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The Japanese Automobile Supplier System Framework, Facts, and Reinterpretation

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Abstract

The paper proposes a systematic explanation as to how the Japanese automobile suppliers system generated international competitive advantages in the 1980s and thereafter. Based not only on the survey of existing literature, some of which were never introduced in English in the past, but also the author's original data and a conceptual framework for coherent interpretation of the phenomena, the paper argues that coexistence of three conditions, as a mutually complementary factors, enabled such a competitive advantage: *long-term relational transactions, bundled outsourcing,* and *dynamic small-number competition.* These three patterns of the inter-firm relations have been much discussed in existing literature as separate factors, but they were not regarded as a coherent total system. This paper proposes a hypothesis that the performance advantage of this system should be ascribed at least partly to the complementarity of the inter-firm routines.

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1 Introduction

The practices and capabilities of the Japanese automobile supplier system have been recognized as one of the main contributors to the competitiveness of the Japanese automobile sector (Womack et al., 1990, etc.). A number of researchers, both Western and Japanese, have done various empirical researches on its organizational routines (structures) and competitive performance (functions), as well as proposing some hypotheses and systematic interpretations on the relationships between the routines and performance. Practitioners of the western auto industries have paid much attention to some of the Japanese supplier management practices and attempted to introduce a significant part of them, whereas some policy makers, mainly American, criticized it (often referred to as "Keiretsu") as a transaction pattern that tends to hamper open competition. In any case, the Japanese supplier system was a hot topic for the industry, government and academics in the 1980s and thereafter.

And yet, as of the mid 1990s, there still remain many research questions to be answered in this field. There are conflicting interpretations as to why the system achieved a high competitive performance; There remain persistent misunderstandings even on some fairly basic facts. After all, the suppliers network is a multifaceted and multi-layer system involving at least thousands of companies, big and small, which are themselves evolving over time. It is a complex and elusive phenomenon.

The main purpose of this paper is to reinterpret the data and literature available as of the mid 1990s on the structures and functions of the Japanese

automobile supplier system, and thereby to propose a systematic explanation as to how the Japanese supplier system generated its international competitive advantages. While based much on existing literature, this paper also includes original data that the author collected, analyses by some Japanese researchers which were never presented in English, and a framework that integrates such literature and data into a coherent explanation[2]. Applying the framework to the data and evidence, my tentative conclusion is that the sources of the Japanese supplier system's competitiveness include three patterns that are complementary with each other: *long-term relational transactions, bundled outsourcing*, and *dynamic small-number competition*. These three patterns of the inter-firm relations have been much discussed in existing literature as separate factors, but they were not regarded as a coherent system of inter-firm routines that are mutually complementary. Thus, in this hypothesis generating paper, my main conclusion is that distinctive performance advantage of the system should be ascribed partly to the coexistence of the three complementary conditions mentioned above, not just one of them.

It should also be noted here that the "automobile parts supplier industry" in this paper refers to not only the first tier suppliers that has direct contractual relations with the automobile manufacturers (assemblers), but also other players in the entire supply chain, including the second tier supplies that provides parts to the first tier firms, the third tier suppliers, and so on. It is true, however, that most of the past academic researches have centered upon

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[2] For literature survey relating this topic (written in English), see, for example, Nishiguchi

the level of the first tier makers. Geographically, most of the studies surveyed here deals with the Japanese supplier system, but international comparison with the American and European systems is also discussed wherever necessary. In terms of the disciplines, the paper will refer to a wide range of academic areas, including business studies, economics, and sociology.

Before starting the analysis, let's briefly examine a set of stylized facts that the researchers in this field seem to have generally agreed as to the structure, function, and evolution of the Japanese automobile supplier system:

(1) The pattern of the Japanese automobile supplier system had been significantly different in structures and behaviors from the Western counterparts by the 1980s and the early 1990s.
(2) It is likely that a certain part of the supplier system's property contributed to the high competitiveness of the Japanese auto industry of this period.
(3) Such characteristics of the Japanese supplier system did not exist at the earlier stage of the industrial history but evolved mostly between the 1950s and 1970s.

I have already analyzed the point (3), the historical or evolutionary aspects of the Japanese supplier system previously (Fujimoto, 1994; 1995a), so in

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(1994), and Cusumano and Takeishi (1995).

this paper I will concentrate on the points (1) and (2) -- the structural and functional analysis[3].

Starting from these stylized facts, this paper will survey the existing literature, add the author's original data, and framework, and reinterpret this elusive phenomenon. Section 2 propose a three dimensional conceptual framework for the subsequent reinterpretation. Section 3 presents facts or evidences on structure and performance of the system. Section 4 reinterprets these facts based on the framework proposed in section 2. Section 5 generate conclusions out of these discussions.

2. Framework: Partition, Competition and Transaction

This section proposes a three-dimensional framework used for the subsequent reinterpretation of the empirical evidences. It consists of three aspects of supplier management, *partition*, *competition* and *transaction*, which are logically interconnected to each other.

The present framework of partition-competition-transaction is derived from the author's broader framework for analyzing total manufacturing system that includes production, product development and suppliers (Clark and Fujimoto, 1991; Fujimoto, 1989; Fujimoto, 1994). This overall view argues that the totality of a firm's manufacturing system (including production, product development and supplier sub-systems) can be fully understood only when it is

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[3] Note that, generally speaking, there are two complementary ways to explain why a particular system (structure) is observed as a stable entity: a genetic-historical explanation (i.e., the system

reinterpreted as a system that creates, stores and transmits value-carrying information--an intangible pattern that is ultimately embodied in its products and delivered to its customers. Quite simply, what a consumer consumes is not a car as a physical entity but a bundle of value-carrying information embodied in the car, and this information bundle is created jointly by the car-maker and the suppliers. In other words, What Penrose (1959) may call "productive resources," or what Nelson and Winter (1982) may call "organizational routines" in the manufacturing area can be reinterpreted as a system of value-carrying information.

The framework for this paper is an application of the above informational approach to the multi-firm situations. The auto makers and the suppliers are connected through various informational linkages, through which they exchange and jointly create value-carrying information to the customers. Information assets (i.e., productive resources) are distributed between the auto makers and suppliers; informational interfaces between the firms are defined, details of the inter-organizational routines are designed as a bundle of information flows between the firms.

The supplier management, defined broadly as a management of the informational assets and linkages between the firms, can be further analyzed at least in the following three dimensions[4]: partition, competition, and transaction.

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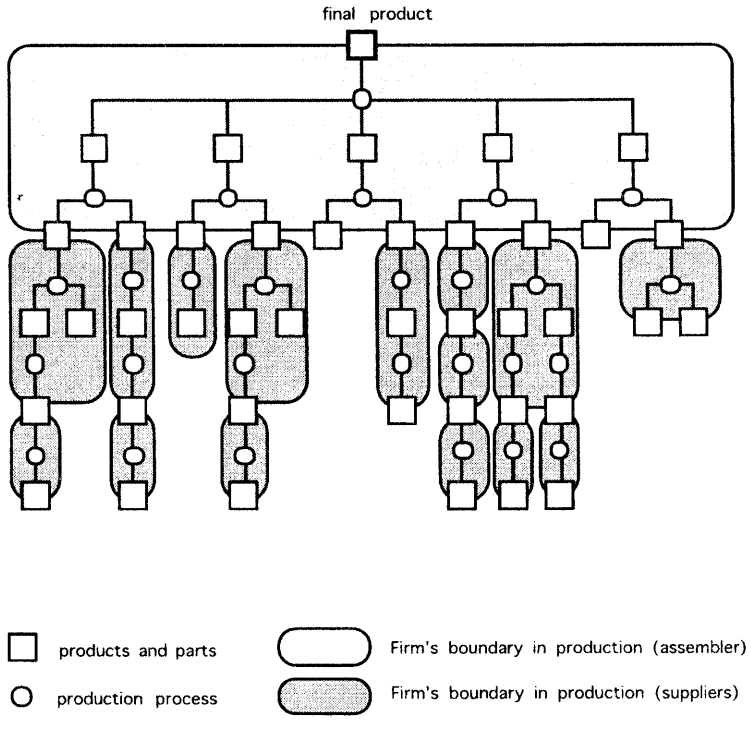
evolved into the current structure), and functional explanation (i.e., the system was functional enough to survive once the structure was established). The main focus of this paper is the latter.

[4] This framework may also be regarded as an extension of the classic differentiation-integration

(1) *Task partitioning between firms*: This means decisions on where do draw a line for make-or-buy decisions (i.e., vertical integration) in terms of both production and product development. In other words, a certain boundary pattern is defined on the network of productive resources and activities (i.e., information assets and processes in my framework), which are assigned to the firms accordingly. To the extent that an assembly product such as the automobile has a hierarchical architecture in which a product is decomposed into, sub-assembly modules, components, and down to the piece parts, the task partitioning results also in a hierarchical linkages of assembly firms, first-tier suppliers, second-tier firms, and so on, for a given product (**figure 1**).

Fig.1 Hierarchy of Product, Process, and Suppliers



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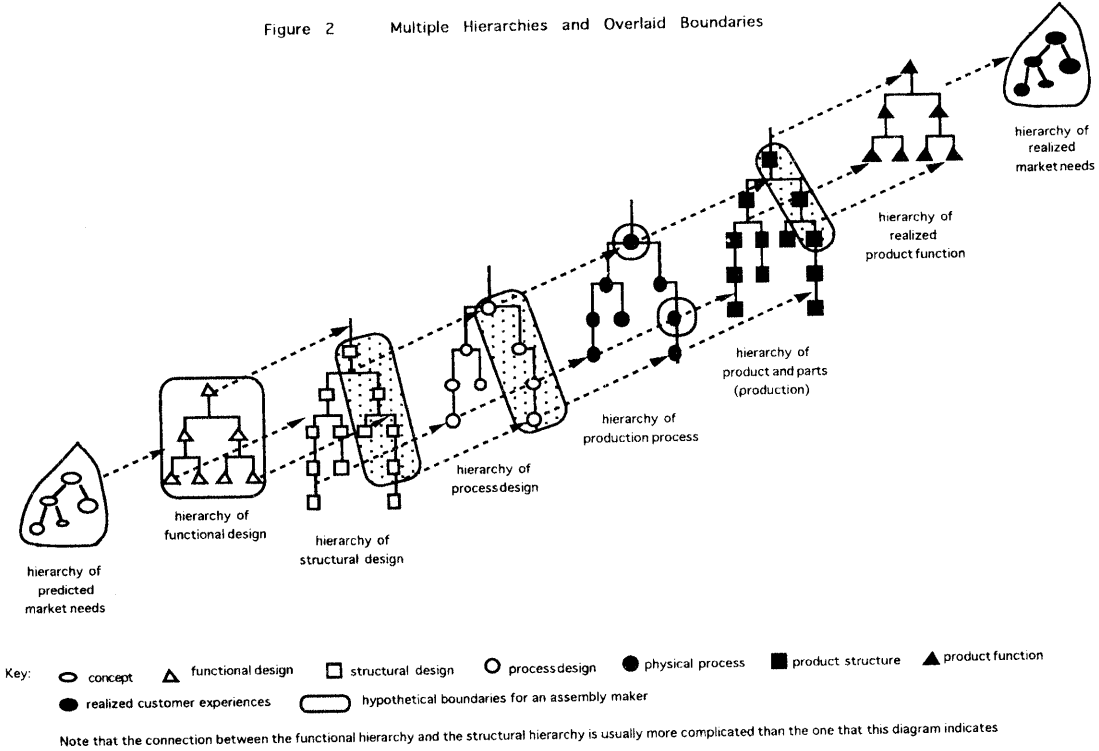
perspective (Lawrence and Lorsch, 1967) to the case of multiple firm situations.

As is clear in the figure, opportunities for inter-firm transactions take place where the boundary cuts across the hierarchy of productive resources. Because an assembly firm with a high vertical integration (high in-house ratio) would have a boundary that cuts the lower part of the productive resource hierarchy, it is natural to predict that the higher the in-house ratio the more suppliers to deal with, other things being equal. (This was one of the reason why a highly integrated firm such as GM had a much larger number of suppliers to deal with than Toyota, which had much lower in-house production ratio.)

Note that the inter-firm task partitioning (make-or-buy) decisions have to be made for multiple stages of the total manufacturing system including not only production activities but also production tools and equipment, process designs, detailed product designs, as well as basic product designs. In other words, the boundaries may be drawn differently for different development-production activities, which would result in an overlaid pattern of boundaries for a firm defined upon multiple hierarchies of productive resources **(Figure 2)**. For example, a given component may be detail-designed in-house but manufactured by outside suppliers (e.g., detail-controlled parts), or both may be conducted by the suppliers (e.g., black box parts).

Figure 2 Multiple Hierarchies and Overlaid Boundaries



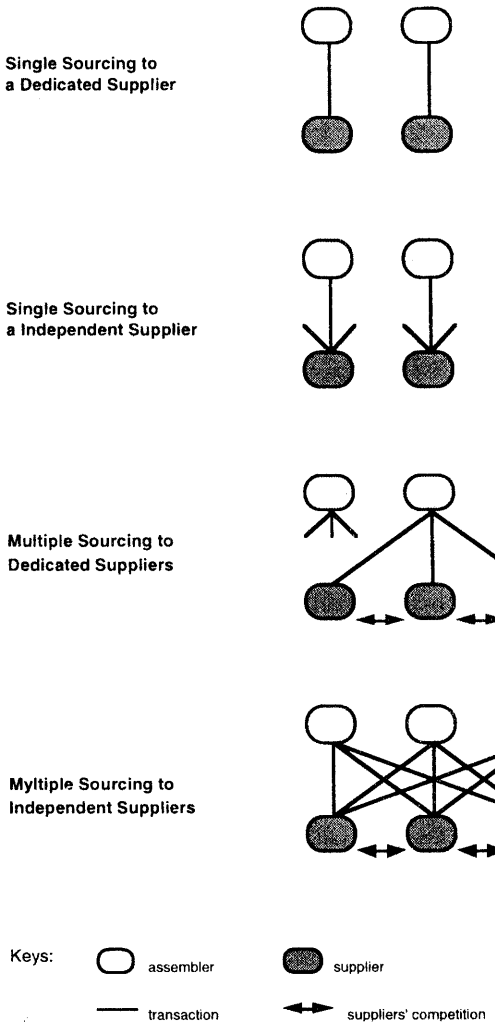
In any case, this decision on task partitioning influence division of contractual responsibility (e.g., responsibility for quantity and quality assurance), and eventually the patterns of distribution of manufacturing (i.e., production and product development) capabilities between assemblers and suppliers.

(2) *Competition between Suppliers* When a firm's overlaid boundary is defined on the multiple hierarchies of productive resources and activities, opportunities of inter-firm transactions occur where the boundary cuts the information asset network. Thus, the next question is how to choose potential, as well as actual, firms with which transactions are made for each component on the interface.

When a buying firm selects more than one suppliers for a single transaction opportunity (e.g., dual or multiple sourcing), or nominates more than one potential suppliers prior to the selection (e.g., bidding, development competition), it results in a competition between the suppliers. The buying firm may alternatively nominate or select only one supplier for each transaction opportunity. Such selection of competitive structure would affect behavioral patterns, organizational structures, capabilities and performance of both suppliers and assemblers.

Conversely, a supplier chooses a set of its transaction partners for each parts item. It may choose to be a dedicated supplier for a given component, or it may decide to be more independent by selling to multiple firms. The combination of the single-multiple suppliers and single-multiple buyers results in four basic cases shown in **Figure 3**.

Figure 3 Types of Transaction Network and Competition



(3) *Transactions between firms*: When the make-buy boundaries and transaction partners are decided on the network of productive resources and activities, details of each individual transaction have to be designed and implemented. As each transaction consists of a bundle of information flows defined upon the interface between the two firms, this means detailed design of information flows in terms of content, timing, media, and so on. For each transaction, the pair of the firms may choose between long-term and short term

contracts, frequent and infrequent contacts, early or late contacts, formal and face-to-face communications, and so on. Also, to the extent that there are multiple organizational units on the boundary that handle different aspects of the transactions, these boundary spanning units also need to be coordinated internally[5].

Thus, conceptually, a supplier system can be designed through these three steps, which are logically interconnected to each other.

3. Empirical Findings: The Japanese Supplier System of the 1980s

Having laid out the framework for the analysis, let's turn to the basic empirical findings. Although a significant amount to empirical studies have been conducted by both Japanese and Western researchers in the past decades, it is still important to review these empirical findings systematically, because Japan's automobile parts transaction system is a very complex and multifaceted subject, and because there still remain many misunderstandings even on basic empirical facts. Let us examine selected empirical evidences based on the existing literature including the author's original data[6]. Performance and routines of the system are examined in this order.

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[5] For the concept of boundary spanning units, see Thompson (1967), Aldrich and Herker (1977), and so on. The idea that differentiated environments need to be handled by differentiated organizational units which in turn needs strong internal integrator stems from Lawrence and Lorsch (1967).

[6] The discussion in this section is based on Fujimoto (1995b)

3.1 Performance of the Japanese Supplier System

Let's first discuss the performance side of the Japanese automobile supplier system. Since the system involves inter-firm relations, we need to examine overall efficiency and equity, as well as competitive performance.

(1) Efficiency of Resource Allocation (Monopoly Rent): The traditional industrial organization theory attempts to detect inefficiency in resource allocation by checking if there is a significant inter-firm differences in profit margins. Specifically, when the large assemblers enjoy significantly higher profit to sales ratio than the suppliers, the standard applied economics suspects that resource allocation is inefficient in the sense that the former is taking monopoly rent.

Crandall (1968), for example, reports that the average profit margin of the major U.S. auto makers between 1936 and 1961 was 24% and was far above that of the suppliers, 8%. In the case of the Japanese assemblers of the late 1980s (i.e., after the appreciation of yen in 1985), by contrast, the average operating profit to sales ratio was less than 5% and was lower than that of the major suppliers listing stocks. More generally, there have been intense domestic competition among about ten Japanese auto makers since the 1960s, which tended to lower the profit from the domestic market[7]. Overall, it is hard to demonstrate that

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[7]In the early 1980s, it is said that the majority of the operating profit of major Japanese auto makers originated from the US market due partly to their productivity advantages then, relatively low exchange rate, supply constraints partly by the Japanese voluntary export

the Japanese auto makers were enjoying a high monopoly rent and thereby seriously distorting the resource allocation.

(2) Distribution Inequity: This has been a focal point of the so called "dual structure" theorists for a long time. The most important indicator in this regard is the average wage difference between large firms and small firms. According to Nishiguchi (1994), average wage rate of small and medium manufacturing firms in general, with 10 to 99 employees, was about 60% of that of the large manufacturing firms (1000 employees or over) in the late 1950s, but the ratio went up to the level of about 80% in the early 1960s (roughly equivalent of that in the U.S.) partly reflecting labor shortage of the high growth era, and stayed around that level until the 1980s[8]. This result could be interpreted as significant improvements toward better distribution equity in the 1960s, or as lack of improvements since that time, depending upon the stance of researchers.

As discussed later, however, it should be noted that the average first-tier parts suppliers in Japan are large firms, and that the boundary between the large and small-medium firms usually exists between the first-tier and the second tier suppliers. This implies that the wage gap between the average assemblers and first tier suppliers is likely to be much smaller than the 20% level shown above[9]. Conversely, it should be noted that, even though we find no

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restriction to the US market, and the relatively high US retail price levels partly as a result of this.

[8] The specific data in the automobile industry is not available.

[9] For example, members of **Japan Auto Workers Union** (JAW) **[check !]** include not only all

significant wage gap between assemblers and first-tier suppliers, it does not guarantee the distribution equity throughout the entire supply chain that includes second-tier, third-tier and so on.

(3) Static Competitive Performance: The data on static performance of the suppliers tend to be limited to the first-tier suppliers. As for conformance quality, Cusumano and Takeishi (1991) reports that the Japanese sample firms studied significantly outperformed the U.S. counterparts. On inventory levels, Nishiguchi (1994) reports that the Japanese average was about one-fifth to one-tenth of the Western counterparts. Womack et al. (1990) summarized international comparisons for various aspects of suppliers' manufacturing performance and concluded that the Japanese supplier system tended to outperform the Western counterparts in the 1980s.

As for unit production cost, no systematic comparative studies are open to public, but some studies conducted inside the Japanese auto firms of that time indicated that most of the Japanese functional components were estimated to be significantly less expensive than the U.S. counterparts in the early 1980s (prior to the appreciation of yen in 1985 and the early 1990s)[10].

However, the Japan - U.S. difference of the industry-wide labor productivity in the late 1980s was smaller than that of assembly productivity of the same period, which makes us infer that the productivity of the Japanese

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assemblers but also many of the first-tier suppliers, but few second-tier suppliers. Thus, there seems to be a constant pressure toward wage levelization between the assemblers and first-tier firms.

[10] Even with freight costs taken into accounted, some Japanese auto firms were estimating that most of the functional parts, except very bulky parts, could be imported from Japan at lower price than those from the U.S. suppliers in the early 1980s.

suppliers at the second-tier, third-tier, and so on, may not have been significantly better than the Western counterparts. It would be natural from these circumstantial evidences to estimate that the source of the Japanese suppliers' cost competitiveness in the 1980s would shift from productivity to wage rate as we go upstream of the parts supply chain (except raw material makers).

(4) Dynamic Competitive Performance: As for the improvement ratio in unit costs and conformance quality, Cusumano and Takeishi (1991) reported that the Japanese first-tier suppliers studied significantly outperformed the U.S. counterparts. Their data on the target price achievement ratio also indicate that the Japanese suppliers tended to improve component designs throughout the process of product development unlike the U.S. counterparts[11]. In the area of component development lead time, development productivity, and die development lead time for components, also, Nishiguchi (1993, 1994) revealed significant advantages of the sample Japanese suppliers over the Western cases. Although it is likely that the U.S. and European catch-up had been accelerated by the mid 1990s, the existing literature generally indicated the dynamic performance advantages of the Japanese first-tier suppliers.

To sum up, as far as the average Japanese first-tier suppliers of the 1980s are concerned, serious problems could not be identified in terms of distortion of

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[11] Lieberman and Asaba (1996) also indicates that the pace of inventory reduction by the U.S. parts suppliers was much slower than that by the U.S. assembly makers.

resource allocation or wage inequity at the industry level[12]. By contrast, their contribution to the competitive advantage of the Japanese automobile industry in both static and dynamic sense was obvious in many indicators[13]. Based on this observation, let us shift out attention to the structural and behavioral aspects of the supplier system that may have affected competitive performance of the Japanese supplier system of the 1980s and 1990s.

3.2 The Structural and Behavioral Characteristics

Let's now move on to the organizational routines. Applying the framework proposed in section 2 here, we can reinterpret the findings on the supplier system into three categories: pattern of task partitioning, pattern of competition and transaction networking, and patterns of each individual contract. Twelve major points in the past empirical analyses are thus mapped into the three dimensions:

(i) Patterns of task partitioning:
- (1) High outsourcing ratio
- (2) Multi-layer hierarchy
- (3) Size difference between the layers
- (4) Suppliers' participation in product designs

(ii) Patterns of competition and transaction networking:
- (5) Diversification of customers (i.e., assemblers)
- (6) Consolidation of the supplier base
- (7) Development competition among suppliers

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[12] We should not forget, however, that the classic problems in resource allocation and income distribution may still exist in the more upstream part of the supply chain.

[13] Theoretically, this implies that the impact of relation-specific quasi-rent (Aoki, 1988) was more important than monopoly rent, and that X-inefficiency (Leibenstein, 1966) was more important than inefficiency in resource allocation in explaining the performance of the Japanese supplier system of the 1980s.

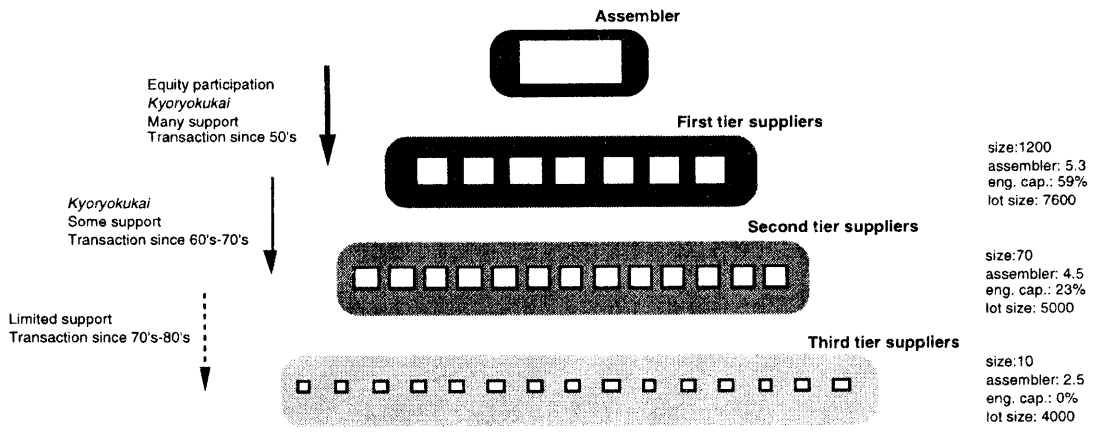
(iii) Patterns of individual contracts
(8) Long-term contractual relations
(9) Technical assistance and diffusion of production practices
(10) Intense coordination and Communication in operations
(11) Sharing benefits from cost reduction efforts
(12) Sharing risks due to production volume reduction

(1) High Outsourcing Ratio (Low Level of Vertical Integration) : It is known that the outsourcing ratio (% of parts and material costs in total manufacturing cost) of the Japanese auto makers has been over 70% since the 1970s, which was significantly higher than the U.S. average. The ratio tended to go up from the 1960s to the early 1970s, when the Japanese domestic market was at the motorization stage, or the period when private ownership of cars stared to increase rapidly (Nishiguchi, 1994). This coincides with the period when many first tier suppliers started to deliver sub-assembly components in stead of piece parts to the assemblers (called sub-assembly delivery or unit delivery), which was apparently a reason for the increase in the outsourcing ratio.

(2) Multi-layer Supplier Network: We can classify the automobile parts suppliers into first tier (selling parts mainly to assemblers), second tier(selling parts mainly to the first tier suppliers), and so on, based on who the main buyers of their parts are. Around each assembler, they tend to form a hierarchical structure, with a larger number of smaller firms at the lower levels. Although the real transaction network is far from a simple hierarchy, such a classification is possible according to the main stream of transactions. Fujimoto, Sei and Takeishi (1994), conducting a questionnaire survey in

Kanagawa prefecture, showed that the first, second and third-and-below suppliers tended to be very different from each other in size, technological capability, behavioral patterns, and so on (**table 1**). The study also indicated that the small suppliers at the third-and-below layers tended to be more independent and floating than their stereotype image as those contained at the bottom of the Keiretsu hierarchy (**figure 4**).

Figure 4 : Illustration of the Japanese Supplier System
(Summary of the Survey Results in Kanagawa, Japan)



Note: Size = # of employees.
Assembler = average number of the final assemblers which use the parts the supplier manufacturers.
Engineering capability = percentage of suppliers which did engineering of the major part.
Lot size = average production lot size per variation of the major part.
See the previous table for more detailed data and the definitions of attributes.
Although each supplier sells its parts to more than one automaker and/or upper supplier, here only one automaker is shown for simplicity.
Also, the number of suppliers does not reflect actual data.
Source: Cusumano and Takeishi (1995). Adapted from Fujimoto, Sei and Takeishi (1994).

It is known that the Japanese supplier system has been taller (i.e., more tiers) compared with the Western counterparts. Such a multi-layer structure was apparently built during the 1960s, as a result of selection of higher level suppliers by the buying companies: Many of those which were not selected

Table 1 Description of Suppliers by Tiers (Summary of the Survey Results in kanagawa, Japan)

Attributes		First tier	Second tier	Third tier
Employees	# of employees	Larger (1,200)	Middle (70)	Smaller (10)
	Average age of employees	Younger (39)	Middle (42)	Older (46)
	Production workers	Mainly fulltime male workers	Mainly fulltime male workers	Higher rate of family, female, part-time, foreign workers
Buyers	Buyers	Mainly assemblers and 1st tiers, but also 2nd and 3rd tiers	Mainly 1st and 2nd, but also assemblers and 3rd tiers	Mainly 2nd and 3rd, but also 1st tiers
	Final assemblers	Diversified	Diversified	Limited to local
	Average # of assemblers	More (5.3)	Middle (4.5)	Less (2.5)
Relations with the primary buyer	Starting year	Mainly 1950's (45%)	Mainly 60's (32%), then 70's (24%)	Mainly 70's (47%) and 80's (42%)
	Participating kyoryokukai	79% join	70% join	30% join 45% no kyoryolkukai
	Support from buyers	Equity share (41%), Directorship (33%), Equip. loan (25%) No support(38%)	Equip. loan (25%) Tech. support(19%) No support (54%)	Tech. support(11%) Equip. loan (11%) No support (79%)
Operations of the major part	Operations in charge	Subassembly, stamping machining, welding	Subassembly, stamping machining, welding	welding, machining
	Production lot size (thousand/month)	Larger (4500)	Middle(500)	Smaller (100)
	Variation of the part	More (595 types)	Middle (107 types)	Less (35 types)
	Lot size per variation	Larger (7600)	Middle(5000)	Smaller (4000)
	Engineering of the part	Own eng. (59%)	Own eng. (23%) Buyer's eng. (77%)	Buyer's eng. (100%)

Note: The sample size differs slightly across the cells, but in most cases 40 responses for the 1st tier suppliers; 60 for the 2nd; 20 for the 3rd; and 120 in total.
The numbers are either the sample means or % of the sample distribution within the group.
1st/2nd/3rd tier supplier: a supplier whose largest buyer is a vehicle assembler/1st tier supplier/2nd tier supplier
Buyers: The buyers who directly purchase the parts from the supplier.
Primary buyers: the buyer who accounts for the largest sales for the supplier.
Final assemblers: The final assembler which uses the parts the supplier manufactures.
Kyoryokukai: An association organized by the buyer to facilitate communication between the buyer and the participating suppliers.
The major part: the type of parts which accounts for the largest amount of sales for the supplier.
This is based on a questionnaire survey conducted in 1992 summer in the Kanagawa prefecture, which is the second largest prefecture for the automobile production in Japan.

Source: Fujimoto, Sei and Takeishi (1994)

Adopted from Cusumano and Takeishi (1995)

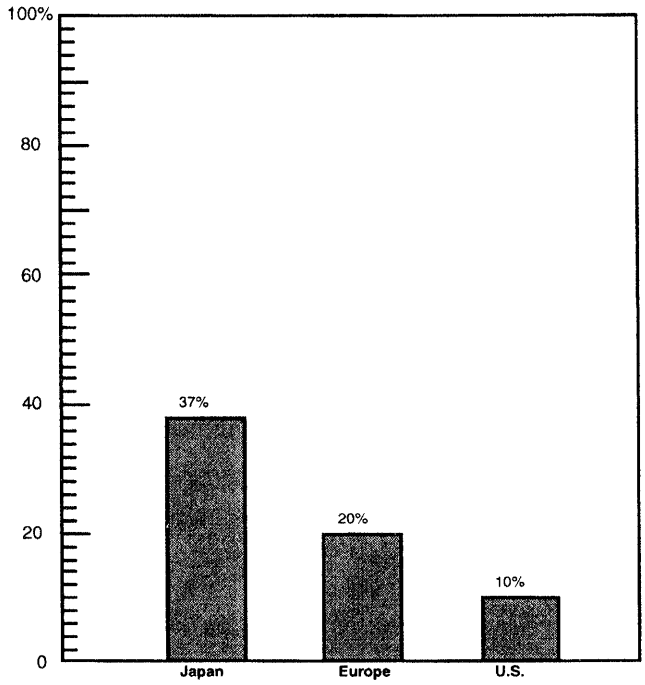
tended to survive as lower tier suppliers. In other words, the multi-layer structure was a result of historical evolution.

(3) Size Differences between the Layers: Today's automobile industry, unlike some others such as synthetic fiber textile industry, is the one in which downstream firms in the supply chain tend to be larger. As Fujimoto, Sei and Takeishi (1994) reports, the first-tier suppliers are on average smaller than assemblers, but most of them are large companies (the number of average employees exceeds 1000). A significant size gap exists between the first and second-tier suppliers, the latter being typically small size firms with 50 to 100 employees (the average is about 70). The third-tier and lower layer firms are normally quite small company run by a family with less than 10 employees.

(4) Suppliers' Participation in Design: As discussed already in the section of product development, the Japanese first-tier suppliers on average tended to participate more in automobile product development in the form of "black box parts" than the US counterparts in the 1980s. In other words, the Japanese automobile manufacturers on average had a higher outsourcing ratio (i.e., a lower in-house ratio) than the Western counterparts not only in manufacturing but also in product development. Clark and Fujimoto (1991), for example, estimated the product engineering in-house ratio to be roughly 40% in Japan, 20% in Europe and 10% in the U.S. based on their survey in the late 1980s (**figure 5**). In the U.S. case, by contrast, the vast majority of the parts procured from the suppliers were "detail-controlled parts," in which car makers

do not only basic design of the total vehicle but also detailed design of the components.

Figure 3 Supplier's Contribution to Product Development



Note: Supplier's contribution ratio was calculated as estimated fraction of supplier engineering in purchased parts multiplied by parts procurement ratio (i.e. fraction of procurement cost in total production cost). Based on the data of 29 projects studied.

Source: Clark and Fujimoto (1991)

There have been detailed studies of the black box parts practice (also called "design-in" or "approved drawing system"), in which basic design is conducted by the car makers while detailed engineering is done by the suppliers (Asanuma, 1984, 1989; Clark and Fujimoto, 1991, etc.). Fujimoto, Sei and Takeishi (1994) shows that this practice tended to be adopted only among the first-tier suppliers, although it is said to be gradually diffusing into second-tier firms in the 1990s. Asanuma (1989) reported that the black box practice was

observed in the Japanese automobile industry rather than the electronics, industry.

As discussed in more details in **Fujimoto (1995a)**, the black box system in Japan was also an outcome of historical evolution. The peak of its diffusion is estimated to have been the 1960s[14]. Thus, the 1960s, the era of rapid growth of domestic sales and production, as well as rapid product proliferation in the Japanese auto industry, appears to be the time when the boundary for assembler-supplier task partitioning shifted not only in production but also in product development toward more outsourcing to suppliers.

(5) Diversification of Customers-Assemblers: The prevalent image of multi-layer hierarchy in the Japanese supplier system tended cause a persistent misunderstanding among many researchers that it is a closed "pyramid" under each auto maker in which a supplier belong to only one hierarchy: an image of feudalistic hierarchy dominated by a big assembler. In reality, however, a first-tier supplier's customers-assemblers tend to be diversified in many component categories, although there are some other parts (e.g. fuel tanks, trim parts, seats) in which a supplier's sales tend to be dedicated to one assembler (**figure 6**)[15].

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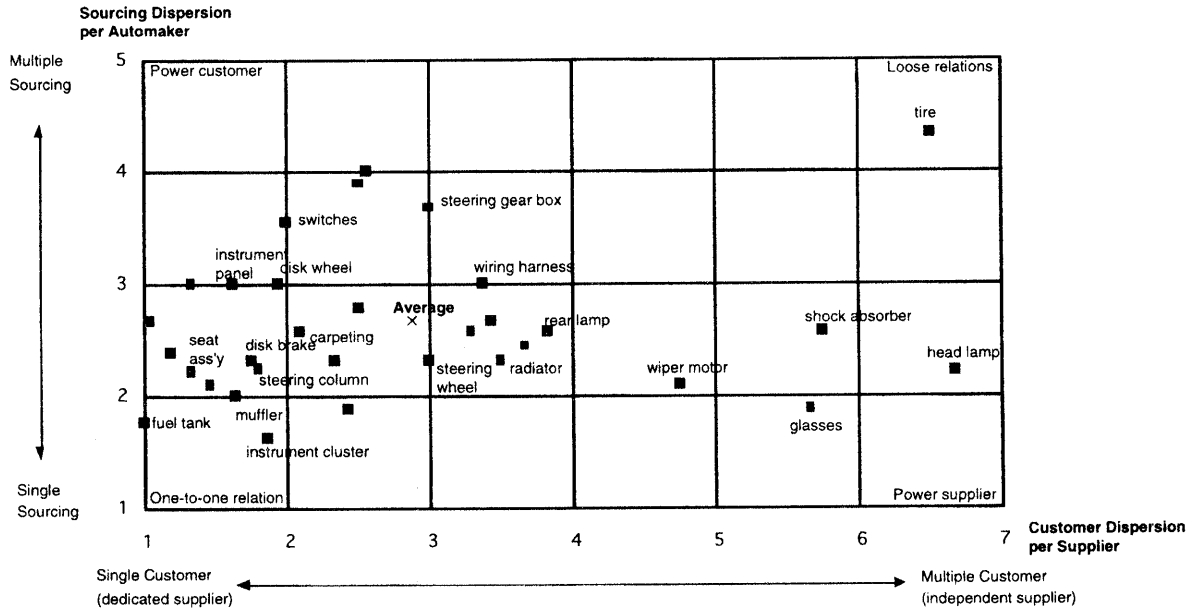
[14] Helper (1991) also indicates that the adoption of the detail-controlled parts system by the U.S. big three was also an outcome of historical evolution. She argues that many of major U.S. suppliers at the early stage of the industrial history had component development capability, but the technological capability started to concentrate in the car makers as they moved to oligopoly, vertical integration, and monopoly rent-seeking by excising negotiation power over parts suppliers.

[15] It should be noted that one assembler may still be a dominant customer in terms of sales share even if there are multiple customers.

Figure 6: Average Structure of Manufacturer-Supplier Transaction for Major Parts in Japan (1990)



Note: Sourcing dispersion = average # of suppliers / automaker
Customer dispersion = average # of customer (automakers) / supplier
Nine Japanese automakers are included. Two heavy duty truck manufacturers are excluded.
Source: Fujimoto and Takeishi (1994). Adopted from Cusumano and Takeishi (1995).

According to some existing literature (Kikuchi, 1976, etc.), there used to exist more dedicated parts transactions, but diversification of customers-assemblers made significant progress in the 1960s. Interestingly enough, such diversification was often promoted by the assemblers themselves, which apparently expected cost reduction effect due to scope economy that the additional customer would bring about (The potential disadvantage of reduced negotiation power and leak of proprietary information was apparently de-emphasized in the situation of rapid production growth)[16].

[16] Nobeoka (1995) indicated that the Japanese auto suppliers with diversified customer bases tended to outperform the others, which is consistent with this view.

As a result, the network of parts transaction tends to resemble not so much isolated mountains (Mt. Fuji) of dedicated suppliers, as a mountain range (the Alps), or overlapped and open hierarchies in most parts categories.

Examining in more detail, one would find that the first tier suppliers in the 1980s could be classified into several types, which were formed for historical reasons: (i) independent suppliers that deal with any assemblers; (ii) Toyota-group suppliers that deal with any assemblers but Nissan group assemblers; (iii) Nissan group suppliers that deal with any assemblers but Toyota group assemblers; (iv) Dedicated suppliers to one assembler; (v) Others[17]. Thus, it was only Toyota and Nissan, the first movers into the automobile mass production in Japan, which have had full scale supplier systems[18]. Other assemblers (Honda, Mitsubishi, Mazda, etc.) tended to rely on the independent, Toyota-group, or Nissan-group suppliers for functional parts, which is supplemented by a relatively small supplier network of dedicated local suppliers that make non-functional parts.

As a result, as **figure 7** shows, the overall transaction structures tend to be classified into at least three cases: (i) a network mainly by independent suppliers (e.g., lamps); (ii) a mix of Toyota-group, Nissan-group and others (e.g., starters, radiators); (iii) mainly by dedicated suppliers (e.g., seats). Thus, there is no one pattern of transaction network in today's Japanese supplier industry.

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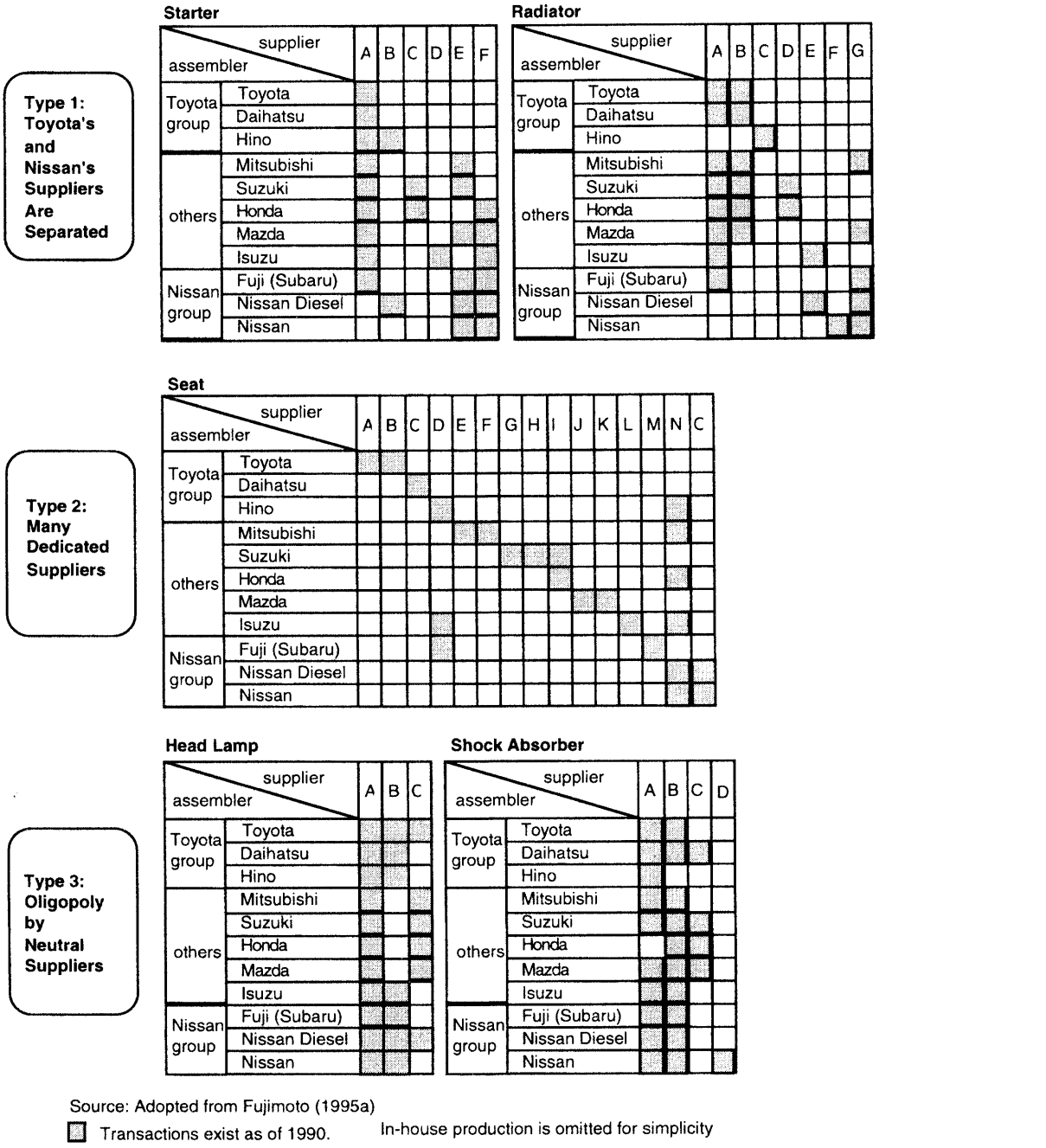
[17] There is a tendency that the barriers between the Toyota-group and Nissan-group suppliers have been slowly decreasing in the 1990s.

[18] There are, however, different types of suppliers within the category of Toyota-group or Nissan-group suppliers in terms of closeness of the connection to their assemblers (e.g., equity ownership, exchange of managers, degree of information sharing in product development, etc.). Se, for

Figure 7 Patterns of Assembler and Supplier Relationship (1990)



Source: Adopted from Fujimoto (1995a)

☐ Transactions exist as of 1990. In-house production is omitted for simplicity

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example, Sato (1988), Ueda (1989-91), Kamath and Liker (1994), etc.

(6) Consolidation of the Supplier Base: Conversely, past researches indicate that the Japanese automobile assemblers had smaller number of first-tier parts suppliers than the U.S. and European counterparts as of the 1980s. There are a few complementary reasons for this result.

First, to the extent that the Japanese assemblers' outsourcing ratio is higher by relying more on delivery of sub-assembled modules from the suppliers, it is natural for each assembler to deal with a smaller number of suppliers, other things being equal, because the make-or-buy boundary cut fewer points when it runs through the upper part of the hierarchy of productive resources (see **figure 1** again to check this logic).

Second, as Cusumano and Takeishi (1991) and others indicate, for each category of parts items (e.g., lamp, starter, seat, etc.), there were a relatively small number of suppliers per assembler (about 3 on average according to Fujimoto and Takeishi, 1994. See **figure 6** again) compared with the Western cases in the 1980s. Note here that, at the level of parts categories, it is not true that the Japanese assemblers usually rely on single supplier, which has been a rather common misunderstanding among the researchers and practitioners since the 1980s. In other words, for each category, suppliers tended to form an oligopolistic structure of competition, as opposed to monopolistic status in most, if not all, cases. The pattern varies depending upon the category of parts, though, as **figure 6** indicates.

Third, at the level of a specific parts number or a drawing number (e.g., a head lamp for North American version of Toyota Corolla 1991 model), the

Japanese assemblers do tend to rely on single souring. As shown in **figure 8**, only a minority of the Japanese suppliers responded that identical parts are made by multiple sources, according to the author's study. This sharply contrasted the multiple sourcing practice for a given component design that was commonly observed in the U.S. makers in the early 1980s. The fact that the detail engineering of the parts are conducted in many cases by the suppliers in Japan (i.e., black box parts practice) seems to be a natural source of their monopoly status for parts from that specific drawing. In any case, we should not confuse the concept of single sourcing at the category level and that at the specific parts number level. The Japanese assemblers of the 1980s relied mostly on single sourcing in the latter case, but <u>not</u> in the former case.

Fourth, since the most of the Japanese first tier suppliers had acquired technological capabilities as specialists in one or some parts categories, the firms tended to diversify its product items within their specialty or in related areas, using its technical resources and customer relations as sources of synergy and thereby exploit economy of scope. As a result, the number of the first-tier suppliers did not increase much in during the 1980s despite the higher complexity of the cars.

Overall, it should be noted that the structure of oligopolistic competition among a relatively small number of specialist sub-assembly suppliers in Japan that we observed in the 1980s was largely a product of historical evolution peaking in the 1960s (Kikuchi, 1976; Sei, Nakajima and Omori, 1975, 1976). Also, the basic pattern has not changed much as of the mid 1990s, although there

have been further consolidation of suppliers since the Japanese auto industry faced erosion of its competitiveness due to the appreciation of yen in the early 1990s.

(7) Development Competition among Suppliers: As already mentioned, the Japanese first-tier suppliers tended to compete against a relatively small number of long-term competitors by parts categories. What is, then, the common pattern of competition among them? Existing literature argues that the most frequent mode of competition among the Japanese first-tier suppliers has been so called "development competition" (kaihatsu konpe), in which each candidate supplier is evaluated and screened by the assembler before the detailed component design is determined[19].

In development competition, supplier selection is based on not only the price that the supplier offer but also its component development capability that is demonstrated by the detailed design proposal, its process improvement capability, and so on (Matsui, 1988; Fujimoto, 1995a, etc.) . In other words, the supplier is selected for each case according to various aspects of its long-term dynamic capabilities. Toyota's supplier guide, for example, explains one of its basic policies of purchasing as follows, and further explain the system that is consistent with this statement:

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[19] As for development competition, the Supplier's Guide published by Toyota explains as follows: "We ordinarily work with prototype suppliers on the assumption that they will become mass production suppliers unless they fail to complete development work on schedule. But we sometimes choose a larger number of prototype suppliers than we need for mass production and cull their numbers to one or two on the basis of performance in development work." (Toyota Motor Corporation, 1996, Supplier's Guide, p.45.)

We evaluate the overall strength of prospective suppliers, including their quality, cost, technological capabilities, and reliability in delivering the required quantities on time. In addition, we evaluate their potential strength, as evidenced in such ways as their amenability to continuous, improvements[20].

This sharply contrasts with the case of the U.S. auto makers up to the mid 1980s, for which a dominant mode of supplier competition was bidding, in which the price that the supplier offers based on a drawing given by the assembler is the dominant criterion for supplier selection.

According to the author's questionnaire survey of the Japanese first-tier suppliers, about 50% of the respondents (N=201) said suppliers were selected by development competition in the case of new model development; the correspondent number in the case of major model changes was about 40% (**Figure 8**). Significant fraction of respondents (particularly in the latter case) said that one suppler was chosen from the beginning, but potential competitors are likely to have existed even in this case. In any case, only a minority (less than 20%) responded that the main mode of competition was bidding (i.e., price competition).

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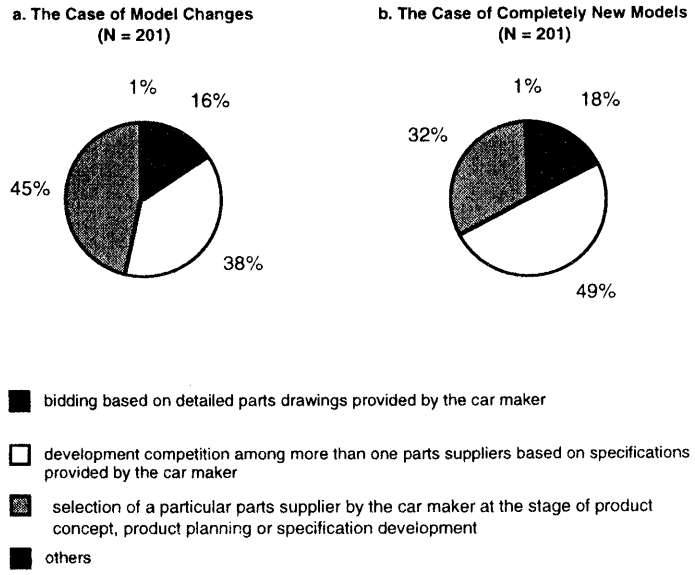
[20]Toyota Motor Corporation (1996). Supplier's Guide. p. 6.

Figure 8 Types of Competition among Japanese Parts Suppliers



Source: A Questionnaire survey by the author in 1993. Almost all of the respondents are first-tier suppliers belonging to Japan Auto Parts Industries Association. Adopted from Fujimoto (1995a).

The same study also indicates that there is a correlation between adoption of development competition as a major competition mode and a option of black box parts practice as a mode of task partition (**table 2**). In other words, there may be a strategic complementarity between the two system properties. In any case, it is important to note that bidding (price competition) is not the only mode of supplier competition.

Table 2 Design Involvement and Supplier Competition

(1) Model Renewal (N=201)

Design / Competition	Detail-Control	Black Box	Supplier Proprietary
Bidding	(45%)	9%	8%
Development Competition	5%	(49%)	33%
No Competition	48%	48%	42%
Others	10%	5%	25%
Total	* (100%)	* (100%)	* (100%)

Note: * The numbers do not add up to 100% as multiple responses are possible.

(2) New Model (N=201)

Design / Competition	Detail-Control	Black Box	Supplier Proprietary
Bidding	(53%)	11%	0%
Development Competition	7%	(64%)	50%
No Competition	38%	31%	33%
Others	10%	6%	25%
Total	* (100%)	* (100%)	* (100%)

Note: * The numbers do not add up to 100% as multiple responses are possible.
Source: Fujimoto (1995a).

(8) Long-term Contractual Relations: Existing empirical studies (Asanuma, 1984; Cusumano and Takeishi, 1991, etc.) have shown that contracts between the Japanese assemblers and the first-tier suppliers tend to last as long as production of the components in question continue (usually until the next model change, or about four years). It has been often said that this kind of long-term contractual relations in Japan contrasted against shorter contract periods in the U.S. supplier relations, but Cusumano and Takeishi (1991) indicate that

the contracts in the U.S. case tended to be renewed, so that actual period of transaction for a specific component did not differ much between the two countries, although the average contractual period was indeed shorter in the U.S. supplier system.

In any case, the Japanese first-tier suppliers enjoyed a long-term (typically about four years) supply contracts for a given transaction in the 1980s, and this tendency has not changed much since then. Although there are possibilities of competition for a new contract against other suppliers when model changes happen, the relationship (i.e., a bundle of the contracts) with the assembler tended to last beyond the term of each individual contract. In other words, as for a given category (e.g., lamp), the membership of competing suppliers for each assembler tended to be fairly stable for a long time, except some cases of technologically new or rapidly changing components.

(9) Technical Assistance and Diffusion of Practices: Japanese auto makers are generally known for providing both detailed technical assistance and multifaceted evaluation for the first tier suppliers. According to Wada (1991), for example, an elaborate system of evaluation and assistance did not exist at the early stage of the industry's history, but evolved gradually after the 1950s. In the case of Toyota, the evaluation and technical assistance of the second tier suppliers tended to be delegated to first-tier suppliers.

Also, Toyota significantly strengthened its organizational capability of supplier assistance for total quality control and just-in-time since the late 1960s: Typical events include the establishment of Purchasing Administration

Department (kobai kanri bu) in 1965 mainly for diffusion of TQC to suppliers, and that of Operations Management Consulting Office (seisan chosa shitsu) in 1970 for diffusion of JIT.

In the area of product development, also, Fujimoto (1995a) reports a case of Toyota and one of its suppliers in which the former assists the latter for over twenty years to gradually build the supplier's component development capabilities. In both production and product development, the suppliers tended to be both assisted and evaluated in terms of multiple dimensions of long-term capabilities.

(10) Close Coordination and Communication: The Japanese auto makers are also known for dense and face-to-face communications with suppliers both at the stages of product development and commercial production. For example, Dyer, in his study in the early 1990s, showed that Major Japanese auto makers (Toyota and Nissan) tended to spend more person-days per sales than the U.S. auto makers, with Toyota leading the others within the sample (Dyer, 1994, 1996)[21].

As already discussed, the production system of the post war Japanese automobile makers (Toyota in particular) was built around JIT and TQC, which required cross-functional coordination and information sharing for simultaneous increase of productivity, conformance quality, delivery speed and flexibility.

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[21] See, also, Bensaou (1992) for the impact of supplier coordination patterns on performance. For, communication in relation to supplier involvement in product development, see Clark and Fujimoto (1991), Kamath and Liker (1994), and Fujimoto (1995).

Full scale diffusion of such systems from Toyota to the first-tier suppliers appears to have started from the late 1960s and more or less completed in the late 1970s, or after the first oil crisis. This meant the establishment of the tight operational ties between the assembler and the suppliers, including Kanban delivery (just-in-time delivery based on pull principle using returnable containers), and elimination of receiving inspection for incoming parts (extension of the "doing things right the first time" (tsukurikomi) principle to supplier relations).

(11) Sharing the Benefits from Improvements: The main Japanese assemblers in the 1980s are generally known for sharing the benefit of component cost reduction activities (value analyses, value engineering, etc.) with the suppliers by maintaining unit component price for a certain period after the cost reduction is achieved, which gives the suppliers incentives to participate in such improvement activities (Asanuma, 1984). As Asanuma himself indicates, however, there appears some cases in which the benefit of value engineering (design improvements that aim at cost reduction for given functions) at the stage of product development are pre-empted by the auto makers. Cusumano and Takeishi (1991), for example, report that the Japanese auto firms studied were enjoying actual unit component price that is on average 2% lower than the target component price specified at the product development stage, which indicates the possibility of such preemption of benefits at least to a certain extent.

Overall, there appears to have been no rigid rules in terms of percentage of such quasi-rent to be given to the suppliers, although "fifty-fifty" is often referred to by the auto makers as a rule of thumb. As of the mid 1990s, some practitioners in the industry are still arguing that the rule of splitting the benefits from value analysis and value engineering should be clarified.

Notwithstanding the lack of clarity in the rules, the principle of the benefit sharing seems to be prevalent at least at the level of the first-tier firms, which is obviously a key for the joint cost reduction efforts between assemblers and suppliers.

(12) Sharing Risks of Production Fluctuation: There have been some debates on whether the assemblers share risks of production decrease with the suppliers. There have been a persistent hypothesis that the large assemblers use the suppliers as a cushion to absorb the impact of production volume reduction by switching previously outsourced parts to in-house production (i.e., expanding the make-or-buy boundary outward) and keep the former's employment at the sacrifice of the latter.

Although there have been anecdotes supporting this supplier-as-buffer hypothesis, recent empirical studies tend not to support it. Asanuma and Kikutani (1992), for example, conclude from their statistical analysis that there is no evidence supporting the buffer hypothesis, and that it is rather consistent with a case in which the assemblers do absorb the volume risks of the suppliers. Asanuma (1984) also report that there is a certain rule for the assemblers to compensate the for loss of stamping die cost that incurs the suppliers when

production volume throughout the model life fall short of the plan, and thereby absorb the volume risk for the suppliers (Note that the die making cost is incorporated into the parts cost by using planned cumulative production volume for the product life. Shiomi (1994) reports that production volume of main auto makers and that of consigned assemblers (i.e., the suppliers of the whole vehicle) decreased almost at the same rate during the first oil crisis, contrary to the buffer hypothesis. Nishiguchi (1994) also argues that the Japanese auto makers are nurturing and utilizing suppliers' flexible capabilities, rather than using them simply as flexible buffers.

Overall, recent literature tends to support the hypothesis that the Japanese assembly makers are sharing not only benefits from cost reduction but also risks of volume fluctuation with the suppliers. No decisive conclusion can be made at this point, though. Also, there has been no systematic research on whether such risk sharing is happening between the first-tier and the second-tier firms.

4. Theoretical Reinterpretations

Having reviewed the main findings to date on the Japanese auto supplier system, let's reinterpret them based on the framework proposed in section 2. We have already discussed that there are three dimensions by which we can analyze the supplier systems: patterns of individual transactions, patterns of inter-firm task partitioning (boundary setting), patterns of competitions among

the firms. As we will discuss next, the patterns of the Japanese parts supplier system of the 1980s in these three dimensions seem to be complementary with each other in jointly contributing to its competitive advantages[22]. The three corresponding aspects may be summarized as follows: (i) long-term relational transactions, (ii) bundled outsourcing, and (iii) dynamic competition of capability building among small number of suppliers. Let us examine these three aspects now.

4.1 Long-term Relational Transactions

As already discussed, many existing researches recognized the stable and long-term contractual relationship between buyers and sellers as one of the main characteristics of the Japanese supplier system, and analyzed how it contributes to competitive advantage of the end products, as well as why such a pattern persists for a long time. The concept of "relational transaction" has been often used by economists for describing this type of phenomenon[23].

Explaining the Stability: The first question is why long-term relational transactions continues in a stable manner. There are two streams of explanations. The first hypothesis, mostly economists, assumes that people are selfish and opportunistic, and try to explain why the firms still do not terminate the transaction. Generally speaking, such explanations argue that e

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[22] Keep in mind that, as far as the supplier system is concerned, both region-specificity and firm-specificity appear to coexist. Many of the capabilities of the Japanese supplier management tend to be shared among a group of auto makers, to the extent that the Japanese supplier system itself is shared to a large extent among them, although significant firm-specificity (e.g., unique feature and strength of Toyota's purchasing management) is also observed.

[23] For general discussions, see Williamson (1979), Monteverde and Teece (1982), Dore (1987),

relational transaction is stable when both parties know that the costs (both actual cost and opportunity cost) incurred from terminating the transaction is high enough (Miwa, 1989)[24]. Such costs of transaction termination would include retaliation from the other firm, deterioration of their reputation to other transaction partners, lost growth opportunity, lost opportunity of joint cost reduction (i.e., relational quasi rent), and loss of the value of transaction-specific assets (Williamson, 1979, 1985). The last hypothesis has been the most prevalent one (Asanuma, 1989; Ito, 1989; Nishiguchi, 1994, etc.). That is, by mutually holding the transaction-specific assets, whose value will be lost when transaction is terminated, the two parties find themselves in the situation of mutually holding hostages. The relation stabilizes as a result.

The asset specificity hypothesis, however, does not itself explain why the firms made transaction-specific investments in the first place, as Nishiguchi (1994) criticizes, although it can explain why it is stable once the relation is established by an elaborate logic.

Another stream of explanations (Dore, 1987; Sako, 1992) assume that the inter-firm relationships are "embedded" (Granovetter, 1985) into the social structures, and argue that there tend to be certain country-specific cultures that nurture mutual trust, reduce opportunism and thereby save transaction cost, which in turn makes relational transactions feasible than in other cultures. Although we should carefully avoid tautology (e.g., "relational-transaction-oriented cultures result in relational transactions"), this stream of hypotheses

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Macneil (1985), Imai, Itami and Koike (1985), and so on.

may partly explain why long-term relations were more often observed in japan than in the West in the 1980s.

However, the cultural theory has an inherent difficulty in explaining dynamic changes of the supplier systems on an international scale, which have been actually observed since the late 1980s (Nishigichi, 1994). As the present book argues, we need to introduce historical or evolutionary point of view that might supplement the above theories on comparative supplier systems[25]. We will explore this direction later in this book.

Contribution to Competitiveness: Generally speaking, literature in economics sometimes argues that asset specificity brings about relational quasi-rent or value added (Dyer, 1996, etc.). The prevalent logic on its competitive contribution seems to go as follows: Stable relationship would facilitate information sharing between the firms (Ito, 1989) and thereby promote "inter-firm problem solving mechanisms" (Nishiguchi, 1994), which may in turn result in incremental improvements of productivity and quality (Miwa, 1989). The benefits of manufacturing cost reduction due to the long-term contractual relationships is often called relational quasi-rent (Aoki, 1988; Asanuma, 1989). Sako (1992) argues that the long-term relations (the obligational contractual relations in her framework) facilitates not only reductions of product cost (i.e. relational quasi-rent) but also reduction of transaction cost in Williamson's term. Dyer (1995), by collecting data from major U.S. and Japanese auto makers

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[24] See, also, Miwa (1994)

[25] Nishiguchi's book on Japanese supplier system takes a similar stance in that it emphasizes the historical evolution of the system (Nishiguchi, 1994).

and suppliers, examined their asset specificity in three dimensions that Williamson (1979) proposed, and found that the Japanese makers tended to show higher asset specificity, and that tended to be positively correlated with performance.

Thus, there seems to be a general consensus that long-term relational transactions facilitate inter-firm information sharing and thereby contribute to dynamic improvement of competitive performance (acquisition of relational quasi-rent).

However, it should be noted that the same system may also bring about negative competitive effects when suppliers take advantage of the assemblers' commitment to the relations, exercise sellers' monopoly power, and thereby raise component prices. Helper and Levine (1992) clearly points out this trade-off. They compare two purchasing policies, the "exit " strategy (low commitment and low information sharing between assemblers and suppliers) and the "voice" strategy (high commitment and high information sharing), and conclude that the former strategy (typical in the U.S. auto firms up to the 1970s) brings about short term benefits as buyers can exercise negotiation power vis-à-vis suppliers but may sacrifice long-term benefit of cost reduction, while the latter strategy (common in the post-war Japanese auto industry) may gain long-term benefits but may face short-term disadvantages as they are more vulnerable to suppliers' monopoly rent seeking.

However, what we observed in the 1980s was that the Japanese automobile makers did not suffer from suppliers' price increase; actually we

were seeing continuous reduction in parts price (Cusumano and Takeishi). Thus, we have to explain why monopoly rent seeking by the suppliers did not occur (discussed alter).

To sum up, while such economic concepts as asset specificity, relational quasi-rent and relational transactions are powerful tools for explaining the advantages of the Japanese supplier systems of the 1980s, they alone do not seem to fully explain the phenomena. We have to look at other aspects of the system.

4.2 Bundled Outsourcing

As already mentioned in the previous section, one of the important characteristics of the Japanese supplier system in terms of inter-firm task partitioning is that outsourcing ratio is high not only in manufacturing but also product development, and that the same company tends to get the two jobs at the same time. Note that, with the same outsourcing ratio, a firm can assign the product development jobs and production jobs of a given component to one company (e.g., a technologically capable suppliers) or to two or more separate companies (e.g., a production subcontractor, a prototype parts specialist, and an engineering house). The former pattern may be called *bundled outsourcing*, in that a bundle of functionally related tasks are subcontracted out to one company as a package.

The Japanese auto firms of the 1980s tended to choose bundled outsourcing. For example, they tended to outsource machining and assembly

(i.e., sub-assembly delivery), detailed engineering and manufacturing (i.e., black box parts), or production and inspection (i.e., elimination of receiving inspection) of a given component to one supplier. The suppliers, on the other hand, can build a certain integrative capability in the long run by repeatedly conducting the bundles of related tasks, which may enable them to reduce cost or improve quality. Thus, bundled outsourcing may result in higher component performance at least potentially. Nishiguchi (1994), for example, pointed out that establishment of system suppliers (i.e., suppliers with the integrative capability) in Japan contributed to their competitive performance. Clark and Fujimoto (1991) also reported that black box parts system tended to contribute to higher product development performance. It is also generally known that the black box parts system facilitates design for manufacturing (i.e., designing easy-to-make components) and thereby reduce component manufacturing cost.

It should be noted, here, that bundled outsourcing tends to create transaction-specific assets. Nishiguchi (1994) argues that the Japanese system suppliers accumulate transaction specific assets and thereby facilitate stable relational transactions mentioned earlier. Asanuma (1989) also analyzes that transaction-specific skills in product development and production are accumulated most in the case of black box parts transactions. Generally speaking, when a product is made by assembling relatively generic parts in a product-specific way, it would be reasonable to predict that the purchased component will become more product-specific as it becomes a leaguer

subassembly module (e.g., seat complete). To sum up, relational transactions and bundled outsourcing, the two main properties of the Japanese supplier system we have discussed so far, may be correlated with each other to the extent that bundles outsourcing results in asset specificity, which in turn facilitates long-term relational transactions.

To sum up, bundled outsourcing is likely to bring about opportunities for cost reduction and quality improvements, at least potentially[26]. The remaining question, however, is whether the system suppliers take advantage of their integrative capabilities and seek for monopoly rents vis-à-vis assemblers, which may wipe out potential competitive advantage for the latter. We have to explain why this did not happen, and why the bundled outsourcing actually tended to contributed to competitive advantages of the Japanese auto industry.

4.3 Capability-Building Competition among a Small Number of Firms

Let us move to the third dimension. It was already discussed that, at the level of parts categories, there are more than one, though not so many, suppliers competing with each other for getting contracts. We also saw that the competition among these small number of suppliers tends to be so called "development competition", particularly in the case of black box parts.

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[26] Note, however, that outsourcing of the capacity of information processing (i.e., production and product development) does not necessarily mean that knowledge on the outsouced activities has to be also abandoned. As Fine and Whitney (1996) clearly point out, "dependency for capacity" and "dependency for knowledge" should be distinguished. Auto-firms may go for bundled outsourcing in terms of capacity and still maintain a high level of knowledge on the suppliers' activities, because the car-makers have to evaluate suppliers' capabilities accurately.

What are the impacts of such competition on the performance of the supplier system? A standard economic theory, based on the assumption of price-based competition, would argue that this is an oligopolistic situation, which will result in monopoly rents on the side of suppliers (i.e. a relatively high parts price). There are counter-arguments, however. Ito (1989) for example, describes the supplier competition in Japan as "face-to-face competition," and argue that competition in this condition may become more intense than usual price competition, even though the number of competitors is small[27]. Itami (1988) propose a similar concept, "competition by visible hands," and also argues that such competition can be more intense than classic perfect competition under certain conditions, and that it will also facilitate dynamic improvements of technologies through information sharing between suppliers and assemblers (i.e., relational quasi-rent)[28].

Thus, these researches argue that the competition among small number of suppliers, under certain conditions, can result in intense competition, rather than their monopoly rent seeking, in terms of not only pricing but also long

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[27] Ito's "face to face competition" assumes that long-term relational transactions and rank order tournament exist, that competitors can observe rivals actions, that Hirschman's voice relations (customers complains to suppliers but do not quit from the transaction unilaterally) prevail, and that criteria for competition is multifaceted including not only price but also suppliers' long term capabilities for improving quality and technologies.

[28] Itami's "competition by visible hands assumes that there are a small number of firms which are visible from each other, that entry and exit are not totally free due to Keiretsu relations, that Hirschman's voice relations prevail, that both party recognize the existence of relational quasi-rent (improvements of productivity and technology by working together), that non-price information is shared between the buyers and the sellers, and that buyers control the transaction in multiple dimensions. Thus, the characteristics of this concept are in many senses similar to those of Ito's.

intra-firm network of information assets, which turned out to be effective to better competitive performance of the auto makers.

5. Conclusion

We have tried to interpret the basic nature of the Japanese supplier systems of the 1980s. Based on the framework proposed in the previous chapter, we have focused on three aspects: long-term relational transactions between suppliers and assemblers, bundled outsourcing, and dynamic and multifaceted competition between small number of suppliers. As already indicated, the current discussion seems to suggest the following three points.

(i) None of the three system property seems to explain the performance of the Japanese supplier system of the 1980s by itself.

(ii) The three elements are obviously logically inter-connected. They are likely to be complementary assets.

(iii) The three system properties, together seem to explain the competitive performance of the Japanese supplier system reasonably realistically, based on the following interrelated logic:

- Bundled outsourcing by assemblers to system suppliers create potential opportunities for better performance through integrative capabilities of the suppliers;

- Bundled outsourcing also increases asset specificity of the transactions;

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[30] See, for example, Nishiguchi (1989, 1993), Cusumano and Takeishi (1991), and Fujimoto (1995a).

- Asset specificity, as well as other cost of transaction termination, make long-term relational transactions reasonably stable;

- Long-term relational transactions creates opportunities for improvements in competitive performance through information sharing, mutual trust, etc.;

- The intense, dynamic and multifaceted competition of capability-building among a small number of system suppliers, seeking for long-term contracts, prevent the suppliers' monopoly rent seeking reasonably effectively, and thereby realize the potential benefits of bundled outsourcing and long-tern relational transactions.

Of course, the above interpretation is only one of many alternative hypotheses for explaining the performance of the supplier system. Further researches are needed on conceptual, empirical, and historical fronts. On the theoretical side, for example, the complementarity of the three conditions would have to be analyzed in more formal and rigorous ways. Empirically, we also have to continue systematic data collection and analyses for better understanding of this system. For example, various field studies indicate that patterns of transaction, competitions, and task partitioning tend to be significantly different between different types of parts, as well as different layers of the suppliers' hierarchy. Thus. we need to continue systematic data collection for further comparative analysis between countries, regions, time, parts types, layers, and so on, for enhancing our fidelity of the empirical researches.

Besides, we need further historical analysis as well. For example, we still have to explain why bundled outsourcing (e.g., black box parts system, sub-assembly delivery) was chosen by the Japanese assemblers at a certain point in

the history, although this has been done partially by the author's other works (Fujimoto, 1995a). Generally speaking, despite the rich tradition of historical analysis in this field, further historical analysis would be necessary for better understanding of the evolutionary path to the current system that we are observing. Again, it is important to combine the functional analysis (i.e., explanation on how the system survives once established) and the genetic-historical analyses (i.e., explanation as to how the system evolved into the current pattern in the first place) of the same structure in a consistent manner, because these two are complementary explanations of the suppliers system analyses (or any complex and stable system in general). This is a typical area in which economists (researchers of system stability) and historians (researchers of system genetics) can collaborate in a constructive way.

After all, the supplier system is a highly complex, multi-layer, multifaceted subject. Despite the remarkable progress of both empirical and theoretical studies in this field since the 1980s, we are still long way from sufficient understanding of this elusive phenomenon in its totality.

Reference

Aldrich, H., and Herker, D. (1977) "Boundary Spanning Roles and Organization Structure." Academy of Management Review, April: 217-230.

Aoki, M. (1988), Information, Incentives, and Bargaining in the Japanese Economy. (Cambridge, UK).

Asanuma, B. (1984), 'Jidosha sangyo ni okeru buhin torihiki no kozo' [Structures of Parts Transactions in the Automobile Industry], Kikan gendai keizai, Summer, 38-48.

Asanuma, B. (1989), 'Manufacturer-Supplier Relationships in Japan and the Concept of Relation-Specific Skill', Journal of Japanese and International Economies, 3, 1-30.

Asanuma, B. and T. Kikutani (1992). "Risk Absorption in Japanese Subcontracting: A Microeconomic Study of the Automobile Industry." Journal of the Japanese and International Economics, 6, March 1992, pp 1-29.

Bensaou, M. (1992), "Inter-Organizational Coordination: Structure, Process, Information Technology," Unpublished Ph.D. Dissertation, MIT Sloan School of Management.

Crandall, R. (1968) "Vertical Integration and the Market for Repair parts in the United States Automobile Industry." Journal of Industrial Economics, 16, 212-234.

Clark, K. B. and Fujimoto, T. (1991). Product Development Performance. Harvard Business School Press, Boston.

Cusumano, M. and A. Takeishi (1991) 'Supplier Relations and Management: A Survey of Japanese, Japanese-Transplant, and U.S. Auto Plants'. Strategic Management Journal, Vol. 12, pp 563-588.

Cusumano, M. and A. Takeishi (1995) "What We have Learned and Have Yet to Learn from Manufacturer-Supplier Relations in the Auto Industry." MIT Sloan School of Management Working Paper #3840-BPS-95.

Dore, R. (1987) Taking Japan Seriously. The Athlone Press, London.

Dyer, J.H. (1994), "Dedicated Assets: Japan's Manufacturing Edge," Harvard Business Review, November-December, pp. 174-178.

Dyer, J.H. (1996), "Does Governance Matter? Keiretsu Alliances and Asset Specificity as Sources of Japanese Competitive Advantage." Organizational Science, Vol. 7, No. 6, November-December, 649-666.

Fine, C. H., and Whitney, D. E. (1996). "Is the Make-Buy Decision Process a Core Competence?" Working paper, International Motor Vehicle Program, Massachusetts Institute of Technology.

Fujimoto, T. (1989) "Organizations for Effective Product Development - The Case of the Global Automobile Industry." unpublished D.B.A. dissertation, Harvard University Graduate School of Business Administration.

Fujimoto, T. (1994) "Reinterpreting the Resource-Capability View of the Firm: A Case of the Development-Production Systems of the Japanese Auto Makers." Paper to be Presented to Prince Bertil Symposium, Stockholm, June. Toyko University Faculty of Economics Discussion Paper 94-F-20.

Fujimoto, T. (1995a) "Note on the Origin of the 'Black Box Parts' Practice in the Japanese Auto Industry." in Shiomi, H., and Wada, K., ed., Fordism Transformed: The Development of Production Methods in the Automobile Industry. Oxford University Press.

Fujimoto, T. (1995b) "Buhin Torihiki to Kigyo-kan Kankei." [Parts Transactions and Inter-firm Relations]. in Uekusa, M. ed., Nihon no Sangyo Sosiki [Industrial Relations in Japan], Yuhikaku, Tokyo (in Japanese).

Fujimoto, T., Sei, S., and Takeishi, A.(1994), 'Nihon jidosha sangyo no supplier system no zentaizo to sono tamensei' [The total perspective and multifaceted nature of the supplier system in the Japanese auto industry] Kikai keizai kenkyu [Studies of a machine economy] , May (in Japanese).

Fujimoto, T., and Takeishi, A. (1994) Jidosha Sangyo 21 Seiki he no Shinario (The Automobile Industry: A Scenario toward the 21-st Century], Seisansei Shuppan, Tokyo.

Granovetter, M.S. (1985) Economic Action and Social Structure: The Problem of Embeddedness." American Journal of Sociology, 91 (3) 481-510.

Helper, S.R. (1991). "How Much Has Really Changed between U.S. Automakers and Their Suppliers? " Sloan Management Review, Sumer, 15-28.

Helper, S.R., and D.I. Levine (1994). "Long-term Supplier Relations and Product-market Structure" The Journal of Law, Economics, and Organization, Vol.8, No. 3, 561 - 581.

Imai, K., Itami, H, and Koike, K. (1985) Naibu Soshiki no Keizaigaku (The Economics of Internal Organizations). Toyo Keizai Shinpo-sha, Tokyo (in Japanese)

Itami, H. (1988) "Mieru Te ni Yoru Kyoso: Buhin Kyokyu Taisei no Koritsusei." [Visible Hand Competition: Efficiency of Supplier Systems], in Itami, H., Kagono, T. , T., Sakakibara, K., and Ito, M. eds, Kyoso to Kakushin: Jidosha Sangyo no Kigyo Seicho [Competition and Innovation: Corporate Growth in the Auto Industry]. Toyo Keizai Shinpo-sha, Tokyo.

Ito, M. (1989) "Kigyo-kan Kankei to Keizoku-teki Torihiki." [Inter-firm Relations and Continual Contracts] in Imai, K., and Komiya, R., eds., Nihon no Kigyo [The Japanese Enterprises], Tokyo University Press, Tokyo (in Japanese).

Kamath, R.R., Liker, J.K (1994). "A Second Look at Japanese Product Development." Harvard Business Review, November-December: 154-170.

Kikuchi, Hideyuki (1976). Wagakuni ni Okeru Gaichu-Shitauke Kanri no Tenkai (Development of Outsourcing-Subcontracting Management in Japan). Chusho Kigyo Kenkyu Center (in Japanese).

Lawrence, Paul R., and Jay W. Lorsch (1967). Organization and Environment. Homewood, Illinois: Richard D. Irwin.

Leibenstein, H. (1966) "Allocative Efficiency vs. 'X-Efficiency'." American Economic Review, 56.

Lieberman, M. and Asaba, S. (1996). "Inventory Reduction and Productivity Growth: A Comparison of Japanese and US Automobile Sectors." The John E. Anderson Graduate School of management at UCLA Working Paper S&O 96-13.

MacNeil, I.R. (1983) "Values in Contract: Internal and External." Northwestern University Law Review, 78 (2) 341-418.

Matsui, M. (1988), Jidosha buhin [Auto parts]. Nihon Keizai Shinbunsha (Tokyo).

Miwa, Y. (1989) "Shitauke Kankei." [Subcontracting Relationship], in Imai, K., and Komiya, R., eds., Nihon no Kigyo [The Japanese Enterprises], Tokyo University Press, Tokyo (in Japanese).

Miwa, Y. (1994) "Subcontracting Relationship (Shitauke Relationship) - The Case of Automobile Industry -." Discussion Paper, Tokyo University Faculty of Economics. F-16.

Monteverde, K., and Teece, D.J. (1982) Supplier Switching Costs and Vertical Integration in the Automobile Industry," Bell Journal of Economics, 13, 206-213.