The Influence of Customer Scope on Supplier's Performance in the Japanese Automobile Industry

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a) Executive Summary

By analyzing data of 125 suppliers, this study has found that a supplier with a broad customer scope tends to be more profitable in the Japanese automobile industry. We have asserted that this finding implies that leading Japanese suppliers may have organizational capabilities with respect to managing cooperative assembler-supplier relationships with multiple customers, rather than only with a single keiretsu buyer.

Most studies on Japanese assembler-supplier relationships have focused on the nature of the inter-firm relationship. However, it is not sufficient for researchers and managers to understand an appropriate setting for industry organizations in that single dimension. Studies that focus only on advantages of a long-term cooperative relationships may even mislead us to consider that an exclusive assembler-supplier relationship may be the optimal solution. This study has argued that management at suppliers should simultaneously focus on benefiting both from inter-firm cooperative relationships and from economies of customer scope.

b) Research Results

(1) Research Questions

This study analyzes the relationship between strategies and performance of the Japanese automobile component suppliers, focusing on the influence of their customer scope. Past studies have emphasized advantages of Japanese long-term and cooperative partnerships, comparing them with the arms-length relationships in the Western industry (Clark and Fujimoto, 1990; Cusumano and Takeishi, 1994; Nishiguchi, 1994; Helper and Sako, 1994). This Japanese model is supposed to be beneficial for both customer firms and suppliers. These studies and others have also implied that this type of supplier relationship is supported by the Japanese keiretsu system (Lincoln, et. al., 1992; Dyer and Ouchi, 1993). The notion of keiretsu may have created some misunderstanding, though. Some may think that Japanese automobile firms have a keiretsu supplier group and maintain a relatively exclusive relationship within the group. However, there is actually a complicated manufacturer-supplier network across these groups. Many suppliers sell a certain type of components to multiple competing automobile manufacturers, while auto manufacturers buy most components from multiple suppliers.

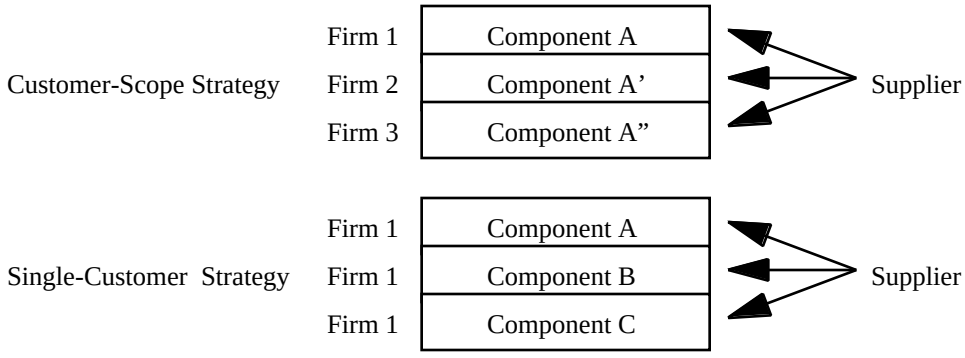
Despite the extensive list of studies on the nature of dyadic inter-firm relationships, few studies have explored the differences in strategies among Japanese suppliers in the context of the entire assembler-supplier industry network. This study examines the relationship between customer scope and profit performance of suppliers, as opposed to focusing on the nature of dyadic assembler-supplier relationships. This study, combined with the existing literature, provides evidence that both cooperative inter-firm relationship and customer scope may be important to supplier's performance.

(2) Conceptual Framework of Customer Scope

There are various types of potential benefits of customer scope for suppliers, which can be divided into three groups: economies of scope, learning opportunities, and bargaining power. First, broad customer base may provide suppliers with more opportunities to capture benefits from scope economies. Figure 1 explains the way customer scope may lead to economies of scope in a simplified model. In the customer-

scope strategy, the supplier sells Component A to three different customers with minor modifications made to adjust to each firm's needs. This model assumes that Firm 1 wants to buy only a limited amount of component A from this supplier. Therefore, if the supplier follows a single-customer strategy and wants to achieve the same amount of total sales, it needs to sell three different components to the single customer. Otherwise, the supplier may be able to sell only one third of the amount, if it sticks to selling only Component A. Because the supplier can sell similar components more in scale in the customer scope strategy, it can enjoy economies, which this study calls "economies of customer scope."

Figure 1 A Model for the Economies of Customer Scope



The second group of benefits from customer scope is related to learning opportunities. Suppliers may obtain specific knowledge from transactions with various manufacturers. For example, Liberman (1994) has reported that Toyota's suppliers learned the Toyota production system and increased productivity earlier than other suppliers that did not have transactions with Toyota. The more customers a supplier deals with, the more opportunities for learning a supplier may have. A supplier with many customers may also accumulate capabilities to deal with inter-organizational transactions better than single-customer suppliers through more experience (Martin, et. al., 1995).

In addition, components that a supplier sells to multiple customers may be enhanced because of the supplier's credibility and reputation. For example, an assembler tends to choose components that have already been tested by other assemblers, other conditions being equal. An assembler in this case may pay a premium for quality assurance.

Lastly, a supplier with a broad customer scope tends to have more negotiation power with each customer (Porter, 1980; Cowley, 1988). Although this is a relevant issue, Japanese suppliers might not be able to fully enjoy this benefit. First, regardless of the industry structure, assembler-supplier relationships in the Japanese auto industry tend to be based on a cooperative long-term relationship (Helper, 1989). Therefore, it is rather difficult for a supplier to be opportunistic based on its relative power. Second, because auto assemblers usually follow a multi-sourcing strategy (McMillan, 1990), even when suppliers have multiple customers, the supplier-assembler power relationship tends to be balanced.

Because of these factors discussed here, this study hypothesizes that a broader customer scope has a positive relationship with supplier's performance.

(3) Sample and Variables

A major challenge in this empirical research is to capture the actual relationship between the customer scope and supplier performance by controlling for other factors. In particular, a supplier's underlying competitiveness variables should be carefully considered. These variables could be common causes shared by both customer scope and a supplier's profit performance. For example, suppliers with innovative technologies may attract many customers, while, at the same time, performing well in terms of profit performance. In this case, the relationship between customer scope and a supplier's performance could be a spurious one. The following sections explain our sample and variables in detail.

Sample and Dependent Variable

This study uses a publicly available database (Japanese Automotive Parts Industry Association, 1995), which contains data on 348 major automotive component suppliers. Among those suppliers, complete data as needed in this study are provided for only 164 suppliers. Since this study focuses on the supplier's relationship with vehicle assemblers as direct customers, it further excludes suppliers that do not have more than 50% of total sales to vehicle assemblers. The final number of suppliers in the sample was 125. For the performance measurement of the suppliers as the dependent variable, this study uses the annual ordinary profit divided by sales in the fiscal year ending in 1994.

Customer Scope Variables

Customer scope is measured by two alternative variables: the Herfindarl Index and number of customers. There are seven groups of automobile assemblers in Japan: namely, the Toyota group, the Nissan group, Honda, Mitsubishi, Mazda, and Suzuki. The Toyota group includes Toyota, Daihatsu, Hino, Toyota Auto Body, Kanto Auto Works, and Araco, all of which actually assemble complete vehicles for Toyota. The Nissan group includes Nissan, Fuji Heavy, Aichi Machine Industry, Nissan Shatai, and Nissan Diesel Motor. For simplification, this study calls these seven independent assemblers.

The Herfindarl Index was calculated, using percentages of a supplier's sales to each assembler among the seven. This index means that the smaller the index is, the broader a customer scope is. Total percentages of these seven assemblers were rescaled to add up to 100%. The second variable is a simple count of customers, the number of assemblers out of the seven. Herfindarl Index and the number of customers naturally have a strong correlation, and are used in the analyses alternatively.

We also defined two other types of customer scope variables. First, some suppliers sell components to other automobile suppliers in addition to the seven automobile assemblers. Second, some suppliers sell components also to non-automobile customers. We calculated ratios of these two types of sales out of total sales. We define the first as related-customer ratio, which is a ratio of supplier' s sales to other automobile suppliers divided by total sales. The second is unrelated customer ratio, which is a ratio of supplier's sales to non-automobile-related firms divided by total sales.

Control Variables

First, suppliers were divided into three sub-industry categories depending on their primary products: electronics, non-metal, and others. Second, customer proportion variables measure a ratio of a sales volume to each customer divided by total sales to the seven assemblers. Third, total sales of each supplier is included to control for its scale effects. The scale variable could also be a common cause of both customer scope and supplier's performance. Lastly, as discussed earlier, we try to control for variables with respect to underlying competitiveness of a supplier in part of our regression models. The models include both sales divided by the number of employees as a proxy of a supplier's efficiency and a supplier's sales growth in the past four years as a proxy of underlying market competitiveness.

(4) Results

Table 1 shows descriptive data and correlation matrices for the variables used in this study. The average profit-sales ratio for suppliers in the sample is about 2%. Sales proportions for each customer seem to be comparable to actual total production volume of each customer in Japan, which indicates that the sample represents the population of suppliers. The average number of automobile assemblers that a supplier sells to is 2.4. On average, 14% of a supplier's sales are to other automobile component suppliers, and 8% are to non-automobile-related firms.

Table 1: Correlation Matrix and Descriptive Data

	Ave	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Profit Sales Ratio	0.02	0.02	-													
2. Toyota	0.30	0.41	.05	-												
3. Nissan	0.22	0.35	.01	-.40	-											
4. Mitsubishi	0.11	0.24	-.11	-.19	-.19	-										
5. Honda	0.17	0.33	.23	-.33	-.23	-.17	-									
6. Mazda	0.12	0.28	-.21	-.26	-.19	-.10	-.18	-								
7. Suzuki	0.04	0.14	.06	-.11	-.12	-.02	-.02	-.09	-							
8. Isuzu	0.05	0.16	-.13	-.16	-.02	-.05	-.14	-.08	-.06	-						
9. Number of Customers	2.40	1.70	.26	-.09	.07	.06	-.01	-.09	.04	.13	-					
10. Herfindarl Index	0.77	0.28	-.26	.13	-.06	-.16	.05	.06	-.04	-.14	-.88	-				
11. Related Customer Scope	0.14	0.11	.20	-.07	.16	.08	-.09	-.04	.17	-.17	-.04	-.04	-			
12. Unrelated Customer Scope	0.08	0.10	.04	.04	-.12	.09	-.04	.06	-.04	.05	.21	-.24	-.28	-		
13. Sales (Log)	10.3	0.96	.08	.05	.23	-.23	.07	-.17	-.25	.06	.35	-.19	-.10	-.15	-	
14. Sales/Employee (Log)	3.56	0.38	.14	.05	-.01	-.02	.09	-.11	-.13	.05	.05	-.06	-.10	-.16	.42	-
15. Sales Growth	0.07	0.29	.35	.08	-.09	.14	.00	-.04	-.01	-.11	.06	-.10	.21	-.15	.01	.03

.22>:p<0.01, .18>:0.05

Figure 2 shows results from regression analyses on supplier performance. Models 1 and 2 do not include supplier competitiveness variables. Models 1 and 3 use number of customers for a customer scope variable, while Models 2 and 4 use the Herfindarl Index. These customer scope variables have a strong positive influence on supplier performance in all models, after all other variables are controlled.

In Models 3 and 4, one of the other customer scope variables, the related-customer ratio, also has a positive and significant influence on supplier performance. This result indicates that in addition to a broad customer scope among auto assemblers, diversified sales to other auto component suppliers also have a positive influence on supplier's performance. On the other hand, the unrelated-customer ratio has no significant relationship with performance. In the latter case, the potential advantages of customer scope discussed earlier are not applied.

Among the customer proportion variables that are used to control for an idiosyncratic influence of each customer, suppliers that sell more to Honda tend to make more profit. Most automobile experts agree that Honda is a firm that focuses on product differentiation strategy, as opposed to low-cost strategy, to the greatest extent among the seven Japanese assemblers (e.g., Kajihara and Takagi, 1994). This nature of the Honda strategy may explain this result, because a cost-sensitive customer tends to lower supplier's profit (Porter, 1980).

Figure 2: Regression Analyses for Supplier Performance (N=125)

Independent Variables	(1)	(2)	(3)	(4)
Constant	0.014	0.031	-0.005	0.010
Primary Products (Dummy)				
Electronics	-0.000	0.002	-0.002	0.000
Non-Metal	-0.010	-0.010*	-0.011*	-0.011*
Customer Proportion (%)				
Toyota	0.020†	0.021†	0.017	0.017
Nissan	0.017	0.018	0.019	0.018
Mitsubishi	0.003	0.002	-0.005	-0.005
Honda	0.031**	0.032**	0.028*	0.029*
Mazda	0.004	0.004	0.002	0.003
Suzuki	0.015	0.018	0.016	0.018
Isuzu	-	-	-	-
Customer Scope				
Number of Customers	0.004**		0.004**	
Harfindarl Index		-0.023***		-0.020**
Related Customer Ratio	0.048**	0.044**	0.041**	0.037*
Unrelated Customer Ratio	0.015	0.014	0.029	0.029
Scale				
Sales (Log)	-0.002	-0.001	-0.005*	-0.003
Competitiveness				
Sales/Employee (Log)			0.012*	0.012*
Sales Growth			0.022***	0.022***
Adjusted Squared Multiple R	0.190***	0.195***	0.314***	0.303***

***p<0.001; **p<0.01; *p<0.05; †p<0.10

c) Implications

Our data analyses have supported that customer scope has a positive influence on a supplier's performance. We believe that this finding is interesting particularly because this relationship has been found in the context of the Japanese supplier-assembler relationship. The Japanese cooperative inter-firm relationship is supposed to be beneficial to suppliers, as well as to assemblers (Nishiguchi, 1994; Helper and Sako, 1994). It is commonly considered that a relatively exclusive keiretsu system facilitates

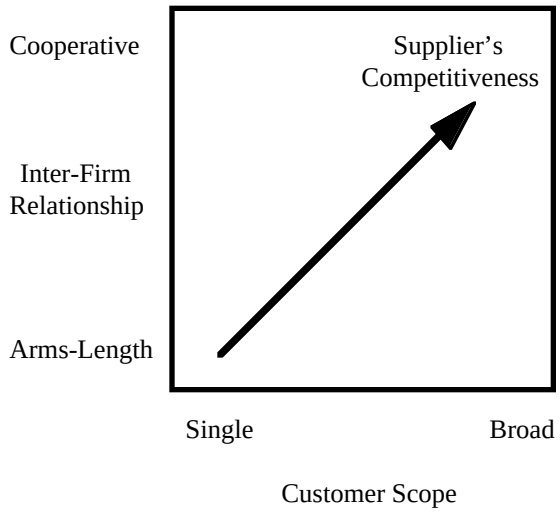
these close inter-firm ties. However, this study has found that a less exclusive relationship is generally more beneficial to suppliers. The following section discusses implications for supplier's customer management.

Customer Scope and Inter-Firm Relationship

This study argues that the dyadic cooperative inter-firm relationship may have only partially explained some aspects of the Japanese assembler-supplier relationship. A discussion of a cooperative supplier relationship based on the keiretsu system sometimes seems to create a misleading impression of a one-to-one exclusive relationship. As this study has shown, on average, Japanese suppliers sell components to 2.4 automobile assemblers among seven. More importantly, a supplier that has a broad customer scope actually performs better than those that deal with a smaller number of customers.

A combination of the existing literature and this study leads to a proposition: a supplier that has capabilities in dealing with multiple assemblers while at the same time maintaining cooperative relationships with each buyer may perform better than others. In order to consider this proposition, it is important to distinguish between these two dimensions, customer scope (or relationship exclusivity) and the degree of inter-firm cooperation. The framework in Figure 3 distinguishes the customer scope dimension from the inter-firm relationship to analyze the relationship from both perspectives.

Figure 3 Inter-Firm Relationship and Customer Scope



The inter-firm relationship dimension ranges from "cooperative" to "arms-length." The customer scope dimension ranges from single to broad. This framework assumes that these two dimensions are independent of each other. For example, the degree of inter-firm cooperation is not necessarily determined by the supplier-assembler structure such as the supplier's customer scope. Rather, a supplier with sufficient organizational capabilities could achieve cooperative inter-firm relationships simultaneously with multiple customers.

A supplier that has interactions with more customers may accumulate capabilities to manage cooperative inter-firm relationships more effectively. For example, Martin, et. al. (1995) have discussed that a supplier with experience in dealing with more assemblers has a superior ability to establish additional links with new assemblers or with the same buyers in new locations such as foreign markets. Their findings imply that there could be general inter-organizational management capabilities, which are accumulated through a variety of inter-firm transactions and can be applied to new inter-firm linkages. From this perspective, customer scope may contribute to a supplier's capabilities in implementing cooperative joint efforts with each assembler.

Implications for Buyer Management

It is not sufficient for suppliers to simply increase the number of customers in order to benefit from customer scope. In order to enjoy the benefit, a supplier may need appropriate organizational capabilities, with which it can achieve both customer responsiveness with each assembler and effective management of multiple customers simultaneously.

The recent competitive environment in the Japanese automobile industry also forces suppliers to pursue these two goals at the same time. First, the cooperative nature of partnership relation has become even more important for international competition. In our interviews with Japanese major suppliers, they mentioned that auto assemblers are asking them for even earlier involvement in product development projects than before. This type of concurrent engineering is beneficial to both sides, because it can shorten product development lead-time and reduce engineering hours by decreasing design changes in the later stage of a project.

Second, automobile assemblers are trying to share a greater number of common components between multiple product development projects even between competitors, as well as among multiple internal projects (Fujimoto and Takeishi, 1994). In the increasing worldwide competition for cost reduction, strategic component-sharing is one of the key issues (Nobeoka and Cusumano, 1995). For example, Toyota and other assemblers have been encouraging their suppliers to sell similar components to multiple firms in order to lower purchasing costs (Nobeoka, 1995). A common supplier that deals with multiple customers could effectively coordinate component sharing between competing automobile assemblers.

Therefore, leading suppliers are currently trying to improve coordination efforts with assemblers both to involve them earlier in each assembler's product development project and to develop components that can be efficiently shared by multiple assemblers. Activities targeting these two goals are mutually reinforcing for the supplier. Earlier involvement enables the supplier to design components that can be shared by multiple customers. In this way, suppliers that have capabilities to effectively manage both activities may become more successful in this environment.

d) Future Research

This study has a limitation because it focused primarily on variables regarding the industry structure, not on the nature of inter-firm relationships. Further studies are needed to examine more explicitly the relationships among the assembler-supplier structure, the nature of dyadic inter-firm relationships, and performances of both

suppliers and assemblers. Studies should focus on details regarding mechanisms by which a combination of inter-firm cooperative relationships and customer scope would create benefits for both assemblers and suppliers. We also need to do similar research on the US and European suppliers.

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