look very nice on the outside on the huge site and no expense seems to have been spared. Taiwan, on the other hand, has low volume type plants built under controlled spending. Concretely speaking, American plants have an annual capacity of more than 200,000 units, which, in general, is conceived as a mass production plant. Auto firms which are not able to sell the same volume of cars in the U.S.A. went into joint ventures with an American partner or a Japanese manufacturers. Only "AF" (see Table 1) has not reached 200,000 units in capacity, but its goal is 200,000 units.

The plants in the U.K., also plan over 200,000 units as a goal and one plant "BB", which started operation in 1984, has already attained 300,000 units in capacity. The two newer plants target 100,000 units for the first phase. Plant BG is a restructured plant, which produces trucks and recreational vehicles, forming a joint venture with an American partner, and is a low volume type. They manufacture only 1, 2, or 3 different models. By strategically restricting production models they increase the sales of various models of import cars from Japan.

Taiwanese plants are a low volume type with various models. Plant capacity is less than 100,000 units annually, to say nothing of 200,000 units, manufacturing various kinds of products. For example, plant "TB", having the longest history there, produces five different kinds of both passenger cars and trucks.

As for entry form, the U.S.A. and the U.K. are similar, but, again, Taiwan is different. Both sole entry and joint venture are seen in the two developed countries, but in Taiwan the only entry form is joint venture with a local partner. As a rule Japanese have managing authority over a plant even in the case of a joint venture, but the situation is different in Taiwan. Local firms have a tendency to control plants by themselves. Local partners manage in the three plants TB, TC, and TD. The Japanese, however, have an initiative in management in the case of TA and TF, which started operation after 1985. In 1985 the Taiwanese government changed the automobile industry policy from one of protection to one of increasing imports by reducing import tariffs and stimulating joint ventures with foreign firms. After that, even local managers adopted the Japanese production system to

Table 1 Japanese Automakers' U.S.A. Manufacturing Operations

Plant	Location	Operation Start-up	Entry Form	Annual Capacity	Products Models	Employees	Japanese Expatriates (%)
ACp1	Ohio	Nov., 1982	Sole Entry	360,000	Pass. Car 1	10,200	500(4.9)
ACp2	Ohio	Dec., 1989		150,000	Pass. Car 2		
AB	Tennessee	June, 1983	Sole Entry	450,000	Pass. Car 2 Truck 1	5,870	20(0.3)
AA1	California	Dec., 1984	J.V. (GM)	260,000	Pass. Car 2 Truck 1	3,883	38(1.0)
AE	Michigan	Sep., 1987	J.V. (Ford)	240,000	Pass. Car 3	3,600	160(4.4)
AA2	Kentucky	May, 1988	Sole Entry	240,000	Pass. Car 1	4,089	73(1.8)
AD	Illinois	Sep., 1988	Sole Entry	240,000	Pass. Car 3	3,139	57(1.8)
AF	Indiana	Sep., 1989	J.V.	160,000	Pass. Car 1 Truck 2	1,893	108(5.7)

Sources: Japan Automobile Manufacturers Association, Inc. *1993 The Motor Industry of Japan* and others.

Table 2 Japanese Automakers' U.K. Manufacturing Operations

Plant	Location	Operation Start-up	Entry Form	Annual Capacity	Products Models	Employees	Japanese Expatriates (%)
BB	Sunderland	Apr., 1984	Sole Entry	300,000	Pass. Car 2	4,600	49(1.1)
BC	Swindon	Oct., 1992	J.V. (Rover)	100,000	Pass. Car 1	2,000	100(5.0)
BG	Luton	Sep., 1987	J.V. (GM)	60,000	Truck 2 R.V. 1	2,100	3(0.1)
BA	Burnaston	Dec., 1992	Sole Entry	100,000	Pass. Car 1	1,900	50(2.6)

Sources: Japan Automobile Manufacturers Association, Inc. *1993 The Motor Industry of Japan* and others.

cope with international competition. Of course, plant TA and TF have been trying to put the system into practice since start-up. Though Taiwan is very close to Japan geographically and has a long history of business with Japan, local partners did not admit to an advantage in adoption of the Japanese system before 1985.

When the Japanese went into Taiwan, they did so in a casual manner, and built low volume type plants. Japanese companies have the power to manage a plant even in the case of a joint venture in developed countries, but, in Taiwan, there are two different cases that management authority is held by the local partner or is passed to the Japanese side. The difference depends on the market scale, the character of the local partner, and government policy. Taiwanese plants started operation as a knocked-down type built on a small scale due to the restricted

Table 3 Japanese Automakers' Taiwan Manufacturing Operations

Plant	Operation Start-up	Entry Form	Startof J.V.	Annual Capacity	Products Models	Employees	Japanese Expatriates (%)
TB	1956	J.V. (Local)	1985	70,000	Pass. Car 5 Truck 5	3,549	14 (0.4)
TC	1969	J.V. (Local)	1974	40,000	Pass. Car 2	4.380	2 (0.001)
TD	Dec., 1973	J.V. (Local)	1986	87,000	Truck 5 Pass. Car 1	2,009	2 (0.001)
TA	May, 1984	J.V. (Local)	1986	45,000	Pass. Car 1 Truck 4	1,867	34 (1.8)
TF	May, 1989	J.V. (Local)	1986	42,000	Pass. Car 2 Truck 1	538	11 (2.0)

Sources: Interviews and others.

market. Then they increased production capacity and raised the number of local parts. The capitalists or managers are Chinese. They do not like to rely upon Japanese managers and choose independent management instead. We can expect the same kind of situation in other Asian countries more or less.

III. An Analysis of the Rate of Application

As mentioned above, both the U.S.A. and the U.K. have much similarities each other but Taiwan is different from them regarding the character of plants and management authority. How do they apply the Japanese production system there?

The Japanese production system is formed by three pivotal elements. The first is a work site oriented work organization. Specific features are flexible work assignments, workers' participation in work and improvement of it, and determination of wage and promotion by seniority and ability. Job tasks are assigned to a team headed by a foreman. A job is not assigned to a specific worker exclusively but reallocated flexibly within the team. Of course, each worker's work load and speed are determined precisely, but they are reallocated to other workers and element tasks are reorganizable within the team. Workers are expected to be multiskilled, performing various kinds of jobs. The foreman evaluates each worker's performance and the result of the performance evaluation determines wage increase as well as promotion. The foreman set a work standard which reflects the results of improvement activities. Workers are promoted within the work organization while getting a wide range of skills. The second pivotal element is a rational production control that eliminates waste completely. A plant keeps parts and stock to a minimum level, and parts which are manufactured or stocked within the plant are provided in accordance with final assembly requirements. The production in previous stages and part manufacturers are required to synchronize with production in the final assembly process. Ordinary workers are required to take responsibility for the quality of the product so that time and materials are not wasted. Workers participate in the "kaizen", or improvement activities to eliminate waste

and improve the quality of the product.

The third element is participative management in harmony with the work site oriented work organization. Managers are required to grasp directly what has occurred at the work site through on going communication. An open style office is needed in the area of white collar workers. This allows employees who are interested in management targets to concentrate on rising in management through a participative system, which includes small group activities, meetings at shops, and conferences between management and labor union.

The JMESG created an internationalization model of the Japanese production system [2], and arranged it into 23 items. We evaluate each element on a five points scale to show an application ratio. If a practice of an item at the local plant is the same as at the plant in Japan, we give five points. Conversely if a practice at the local plant is the same as an indigenous firm, we give it 1 point. The evaluation system allows us to recognize the rate of application at the local plant quantitatively even though it is not strictly precise. The quantitative analysis not only makes it possible to understand the application situation of each item in quantity, but it also makes possible to grasp the application pattern by grouping related items. We have two different kinds of groupings called the "Six Groups Evaluation" and the "Four Aspects Evaluation". Regarding the first one, we classified the 23 items into six groups: "I. Work Organization", "II. Production Control", "III. Parts Procurements", "IV. Participation", "V. Labor Relations", and "VI. Parent-Subsidiary Relations". We consider the work organization and the production control as the core of the system, and place the other four groups as the framework for making the core groups work well.

As for the "Four Aspects Evaluation", we reclassified specific items out of the 23 into four aspect groups. The four aspects include "Human", indicating human items, "Material", indicating material items, "Method", showing the system-related items, and "Result", showing ready-made-related items. Of that, "Method" is difficult to apply and "Result" is easy to bring in. This classification allows us to assess the content of the technology transfer by analyzing the combination patterns of the four aspects.

Now let us see the rate of application for the three countries. According to Table 4: Hybrid Ratio for Three Countries, the rate of application is as follows: both the U.S.A. and Taiwan are 3.5, and the U.K. is 3.3. These ratios mean that all three countries have an application of the system at a high level. The results of the research study on auto assembly, auto parts, home electronics, and semiconductors in North America in 1989, found the average rate of application was 3.3. Separate industry averages were: auto assembly 3.5, auto parts 3.6, semiconductor 3.2, and home electronics 2.7 (Abo *et al*, 1991). We concluded from the 1989 study that both auto assembly and parts were an application-oriented type industry, and that home electronics was adaptation-oriented. Thus, as far as viewing the application situation from the average ratio, Japanese firms are managing their international plants by applying the Japanese production system.

Generally speaking, there are many similarities in the environments of the

(2) Regarding the standard evaluation model for the 23 items of the Japanese production system, see Abo *et al.*, 1991:33-5.

Table 4 Hybrid Ratio for Three Countries

	United Sates of America	United Kingdom	Taiwan
I. Work Organization	3.3	4.1	3.9
1. Job Classification	4.8	5.0	5.0
2. Job Rotation	3.2	4.0	3.8
3. Education and Training	3.4	3.5	3.6
4. Role of Supervisor	3.1	4.0	3.4
5. Wage System	2.1	4.0	4.4
6. Promotion	3.2	4.0	3.4
II. Production Control	3.4	3.3	3.6
7. Production Equipment	3.9	2.0	3.6
8. Quality Control	4.0	4.0	3.8
9. Maintenance	2.9	3.0	3.2
10. Operation Control	2.9	4.0	3.8
III. Parts Procurement	3.0	2.2	3.0
11. Local Content	2.3	2.0	2.4
12. Suppliers	3.8	2.0	3.0
13. Procurement Systems	3.0	2.5	3.6
IV. Participation	3.9	3.8	3.9
14. Small Group Activities	2.7	4.0	4.0
15. Information Sharing	4.4	4.0	3.8
16. Unity	4.6	3.5	4.0
V. Labor Relations	4.2	3.9	3.6
17. Employment Policy	4.3	4.0	3.0
18. Employment Security	4.9	5.0	3.6
19. Union	4.2	3.5	4.2
20. Grievance	3.2	3.0	3.4
VI. Parent-Subsidiary Relations	3.5	2.0	2.2
21. Ratio of Japanese Expatriates	3.8	1.5	1.6
22. Delegation of Power	3.3	2.5	2.4
23. Status of Local Manager	3.3	2.0	2.6
Total Average	3.5	3.3	3.5

Note: U.S.A. includes 9 plants with 2 plants in Canada. U.K. includes 2 plants, and Taiwan includes 5 plants.

U.S.A. and the U.K., whereas Taiwan is different from the two. That is to say, there is an Anglo-American similarity in the work organization, the production control, part procurements; the job classifications system, wages based on the job, inflexible work assignments, clear division of labor between manufacturing workers and quality control workers, and between skilled workers and unskilled workers, and the possibility of important parts procurements within the country or from neighboring countries. On the other hand, there is no job classifications system which determines work assignments and wages in Taiwan. There wage is deter-

mined by educational background and seniority as well as qualifications within the company. Although Taiwan has not had a custom of having multi-skilled workers, it is possible to implement the practice due to the nonexistence of a demarcation system based on job classifications or titles. But I can see that the key weak points in Taiwan are the fault of the systematic production system and a lack of self procurement of key parts.

As mentioned above, Anglo-American similarity exists clearly in the work organization, production control, and part procurements, but Taiwan is different. Taiwanese work organization is similar to Japan but different from Japan in the field of production control and parts procurements. So, in regards to environmental patterns, the same features exist in the U.S.A. and the U.K., but Taiwan has uniqueness. However, there is an interesting trend in the real application pattern. That is, both the U.S.A. and Taiwan show a contrasting pattern in general, but the U.K. shows a subtle trend, which is close to Taiwan in some groups. There is a discrepancy between the expectable application pattern foreseeable from the managerial environments and the real application pattern.

Regarding groups which indicate a large gap of application rate among countries — such as work organization, parts procurements and parent-subsidiary relations — there exists an interesting difference between the real application rate and the expectable application pattern based on the managerial environments. The average rate of work organization indicates a 3.3 point for the U.S.A. On the other hand, it indicates a 4.1 points for the U.K. and 3.9 for Taiwan, which means an extremely high rate of application. The high rates for the U.K. and Taiwan are because the U.K. plants adopt the Japanese-style work organization very flexibly and Taiwanese plants adopt the system easily due to an institutional similarity in the group. In addition, both the U.K. and Taiwan are close in points in the parent-subsidiary group. The U.K. has 2.0 points and Taiwan has 2.2 points, showing the attainment of localization of management. The U.S.A. has 3.5 points, meaning that Japanese expatriates play an important role in plant management and local plants rely on the Japanese parent firms in various fields.

An examination of the parts procurement group also points out a difference among the countries with both the U.S.A. and Taiwan having 3.0 points and the U.K. having 2.0 points. Japanese part makers make inroads in large numbers into the U.S.A. and Taiwan, so some of them form intimate transaction relations with assembly makers that are similar to the "Keiretu" used in Japan. Japanese assembly makers must consider the strict local content rule on the part of the EC and that not many part makers go into the U.K. or Europe, so the localization of procurements grows there.

There are no distinguishable differences in the groups of production control and participation among the countries, but there is a subtle difference in the labor relations group. A 0.3 point difference exists between each of the countries. The U.S.A. has 4.2 points, the U.K. has 3.9 points and Taiwan has 3.6 points. Japanese firms take a careful stance against labor practices in the U.S.A. and the U.K. due to adversarial practices in the past and choose a prudent response to them, though experiencing an excessive reaction sometimes. Japanese make a prudent choice of site location, are carefully in considering work ethic, are cautious in the selection of employees, etc. On the other hand, they do not emphasize the Japanese style in

Taiwan. As stated above, being different from the image attained out of the environments for the three countries, the same application pattern is recorded by the U.K. and Taiwan as for the work organization and the parent-subsidiary relations. But the average points for labor relations which constitute a framework for applying the core parts of the system, such as work organization and production control is rated at the highest in the U.S.A., second in the U.K. and the third, and lowest, in Taiwan. This implies that Japanese firms pay careful attention in applying the core elements of Japanese labor practices in the U.S.A. and the U.K.

Next, let us see the other side of the application by focusing on the Four Aspects Evaluation (see Table 5). Comparing "Methods", which are difficult to put into effect in different environments, with "Results", which are easy to put into effect, the U.S.A. has a difference from the other two countries. Namely, the U.S.A. has 3.5 points for the methods and 3.4 points for the results, meaning that a high rate of application in the methods needs a high rate of application in the results. Contrary to this, there is a gap in the application rates between the methods and results in the case of the other two countries. The U.K. records 3.8 points for the methods and 1.9 points for the results while Taiwan indicates 3.8 points for the methods and 2.6 points for the results. Two countries apply the methods, that are difficult to put into effect, at a high level without relying on the same high rate of application on the part of the results. In other words, a high application level of the methods is possible with a low application level of the results.

Breaking down the four aspects, both "Human methods" and "Human results" record the same 3.6 points in the U.S.A. However, both the U.K. and Taiwan record higher points in the "Human methods" and show lower points in "Human results" than the U.S.A. As for the U.K., "Human methods" is 4.0 and "Human results" is 1.8. In the case of Taiwan, "Human methods" is 3.9 and "Human results" is 2.1.

I see the same trend regarding the "Materials" category, even though it is not as clear as with the "Human" category. That is, although the U.S.A. records 3.3 in

Table 5 Four Aspects Evaluation of Hybrid Ratio for Three Countries

	Human		Material			
	Methods	Results	Methods	Results	Methods	Results
U.S.A.	3.6	3.6	3.3	3.3	3.5	3.4
U.K.	4.0	1.8	3.2	2.0	3.8	1.9
Taiwan	3.9	2.1	3.5	3.0	3.8	2.6

Sources: Calculation by the JMESG and author.

Notes: (1) Human Methods include Job Classification, Job Rotation, Education and Training, Supervisor, Wage System, Promotion, Small Group Activities, Information Sharing, Unity, Employment Security, and Grievance.
(2) Human Results include Ratio of Japanese Expatriates and Status of Local Managers.
(3) Material Methods include Quality Control, Maintenance and Procurement Systems.
(4) Material Results include Production Equipment, Local Content and Suppliers.
(5) Methods include both Human and Manterial Methods.
(6) Results include both Human and Material Results.

both "Material methods" and "Material results", the U.K. and Taiwan show higher points in the methods than in the results. When the plants in the U.S.A. apply the system at a high level, they need to bring the results to the same level for the material category as well as the human category. But in the U.K. and Taiwan, it is possible to apply the system at a high level without the same high level of application of the results.

IV. Application Situation of the Japanese Production System

Japanese-affiliated auto plants in the three countries show an application orientation of the system, but they have different types of patterns. Generally speaking, the application pattern indicates a contrast between the U.S.A. and Taiwan. The U.K. shows the same pattern as Taiwan. The following is a concrete explanation of a real application situation under the six groups classification.

1. Work Organization

The average rate of application in the work organization group is 3.3 for the U.S.A., 4.1 for the U.K. and 3.9 for Taiwan. Though all three countries express an application orientation, it is a characteristic feature that both the U.K. and Taiwan display an especially high rating in this group. As stated earlier, one of the basic constituents of the system is a work site oriented work organization. We have identified six items as parts of the group: job classification, job rotation, education and training, role of supervisor, wage system, and promotion. Looking at the local environments of the three countries, it is impossible to deny an existence of similarity between the U.S.A. and the U.K. The job determines work content and wage, and the job ladder constitutes the promotion route. Work content or position is fixed due to job contracts. An improvement in the work flow is a task for industrial engineers and workers do not take part in it. Even though there is a difference between the U.S.A. and the U.K. in the way the job is controlled by the union (Tolliday and Zeitlin, 1987), they have much in common in their work organization, especially when compared with Asian Japan and Taiwan.

Contrary to this, under the Japanese system, a concept of job which plays an integral role in the work organization in the above two developed countries does not exist. Wage system, work, and promotion are not connected by the integral job concept. Educational background, length of service and job qualifications within the company serve as pivotal elements which form an employee's order within the company. Wage is determined by educational background, seniority and ability. Work scope is prescribed widely, and job rotation is implemented systematically. Promotion follows within both position and company qualifications. Workers are expected to be multiskilled and to take part in "kaizen" or improvement activities. According to our field research, traditional work organization in Taiwan is similar to Japan and different from the Anglo-American type. There is a qualification system only effective within the company and does not exist as an integral job concept which determines work scope, wage and promotion ladder. The company qualification is determined by educational background, length of service and per-

formance evaluation. But performance evaluations have been done by the foremen under vague standards. There has not been a job rotation system nor have workers expected to be multiskilled. Accordingly, traditional Taiwanese work organization is similar to Japan in that educational background, length of service and company qualifications rank the employees.

So both the U.S.A. and the U.K. have much in common with the traditional local work organization, whereas Taiwan has much in common with Japan. How about the real application pattern?

We presumed that Japanese firms would have difficulty in applying their system in the U.S.A. and the U.K. and no difficulty in Taiwan. In reality, they apply the system successfully in all three countries. Japanese firms realize their unique work organization in an alien environment. So the rating points of the work organization are high in the three countries. However, the U.S.A. is different from the other two countries. The average points in the work organization is 3.3 for the U.S.A., 4.1 for the U.K., and 3.9 for Taiwan. The points of the U.S.A. are lower than the other two. The U.S.A. scores significantly lower points than the other two countries in such items as job rotation, role of supervisor, and promotion.

At first, let us examine the job classifications which show almost the same points for the three countries. Simplification of the job classifications is a precondition for implementing the Japanese-style work organization in the U.S.A. and the U.K. In fact, they realize the simplification of it. Though traditional American auto plants have nearly 100 jobs including both the skilled and the unskilled, Japanese plants changed them into 2 categories, production and maintenance. In the U.K., Japanese plants also have two categories for workers. On the other hand, they do not need to change the job classification system in Taiwan, because such a system has never existed. In this way, Japanese firms succeed in making preconditions in order to set their own flexible work organization in the three countries, even though the process was different, by reforming the traditional job classifications in the U.S.A. and the U.K. and by adapting themselves to the traditional customs in Taiwan. As a result, job classification gets high rating points of 4.8 in the U.S.A. and 5.0 in the other two countries, which means having virtually the same system as Japan.

Like this, other items show high rating points of over 3. The American plants display lower points than the others. Of those, the item of wage is a very low 2.1 for the U.S.A. Whereas the U.K. is 4.0 points and Taiwan is 4.4 points, which means they are very close to Japan. The most important difference between the U.S.A. and others is whether or not they introduce performance evaluation as a deciding factor of wage. In the U.S., wage is determined by simplified job classifications with an hourly rate. They do not use performance evaluations as a determinant of wage. On the other hand, in the case of British plants, all employees are treated as the salaried and performance evaluation was adopted as a determinant of wage level. Also in Taiwan, performance evaluation was adopted as in Japan. So both the U.K. and Taiwan use the merit system which reflects the workers' attitude or result, so their rating points are higher than those of the U.S.

The Japanese system requires workers to be multiskilled, to be responsible for quality control and partially maintenance, and to participate in kaizen activities. Because they are required not only to do assigned tasks but also to perform a wide

range of tasks, and because they are expected to have a high morale, to take care of other team members' tasks, and to keep concentration and judgement on tasks, such workers deserve to be treated equally with white-collar workers regarding their wage system. Plants in the U.K. and Taiwan implement the wage system in order to raise up expectable workers.

British plants display the highest rating of 4 points regarding such items as job rotation, role of supervisor, and promotion. The second highest rating is Taiwan and then comes the U.S. In the British plants, managers ask workers to do job rotation systematically, so that workers are able to perform a wide range of different tasks. The foreman performs both workers' management and production control and meets kaizen activities aggressively. Regarding promotion, there is no limit of upward promotion within the company and recommendation by a direct supervisor is necessary as the first step. Therefore all three items rate 4 points in the U.K. In other countries, Japanese plants implement their own system. But there is a disparity in operating levels among plants, so the ratings are a little lower than the U.K.

2. Production Control and Parts Procurement

Here I'd like to explain an application of Japanese-style production control which eliminates waste completely and puts great importance on quality. The average points for the production control groups is 3.4 for the U.S.A., 3.3 for the U.K. and 3.6 for Taiwan. They show a basic application orientation and have no distinguishing differences among them. The group is formed by four items; production equipment, quality control, maintenance, and operation control. Of that, according to our four aspects evaluation model, only the production equipment item belongs to "Material results" which means 'ready-made' and easy to bring in. The other three items belong to "Material methods", which are assessable at an applied level of the system.

Concerning local environmental conditions for production control, as expected, both the U.S.A. and the U.K. have many similarities. Taiwan is different from them, because there exists a difference in the basic manufacturing capabilities between developed countries and newly industrialized countries. Of course, there is a difference between the U.S.A. and the U.K. The U.S.A. is the birth place of Taylorism and Fordism, whereas the U.K. has lagged behind in the adoption of American-style mass production. This difference should not be forgotten, however, even when considering it, the two countries have common environments in comparison with Taiwan. Quality control and maintenance have constituted specialized jobs and have kept demarcation against production jobs. Therefore there has been an established production system with an inflexible, stiff style in the developed countries. But, in Taiwan, they have a weak manufacturing foundation due to late industrialization. They can not provide all the necessary parts. Also, maintenance workers have not been promoted sufficiently and ordinary workers do not have the necessary quality consciousness to compete with the world market. So regarding production control, it is possible to note that the U.S.A. has established a mass production system and the U.K. has established a manufacturing system based on skilled workers, but Taiwan has weak manufacturing capabilities, espe-

cially in the automobile industry.

How about the real application pattern? As for production equipment, while the rating is 2.0 for the U.K., which means adaptive, contrastingly, the U.S.A. is 3.9 and Taiwan is 3.6, which means they have application orientation. In the case of the U.K., because a restructured plant takes advantage of using old equipment, the rating points becomes low. Regarding quality control, maintenance, and operation control, the highest ranked is the U.K., the second is Taiwan and then comes the U.S.A. In the U.K., foremen and workers use the Japanese-style quality control and operation control flexibly. Concerning quality control, British plants implement the Japanese way of "built-up quality within the manufacturing process", in which ordinary workers have responsibility for quality. Surprisingly, whereas the brother plant in the U.S.A. takes after the American system that allocates special workers to check quality, the British plant, having the same parent company, implements the Japanese system thoroughly. Also, concerning operation control, foremen set a work standard and take part in line balancing. British plants are prominent in taking on the Japanese system flexibly. In the case of the other two countries, a Japanese-style quality control has been adopted. The reason why the rating for maintenance is less than 3 points, not as high as others, is that skilled workers are hired separately from ordinary workers and they can not perform preventive maintenance yet. As stated above, a Japanese-style production control system is applicable even in the U.S.A. and the U.K., where the job demarcation system is deeply rooted.

Regarding parts procurement, there is an environmental similarity between the two developed countries and Taiwan is different, since it is just newly industrialized. It is possible to procure parts in developed countries, but Taiwanese part makers can not provide key parts yet. Setting aside the manufacturing of parts, developed countries have established procurement systems which are different from the Japanese JIT system. Therefore adoption of the Japanese system is not easy.

In reality, parts procurement's rating points as a group are not as high as other groups. Both the U.S.A. and Taiwan are 3.0 and the U.K. is an especially low 2.2., where all three items received about 2 points. The rating of this group depends on the local government policy and an advance from the Japanese part makers. Regarding the U.K., where the points show an adaptive stance, the EC requests a higher rate of local content than the others, so Japanese firms must adapt to it. In addition, although many Japanese part makers go into the U.S.A. and Taiwan, they don't advance into Europe in large numbers. The low rating points in the U.K. reflect this passive attitude of the part makers. On the other hand, in the U.S.A. and Taiwan, assembly plants procure parts from Japanese-affiliated makers and partially implement JIT procurement practice. So the scores are over 3 points in each of the two countries.

In this way, this item's group displays relatively fewer points than the others, because these points are influenced by local government policy and the advancement policy by the part makers.

3. Participation and Labor Relations

Regarding the participation and labor relations, there are similar local environ-

ments in the U.S. and the U.K. but Taiwan is different from them. Due to the tradition of a class society in the U.K. and the tradition of the immigrant society as well as a following for British institutions on the part of the U.S.A., relations between management and labor have been adversarial. Workers have been discriminated against in the wage system and in working conditions. Because such a relationship of opposition has been continued, a consciousness of "them versus us" has been prominent and there has been no room for a participative consciousness to develop among workers. Contrary to this, in Japan, managers have put great importance on having harmonious relations with workers since the end of World War II. Japanese companies have established firm practices to make management-labor relations stable and interactive: Those practices include workers' participation in working through small group activities, the participation of management in meetings on the shop floor and through a consultation system between management and the union.

There are no noteworthy differences regarding participation groups among the three countries; 3.9 for the U.S.A., 3.8 for the U.K., and 3.9 for Taiwan, displaying an application orientation at a high level. Japanese local plants try to initiate various kinds of participative measures: small group activities, meetings, open-style offices, cafeterias for all employees, social gatherings, uniforms, etc. It seems that Japanese managers have been taking a more active stance towards stimulating participation in the U.S.A. and the U.K. than in Taiwan. It is possible to assume that the reason for this is that Japanese managers are afraid that the workers' traditional adversarial attitude against management may appear. One notable item is small group activities. Although all three countries implement them, the U.S.A. reveals the lowest rate of participation among the workers at about 30%. So the rating for the U.S.A. is a very low 2.7, whereas the other two countries are 4.0. A small number of Americans are interested in the activities, but, unlike Japan, it seems to be difficult for all of them to participate.

It is very interesting that the labor relations group displays a contrasting rating to the work organization group. Based on the traditional local environments, both the U.S.A. and the U.K. have much in common in their work organization, participation, and labor relations. Conversely, Taiwan is different from them and similar to Japan. As stated above, real application patterns are different from environmental similarity. Regarding work organization, the rate of application for the U.S.A. is relatively low at 3.3, but the other two countries are relatively high; the U.K. is 4.1 and Taiwan is 3.9. However, in the case of labor relations, the ratings are reversed; the U.S.A. is the highest at 4.2, the second is the U.K. at 3.9, and the last is Taiwan at 3.6. So the three countries score high points, which means the system is applicable, in one sense. At the same time, interestingly enough, the order of each country's application rate is also highest in the U.S.A., second in the U.K. and lowest in Taiwan. Because managerial environments are not supportive to the Japanese system in the U.S.A. and the U.K., the plants in the two countries put great importance on the labor relations which constitute a framework for smooth working conditions for the work organization and production control. As a result, Japanese companies succeed in applying harmonious labor relations. Japanese-style labor relations are supported by workers due to egalitarian measures for all employees and cooperative labor relations.

Now let us see how labor relations are taken care of item by item. The ratings for the employment policy are 4.3 points for the U.S.A., 4.0 for the U.K., and 3.0 for Taiwan. So the two developed countries get higher points, because Japanese plants there chose rural areas as site locations very carefully, they considered the work ethic and the low turnover rate and they hired workers prudently through various selection steps. Contrary to this, Japanese plants did not thoroughly implement their way in Taiwan, partially because local partners have the initiative in management.

Regarding job security, Japanese firms in the U.S. and the U.K. attach great importance to long term employment. When production volume decreased due to bad sale conditions, they did not resort to lay-offs. The policy of long term employment is consistent with the simplification of job classification logic. That is to say, because one of the functions of large numbers of job classifications in America has been recognized to serve to keep employment as a function of the labor union, Japanese plants must show they can secure jobs under simplified job classification. So the job security item for the U.S. is 4.9 points and 5.0 points for the U.K., which are both very high. Japanese plants put great importance on job security even under a great burden in order to have stable labor relations and also to have a comparative advantage against local indigenous firms that occasionally resort to lay-offs. Interestingly enough, both job classification and job security are almost the same high ratings in the U.S. and the U.K. I can see a logical consistency in the way these two items can apply to the Japanese system in different managerial environments. Of course, Taiwanese plants put great importance on job security as a policy. But one plant where the local partner has an initiative in management is not particular about it. Therefore the average points are only 3.6.

Japanese plants take a prudent stance to labor unions, of course. In the developed countries, labor unions are organized by industry or occupation, but in Japan and Taiwan, they are organized within the company. Japanese firms are very sensitive to unionization and its stance against management. In the U.S., the main trend of Japanese plants is to reject labor unions. Whether or not a union exist at plant depends on the entry form. In the case of sole entry, they reject unionization, and in the case of joint venture with one of the Big Three, they allow it. In the U.K., two plants have labor unions. In Taiwan, though unions were organized after the lifting of martial law, troubles between management and labor are very few. In this way, Japanese-affiliated plants put great importance on such items as participation and labor unions in the developed countries, seeming to sometimes have excessive concern for them. As a result, the rating points become very high. On the other hand, in Taiwan, they do not worry about participation and labor unions as they do in the developed countries, due to the institutional similarity with Japan. They do not need to do so, because of less trouble with labor unions.

4. Parent-Subsidiary Relations

Here I would like to explain the relationship between parent companies and local subsidiaries. Such items as the ratio of Japanese expatriates, the delegation of power, and the status of local managers are the subjects that are included in this category. Generally speaking, parent-subsidiary relations are influenced by local

managerial environments and an advance strategy by the parent company. The Japanese parent company has strong intentions to keep intimate relations so that they can control subsidiary. They dispatch many Japanese into the plants in developed countries, because their established systems are different from Japan. Contrary to this, plant management will be possible through fewer Japanese expatriates in Taiwan, due to its environmental similarity with Japan. Almost the same expectation will be possible according to an advance strategy and the rate of share holdings. In the U.S.A. and the U.K., Japanese companies built large scale plants with state-of-the-art facilities by investing a large amount of money and Japanese managers took an initiative in management whether the entry form was sole entry or joint venture. On the other hand, in Taiwan, all local plants are joint ventures with local firms. So it is possible to presume that American and British plants will display the same high ratings, whereas Taiwanese plants will differ with only low ratings.

However, in reality, only American plants receive high rating points. British and Taiwanese plants receive low points. Namely, the rating points of this group are as follows: the U.S.A. is 3.5, the U.K. is 2.0, and Taiwan is 2.2. American plants show they are an application type, but British and Taiwanese plants are an adaptive type. Here again I can see characteristic feature of the British plants which are adaptable to the Japanese system in some depth, likewise of the work organization.

In the ratings by country, the U.S.A. scores over 3 points in each of the three items: the ratio of Japanese expatriates is 3.8, the delegation of power is 3.3, and the status of local managers is 3.3. Contrary to this, both British and Taiwanese plants score 1 point in the ratio of Japanese expatriates; the U.K. is 1.5 and Taiwan is 1.6. The two countries go up to 2 points in such items as the delegation of power and the status of local manager (see Table 4). It is possible to assume that the Japanese system is introduced on the initiative of Japanese managers. As a matter of fact, a standard practice of plant management is to dispatch many Japanese (see Table 1). Only plant AB thoroughly entrusts management to local managers. On the other hand, regarding the U.K., the points indicate that local managers had an initiative in the adoption of the Japanese system. This image is correct in the present situation. But I should consider another side. Two plants were operating when I visited the U.K. Of those, the parent company of the plant BB which produces passenger cars had a policy of localization of management. The brother plant in the U.S.A. has 0.3% Japanese expatriates, which is an extremely low rate; and the British plant has 1.1% Japanese expatriates, which is also a low rate. The other one plant operating in the U.K. is a joint venture and the parent company has no room to invest much there. Even when considering such a special situation, it is surprising to realize the localization of management is at such a high level in the U.K.

Also in Taiwan, the Japanese system is applicable through the initiative of local managers. As mentioned earlier, three out of the five plants leave management power to local partners in Taiwan. Japanese have the management power in the other two plants. In spite of this situation, the application rate is very high in Taiwan. So an application of the Japanese system is possible through a local partner's initiative in Taiwan. Local managers understand and master the Japa-

nese system very well. This is dependant on Taiwan's institutional similarity with Japan as well as local managers' ability to understand the Japanese system. Different from the general expectation based on local environments, only American plants have strong connections with the parent company regarding this group. Plants in the other two countries are inclined to be more independent and more autonomous.

V. Concluding Remarks

The main purpose of this paper was to explain the international transferability of the Japanese production system by focusing field research results on Japanese-affiliated auto plants in the U.S.A., the U.K. and Taiwan. The theoretical framework for the study was "Application-Adaptation Dilemma Model". The model helps study the applicability of the Japanese system with relation to local environments. We also created an internationalization model, which is made up of 23 items, to investigate the activities of Japanese multinational enterprises. In addition, we reclassified the 23 items into two different evaluation groups: "Six Groups Evaluation" and "Four Aspects Evaluation".

In conclusion, first, it is possible to transfer the Japanese production system into the three countries, which all have different managerial environments. International transferability is identified by the high rate of application points.

Second, there is a gap between an expectable application pattern and a real application pattern. It is normal that Taiwanese plants display a high rate of application because of the institutional similarity with Japan. Also it is normal that American plants have a different application pattern with Taiwanese plants, because the managerial environments are extremely different from each other. British plants, which have the same managerial environment with the U.S.A. originally, show flexibility in taking on the Japanese system and demonstrate the same application pattern as Taiwanese plants in some groups.

Third, according to the "Four Aspects Evaluation", almost the same application pattern is identified. The American plants apply both "methods" and "results" at the same rate. This means that a high rate of application in "methods" becomes possible if it accompanies the same rate of application of "results" in the U.S.A. Contrary to this, both British and Taiwanese plants show higher points in "methods" than "results". That is to say, "methods" which are difficult to bring into different environments are applied at a high level without a high rate of application of "results".

Therefore, according to the analysis, the Japanese system is transferable to the three different countries, and it is very interesting that the British application pattern shows a similarity to Taiwan. I should do research on the other two British auto plants at a later date.

References

Abernathy, William J., Kim B. Clark and Alan M. Kantrow. 1983. *Industrial*

Renaissance: Producing a Competitive Future for America. New York: Basic Books.

Abo, Tetsuo. 1990. "Overseas Production Activities of Nissan Motor Co.: The Five Large Plants Abroad". Euro-Asia Management Studies Association. Berlin. December 17-19.

Abo, Tetsuo *et al.* 1991. *Amerika ni Ikiru Nihonteki Seisan Shisutemu: Genchi Kojyo no 'Tekiyo' to 'Tekio'.* Tokyo: Toyo Keizai Shinposha (Abo *et al*, *Hybrid Factory*, New York: Oxford University Press, forthcoming in 1994).

Beynon, Huw. 1973. *Working for Ford.* London: Allen Lane.

Cusumano, Michael A. 1985. *The Japanese Automobile Industry.* Cambridge, MA: Harvard University Press.

Dohse, Knuth, Ulrich Jürgens and Thomas Malsch. 1985. "From 'Fordism' to 'Toyotism'? The Social Organization of the Labor Process in the Japanese Automobile Industry". *Politics & Society.* 14(2): 115-46.

Doner, Richard F. 1991. *Driving a Bargain: Automobile Industrialization and Japanese Firms in Southeast Asia.* California: University of California Press.

Dunnett, Peter J.S. 1980. *The Decline of the British Motor Industry.* London: Croom Helm.

Florida, Richard and Martin Kenney. 1991. "Transplant Organizations: The Transfer of Japanese Industrial Organization to the U.S.". *American Sociological Review.* 56 (June): 381-98.

Fucini, Joseph J. and Suzy Fucini. 1990. *Working for the Japanese: Inside Mazda's American Auto Plant.* New York: The Free Press.

Garrahan, Philip and Paul Stewart. 1992. *The Nissan Enigma: Flexibility at Work in a Local Economy.* London: Mansell.

Gilbert, Nigel, Robert Burrows and Anna Pollert eds. 1992. *Fordism and Flexibility: Divisions and Change.* London: Macmillan.

Gordon, Donald Duncan. 1988. *Japanese Management in America and Britain.* Vermont: Avebury.

Inagami, Takeshi. 1990. *Gendai Eikoku Rodo Jijyo.* (Labor Situations in Present Time U.K.). Tokyo: University of Tokyo Press.

Institute of Social Science, University of Tokyo. 1990. *Local Production of Japanese Automobile and Electronics Firms in the United States.* Research Reports No.23. Tokyo: University of Tokyo.

Iwade, Hiroshi. 1991. *Eikoku Romukanri.* (Human Resources Management in the U.K.). Tokyo: Yuhikaku.

James, Barrie G. 1989. *Trojan Horse: The Ultimate Japanese Challenge to Western Industry.* London: W.H. Allen and Company Ltd.

Jürgens, Ulrich. 1991. "Internationalization Strategies of Japanese and German Automobile Companies". Paper Presented at the Symposium on "Production Strategies and Industrial Relations in the Process of Internationalization". Tohoku University and the German Institute of Japanese Study. Sendai. October 14-16.

Katz, Harry C. 1987. *Shifting Gears: Changing Labor Relations in the U.S. Automobile Industry.* Cambridge, MA: The MIT Press.

Katz, Harry C. and Chales F. Sabel. 1985. "Industrial Relations and Industrial Adjustment in the Car Industry". *Industrial Relations.* 24(3) (Fall): 295-315.

Kenney, Martin and Richard Florida. 1993. *Beyond Mass Production: The Japanese System and Its Transfer to the U.S.* New York: Oxford University Press.

Kumon, Hiroshi. 1990. "Zaibei Nikkei Jidosha Kigyo no Sagyo Soshiki". ("Work Organization of Japanese-Affiliated Automobile Plants in the U.S.A."). *Society and Labour.* Hosei University. 37(1): 49-94.

——. 1992a. "Multinationalization of Toyota Motor Corporation". *Journal of International Economic Studies.* Hosei University. 6: 80-99.

——. 1992b. "Taiwan no Nikkei Jidosha Kojyo" ("Japanese-Affiliated Auto Plants in Taiwan"). *Society and Labour.* 39(2,3): 454-90.

——. 1993. "Japanese-Affiliated Auto Plants in the United Kingdom". *Journal of International Economic Studies.* Hosei University. 7: 67-88.

——. 1994. Japanese-Affiliated Automobile Plants in the United States and Taiwan. in *The Global Competitiveness of the Asian Firm.* ed. Hellmut Schütte. London: Macmillan. Forthcoming.

Laux, James. 1992. *The European Automobile Industry.* New York: Twayne Publishers.

Law, Christopher M. 1991. *Restructuring the Global Automobile Industry: National and Regional Impacts.* London: Routledge.

Lewchuk, Wayne. 1987. *American Techonology and the British Vehicle Industy.* Cambridge: Cambridge University Press.

Mair, Andrew. 1994. *Honda's Global Local Corporation.* N.Y.: St. Martin's Press.

Nissan Motor Manufacturing (U.K.) Limited. 1991. *Agreement on Terms and Conditions of Employment between Nissan Motor Manufacturing (UK) Ltd/Nissan European Techonology Centre Ltd and Amalgamated Engineering Union.*

Oliver, Nick and Barry Wilkinson. 1988. *The Japanization of British Industry.* Oxford: Blackwell.

Ono, Tai'ichi. 1988. *Toyota Production System: Beyond Large-Scale Production.* Cambridge, MS: Productivity Press.

Parker, Mike and Jane Slaughter. 1985. *Inside the Circle: A Union Guide to QWL.* Boston, MA: South End Press.

——. 1988. *Choosing Sides: Union and the Team Concept.* Boston, MA: South End Press.

Payne, Mark. 1991. *The Internationalization of the Japanese Automotive Industry.* London: Financial Times.

Quinn, Dennis Patrick Jr. 1988. *Restructuring the Automobile Industry: A Study of Firms and states in Modern Capitalism.* New York: Columbia University Press.

Sangyo Journal ed. 1989. *Nihon Jidosha Sangyo no Oshu Shinshutu Jittai Chosa.* (Research Report on Advancement of Japanese Auto Firms to Europe). Nagoya: IRC.

Sherman, Joe. 1993. *In the Rings of Saturn.* N.Y.: Oxford University Press.

Shimada, Haruo. 1988. *Hyuman-Wuea no Keizaigaku.* (Economics of Humanware).

Tokyo: Iwanami Shoten.

Shishido, Zen'ichi and Atsushi Kusano. 1988. *Kokusai Goben: Toyota-GM Jyo'into Bencya.* (International Joint Venture: Joint Venture between Toyota and GM). Tokyo: Yuhikaku.

Shook, Robert L. 1988. *Honda: An American Success Story.* New York: Prentice-Hall Press.

Suzuki, Naotsugu. 1991. *Amerika Shakai no nakano Nikkei Kigyo: Jidosha Sangyo no Genchi Keiei.* (Japanese-Affiliated Firms in the American Society: Local Plants Management of Automobile Industry). Tokyo: Toyo Keizai Shinposha.

Tolliday, Steven and Jonathan Zeitlin. 1987. *The Automobile Industry and Its Workers.* New York: St. Martin's Press.

Totsuka, Hideo *et al.* 1987. *Gendai Igirisu no Roshi Kankei: Jyo.* (Industrial Relations in Present Time U.K.: Book One). Tokyo: University of Tokyo Press.

Toyota Motor Corporation. 1988. *Toyota: A History of the First 50 Years.* Toyota: Toyota Motor Corporation.

Trevor, Malcolm. 1983. *Japan's Reluctant Multinationals.* London: Frances Pinter.

——. 1988. *Toshiba's New British Company: Competitiveness through Innovation in Industry.* Policy Studies Institute.

White, Michael and Molcolm Trevor. 1983. *Under Japanese Management: The Experience of British Workers.* London: Heinemann.

Wickens, Peter. 1987. *The Road to Nissan: Flexibility, Quality, Teamwork.* London: Macmillan.

Wilkinson, Barry, Jonathan Morris and Nick Oliver. 1989. "Japanizing the World: The Case of Toyota". Paper Presented to the APROS Conference on Organizations, Technologies and Cultures in Comparative Perspective. Australian National University, Canberra. December 13-15.

Williams, Karel, John Williams and Colin Haslam. 1987. *The Breakdown of Austin Rover: A Case-Study in the Faiture of Business Strategy and Industrial Policy.* Leamington: Berg Publishers Limited.

Willman, Paul. 1986. *Technological Change, Collective Bargaining and Industrial Efficiency.* Oxford, NY: Oxford University Press.

——. 1988. The Future of the Assembly Line in the U.K. Car Industry. in *Die Zunkunft der Arbeit in der Automobileindustrie.* eds. by Dankbaar, Ben, Ulrich Jürgens and Thomas Malsch. Berlin: Ed. Sigma.

Wood, Stephen. 1988. Some Ovservations on Industrial Relations in the British Car Industry 1985-87. in: Dankbaar, Ben *et al.* op. cit., pp.229-48.

——. ed. 1989. *The Transformation of Work?* London: Unwin Hyman.

Womack, James P., Daniel T. Jones and Daniel Roos. 1990. *The Machine that Changed the World.* London: Rowson Associates, Macmillan.

Yoshida, Nobuyoshi. 1990. *EC Jidosha Dai Senso.* (Car Wars in EC). Tokyo: Toyo Keizai Shinposha.