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Manufacturer-Supplier Relationships in Japan and The Concept of Relation-Specific Skill*

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ABSTRACT

This paper investigates manufacturer-supplier relationships in Japan based on field research on two major industries. I show first that various modes of relations exist and that longstanding relations are more densely distributed where customized parts are transacted. Then I show that this phenomenon is to be ascribed to ratings exercised by the purchasing firm on some skill accumulated by each supplier. I construct the concept of multidimensional relation-specific skill accumulated by each supplier through learning and technological investments, and relate this concept to Aoki's work on relational quasi-rent and Williamson's scheme to classify transactions.

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1. Introduction

There have been several prevailing notions concerning the nature of manufacturer-supplier relationships developed in Japan. Especially widely held are the following two. First, a typical Japanese manufacturing firm tends to buy only from a select group of firms which has been formed having this firm either as the organizer or as a participating member thereof; members of such a group maintain perpetual business relations with each other, which non-members face difficulties to enter. Second, formation of such a group is a phenomenon specific to Japan and is therefore to be explained only in terms of cultural or historical peculiarities of the Japanese.

As to the first notion above, one could easily collect casual examples which appear to endorse them. To ascertain whether such purchasing practices have indeed been followed regardless of the type of the final product manufactured and that of the intermediate good transacted, however, systematic comparisons have to be made between different industries. But the literature to date seems to lack the backing of such studies. The primary objective of this paper is to fill this gap based on a series of field research that I conducted on the Japanese automobile and electric machinery industries since 1982.

Following the view originally put forth by Williamson (1979), I adopt the hypothesis that the mode of governance structure systematically differs depending on the nature of transactions and that longstanding relations between a manufacturer and suppliers thereto can be analyzed as just a subset of the entire set of such different modes which governance structure can take. I focus on the relations between typical large firms that manufacture the final products of the two industries and those suppliers thereto that are

on the first tier and are supplying recurrently transacted parts. For brevity, henceforth I call each of the former a "core firm," and each of the latter a "supplier." Based on interviews with managers in relevant positions, I investigate how the relations vary depending on characteristics of the final products and of the parts, and then analyze causal factors.

The organization of the paper is as follows. In Section 2, I show the basic structure of the contractual framework which is used to govern recurrent type transactions of parts in each of the two industries, touching upon the characteristic composition of suppliers that surround core firms in each industry. It already becomes evident here that types of relations and of suppliers are not so homogeneous as is implied by the prevailing notion, at least in the electric machinery industry. In Section 3, I differentiate systematically several types of relations and of suppliers. As a consequence, it is shown that longstanding relations are to be found more densely where customized parts are transacted and that this is based on high ratings which the suppliers concerned receive from the core firm. This pair of findings evoke the following question. What kind of specific capabilities are required of to be rated as a superior supplier of customized parts? In Section 4, I tackle this question and formulate the concept of relation-specific skill. In Section 5, I show how the results presented in this paper can be related to the existing theoretical literature. First, I show the notion of relational quasi-rent and its sharing among members of a group of firms presented by Aoki (1988) can be based on the concept of relation-specific skill as I constructed. Second, I briefly discuss how the scheme presented in this paper can be related to Williamson's framework to classify transactions. Section 6 concludes the paper.

2. Structure of the Contractual Framework

In this section I first describe the contractual framework that governs transactions of parts in the automobile industry and then compare it to its counterpart in the electric machinery industry. I show that while business relations in the automobile industry are indeed typically longstanding as has been generally perceived, they are more heterogeneous in the electric machinery industry. Further, I show that even the relations in the automobile industry contain various aspects that differ from the conventional view which spotlights family-like group formation. They include competition among potential suppliers, bargaining between core firms and suppliers, as well as cooperation between them.

2.1 The automobile industry

Casual observers have asserted that written contracts are largely lacking in Japanese business practice, but this is incorrect. Instead of a single contract which prescribes specifications of the item to be delivered, its price, and other aspects of the transaction in one shot, there are a set of contracts, documents that function as contracts, and well-established practices. Assembly of these pieces in a coherent way gives a contractual framework, by which recurrent type transactions of parts are regulated in Japanese industries.

At the very basic level, there is a contract called the "basic contract," which is exchanged when a core firm enters into a business relation with a supplier. The duration of this contract is usually one year, but it is automatically renewed unless either side raises an objection. This contract

by itself may seem vague since it determines only general obligations of both parties that should be obeyed irrespective of specific items to be transacted. It gives, however, useful clues for grasping the total contractual framework. For one thing, it provides that monthly schedules should be regarded as contracts once the supplier gives its consent to it. It states, further, that kanbans are fine tunings which the core firm can add to each such schedule if the supplier agrees to the introduction of the kanban system. For another, it states that an occasion for the renegotiation of prices is provided regularly, usually at six-month intervals.

But the basic contract does not state when the initial level of the price is determined. Nor does it reveal how long deliveries by each supplier are supposed to continue. To know such aspects, actual practices should be observed, focusing on the life cycle of each model of a car.

For passenger cars, recent practice is to make a full model change every four years and to conduct a minor model change inbetween. Prior to the model change, there is a period for development. Specifications for, and suppliers of, each part of the new model, as well as the price thereof, are determined during this development period. Once a supplier receives an order for a part when the commercial production of the new model is launched, his delivery normally continues for two years if the part is of the kind which changes at the time of the minor model change and for four years if the part changes only at the time of the full model change.

It is of crucial importance to understand precisely the relation between this practice of nonswitching and the so-called "two-vendor policy," the meaning of which is given below. Let us first look at broad groups of parts such as head lamp, brake, steering column, etc., and refer to them as kinds of parts. At this level, each core firm seeks to secure more than one--typically

two to three--suppliers for each kind and hold them in parallel. One of these is in some cases an in-house parts manufacturing plant of the core firm itself. This policy, which is often called the "two-vendor policy," has two objectives. One is to insure against a sudden stoppage of delivery from either source due to accidents. The other is to put competitive pressure on the suppliers to educe a more cooperative attitude with respect to prices and quality than would otherwise be available. Let us next turn to each particular part such as the head lamp designed for the current model of Corona, the brake adopted for the current model of Accord, the steering column assembled to the current model of Capella, etc. Let us call it a subkind of part. There is a remarkable tendency for each core firm to assign responsibility for the supply of a subkind of part to a single supplier. One important reason for this practice seems to be avoidance of a duplicate investment in the same kind of specific dies and jigs since, as is reported by Asanuma (1984b), the financial burden for this type of investment has to be borne in one way or another by the core firm.[1)] Irrespective of the underlying reason, however, this practice stabilizes the status of each supplier during the life of a given model.

Consequently, quantity adjustment in the automobile industry is performed in the following way. The quantity of a given part which a supplier is asked by the core firm to deliver in the course of the next month varies from month to month. This variation occurs, however, exactly in proportion to the fluctuation in demand for the car to which the part in question is assembled. The core firm and its suppliers share the effects of business upswings and downswings as long as the life of a given model continues.

On the other hand, when the life of a given model comes to an end, there is no guarantee that each firm which has been supplying some part for that

model can receive an order for the same kind of part for the new model. Competition resumes among the suppliers which have the general capability of supplying that kind of part. In the case of the automobile industry, this competition is for the most part limited to a small number of firms which have already been supplying that kind of part to the core firm. Based on ratings of these suppliers, its policy concerning the allocation of business shares among them, as well as an assessment of the proposal submitted by each candidate for the supplier of the new part, the core firm selects a suitable supplier (or suppliers) for each part.

Note in this connection that typical core firms are manufacturing a number of makes of car in parallel and make staggered model changes every year. As a consequence, competition among potential suppliers for each new part seems to have worked considerably well as a means for core firms to educe favorable terms of trade from suppliers.

However, at the same time, it seems to be a remarkable aspect of the Japanese automobile industry that the members of the set of suppliers to each core firm are both relatively small in number and relatively very stable in identity. For instance, as of 1984, the member firms of Kyohokai, an association formed by the suppliers of parts to Toyota Motor Company, numbered 171. Of these 171, 153 firms had been continually members of that association during the eleven years since 1973. During the same year period, exits from the association numbered only 3, whereas new entrants numbered 21.[2)]

It would be incorrect to regard a typical core firm as relying exclusively on associated firms for parts obtained from outside the company. For instance, as of 1983, Nissan Motor Company bought 10 percent of such parts from non-associated firms. Still, we can see from these figures that, in the case of the automobile industry, a dominant portion of parts obtained from

outside the company is purchased from firms with which the core firm has longstanding relations.

As a matter of fact, those suppliers that have established a longstanding relation with a given core firm typically have succeeded in receiving orders continually. This has contributed toward nurturing a feeling among suppliers that they share a common fate with the core firm, despite the fact that they have to face ratings from the core firm and engage in renegotiations on business terms with the core firm at regular intervals.

2.2 The electric machinery industry

A typical core firm in the automobile industry produces essentially one single kind of final product, the automobile. It is produced continuously in the typical way of mass production and is a product which is in a relatively mature stage with respect to technology. By contrast, a typical core firm in the electric machinery industry produces many kinds of final products that are extremely diverse both with respect to the typical scale of production, which in turn is determined by the volume and the time pattern of incoming demand, and regarding the degree of technological maturity.[3] A typical core firm in either of the two industries operates a number of plants in parallel in which the final products supplied by the firm are manufactured. But a characteristic of the electric machinery industry is that each of such plants is specialized in some subset of final products, which, in view of the typical scale of production and the degree of technological maturity, substantially different from those which other plants in the same corporation are in charge of. The product lines handled within a plant typically have some interconnections with each other from the viewpoint of core technology. But

they are still diverse in the typical scale of production and the degree of technological maturity. To investigate how these features of the industry affect manufacturer-supplier relationships, I visited three different plants, of which characteristics are given in Table 1. Comparisons of the contractual framework follow.

Table 1 about here

In common with the automobile industry, "basic contracts" are used and provide the basis for the contractual framework that governs recurrent type transactions in the electric machinery industry. However, two subtle differences arise reflecting the characteristics of this industry. First, it is each plant of the core firm which is the party to the contract on the buyer side. For some basic raw materials and a selected number of components which are used in common in several plants of the same corporation, the purchasing division of the corporate headquarters acts as the agent for all the plants concerned. In addition, this division sets the basic purchasing policies of the company and supervises the purchasing activities of all the plants. To see the details of purchasing activities, however, we have to look at the plant level. Second, a typical basic contract used in this industry does not presume that each object is transacted continuously for such a long period as two or four years. Thus it provides that each "order," instead of the "monthly schedule," as in the automobile industry, is regarded as an individual contract when the supplier gives its consent to it. Also, the basic contract does not contain stipulations for the frequency of price adjustments. With these in mind, let us look next at actual practices.

I first show the typical length of the life of a given model. For

electronic rice cookers, the standard length is two years. A minor model change is made one year after the introduction of a new model. Many of other home appliances manufactured at Plant X have a similar cycle, though microwave ovens have a life of only one year. Electronic office equipment such as plain paper copiers have a shorter life than most home appliances. This is because nearly twenty manufacturers have been competing vigorously to establish market shares. The competition is especially keen at both ends of the price range. The cheapest model as well as the most expensive model endures less than a year. Models of intermediate price have a life of slightly more than a year. Control and measuring instruments for plant or home use have a relatively long life. In some cases it reaches ten to twenty years. Instruments for office use such as plotters, however, have a much shorter life -- approximately one year. In this way the length of the life of a given model varies depending on the nature of the product and the market therefor.

The quantity adjustment mechanism for the parts of mass produced products such as rice cookers, copiers, meters and compressors is remarkably similar to that found in the automobile industry. Once the core firm has ordered a particular part for a given model from a supplier, the core firm rarely switches suppliers during the life of this model.[4] The amount of the part ordered by the core firm from this supplier changes monthly only in proportion to the change in demand for the final product to which the part in question is assembled.

The price adjustment mechanism for this class of parts is, again, similar to that found in the automobile industry. It is a well established practice in the case of this class of parts for the core firm to provide an occasion for the renegotiation of prices at six-month intervals, though this is not explicitly stipulated in the basic contract.[5] On the other hand, for small

lot items, which characterize Plant Z, this practice of renegotiation at regular intervals is not found.

At the time of model changes, in common with the automobile industry, the supplier of a particular item for the current model is not necessarily awarded the contract for the same kind of part for the next model. Since the typical life of a given model is much shorter than that found in the automobile industry, competition among suppliers who are able to offer the same kind of part is all the more keen.

Finally, let us have a glance at the composition of suppliers to each core firm. Recall first that in this industry the party to the contract on the buyer side is basically an individual plant that manufactures a set of final products. To designate such a plant that acts as a purchaser, I use the term "core plant" hereafter. Each core plant has its own set of suppliers. Some members thereof may be simultaneously supplying to other plants of the same corporation, but there are a nonnegligible number of firms that are supplying only to this plant. Correspondingly, it is hard to find in this industry a comprehensive association which organizes a great majority of suppliers to the corporation, like Kyohokai mentioned above. Further, a remarkable fact is that, even at the level of each core plant, such an association that includes the great majority of suppliers to the plant as members has not been organized.

Plant X, as of 1985, had 253 suppliers, if we count every firm from which the core plant purchased more than six million yen per six-month period. Of these, 117 are classifiable as "subcontractors (shitauke kigyo)". Only 60 of these subcontractors have been organized into a cooperative union. The core plant is seeking to reduce the number of its subcontractors to approximately half. Plant Y had 985 suppliers in 1984, if we count every firm from which

the core plant bought something including raw materials that year. It is quite normal in the case of this plant for 20 per cent of suppliers to change every year. Overlapping with this change, the core plant is trying to remove some of its subcontractors from the set of its suppliers. As of 1985, Plant Z had an association for its subcontractors and a separate association for more general suppliers. The former association does not include all the subcontractors with which this core plant had transactions in 1984.

A glance taken above at the composition of suppliers reveals two points to be noted. First, though some portion of the first tier suppliers to each core plant in the electric machinery industry seem to have longstanding relationships with the core plant, this plainly does not apply to all of the suppliers on the first tier. This forms a marked difference in comparison to the case of the automobile industry. Second, overlapping with this heterogeneity of suppliers, which comes out with respect to the duration and cohesiveness of their relations to core plants, another sort of heterogeneity is more readily observable than in the automobile industry: distinction between subcontractors and general suppliers. In Section 3, I examine these two kinds of heterogeneity and their interrelations more in detail.

3. Types of Suppliers and of Their Relations to Core Firms

In this section I discriminate among several types of suppliers and of their relations to core firms. I start from discussing the dichotomy of suppliers into subcontractors and general suppliers which was touched upon at the end of Section 2. This dichotomy is a traditional one which has been used not only in purchasing practices in the electric machinery industry, but also by many of social scientists and administrators in Japan. The dichotomy has

become somewhat too coarse, however, especially in the automobile industry, due to increasing customization of parts. The upshot is that the classical dichotomy cannot give a proper place to those suppliers which develop parts to be manufactured in response to broad specifications transmitted from core firms. Based on this observation, I develop a scheme to classify parts and suppliers which is a natural extension of the classical dichotomy. The second task of this section is to examine the heterogeneity of suppliers in terms of the duration and cohesiveness of their relations to core firms and to relate it to the first kind of heterogeneity.

3.1 Classical dichotomy of suppliers

Figure 1 shows the composition of parts and materials and that of their sources used by Plant Y during a recent fiscal year. The left hand column shows, first of all, the outcome of the "Make or Buy" decision. Second, it shows that the purchased items are divided into two categories: "purchased goods (konyuhin)" and "ordered goods (gaichuhin)". I start from the meaning of this classification.

Figure 1 about here

The classification above is a classical dichotomy which has been widely used in the electric machinery industry. The conventional view of the subcontracting relationship in Japan as well as the definition of subcontracting used in official statistics and public administration closely corresponds to this dichotomy. An alternative expression used in official statistics in place of "purchased goods" is "marketed goods (shihanhin),"

which conveys the criterion for classification more clearly. That is, this category corresponds to those goods which are offered to the public irrespective of the will of the core firm and are therefore purchasable by merely selecting from the catalog. In contrast, "ordered goods" means those goods or processing services which are supplied by outside firms according to specifications issued by the core firm.

"Ordered goods" constitute a subset of the whole collection of goods and services that are supplied according to specifications provided by the core firm, which include parts and services supplied from in-house plants. Historically, this collection has been regarded as equivalent to the collection of goods and services for which the core firm itself has key technology and manufacturing know-how and which in-house plants could therefore supply if the core firm wished. For economic reasons, the core firm has assigned a relatively peripheral portion thereof to outside firms while retaining a central portion inside.

It has thus been taken for granted that the term "ordered goods" corresponds to the term "subcontractor". The right hand column of Figure 1 in fact shows that the sum of the portion supplied by "common subcontractors" and by "excellent subcontractors" largely corresponds to the total amount of "ordered goods". There is no question in that "suppliers in general" in Figure 1 are supplying "purchased goods," so that "related companies", companies in which the core firm holds substantial shares, must be providing both "purchased goods" and "ordered goods".

The reader may want to know at this point the meaning of the distinction between "common subcontractors" and "excellent subcontractors" as well as the role played by "related companies" in Figure 1. But I put aside these issues for later discussions and examine in the next subsection whether the dichotomy

of goods and that of suppliers we have just seen are similarly used in the automobile industry.

3.2 Subcontractors in the automobile industry

In the automobile industry, the meaning of the term "subcontractor" has become much ambiguous. A basic underlying factor is the following development. Core firms in this industry have increasingly come to issue specifications even for those items for which they have not acquired manufacturing capabilities and which have been thought by outside researchers to be "marketed goods." Thus virtually all of the parts supplied from outside firms can now be regarded as "ordered goods." It is indeed very difficult to find, from among those items that are being supplied from suppliers on the first tier, such parts that fall under "marketed goods" category. Even so, one could still call all the firms that supply "ordered goods" to a given core firm "subcontractors" thereof. Then, however, the "subcontractor" category would include such firms as Hitachi, Ltd., Mitsubishi Electric Corporation, etc., which are not only large in company size but also equipped with significant capabilities for the development of the parts concerned. One of the main reasons why the subcontracting relationship has attracted the attention of scholars and administrators in Japan lies in the concern that typical subcontractors, being small and underdeveloped, face the danger of being exploited by core firms and hence may deserve special protection from public authorities. In view of such a concern, the conventional definition of subcontractor thus seems to have become too broad, at least in the automobile industry. In fact, major Japanese automobile manufacturers have abolished the use of the word "subcontractor". This seems to reflect at least partly the

situation described above.

Nevertheless, a broad classification of suppliers is possible based on the function exercised by the supplier concerned. First, we note that there is an important dichotomy of purchased parts in the practice of automobile manufacturers between: (1) parts manufactured by outside suppliers according to the drawings supplied by the core firm; and (2) parts manufactured by outside suppliers according to the drawings made by the respective suppliers themselves and approved by the core firm. Since the drawings in (1) and (2) are called "drawings supplied (taiyozu)" and "drawings approved (shoninzu)" respectively, let us call the parts (1) and (2) "DS parts" and "DA parts" respectively. Second, carrying over this distinction into categories of suppliers, let us call those firms which predominantly supply DS parts "DS suppliers" and those which predominantly supply DA parts "DA suppliers." Note that DS suppliers are providing basically only capabilities for manufacturing of the parts transacted, while DA suppliers are providing capabilities for product development as well.

Although major Japanese automobile manufacturers have eliminated the word "subcontractor" from their company language as mentioned above, there has also been a remarkable degree of consensus among them that, if the word has to be used by outside researchers at all, the most accurate use would be to let the word designate DS suppliers in the meaning defined above.[6] I should add here that supply of "DS parts", in its simplist extreme, merges into supply of processing services such as subassembly or machining according to minute instructions given by the purchaser. Taking these into consideration, I propose to use the term "subcontractor" as synonymous to "DS supplier" in the broad sense, which includes suppliers of such processing services.

The following should now be clear: it is expansion of "DA parts" in

relation to "DS parts" and to "marketed goods" that has made the conventional meaning of subcontractor ambiguous, driving the classical dichotomy of suppliers out of use in the automobile industry.

3.3 A classification scheme of parts and suppliers

Let us consider how observations made in 3.1 and 3.2 can be integrated to generate a common scheme applicable to both industries to classify parts and suppliers thereof.

I examine first whether the concepts of "DS parts" and "DA parts" introduced in 3.2 have relevance in the electric machinery industry as well. It can be relatively easily confirmed that the notion of subcontractors conceived by purchasing managers of core firms in the electric machinery industry is in fact not different from the definition I proposed above. This leads to the following reasoning. It must be relative thinness of DA parts, in relation to "marketed goods" type parts, that explains why the classical dichotomy of suppliers has been still used in this industry. Indeed, in contrast to the automobile industry, core plants in this industry buy lots of "marketed goods" type parts such as switches, connectors, capacitors, resistors, cables, motors, memory ICs and so on, made according to standardized specifications. However, purchasing managers of these core plants are currently perceiving that the demarcation between "ordered goods" and "marketed goods," which was once clear-cut, tends to become blur as time goes by. Underlying this perception is the development that DA parts have come to be nonnegligible both with respect to the role they play for improvement of the final products and with respect to the proportion they occupy in the total amount of the purchased intermediate goods. One

conspicuous example of such DA parts is custom ICs. Thus we can confirm that concepts of DS parts and DA parts have relevance to both industries.

In contrast to the automobile industry, where core firms rarely buy "marketed goods" type parts, core plants in the electric machinery industry purchase both "marketed type" parts such as memory ICs and DA parts such as custom ICs often from identical firms. Thus, although the distinction between "marketed goods" and "DA parts" can always be clearly made, it is often not easy to tell whether a firm belongs to the "general supplier" category or falls under the "DA supplier" category. Nor does it seem necessary to regard each supplier as forming a monolithic entity in this respect. It seems more meaningful to see each of such firms as functioning as a "general supplier" to the core plant in question, to the degree in which it is supplying "marketed goods" type parts thereto, and at the same time, functioning as a "DA supplier" precisely in the specific region of transaction where this firm is supplying "DA parts" to the same core plant. I carry over the distinction between types of parts into types of suppliers just in this manner hereafter.

From the viewpoint of historical evolution, DA parts mainly originate from two directions: from "marketed goods" type parts and from DS parts. One route of evolution is as follows. As the demand for a final product manufactured by a given core firm grows into a large volume, the quantity of a particular part which this core firm can order from a given supplier to assemble into the final product in question also grows. Then it becomes easier for the core firm to ask the supplier to add some special modifications to specifications of the part, which have heretofore been common to all purchasing firms in the industry, in response to some specific needs that this core firm perceives. One reason is that the larger volume warrants specific investments that have to be incurred to implement such customization. In

addition, under such a large volume situation, it becomes easier for the core firm to persuade the supplier that such customization would have a further boosting effect on the demand. If the supplier agrees to produce such modified part, then a DA part emerges as a derivative from a "marketed goods" type part. Another route of evolution is as follows. At the early phase of development, core firms tend to buy relatively simple parts or elementary processing services from subcontractors. As time goes by, however, core firms select a number of firms that have relatively good qualities from among those suppliers that have already been tried and have these selected suppliers to supply parts in increasingly more assembled forms. In this process, core firms sometimes come to entrust substantial portion of the development stage of such assembled parts to the suppliers concerned, saving engineering man-hours that would have to be incurred by themselves otherwise. When drawings of one of such parts come to be entirely done by the supplier concerned, with specifications still being issued from the core firm, then a DA part emerges originating from DS parts.

It should be noted here that there are cases in which some technologically advanced part, such as electronic fuel injection system or optic fiber wire harness, emerges from the outset as a DA part through R & D jointly done by some core firm, usually a leading firm of the industry, and some selected supplier thereof, and then the similar kind part diffuses industry wide afterwards. In such cases, the order of evolution is from "newly created DA part" to "more-marketed-goods-like DA part." However, once standard elements of the part have been identified and established, the aforementioned argument as to the route to customization from "marketed goods" type part approximately applies to such items as well. It seems therefore a natural way in conceptualization to assign the DA parts category an

intermediate region between "marketed goods" type parts and DS parts.

There exist some parts that can properly be characterized as quasi DA parts. For them, core firms provide only rough drawings, entrusting completion of details to the suppliers concerned. These parts therefore share some elements of DA parts, though they retain the basic character of DS parts. Similarly, we can distinguish subcategories among DA parts. Some DA parts are relatively closer to DS parts, others being closer to "marketed goods," looking from the degree in which the core firm in question gives detailed technological directions to the supplier concerned.

Based on these observations, I propose a scheme for classification of parts and suppliers shown by Table 2. The basic criterion for classification in this scheme is the degree of initiative that a typical supplier of a given category of part can exert vis-a-vis a given core firm in the development and the manufacturing stages. This variable, which henceforth will be called "degree of technological initiative" for brevity, is measured along the horizontal axis of Table 2. The left hand extreme of this axis corresponds to a situation in which the supplier can exert only a very passive role both in the development and the manufacturing stages. The further rightward we go, both stages increasingly contain black-box elements looking from the core firm. On this axis I differentiate seven categories from I to VII. Subcontractors in my definition, or DS suppliers, span from I to III. I and II have been recognized in the previous literature, but III, the quasi DA parts suppliers, has not been distinguished therein. DA suppliers span from IV to VI. The classical dichotomy spotlighted I plus II and VII. In the actual development of the industries, however, regions from III to VI are growing. The scheme thus extends the classical dichotomy in a natural way by introducing subcategories that have been overlooked but are of increasing

importance.

Table 2 about here

Examples of parts in Table 2 are taken from the automobile industry. The assignment of each of these parts to a column has been made for the purpose of illustration based on responses from managers of a number of core firms. Very interestingly, actual assignments sometimes differ among core firms, reflecting the difference in the degree of technological expertise that they have accumulated with respect to particular items. For instance, core firms occupying the leading position in the industry tend to place such items as starter motors or batteries to relatively leftward positions among subcategories of DA parts in Table 2, say IV or V. On the other hand, core firms occupying lower echelons tend to place the same items to more rightward positions, say somewhere very close to VII within VI.

This implies at the same time that, if, through concentrated investments, a particular core firm achieves a higher technological expertise than heretofore concerning a given item and in relation to the state of technology that the suppliers of the item currently have, a leftward shift occurs in the positioning of the item by this core firm, vice versa. In this way, the scheme given by Table 2 can be used to express changes that occur over time as a net result of moves taken by the parties, as well as crossections taken at a given time point.

3.4 Duration and cohesiveness of relations

Let us turn to another kind of heterogeneity of suppliers that we noticed

to exist with respect to the duration and cohesiveness of their relations to core firms and investigate how this is related to the categories that have been differentiated above.

I examine first the the meaning of the distinction made in Figure 1 between "common subcontractor" and "excellent subcontractors." Plant Y has been rating its subcontractors in terms of performances as well as potential capabilities, classifying them into A, B, C, and D based on the ratings. "Excellent subcontractors" comprises "Rank A" and "Rank B" subcontractors, "common subcontractors" being the rest. The core plant applies its effort to develop relationships selectively. "Excellent subcontractors" are supposed to be suitable candidates with which the core plant should seek to build up close and longstanding relationship, subject to repeated reappraisal though. "Rank A" firms are those which have been most successful in establishing reputation and the core plant often seeks to acquire part ownership therein. A "Rank B" firm can be reclassified into "Rank A" in due course of time, if it achieves substantial improvements in response to comments from the core plant, but may become "Rank C" if it persistently fails to respond in the right direction. "Rank D" firms are those which have finally come to be evaluated as lacking hopelessly possibility of improvements and the core plants wants to terminate the relation therewith at a suitable time point. A "Rank C" firm may also become either "Rank B" or "Rank D," depending on performances it will show henceforth.

One interesting point to note is how the core plant deals with "Rank C" firms as such. The core plant plans to increase the proportion of orders from "excellent subcontractors" at the expense of those from "common subcontractors" over time, removing simultaneously "Rank D" firms from the first tier. But the core plant does not expect that "Rank C" firms will

disappear from the first tier entirely. The management feel it difficult to recompose the first tier within a short time span so as to make it consisting entirely of "Class A" and "Class B" firms. Moreover, they feel it even necessary for the core plant to retain at least part of "Rank C" firms on the first tier as a capacity buffer, to which orders are placed rather intermittently only when capacities of the core plant and of more highly ranked subcontractors cannot absorb suddenly swollen up demands.

So far I described practices at Plant Y. But similar practices are found at Plant X and Plant Z as well. Interestingly, necessity of retaining firms to be used as a capacity buffer is more strongly expressed at Plant Y and Plant Z. On the other hand, purchasing managers of major core firms in the automobile industry unanimously assert that practices in the electric machinery industry of retaining capacity buffer type firms on the first tier sound rather strange to them. For them, once admitted to the first tier, suppliers should be more or less kept operating continuously, unless they have come to be rated so low that they be removed from the first tier entirely.

These observations suggest some generalizations to be made. The following notion on the subcontracting relationship in Japan has been prevalent, though gradually facing criticisms in recent years: the main reason for Japanese firms to subcontract is to utilize subcontractors as a capacity buffer. Although this notion is not quite compatible with another prevalent notion that Japanese firms tend to form family-like groups with perpetual trades between group members, the structural relation between the aspects which correspond to these two notions has not been illuminated. I submit, however, the following propositions.

Proposition 1. Core firms continually exercise ratings on suppliers. With

suppliers ranked as A and B based on cumulative ratings, core firms seek to keep business as continuously as possible, and with those ranked as D, core firms seek to terminate the relation. Those ranked as C are dealt with as marginal suppliers.

Proposition 2. The more intermittent and uneven is the demand for the final product which features a core firm or a core plant, the more necessary for this firm or plant to retain marginal suppliers on the first tier as a capacity buffer.

Now I consider how the system of ranking of suppliers by the core firm is related to the categories given in Table 2. In principle, the system of ratings of the kind described above is applied by the core firm regardless which category the supplier in question falls under. However, the brief description given in 3.3 concerning the routes of historical evolution via which DA parts emerge points to the following causal relations. First, the higher the ratings a given subcontractor receives, the higher the probability that this subcontractor receives an order for a part which requires more technological capabilities than previous rounds. Second, the higher the ratings a given supplier of a "marketed goods" type part receives, the higher the probability that this supplier receives an order for a DA part which is a derivative of the type it delivered in previous rounds. Based on these causal relations, it can be inferred that in comparison to regions I, II, and VII, firms with high ranks are more densely distributed within each of regions from III to VI. Combining this inference with Proposition 1, I submit:

Proposition 3. In comparison to regions I, II, and VII in Table 2, suppliers

which have longstanding relations with a given core firm are more densely distributed in regions from III to VI.

4. Interactions between a Core Firm and a Supplier

I have shown that suppliers which maintain longstanding relations with a given core firm are to be found more densely in regions from III to VI in Table 2 where customized parts are transacted. Further, I have shown that in order to enter and maintain such longstanding relations the suppliers concerned should acquire at some time point and maintain continually afterwards high ratings from the core firm. This pair of findings in turn evoke the following question. What kind of specific capabilities are required of to be qualified as a superior supplier of customized parts? To answer this question, I examine in this section typical interactions between a given core firm and a supplier thereto that occur over time within and beyond the life of a given model of a final product. I deal with (1) suppliers of "marketed goods" type parts, (2) suppliers of DS parts, and (3) suppliers of DA parts, separately in this order. For each of these categories, I examine the following two kinds of interactions interrelatedly. The one is interactions that occur in the real domain concerning development, manufacturing, and delivery of the part. The other is interactions that occur in the price domain: price negotiations. Examination of these interactions illuminates what constitute the relation-specific skill of a supplier and how it is related to technological capabilities.

4.1 Suppliers of "marketed goods" type parts

To be qualified as superior suppliers for the items that are to be

delivered continuously for a certain time span, even suppliers in this category are required to demonstrate following two properties that are not explicitly dealt with in the usual textbook of microeconomics: high reliability in quality assurance and high reliability in keeping up the delivery schedule, which may require continual fine tunings of shipments. In this sense, even suppliers in this category have to develop some skill to maintain the relation. In comparison to other two categories of suppliers, however, interactions that involve development and manufacturing processes of the suppliers are less and, accordingly, the core firm knows relatively little about the processes.

It should be noted here that Japanese core firms tend to expect that each supplier can achieve price reduction by some targeted percentage within a certain time span reflecting efforts to reduce costs. For suppliers of this category, however, the process through which each supplier achieve cost reductions remains largely a black-box for the core firm. The core firm can only look at the price itself to measure the cooperativeness of the supplier in the dimension of price. And the only weapon that the core firm can mobilize to secure reasonable prices is to seek recourse to competition among potential suppliers of the same item. The number of potential suppliers ranges from zero in the case of monopoly to a very large number in the case of competitive markets.

4.2 Suppliers of DS parts

Reliabilities in quality and delivery are of course important for suppliers of DS parts as well, to acquire high ratings from the core firm. In addition, suppliers in this category have to develop and demonstrate the

following two kinds of capabilities.

The first is the ability to achieve during the manufacturing stage reductions of the manufacturing costs of the item transacted through "rationalization (gorika)," or cost reduction through process improvements, and VA (value analysis), or efforts to reduce costs through proposals on improvements of the design of the part. As I remarked in 4.1, typical Japanese core firms urge their suppliers to achieve stepwise price reductions within the life of a given model of a final product. In making this request, they normally expect that the suppliers would comply through the two kinds of conscious efforts to reduce costs just mentioned, "rationalization" and VA, rather than via sacrificing their profit margins. This is because the core firms know that the latter route would not endure.

The second is the ability, required in the development stage, to respond to the trial order or the invitation for quotation issued from the core firm with the price and quality that can clear the targets set by the core firm. This ability in turn is supposed to be based on abilities to skillfully design the manufacturing process in response to the drawings supplied from the core firm and to conduct VE (value engineering), or efforts to reduce prospective manufacturing costs through proposals on improvements of the design of the part during the period prior to mass production.

As has been reported by Asanuma (1984b), "rationalization," VA, and VE are all rewarded directly in some form of surplus profit built in the formula for negotiated prices. But a more indirect and long-run economic incentive for the supplier accompanies each of these efforts. The demonstrated results of such efforts are considered by the core firm as indicators of technological capabilities of the supplier. And as cumulative ratings given by the core firm along these dimensions rise up, the probability that this supplier will

be awarded a slightly more favorable and/or more challenging task at the next round becomes higher.

4.3 Suppliers of DA parts

In addition to all of the properties and abilities listed in the foregoing two subsections, the following ability is required of suppliers of DA parts to be rated highly from the core firm. That is the ability to develop successfully within a limited time span a part in response to specifications issued from the core firm. This obviously includes abilities and equipment to design, manufacture and test trial parts, as well as abilities to understand and finely adapt to the subtle needs of the core firm. The ability to make proposals on improvements of the specifications of the part concerned in a sufficiently early phase of the development as a feedback to the core firm is also included.

To the degree that development processes are entrusted to the supplier, knowledge on the detailed cost contents becomes more difficult to be obtained by the core firm. In this sense, suppliers become more independent and acquire higher technological capabilities than suppliers of DS parts. Nevertheless, they are required of more complex skills to respond efficiently to the needs of the core firm. Since developments of parts in response to specifications issued from the core firm have to be initiated at least several months earlier than the time point when the core firm supplies drawings to suppliers of DS parts, interactions between the parties occur over a longer time and become more complex for DA parts. Many of the quasi DA parts have similar properties.

4.4 The relation-specific skill

Let us conclude this section with constructing the concept of the relation-specific skill. Basically this is the skill required on the part of the supplier to respond efficiently to the specific needs of the core firm. Formation of this skill requires that learning through repeated interactions with a particular core firm be added to the basic technological capability which the supplier has accumulated. In this sense, the skill always consists of two layers: the surface layer which corresponds to accumulated learning acquired through transactions with a given core firm, on the one hand, and the basic layer which corresponds to general technological capabilities, on the other.[7] Further, we can introduce multidimensionality to this two-layer structure in the following way.

In subsections from 4.1 to 4.3 above, I enumerated various kinds of abilities which a supplier is required to develop and exert in order to respond to the specific needs of the core firm. Each ability becomes more or less visible to and is rated by the core firm at a certain phase of interactions that occur between the core firm and the supplier with respect to a given part. Let us array these abilities according to the sequence in which interactions corresponding to each ability occur over time and classify the abilities into the following four disjoint groups.

X_1: abilities that are required of the supplier to exert and become visible to the core firm during the early phase of the development stage.

X_2: abilities that are required of the supplier to exert and become visible to the core firm during the late phase of the development stage.

X_3: abilities that are required of the supplier to exert during the

commercial production stage concerning the routine operation of the manufacturing process and become visible to the core firm at deliveries.

X_4: abilities that are required of the supplier to exert during the commercial production stage concerning improvements of the manufacturing process and become more or less visible to the core firm at the time of price negotiations.

More specifically, X_1 consists of (1) ability to develop the part in response to the specifications received from the core firm; and (2) ability to propose improvements on the specifications received from the core firm. X_2 consists of (1) ability to develop the manufacturing process according to the drawings which has been either supplied by the core firm or made by the supplier and approved by the core firm; and (2) ability to reduce prospective costs through VE. X_3 comprises (1) ability to assure quality and (2) ability to assure timely delivery. X_4 comprises (1) ability to reduce costs through "rationalization" and (2) ability to reduce costs through VA.

Thus, according to the descriptions given in subsections from 4.1 to 4.3, each of X_1, X_2, X_3, and X_4 has at least two components. But, for simplicity, let us deal with X_i ($i = 1, \ldots, 4$) hereafter as if each of them comprised just one component and denote the level of this component by x_i ($i = 1, \ldots, 4$).

I define the relation-specific skill that a supplier has accumulated and can exert in its transactions with a given core firm by (X_1, X_2, X_3, X_4) and denote the level of the skill that the supplier has achieved at a certain time point by (x_1, x_2, x_3, x_4).

Thus, the concept of relation-specific skill that I constructed above is essentially multidimensional. Further, in the following sense, the

dimensionality of the skill differs depending on which major category the part and the supplier in question falls under. Suppose that the part in question is a DS part. Then, by definition of DS parts, X_1 is irrelevant for this transaction. On the other hand, X_2, X_3, and X_4 all matter. In other words, we can express the relation-specific skill of a particular supplier of this part by $(0, x_2, x_3, x_4)$ with x_2, x_3, and x_4 assuming some positive values. Next, suppose that the part in question is a "marketed goods" type part. Then, X_3 is the only component of the relation-specific skill that directly matters and is visible to the core firm. In fact, both to assure quality and to assure timely delivery, abilities to skillfully develop and to skillfully operate the manufacturing process matter. But, from the viewpoint of the core firm, these abilities can only become assessible through the supplier's performances shown at each delivery. In this sense, the relation-specific skill of this supplier can be expressed by $(0, 0, x_3, 0)$ with x_3 assuming some positive value. Finally, suppose that the part in question is a DA part. Then, all of X_1, X_2, X_3, and X_4 matter. Accordingly, we can express the relation-specific skill of the supplier in question by (x_1, x_2, x_3, x_4) with all components assuming some positive values. Note that visibility of X_2 and X_4 to the core firm in this case varies according to which subcategory this part and supplier falls under. Thus, if the part belongs to IV in Table 2, X_2 and X_4 will be more visible; if it belongs to VI in the same diagram, they will be less visible and the skill of the supplier could approximately be expressed by $(x_1, 0, x_3, 0)$. I summarize the foregoing arguments by Table 3.

This way of constructing the concept of relation-specific skill enables the distinction between the following two notions: the level of a particular component of the skill, on the one hand, and the degree of complexity of the skill, on the other. If a pair of suppliers fall under different major

categories, then the degree of complexity of the skill differs between the two firms and their skills therefore are not comparable in the sense of ordering of vectors. In other words, the two firms cannot be given a rank-ordering in terms of relation-specific skill. If the two firms belong to the same major category but deal with different kinds of parts, their skills become roughly comparable. If the two firms deal with the same kind of part, say brake or battery, their skills become strictly comparable and the two firms can be given a clear-cut rank-ordering.

We can rotate Table 3 clockwise by right angle and make the vertical axis of Table 3 overlap with the horizontal axis of Table 2. The brackets in Table 3 characterized with "low visibility to the core firm" shows precisely in which spheres the supplier in question can exert a high degree of technological initiative vis-a-vis the core firm, keeping black-box elements in the processes looking from the core-firm. As to the effect of the degree of technological initiative on price negotiations, I submit the following proposition based on the arguments presented up to this point.

Proposition 4: The higher the degree of technological initiative that a supplier has concerning a part, the more probable that this supplier can earn from the transaction of this part some surplus profit which is not readily perceptible by the core firm. The core firm can counteract to this tendency by investing in the technology concerned, including initiation of part in-house production, or by finding alternative suppliers.

But what about the effects of the level, on the one hand, and the degree of complexity, on the other, of the relation-specific skill on interfirm negotiations? And how are these effects related to Proposition 4? I will

discuss these problems in Section 5.

5. Relation to the Theoretical Literature

Summarizing observations on interactions between a core firm and its suppliers, I have formulated the concept of the relation-specific skill in Section 4. From this point we can proceed a step further to base the notion of the relational quasi-rent, which has been introduced by Aoki (1988), on our formulation of the relation-specific skill. This will be done below in 5.1. Then in 5.2 I discuss briefly how the results reported in this paper can be related to Williamson's framework to classify transactions.

5.1 Distribution of the relational quasi-rent

Take a core firm and all of the suppliers with which this core firm has transactions currently and name these suppliers "incumbents." Suppose for simplicity that this core firm is manufacturing only one kind of final product. At least a portion of the incumbents consists of those suppliers with which the core firm has maintained longstanding relations, as we have seen. Due to the relation-specific skill that these suppliers have accumulated, the entire system formed by the core firm and the incumbents must be generating some surplus value added in comparison to the fictitious state in which all of the incumbents have been replaced by non-incumbents. This surplus value-added corresponds to the relational quasi-rent introduced by Aoki (1988). Based on the scheme to classify parts and suppliers that I introduced in this paper, I elaborate his argument on distribution of the relational quasi-rent.

Denote the amount of the relational quasi-rent that is generated by the system within a certain time span (say, a year) by R. Denote the portion of R that is attributable to the l-th kind of part by Rl. As we have seen, typically there are two to three incumbents who are supplying the l-th kind of part, if this belong to customized parts in the automobile industry. The core firm and each of the suppliers of the l-th kind of part share Rl according to some suitable ratios. As we have seen, the supplier which has achieved higher level of the relation-specific skill is ranked higher in comparison to other suppliers of the same kind of part, and tends to be offered more favorable business by the core firm. For instance, the supplier may be able to receive orders for a larger number of different car makes in parallel than any of its competitors receives, or to receive an order for a car make which sells in a larger volume than any other car makes which some of its competitors is in charge of. Thus the incumbents are apportioned shares in Rl respectively according to the ranks they are awarded from the core firm.

In the extreme case where the incumbent suppliers of the l-th kind of part comprise only one firm, the situation of bilateral monopoly emerges. This is the case analogous to the situation, in the context of analytical framework introduced by Shaked and Sutton (1987), where the parameter T, which can be interpreted as indicating the degree of difficulty of switching the partner looking from the employer, approaches infinite. In the other extreme where none of the incumbent suppliers of the l-th kind of part can exceed non-incumbents in terms of relation-specific skill, the situation is analogous in the same framework to the case where T approaches one and the Walrasian type distributional outcome emerges as the limit. In the intermediate cases where the "two vendor policy" has been effectively implemented by the core firm, the situation is analogous to the cases where T takes intermediate values. In

practice, it is remarkably common to all core firms that they do not want to maintain bilateral monopoly situation. Whenever feasible, they endeavor to correct the situation by developing alternative qualified sources. This can be interpreted, in a framework similar to that introduced by Shaked and Sutton, as an effort to reduce T, a surrogate for the bargaining power of the supplier concerned.

As the next step, I consider another kind of part, say the m-th kind of part. If Rm > Rl, I call the m-th kind of part " a part which has more weight than the l-th part in the composition of the final product which the core firm supplies." For instance, engine has more weight than electronic fuel injection system in the composition of a car, the latter having more weight than transmission. If a supplier which used to supply only the l-th kind of part until recently successfully receives an order for the m-th kind of part in addition to the older line of business, it acquires a positive share in Rm in addition to that in Rl. Then it achieves a larger share in the whole R than it used to have.

Thus for a supplier that seeks to grow, the following three means are available.

(1) Within the l-th kind of part, to endeavor to achieve a higher rank by accumulating higher relation-specific skill.

(2) To endeavor to enter the business for another kind of part, desirably with more weight in the composition of the final product than the old line, dealing with the same core firm.

(3) To endeavor to enter or increase the business with other core firms.

Combinations of these means give strategies, or paths of evolution, that suppliers have actually chosen or can choose for their growth.

In the arguments given in this section up to this point, I have not dealt

with the distinction between major categories of parts yet but have discussed only the distinction between different kinds of parts. Let us introduce at this point the former distinction into our discussion. When a supplier of a DS part seeks to grow through diversifying into another kind of part, a natural order for this supplier is to launch on production of another DS part, which has some interconnection in view of core technology with the DS part it has been supplying heretofore. In this case, the l-th kind of part, the older line of business, and the m-th kind of part, the new line of business, belong to the same major category. But, at some point in the course of its evolution, the supplier may successfully enter production of a DA part, based on technological capabilities and reputation it has achieved. At this point, development across major categories, rather than that within a major category, occurs. What are the incentives for suppliers to seek developments across major categories? We can distinguish the following two effects of the development across major categories on the profitability of the supplier concerned: (1) the profit margin effect; and (2) the value added effet.

The profit margin effect is basically given by Proposition 4. Adding slight modifications to Proposition 4, I submit:

Proposition 5: Let l and m be two different kinds of parts. Suppose that l belongs to either the DS parts category or the DA parts category. Suppose further that m belongs to a different major category that lies in the right hand side in Table 2 to the major category which l falls under. Assume that the weights of l and m in the composition of the final product are about the same. Assume further that the numbers of incumbents for l and m are about the same. Then, the profit margin which a supplier can earn from a unit of the part m will be larger than that which this supplier can earn from a unit

of part 1.

When a supplier which has supplied a "marketed goods" type part to a core firm agrees to begin supplying a DA part derived from the "marketed goods" type part to this core firm, however, it is normally expected that the weight of the part in the composition of the final product will increase by the transition contemplated. The share of the supplier in the relational quasi-rent brought forth by the new part may become somewhat smaller in comparison to the older part, since the core firm may claim a larger share based on its own contribution. But even if this reduction of the supplier's share occured, it would be compensated by the increase of size of the relational quasi-rent.

As a summary, I submit:

Proposition 6: Suppose that 1 is a "marketed goods" type part and that m is a DA part derived from 1. Then, Rm> Rl.

Competition among incumbents to a core firm in their endeavor to grow following the strategies seen above may push up the whole R as an aggregated result, if, during the same time period, none of the non-incumbents can reach the level and complexity of the skill that would be enough to replace at least one of the incumbents, through technological investments and transactions with other superior core firms.

In this way, my scheme to classify parts and suppliers can be used to analyze paths for upgrading of and incentives for a supplier in a step more articulated way than the previous literature.

5.2 The scheme to classify transactions

Williamson (1979) classifies transactions along the following three dimensions: (1) the degree of uncertainty which parties to the transaction face; (2) the degree of frequency of the transaction; and (3) the degree to which transaction-specific investments are incurred (the degree of asset specificity, in short). Below I briefly compare my scheme with Williamson's framework in this order. First, I did not discuss the issue of uncertainty fully in this paper. However, I introduced the notion of degree of technological maturity of the final product, which is an important determinant of the degree of uncertainty. Regarding this factor, I observed the following fact at Plant Y: while 20 percent of suppliers to this plant are said to change annually as remarked in 2.2, suppliers for meters and compressors have been fixed. This suggests the following proposition.

Proposition 7: The more immature the key technology for a final product, the more incentive there will be for the core firm to keep the membership of the set of suppliers open for this particular product.

Williamson (1979) gives the following prediction concerning the effect of an increase in the degree of uncertainty on bilateral governance: the parties either have to make the good transacted less customized or to make the contract more elaborate. To this, I add my Proposition 7.

Proposition 7 can be explained in my scheme by the following reasoning. Take an incumbent supplier for such final product. As I argued in 4.4, the relation-specific skill consists of two layers. In the case of the product featured by technological immaturity, the competitive edge which this incumbent keeps at the present moment with respect to the surface layer, the skill acquired through transaction, can easily be cancelled out at the next

moment by the advantage which a non-incumbent might achieve in the basic layer through purely technological investments.

Second, the typical scale of production of the final product caused by the time pattern or intermittency of incoming demand, which I used as another variable in this paper, brings a finer partition within Williamson's "recurrent" class of transactions along the dimension of frequency.

Third, several differences are found between Williamson's treatment of asset specificity and my way of dealing with relation-specific skill. The first difference is that while he treats asset specificity as if it could be measured by a scalar, I deal with the relation-specific skill as something to be expressed by a multi-dimensional vector. Further, in my scheme, the dimensionality of this vector differs depending on which category the supplier in question falls under. For instance, for a supplier of a DA part, the relation-specific skill that this supplier has accumulated with respect to some core firm i is expressed by a four dimensional vector (x_{1i}, x_{2i}, x_{3i}, x_{4i}) with x_{1i} assuming a positive value. The second difference is that while Willamson emphasizes such investments in specific equipment or locations that would come to be locked into a relation with a particular core firm once invested, I mainly focus on human know-how accumulated in a supplier as an organization. Thus, if a core firm numbered i is superior to another core firm j, achieving a high value of x_{ki} through transactions with core firm i may have a spillover effect on x_{kj} in the same kind of skill that this supplier can exert in transactions with another core firm j. In this sense, investments made by a supplier in relation-specific skill do not necessarily come to be locked into a relation with a particular core firm. In other words, accompanying either x_{ki} or x_{kj}, some general capabilities grow.

Finally, there is another difference concerning the time horizon of the

relation analyzed. Williamson assumes that initial negotiation on the initial price and specifications of the item has already been concluded before the analysis begins. The analysis is focused on "interim adjustments," which become necessary as time goes on, the time length of the transaction being supposed to be the same as that of the relation. On the other hand, longstanding relations I dealt with in this paper can span much longer time. It can be maintained over different generations of the same make of the final product. Each time when a new model is developed, the relationship is renewable with reappraisal of the supplier's capabilities and renogotiation of the terms of trade. This difference in the time horizon of analysis seems to partly reflect the difference between contractual practices in the United States and those in Japan. But, due to the limitation of space, I have to cut out descriptions of this difference. This point as well as a full analysis of implications brought by the differences between Williamson's argument and mine are left for discussions on another occasion.

6. Concluding Remarks

In this paper I showed that a variety of relations exist between a typical Japanese core firm and suppliers thereto. I showed further that longstanding relations are to be explained in economic rather than cultural terms based on the relation-specific skill accumulated by suppliers as well as ratings exercised thereon by the core firm. I constructed the concept of relation-specific skill as something multidimensional which has different dimensionality depending on types of parts transacted. In passing, I analyzed effects of the characteristics of the final product on the mode of relations between the core firm and suppliers concerned. Finally, I related the results

acquired to works by Aoki and Williamson.

Several points remain to be given further illuminations. For one thing, I have not analyzed fully in this paper the determinants of make-or-buy decisions. Relatedly, I have not clarified the role of related companies. For another, I have not given any international comparisons in this paper. These points are to be discussed on other occasions.

Footnotes

* The first version of this paper was presented at the Rokko Conference in July 1985 and at a seminar organized by Oliver E. Williamson at Yale in June 1986. The second version Asanuma (1986) was presented at a seminar at Stanford in September 1986 and at a U.S.-Japan Symposium organized by MITI in Tokyo in January 1987. I thank the participants of these meetings, Ronald Dore, Kazuo Koike, Masahiko Aoki, Daniel Okimoto, Scott Masten, G. Mustafa Mohatarem, Keinosuke Ono, Charles Horioka, Haruo Imai, Ken Ariga, and a referee of this Journal for helpful comments and suggestions. Research leading to this article was supported by grants from the Japanese Ministry of Education, the Japan Economic Research Foundation, and the Kyoto University 70th Anniversary Memorial Foundation.

1) When the demand for a subkind of part is large enough, there are cases in which more than one supplier receive orders for this same kind of part. However, in such cases as well, some measure is normally taken by the core firm so as to stabilize the relative status of each supplier during the life of the model. For instance, each supplier is assigned a fixed proportion of the total demand.

2) See Shiomi (1985), 97-98.

3) The degree of technological maturity is the inverse of the degree of technological immaturity. By the latter term I mean the degree to which the key functions as well as the key components of the final product in question are in a relatively fluid state from technological viewpoint. For instance, since the first wordprocessor that can deal with the Japanese language appeared early in 1970s, increasingly more handy models with more elaborate functions came out, within a remarkably short period. This was largely due to rapid advancement of LSI technology and was accompanied by drastic reductions

of costs and prices, which in turn boosted rapid expansion of the market. This means that during the last fifteen years this product remained technologically immature in the meaning defined above.

4) Precisely speaking, a purchasing manager of Plant Y admitted the possibility that he may suggest supplier switching as a kind of threat even within the life of a given model; he may even carry out the threat, however rare this may be. On the other hand, managers of Plants X and Z asserted that it is a well-established custom to refrain from such interim supplier switching. Thus it cannot be asserted that supplier switching within the life of a given model is never planned or executed. My assessment is that the dominant trend is to refrain from it, however.

5) For some items characterized by technological immaturity and vigorous competition, there are cases in which the price is changed at shorter intervals.

6) For instance, refer to the list of replies to a questionnaire survey on the criteria used by automobile manufacturers to classify transactions into subcontracting, purchasing, and car assembly subcontracting attached as Table IV-A-3 to Kikai Shinko Kyokai Keizai Kenkyusho (1975).

7) There are dynamic interactions between these two layers. For instance, to respond to a specific need expressed by a core firm, the supplier in question may have to be equipped with, or have to develop anew, a method to process a new kind of material, or a method to design a more compact tip than the ones that have been available heretofore. Such methods are or will become applicable to other uses as well, forming part of general technological bases of the supplier.

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Table 1 Characteristics of the Plants Visited

code name of plant	product (a) main (b) secondary (c) third	relative maturity of product	scale of production
X	(a) microwave ovens	high	large
	(b) washers	very high	large
	(c) electronic rice cookers	high	large
Y	(a) plain paper copiers	low	large
	(b) cash dispensers and other labor saving machines	low	small
	(c) meters and compressors	very high	very large
Z	(a) control instruments	high	rather small
	(b) automatic clinical analyzers	very low	small
	(c) electron microscopes	low	very small

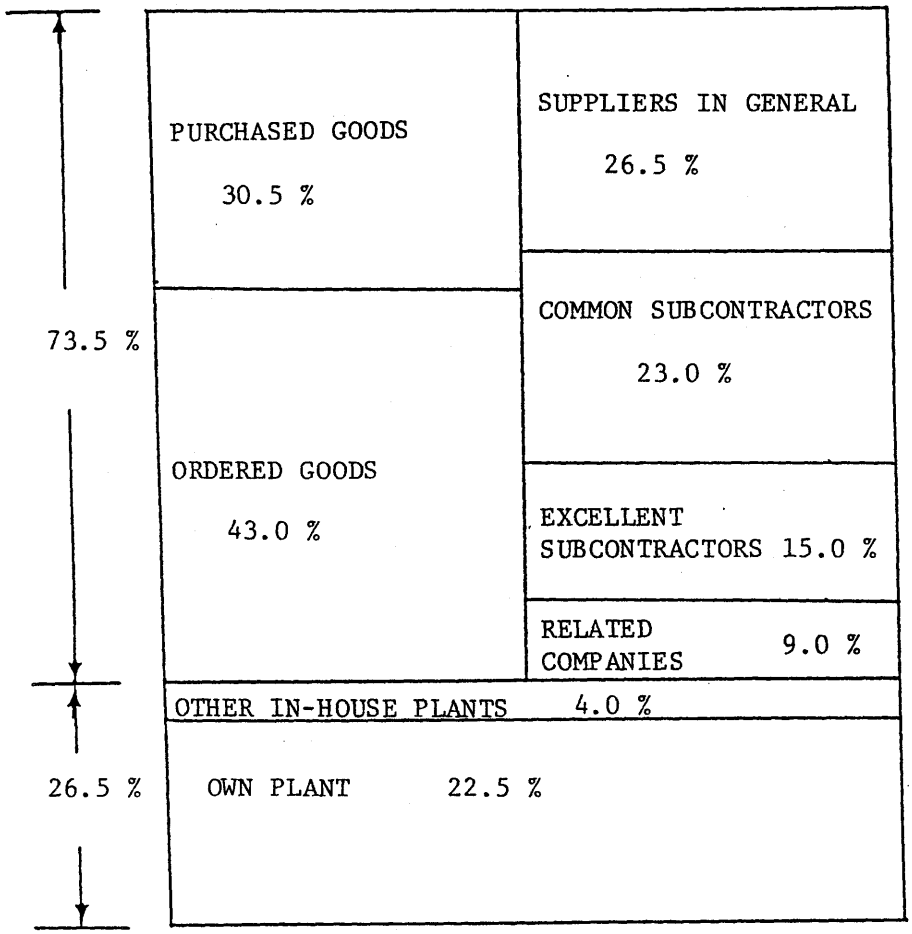

Figure 1 Composition of Parts and Materials and That of Their Sources: An Example

	parts manufactured according to specifications provided by the core firm ("ordered goods")						parts offered by catalog ("marketed goods")
	parts manufactured according to drawings provided by the core firm			parts manufactured according to drawings provided by the supplier			
	A	B	C	D	E	F	G
criterion for classification	the core firm provides minute instructions for the manufacturing process	the supplier designs the manufacturing process based on blueprints of products provided by the core firm	the core firm provides only rough drawings and their completion is entrusted to the supplier	the core firm provides specifications and has substantial knowledge of the manufacturing process	intermediate region between D and F	though the core firm issues specifications it has only limited knowledge concerning the process	the core firm selects from a catalog offered by the supplier
example	small parts assembled by firms offering assembly service	small outer parts manufactured by firms offering stamping service	small plastic parts used in dashboard	seat	brake, bearing, tires	radio, electronic fuel injection system, battery	

Table 2 Classification of Parts and Suppliers according to the Degree of Initiative in Design of the Product and the Process

major categories of parts	major components of relation-specific skill			
	X_1	X_2	X_3	X_4
	capabilities that become visible through interactions held during the early development stage	capabilities that become visible through interactions held during the late development stage	capabilities that become visible at deliveries during the production stage	capabilities that become visible at price renegotiations during the production stage
"marketed goods" type parts	(low visibility to the core firm)	(low visibility to the core firm)	1. ability to assure quality 2. ability to assure timely delivery	(low visibility to the core firm)
DA parts	1. ability to develop the product in response to the specifications from the core firm 2. ability to make proposals on specifications improvements	1. ability to develop the process based on the drawings approved (visibility ranges from high to low) 2. ability to reduce prospective costs through VE	1. ability to assure quality 2. ability to assure timely delivery	1. ability to reduce costs through process improvements (visibility ranges from high to low) 2. ability to reduce costs through VA
DS parts	(not relevant)	1. ability to develop the process based on the drawings supplied 2. ability to reduce prospective costs through VE (through proposals on design)	1. ability to assure quality 2. ability to assure timely delivery	1. ability to reduce costs through process improvements 2. ability to reduce costs through VA (through proposals on design improvements)

Table 3 Contents of Relation-specific Skill by Major Categories of Parts