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When Does Product Diversity Improve Performance? The Moderating Role of Customer Scope Strategy

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ABSTRACT

This paper investigates the interaction effect of customer scope strategy and product diversification strategy on firm performance. The result provides a support for a positive moderating effect for product diversity on the relationship between customer scope and firm performance in 2005, while pursuing only product diversity has a negative but insignificant influence on performance. This result indicates that the combination strategy, which refers to implementing the both strategies (broadening customer scope and product diversity), improves firm performance under certain conditions. In the main body of the discussion, this paper suggests some theoretical implications based on the empirical results.

Keywords: product diversity, within-industry diversification, product scope, customer scope, combination strategy, transaction cost, coordination cost, automotive industry

INTRODUCTION

Previous studies on strategic management have expounded the antecedents which affect positively firm performance. Studies on interorganizational relationships have suggested that the most important sources of innovation are resulted from customers and having a broader customer scope positively affects firm performance, especially within the Japanese automotive industry (Clark & Fujimoto, 1991; Dyer & Chu, 2011; Dyer & Nobeoka, 2000; Konno, 2017; Martin, Mitchell, & Swaminathan, 1995; Nobeoka et al., 2002; Sako & Helper, 1998; von Hippel, 1988). Those studies have basically assumed that interorganizational learning through interactions with multiple customers is critical for achieving competitive advantage and outstanding performance. Prior research on interorganizational relationships indicates a positive relationship between customer scope and firm performance; yet, a study examining the relationship in different fiscal years has founded an inconsistent result with the previous research (Min & Song, 2017).

Meanwhile, scholars on diversification strategy have empirically demonstrated the impact of within-industry diversification or intra-industry diversification on firm performance (Hashai, 2015; Min & Mitsuhashi, 2016; Stern & Henderson, 2004; Tanriverdi & Lee, 2008; Zahavi & Lavie, 2013). These studies have examined if product diversification within a particular market or industry enhances firm performance, but the findings on the linkage between product diversity and performance have remained somewhat inconsistent.

This study suggests that customer scope can be a critical factor to moderate the relationship between product diversification and firm performance positively; however, in the existing literature, how the interaction of two strategies affects performance remains

unclear since there has been no examination of the outcomes of simultaneously pursuing customer scope and product diversity.

To examine the interaction effect of customer and product diversification strategy on performance, the remainder of this paper is arranged as follows. Following this introduction, the next section reviews the previous literature on the effects of customer scope and product diversity on firm performance. After briefly describing the research method including the data, variables, and the model, the study presents the empirical results and concludes with discussing some theoretical implications.

LITERATURE REIVEW

Product diversity on performance: Within-industry diversification

After the pioneering research on diversification strategy by Ansoff (1957) and Chandler (1962), over the past several decades, strategic management scholars have empirically examined whether the diversification across industries has a positive effect on firm performance at the corporate level (Markides, 1995; Palepu, 1985; Palich, 2000; Rumelt, 1982).

However, firms diversify not only across industries, but also diversify within-industry. In a lot of cases, small to medium-sized high technology firms are likely to pursue product diversification strategy within their industry to strengthen the engine of growth. This kind of diversification is described by terms such as intra-industry diversification or within-industry diversification (Hashai, 2015; Min & Mitsuhashi, 2016; Stern & Henderson, 2004; Tanriverdi & Lee, 2008; Zahavi & Lavie, 2013). In fact, most of the suppliers, which dealt with in Nobeoka et al. (2002) and Min & Song (2017), remained focused on the automotive industry; at the same time, some of those might had diversified product scope (product categories) within the industry.

Little was known about the link between product diversity within-industry and firm performance, but recently several studies on performance consequences of the within-industry product diversification have appeared in the literature. The findings on the effect of within-industry diversification on firm performance is somewhat mixed and inconsistent. This mixed evidence might be caused by methodological differences including variables and measures or some latent contingencies.

One study, analyzing the relationship with the data of Canadian general insurance industry, found that there is no relationship between within-industry diversification and profit performance measured by ROA (Li & Greenwood, 2004). An analysis that reports mixed effect including a negative effect also exists. Tanriverdi & Lee (2008) analyzed the data of 884 firms in the software industry and concluded that implementing only market-related diversification or only platform-related diversification reduces performance (sales growth), while implementing the two strategies in combination has a positive effect on performance.

In contrast, several studies reported positive relationships between within-industry diversification and firm performance. For example, Nobeoka & Cusumano (1997) find that product diversity has a positive effect on sales growth that because technology sharing enhance economies of scope. One study reports that product diversity as well as introduction rate of new products have positive relationships with firm survival by analyzing the U.S. personal computer industry, though the impact of product diversification on survival is weaker when environments are unstable (Stern & Henderson, 2004). Meanwhile, Zahavi & Lavie (2013) examines that U.S. software firms' product diversity initially has a negative effect on performance at a low level because of negative transfer effects but then improve performance to

enlarge economies of scope. In this vein, they contend that the degree of within-industry diversification has a U-shaped relationship with sale growth. Further, recent research on small and medium-sized high technology firms shows that there is a S-shaped relationship between within-industry diversification and ROS (Hashai, 2015). Hashai (2015) points out that a higher level of within-industry diversification hampers firm performance, resulting from the influence of adjustment costs and coordination costs.

Customer scope on performance

Customers are a valuable source of innovation because suppliers acquire external knowledge and information for new product development, thus helping them creating product innovation(von Hippel, 1977; von Hippel, 1978; von Hippel, 1988). von Hippel (1988) investigated the sources of the innovation in the semiconductor industry, founding the primary sources of innovative ideas come from firms' customers. This means that close relationships with customers help suppliers acquire knowledge that might be valuable to create new value for them. Thus, we can assume that suppliers with multiple customers are more likely to develop innovative new products that meet the needs of customers, thus resulting in outstanding performance.

In the Japanese automobile industry, automotive suppliers acquired the most important sources of technical knowledge for new product developments through supplier associations that Japanese automakers established(Nishiguchi, 1994). The Japanese supplier associations have a critical role to play in sharing technologies and ideas between the suppliers and the assemblers (Clark & Fujimoto, 1991; Cusumano & Takeishi, 1991; Dyer & Chu, 2011; Dyer & Nobeoka, 2000; Konno, 2017; Sako & Helper, 1998). More importantly, Martin, Mitchell, &

Swaminathan (1995) indicate that a supplier with broader customers might achieve a greater profits because it could develop negotiation skills from experiences in transactions with multiple customers.

Based upon the above arguments, pointing out that leading Japanese automotive suppliers have actually a broader range of customers, Nobeoka, Dyer, & Madhok (2002) examine the effect of customer scope strategy on firm performance of the suppliers. In the research by Nobeoka et al. (2002), customer scope is measured by the number of automakers to whom components were supplied and the Herfindahl index (the concentration ratio of automakers) with the data from Japanese Automotive Parts Industry. Their results confirm that suppliers with a broader customer scope achieve superior performance. This is because interactions with multiple customers make suppliers take advantages of economies of scope through increases of learning opportunities and acquire relation-specific knowledge, thus receiving the benefit of reduction in transaction costs (Dyer, 1997; Nishiguchi, 1994; Nobeoka et al., 2002).

Recently, pointing out the methodological limitation of Nobeoka et al. (2002) in that the analysis is only based on a single-year data for 1995, Min & Song (2017) examined the impact of customer scope on performance at different fiscal years. In order to enhance the theoretical reliability of the research result, they composed multiple-year dataset by gathering additional data from Japanese Automotive Parts Industry for 1985 (the fiscal year ending in 1984) and 2005 (the fiscal year ending in 2004) in addition to the data for 1995(the fiscal year ending in 1994). The results for 1985 and 1995 are basically consistent with the resultant of Nobeoka et al. (2002); however, no significant relationship between customer scope and performance is observed for 2005. In short, the empirical research reviewed above show that while there was a support for the

relationship between customer scope and firm performance in 1984 and 1994, the relationship could not be found in the 21st century. In order to grasp the insignificant result for 2005, Min & Song (2017) noted that no one argues relation-specific skill (Asanuma, 1989) can be re-deployed to other customers with no additional adjustment costs, thus proposed a plausible hypothesis that the level of costs to coordinate and redeploy went on increasing as the number of customers grew up. In the previous literature, though the most studies stand on the buyer side, strategic management scholars pointed out that coordination costs may increase with a rise in the number of transactional firms at the same time (i.e., Bakos & Brynjolfsson, 1993).

In the context of costs, Nobeoka et al. (2002) also pointed out that suppliers having multiple customers can take advantage of relation-specific knowledge which leads to cost reduction, even though the optimum degree of customer scope to maximize is still a subject to debate. Generally, it is considered that the relation-specific knowledge enables suppliers to conduct transactions more efficiently.

On this point, this study assumes that not only customer diversity, but also product diversity within-industry can positively influence the firm performance by enlarging the effects of economies of scope. Therefore, it is worthwhile to consider the way in which product diversity affects the relationship between customer scope strategy and firm performance.

In combination with the literature above, this paper assumes that simultaneously pursuing customer-product diversification strategies may lead to enhance firm performance by enlarging economies of scope resulting from complementary effects; of course, pursuing two strategies simultaneously might inhibit the firm performance by raising costs such as coordination or adjustment. Surprisingly, there is no empirical research to demonstrate the

outcomes of pursuing both strategies simultaneously with the exception of Konno (2017). Thus, this paper examines the relationship following a research question: Does broadening customer diversity or product diversity enhance performance? Does pursuing both customer and product diversity enhance performance?

RESEARCH METHODS

Sample and Data Collection

This paper collects the data from Japanese Automotive Parts Industry (Japanese Automotive Parts Industries Association [JAPIA], 2005), which covers the transactional and financial information of the Japanese automotive component suppliers. This research consists of the data set based on automotive component suppliers that have more than 50% of the total sales to automotive assemblers. We exclude automotive component suppliers with missing information regarding products, sales, profits, or shipment ratios (customer proportions - aggregated percent sales to automotive assemblers) from the data. The final numbers of suppliers in the sample is 81. Data on products, customer proportions and the numbers of employees are based on the annual data for the fiscal year ending in 2004. The annual data on performance (i.e., sales and profits) is based on the fiscal year ending in 2004 and 2005.

Operational Measure

Dependent variable

In this research, suppliers' profit-sales ratios are the firm performance as the dependent variable, following the method of

existing research (Nobeoka et al., 2002). In general, profit-sales ratio is calculated by dividing the operating income by total sales. To reduce concerns about the problem of reverse causality, this paper includes a time lag between the dependent variable and independent variables. Thus, profit-sales ratio in this paper is calculated as the average value during a two-year period (t0+t1).

Independent variable

Product diversity is measured by the natural logarithm of the number of product categories in each year (Hashai, 2015). The data book, Japanese Automotive Parts Industry, classifies products that Japanese automotive suppliers produce into 148 categories and provides the information of what products each supplier deal with. Thus, this study uses those numbers to measure product scope for each supplier in each year.

Customer scope is measured by the number of automotive customers. This is a simple count of customers, to whom a supplier provides its own components among seven automotive assembler groups. This study adopts the customer classification by Nobeoka et al. (2002) that classified Japanese automotive assemblers into the following 7 groups: the Toyota group (Toyota, Toyota Auto Body, Daihatsu, Hino, and Kanto Auto Works), the Nissan group (Nissan, Nissan Shatai, Nissan Diesel Motor, Fuji Heavy Industries, and Aichi Machine Industry), Mitsubishi, Honda, Mazda, Suzuki, and Isuzu.

Control variable

Following prior research, this study includes control variables to consider other factors that might affect firm performance (Lieberman & Demeester, 1999; Nobeoka et al., 2002). First, as some suppliers sell components to other automobile suppliers or to non-automobile customers, the model includes control variables for

related customer ratio, a ratio of supplier's sales to other automobile suppliers divided by total sales, and for unrelated customer ratio, which is a ratio of a supplier's sales to non-automotive firms divided by total sales. Also, this paper considers customer-proportions with the ratio of a supplier's sales volume to each customer divided by total sales to the seven assemblers, scale effects with the natural logarithm of the total sales of each supplier, and competitiveness of each supplier with natural logarithm of the sales per employee and sales growth in the past four years.

ANALYSIS AND RESULTS

To investigate the effects of broadening customer scope and product diversity on firm performance, this study conducted multiple regression analyses. Tables 1 summarizes descriptive statistics and correlations across the variables. The means, standard deviations, correlations among the variables are described. The average of profit-sales ratio in which the sampled firms were involved is 0.042, which means 4.2%, with a standard deviation of 0.026. The mean value of customer scope is 2.840 and product diversity is 1.171.

Table 2 shows the results of the regression analyses. As explained previously, this study has used profit-sales ratios as the dependent variable of firm performance. Since the variance inflation factors (VIF) of all variables observed in the regression analyses were below 10, there is no evidence of multicollinearity to be a problem.

Model 1 is the analysis to check the effects of the control variables. These control variables account for 20.8% of the variation in firm performance. For the ratio of Mitsubishi (β = -0.444, $p < 0.05$), the ratio of Suzuki (β = -0.258, $p < 0.1$), sales

growth (ß = 0.183, p < 0.05), the regression coefficients were statistically significant. The ratios of Mitsubishi and Suzuki have negative effects on performance, while sales growth has a positive relationship with performance.

Model 2 and Model 3 are the direct effects of customer scope and product diversity on performance. The results show that customer scope has a positive and significant effect on performance (ß = 0.218, p < 0.1), while product diversity has a negative but insignificant effect on performance respectively (ß = -0.036, p > 0.1).

Model 4 and 5 include the interaction term of customer scope and product diversity on performance. The result of Model 5 shows significant positive relationship between the interaction term and the performance (ß = 0.268, p < 0.05). Furthermore, the effect of product diversity on performance changed from a negative sign to a positive sign.

DISCUSSION AND CONCLUSIONS

The effects of pursuing customer-product diversity simultaneously on firm performance is a topic that has not been examined in the field of strategic management. To date, the literature has examined the effect of each product diversity or customer scope on performance separately. This paper has examined in detail the issue of whether pursuing two strategies (customer scope strategy and product diversification strategy) simultaneously affect firm performance or not with a sample of Japanese automotive suppliers.

Table 1. Descriptive Statistics and Correlations Matrix

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Profit-Sales Ratio	0.042	0.026	1													
2 Customer Scope	2.840	1.699	.098	1												
3 Product Diversity (Log)	1.171	0.790	-.004	.125	1											
4 Toyota	0.290	0.381	.307**	.083	.052	1										
5 Nissan	0.248	0.352	-.094	.045	-.032	-.396**	1									
6 Mitsubishi	0.085	0.208	-.383**	.032	-.050	-.177	-.144	1								
7 Honda	0.202	0.336	.027	-.083	.165	-.356**	-.270*	-.174	1							
8 Mazda	0.083	0.240	.058	-.158	-.162	-.227*	-.190	-.060	-.151	1						
9 Suzuki	0.053	0.154	-.196	.076	-.007	-.075	-.140	-.099	-.072	-.091	1					
10 Isuzu	0.039	0.153	.017	-.002	-.090	-.126	-.087	-.009	-.144	-.063	-.057	1				
11 Sales (Log)	10.213	1.347	.100	.351**	.590**	.054	.035	-.118	.220*	-.072	-.234*	-.190	1			
12 Sales/Employee (Log)	3.734	0.478	-.013	-.055	.170	-.109	.104	.006	.222*	-.059	-.258*	-.112	.526**	1		
13 Sales Growth	0.213	0.257	.253*	-.114	.090	.050	.157	-.099	-.119	.023	-.187	.060	.213	-.044	1	
14 Related Customer Scope	0.057	0.084	-.004	-.380**	-.094	.045	.102	-.136	-.109	.125	-.185	.063	-.147	-.018	.033	1
15 Unrelated Customer Scope	0.018	0.034	-.015	-.043	-.110	.033	-.139	.310**	-.124	.056	.117	-.116	-.189	-.244*	.061	-.063

Note: **p < 0.01; *p < 0.05. *n* = 81

Table 2. Regression Results (dependent variable: profit-sales ratio)

Independent variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	β	*t*-Value	β	*t*-Value	β	*t*-Value	β	*t*-Value	β	*t*-Value
Toyota	0.142	0.53	0.186	0.70	0.140	0.52	0.188	0.70	0.294	1.12
Nissan	−0.146	−0.59	−0.122	−0.50	−0.149	−0.59	−0.120	−0.48	−0.007	−0.03
Mitsubishi	−0.444 **	−2.46	−0.424 **	−2.38	−0.443 **	−2.44	−0.424 **	−2.36	−0.380 **	−2.17
Honda	−0.027	−0.11	0.052	0.21	−0.027	−0.11	0.054	0.22	0.189	0.77
Mazda	0.010	0.05	0.058	0.31	0.004	0.02	0.062	0.33	0.105	0.57
Suzuki	−0.258 *	−1.76	−0.243 *	−1.68	−0.254 *	−1.72	−0.245 *	−1.68	−0.202	−1.42
Sales (Log)	−0.055	−0.43	−0.186	−1.24	−0.029	−0.18	−0.203	−1.07	−0.363 *	−1.85
Sales/Employee (Log)	0.020	0.16	0.096	0.73	0.012	0.09	0.102	0.74	0.220	1.55
Sales Growth	0.183 *	1.68	0.244 **	2.15	0.182	1.65	0.246 **	2.13	0.269 **	2.41
Related Customer Ratio	−0.115	−1.08	−0.048	−0.43	−0.113	−1.05	−0.048	−0.42	−0.051	−0.46
Unrelated Customer Ratio	0.100	0.89	0.105	0.95	0.098	0.87	0.106	0.95	0.121	1.12
Customer Scope			0.218 *	1.70			0.223 *	1.67	0.263 **	2.03
Product Diversity (Log)					−0.036	−0.28	0.020	0.15	0.006	0.04
Customer Scope X Product Diversity (Log)									0.268 **	2.41
R-Squared	0.317		0.345		0.318		0.345		0.398	
Adjusted *R*-Squared	0.208		0.230		0.198		0.218		0.271	
F-value	2.92 ***		2.99 ***		2.64 ***		2.72 ***		3.12 ***	

Note: *n*=81. Standardized coefficients are shown.
***p < 0.01; **p < 0.05; *p < 0.10.

The result shows that customer scope has a statistically significant positive effect on performance, while product diversity has a negative effect on performance though it is not statistically significant; However, the interaction term of customer scope and product diversity has a statistically significant positive effect of performance.

This paper has made two main contributions to the existing literature. First, regarding the inconsistent results among the literature (Min & Song, 2017; Nobeoka et al., 2002), it has been empirically examined that product diversification strengthens the effect of customer scope strategy on performance. The combination strategy of pursuing both customer diversity and product diversity may help increase the effect of economies of scope under certain specified conditions. Second, in regard to the conflicting arguments that prior studies on within-industry diversification have also shown (Hashai, 2015; Li & Greenwood, 2004; Stern & Henderson, 2004; Tanriverdi & Lee, 2008; Zahavi & Lavie, 2013), the result of this paper provides a new perspective that pursuing both two strategies at the same time could produce complementary effects to maximize economies of scope under a certain condition. Briefly, this paper provides a clue to grasp the inconsistent results in the literature by shedding light on the interaction effect of simultaneously pursuing customer-product diversification strategies.

To make the results more robust, this study also conducted a regression analysis using the data for 1995 (for details, see Appendix 1). Compared to the result in 2005, the analysis in 1995 shows that customer scope is significantly correlated with performance (profit-sales ratio), while the effect of product diversity and the interaction term on performance does not exist. These results may be better explained by the contingent perspectives. A major difference is that the average profit-sales

ratio of assemblers is lower than suppliers in 1995, but the average profit-sales ratio of assemblers is higher than suppliers in 2005. This difference indicates the comparative performance between suppliers and assemblers or customers might affect the effect of diversification strategies.

Like all studies, this research has limitations. First, some issues nonetheless remain. This paper could not explain why the impact of product diversity on performance is not significant. Also, since this paper did not uncover the certain conditions, further study should investigate the relationship including these variables so to figure out the conditions to make the combination strategy effective in maximizing economies of scope. In order to explain these issue, future research is required to examine time-series analyses so that we could better understand the dynamic interaction between product diversity and firm performance. Second, since this research uses the number of product categories for measuring product diversity, further work should be carried out to use the other indicators such as the Herfindahl-Hirschman index and entropy measures (Hashai, 2015; Miller, 2006; Park & Jang, 2013; Suzuki & Kodama, 2004). As for the dependent variable, while some of previous studies uses ROA, EVA, Tobin's q or sales growth to measure firm performance(Chen, Yang, & Lin, 2013; Miller, 2006; Montgomery & Wernerfelt, 1988), this research adopts profit-sales ratio from limitations on the data. Also, considering cooperative performance might make analysis results more robust like Wu, Chang, & Weng (2009). We might obtain different results of the effect of product diversity on firm performance with from this paper if one analyzes the relationship using the other variables.

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Appendix 1. Regression Results in 1995 (dependent variable: profit-sales ratio)

Independent variable	Model A1		Model A2		Model A3		Model A4		Model A5	
	β	t-Value	β	t-Value	β	t-Value	β	t-Value	β	t-Value
Toyota	0.327	1.18	0.378	1.49	0.261	0.89	0.340	1.26	0.415	1.48
Nissan	0.443 *	1.74	0.465 *	1.99	0.394	1.48	0.437 *	1.79	0.470 *	1.91
Mitsubishi	0.042	0.23	−0.007	−0.04	0.028	0.15	−0.015	−0.09	0.004	0.02
Honda	0.423 *	1.72	0.450 *	2.00	0.377	1.48	0.424 *	1.81	0.453 *	1.92
Mazda	0.235	1.62	0.151	1.12	0.196	1.26	0.130	0.90	0.158	1.07
Suzuki	0.174	1.05	0.128	0.84	0.171	1.02	0.127	0.83	0.125	0.81
Sales (Log)	−0.189	−1.23	−0.350 **	−2.37	−0.128	−0.72	−0.314 *	−1.84	−0.346 *	−1.99
Sales/Employee (Log)	0.200	1.53	0.303 **	2.46	0.177	1.31	0.289 **	2.25	0.293 **	2.28
Sales Growth	0.330 **	2.40	0.296 **	2.35	0.319 *	2.30	0.290 **	2.28	0.279 **	2.18
Related Customer Ratio	−0.101	−0.77	−0.012	−0.10	−0.111	−0.84	−0.019	−0.15	0.005	0.04
Unrelated Customer Ratio	−0.169	−1.37	−0.092	−0.80	−0.156	−1.24	−0.085	−0.73	−0.106	−0.89
Customer Scope			0.428 ***	3.59			0.423 ***	3.50	0.443 ***	3.62
Product Diversity (Log)					−0.104	−0.70	−0.058	−0.43	0.007	0.04
Customer Scope X Product Diversity (Log)									−0.121	−0.99
R-Squared	0.222		0.359		0.228		0.361		0.372	
Adjusted R-Squared	0.082		0.231		0.074		0.221		0.220	
F-value	1.58		2.80 ***		0.07		2.57 ***		2.45 ***	

Note: n=81. Standardized coefficients are shown.
***p < 0.01; **p < 0.05; *p < 0.10.