RIETI Discussion Paper Series 19-E-075

Price Competition vs. Quality Competition: Evidence from a Survey

MORIKAWA, Masayuki
RIETI

The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series19-E-075
September 2019

Price Competition vs. Quality Competition: Evidence from a Survey

Masayuki Morikawa (RIETI)

Abstract

The argument that Japanese firms which operate under a price competition paradigm should change their strategy from price competition to quality competition to improve their productivity is prevalent, but empirical evidence to support this argument has rarely been presented. This study, using data from an original firm survey, presents findings on firms' strategy on price/quality competition and on the relationship between this competition strategy and firm characteristics. The results indicate, first, that the majority of firms prefer quality competition to price competition and this tendency is stronger among firms operating in the service industries. Second, firms which employ a quality competition strategy tend to have highly educated employees, to actively invest in intangible assets such as R&D, and demonstrate a higher tendency to engage in innovation. Third, the profitability of firms that employ a quality competition strategy is higher than firms with a price competition strategy, but the difference in productivity between the strategies is unclear.

Keywords: price competition, quality competition, differentiation, innovation, profitability, productivity
JEL Classification: D22, D24, L11, L13, M21

Price Competition vs. Quality Competition: Evidence from Firm Surveys

1. Introduction

A prevailing argument proposes that Japanese firms should change their strategies from price competition to quality differentiation to improve productivity.[1] However, there is little empirical evidence to support this argument. From the viewpoint of firm management, both price and differentiation competition strategies have advantages and disadvantages (e.g., see Porter, 1980). This study uses data from original firm surveys linked with government statistics to present evidence on firms' price/quality competition strategies and on the relationship between competition strategy and various firm characteristics, including profitability and productivity.[2]

Theoretically, differentiation of products and services is associated with the producer's market power and higher price. In the case of textbook-style monopolistic competition, price will be higher than in perfect competition, but firm profits will be zero in equilibrium due to free entry. However, in reality, temporary market power arising from intellectual property rights and complementary assets necessary for the production of differentiated products/services creates a barrier to entry in the differentiated market. As a result, if consumers and customer firms evaluate differentiated products/services highly, the producers may enjoy higher profits.[3] On the other hand, the relationship between differentiation and productivity is theoretically ambiguous. Differentiation arising from innovation can lead to higher productivity, but weakened competition pressure can reduce productivity.[4]

When goods and services are differentiated, it is difficult to measure productivity because standard empirical approaches to measuring productivity, such as production function estimation, assume homogeneous quality and price within an industry. In fact, most empirical productivity

---

[1] An example of such an argument can be seen in the *Investments for the Future Strategy 2019* (Council on Investments for the Future).

[2] In this paper, the terms "quality competition" and "differentiation" are used interchangeably.

[3] For surveys on theoretical and empirical studies of product differentiation, see Eaton and Lipsey (1989) and Bresnahan (1989), respectively. Kato (2012) presents evidence that service differentiation in Japanese retailers has a positive impact on their profitability.

[4] Many studies have indicated that market competition has a positive impact on productivity (see Holmes and Schmitz, 2010, for a survey). Empirical studies in Japan include Okada (2005) and Inui *et al*. (2012).

studies using firm- and establishment-level data neglect price differences within an industry, as prices of individual firms or establishments are rarely available. In such cases, the measured productivity obtained from standard approaches is a mixture of physical productivity and difference in price.

Although the focus is on homogeneous products that are not differentiated, Foster *et al*. (2008) estimate both the physical productivity (TFPQ) and revenue-based productivity (TFPR) of U.S. manufacturing plants and indicate that, while TFPR is positively correlated with price, TFPQ has a negative correlation to price. That is, the price of establishments with higher physical productivity is lower, and vice versa.[5] In Japan, Kawakami *et al*. (2011) measure TFPR and TFPQ in manufacturing plants and present evidence to support the result of Foster *et al*. (2008). Morikawa (2019b), on the other hand, estimates TFPR and TFPQ for service establishments and finds that the relationship between TFPQ and price is not uniform across the service industries.

The observed price differences within a single industry reflect both quality differences and monopolistic rents. In addition to the difference in the prices of products and services, input prices can also differ by firms/establishments within the industry. For example, firms producing differentiated, high-quality products/services may use high-quality and high-price inputs. In considering these possibilities, measured productivity without using information about firm- or establishment-level prices can have both positive and negative biases (e.g., Katayama *et al*., 2009; De Loecker, 2011; Kugler and Verhoogen, 2012).

Due in part to issues around measurement, empirical studies on the relationship between differentiation and productivity are scarce. Syverson (2004a) is a rare exception, which indicates that, in the U.S. manufacturing sector, industries with high-substitutability (low product differentiation) exhibit less productivity dispersion and have higher average productivity levels, although the productivity measurement is based on a standard approach, without explicitly taking account of quality or price differences. Larger productivity dispersion in differentiated industries suggests firms that successfully differentiate their products from their competitors enjoy higher productivity, but a lower average productivity level has negative implications for the argument that differentiation is an effective strategy for improving the productivity performance of the industry.[6]

---

[5] Haltiwanger (2015) states that the inverse correlation between prices and TFPQ is consistent with models of product differentiation.

[6] Syverson (2004b), using data from the U.S. ready-mixed concrete plants, indicates that plants with

Against this background, this study contributes to the existing literature by presenting new evidence on price/quality competition strategy and its relationships with various firm characteristics, including profitability and productivity. To preview the main findings, first, a relatively large number of firms adopts the quality competition strategy and this tendency is stronger among firms operating in the service industries. Second, firms adopting the quality competition strategy tend to have highly educated employees, invest in intangible assets, such as research and development (R&D) and advertising, and show a higher probability of innovating. Third, the profitability of firms using quality competition strategies is higher than that of firms using price competition strategies, but the difference in productivity according to firm strategy is inconclusive.

The rest of this paper is organized as follows. Section 2 explains the survey data used in this study and the method of analysis. Section 3 presents the empirical results and Section 4 summarizes the conclusions and discusses the implications.

2. Data and Method of Analysis

This study mainly uses firm-level data from the Survey of Corporate Management and Economic Policy (SCMEP). The SCMEP was designed by the author and was conducted by the Research Institute of Economy, Trade and Industry (RIETI) in 2011, 2015, and 2018. The survey questionnaire was sent to, and collected from, about 15,000 public and private Japanese firms operating in both the manufacturing and service industries. About 3,000 firms responded to each round of the SCMEP.[7] The number of responding firms and their respective industries are presented in **Appendix Table A1**. The questions in the survey are wide-ranging, such as the characteristics of the CEO and employees, competition strategy, and corporate governance. The specific questions are different in each round of the survey, but about half of the questions and their wording are common across the three rounds.

The SCMEP is designed to link to the Basic Survey of Japanese Business Structure and

higher spatial substitutability have higher average productivity levels and exhibit less productivity dispersion, which has similar implication with Syverson (2004a).

[7] The questionnaire of the SCMEP was sent to 15,000 firms randomly chosen from the registered list of the BSJBSA, excluding firms classified as being in mining and utilities.

Activities (BSJBSA) conducted by the Ministry of Economy, Trade and Industry. The BSJBSA, an annual survey started in 1992, accumulates representative statistics for all Japanese firms with 50 or more regular employees engaged in mining, manufacturing, electricity and gas, wholesale, retail, information and communications (I&C), and several service industries. The survey items include their basic financial information (e.g., sales, costs, profit, book value of capital), number of employees, number of establishments, number of subsidiaries, and R&D expenditure. Since the BSJBSA is one of the "fundamental statistical surveys" designated by the Statistics Act, firms are obliged to respond. Approximately 30,000 firms are surveyed every year, and the response rate is over 85%.

This study constructs panel data of the SCMEP linked with the panel of the BSJBSA from 2009 to 2017. The main survey question used in this study concerns the firms' competition strategy—their preference for price/quality competition— asked in each of the three rounds of the SCMEP. The specific wording of the question is "Regarding market competition, which is more important to your firm: competition over prices of goods and/or services, or competition over quality of goods and/or services?" The answer choices are "1 competition over prices of goods and/or services," "2 competition over quality of goods and/or services," and "3 we can't say either way." In this study, firms that chose '2' are regarded to be those adopting quality competition (or differentiation) strategies.[8] Although the response to this question is subjective in nature, our interest is not in the actual differentiation, but rather in firms' competition strategies and their association with firm characteristics.

Based on the competition strategies of firms obtained from the SCMEP, we first compare firm characteristics, such as industry, firm size, education level of employees, R&D investment, advertising expenditure, various forms of internationalization, and propensity to innovate. In addition, we compare profitability and productivity by firm competition strategy. After presenting t- test statistics, regression results to control for three-digit industry, firm size, and survey years are reported to see the coefficients for the quality competition strategy. OLS is applied for continuous dependent variables and the probit model is applied to binary dependent variables. In these estimations, firms with price competition strategies are used as the reference category and the dummies for firms with quality competition strategies and firms that responded "we can't say

[8] The literature often distinguishes between horizontal differentiation and vertical differentiation. Although we do not explicitly treat these differentiations differently, vertical differentiation, where the quality of products and services is different in the same industry, is the main interest of this study.

either way" are included as the main explanatory variables.

Since the currently available BSJBSA data are up to 2017, the 2018 SCMEP data cannot be linked with the BSJBSA data. Therefore, analyses using firm characteristics, such as R&D intensity, advertising intensity, international trade, profit rate, and productivity, are limited to the years 2011 and 2015. However, it is important to control for industry classification and firm size (number of employees), even in the analyses that use only SCMEP data, and relevant information in the 2017 BSJBSA is applied to the 2018 data.

The variables used in this study, along with their summary statistics, are presented in **Appendix Table A2**. The details of the variables are explained in the next section.

3. Results

3.1. Competition Strategy and Firm Characteristics

Table 1 reports the simple tabulation result of the competition strategy by survey year. The number of firms adopting a quality competition strategy is larger than that of price competition: About a quarter of respondents attach importance to price competition and about a half of firms do so to quality competition. The percentages are not much different throughout the three rounds of the SCMEP. **Table 2** is a comparison of competition strategy by industry, where data for three survey years are pooled. The percentage of firms adopting a quality competition strategy is larger in non-manufacturing industries, particularly in retail, I&C, and service industries, than the manufacturing industry, but the pattern in wholesale industry is similar to that in the manufacturing industry. However, it is important to see that different competition strategies co-exist within the same industry.

Table 3 contains the comparisons of mean firm characteristics by firm competition strategy. Firm size measured as the logged number of employees is about 20% larger for firms with quality competition strategy, although the difference is reduced to 13% after controlling for three-digit industry (column (4) of the table). Distribution of firm size by competition strategy is presented in **Figure 1**, confirming that the size distribution of firms with quality competition strategies is larger than for those with price competition strategies.

Regarding the skill level of employees, the percentages of those with university or higher

education and with postgraduate education is significantly higher for firms adopting a quality competition strategy. The differences are statistically significant at the 1% level after accounting for industry and firm size.[9] Firms attaching importance to quality competition exhibit higher R&D intensity (R&D investments divided by sales), advertising intensity (advertising expenditure divided by sales), and patent intensity (the number of patents per employee). All of the differences are statistically significant at the 1% level, after controlling for industry and firm size. As firms with quality competition strategies are oriented to differentiate their products/services, it is natural for them to have larger R&D investments for developing new products/services and to utilize more advertisements for establishing brand royalty.[10]

On the other hand, variables related to the internationalization of firms—dummy for exporter, export intensity (export value divided by sales), dummy for firms possessing foreign subsidiary, and foreign ownership ratio—are generally indistinguishable by type of competition strategy.[11] Although the coefficient for the exporter dummy is significant at the 5% level (column (4) of **Table 3**), firms with a price competition strategy are more likely to export, after controlling for industry and firm size. Firms attaching importance to quality competition are not necessarily more globalized.

Next, the relationship between competition strategy and innovation is reported in **Table 4**. Innovations asked about in the SCMEP and used in this study are (1) development of new products/services, (2) improvements to existing products/services, and (3) adoption of new production or delivery methods during the previous three years of the survey years. Roughly speaking, (1) and (2) correspond to product innovation, and (3) represents process innovation. Firms with quality competition strategies are more likely to engage in products/services innovation. Marginal effects from the probit estimations (column (4)) are more than 10% larger after accounting for industry and firm size. In contrast, the probability of engaging in process innovation, which is likely to contribute to a reduction in production costs, is statistically indifferent by type of competition strategy.[12]

---

[9] The percentages of employees with university or higher education and with postgraduate education are not surveyed in the 2011 SCMEP. The results for education are for the years 2015 and 2018.

[10] R&D intensity, advertising intensity, patent intensity, exporter dummy, export intensity, dummy for possessing foreign subsidiary, and foreign ownership ratio are calculated from the BSJBSA for the years 2011 and 2015.

[11] Exporter dummy and export intensity cover both goods and service exports.

[12] Although the number of firms that consistently responded to the SCMEP is about a third of all those observed, when innovations in the next SCMEP is used as the dependent variables of the probit

To summarize, firms adopting a quality competition strategy have characteristics that include having highly educated employees, investing in intangible assets, such as R&D and advertising, and showing a higher probability of innovating.

3.2. Competition Strategy and Profitability/Productivity

This subsection presents findings on the relationship between competition strategy and profitability/productivity. It should be noted that the competition strategy is endogenously determined by firms, meaning that the observed association with firm performance cannot be interpreted as being causal, but rather an equilibrium relationship. The main performance measures used in this study are current profits per sales (ROS), current profits per assets (ROA), labor productivity (LP), and total factor productivity (TFP). All of these variables are calculated from the BSJBSA data.[13] LP and TFP are expressed in logarithms and LP and TFP growth rates are the difference between the two years after the base year (2011-13 and 2015-17).

Value-added for calculating LP and TFP is the sum of the operating profits, depreciation, wages, welfare costs, rent, and paid taxes. LP is value-added divided by total hours worked (labor input). Total hours are the sum of the number of full-time employees multiplied by their industry-level working hours and the number of part-time employees multiplied by their industry-level working hours. The numbers of full-time and part-time employees are available in the BSJBSA. Working hours at the industry-level are taken from the Monthly Labor Survey (Ministry of Health, Labor and Welfare).

TFP is calculated non-parametrically using the cost-share based index number approach, which uses a hypothetical representative firm from each three-digit industry as a reference.[14] The value-added, capital stock, and hours worked of a hypothetical representative firm in the base year

---

estimations, quality competition strategy is associated with a 7.4% higher probability of development of new products/services and significant at the 1% level. The relationships with the improvements to existing products/services and the adoption of new production or delivery methods are statistically insignificant.

[13] We remove outliers where calculated ROS and ROA exceed 100%. This study uses current profits in the calculation of ROS and ROA, but the results are essentially the same when using operating profits instead.

[14] The index number method of TFP calculation is frequently employed in productivity studies (see Syverson, 2011). Fukao and Kwon (2006), and Morikawa (2015, 2016, 2019a) are examples of applying this method to calculate TFP using the BSJBSA data.

(2009) are calculated as the geometric means of all firms in the same three-digit industry, and the cost shares of labor and capital are calculated as arithmetic means. Capital stock is the book value of tangible assets available in the BSJBSA. In constructing real (constant price) figures of value-added and capital stock, the price deflators of the National Accounts (Cabinet Office) are used.[15] The cost share of labor is the sum of wages and welfare costs divided by the value-added.

As explained in the introduction, when goods/services are differentiated, accurate measurement of productivity is difficult because standard measurement of productivity assumes that price within an industry is common across firms. Since the abovementioned LP and TFP do not take account of price heterogeneity, the results for productivity should be interpreted with some caution. In the context of this study, firms producing differentiated (high-quality) goods/services have (possibly higher) prices that reflect both quality difference and monopolistic market power. If the quality differences are completely reflected in the prices, the measured revenue-based LP and TFP (LPR and TFPR) are the exact true productivity. In contrast, higher price arising from market power causes upward bias in the revenue-based productivity measures.

With this limitation in mind, the results for profitability and productivity are summarized in **Table 5**. ROS and ROA of firms with quality competition strategies are 0.7%–0.9% point higher than those of firms with price competition strategies. After controlling for three-digit industry and firm size, the profit rates are about 0.5% point higher and statistically significant at the 1% or 5% level. As the mean ROS and ROA are 3.2% and 4.1%, respectively (see Appendix Table A2), the differences are economically nonnegligible.

LP and TFP levels are about 2% higher for firms adopting quality competition strategies, but statistical significance is low. Although difference in TFP is marginally significant (10% level), that of LP is insignificant. OLS estimations to control industry and firm size confirm that the productivity of such firms is about 2%–3% higher, but the significance level of the coefficients is low. Differing from profitability, statistical association between type of competition strategy and productivity is weak. In addition, we should be careful that the measured productivity of firms with quality competition strategies may be biased upward. The table also reports results for LP and TFP growth rates (the last two rows), but differences by competition strategy are insignificant.

The distributions of ROA and TFP by type of competition strategy are depicted in **Figures 2**

[15] This study uses deflated series of LP and TFP, but the results are essentially unchanged if we use nominal series of LP and TFP.

and **3**. ROA of firms with quality competition strategies is obviously distributed higher than that of firms with price competition strategies. By contrast, difference in TFP distributions is less obvious from the figure.

To summarize, the result of higher profitability among firms with quality competition strategies is consistent with the theoretical prediction of market power arising from products/services differentiation. On the other hand, the relationship between competition strategy and productivity is unclear, at least on average. One possible interpretation is that the observed relationship reflects two offsetting effects that high quality from innovation positively affects productivity and that weaker competition pressure arising from market power has a negative impact.

4. Conclusion

This study used data from an original survey on Japanese firms to present descriptive findings on firm strategy for price/quality competition and on the relationship between competition strategy and various firm characteristics. Although the analysis depends on firms' subjective judgment on their competition strategies, it contributes to the literature and policy discussion by presenting previously unknown facts.

The results are summarized as follows. First, a relatively large number of firms adopt quality competition strategies rather than price competition strategies. The percentage of firms with quality competition strategies is higher among firms operating in service industries than those in the manufacturing industry. Second, firms adopting quality competition strategies tend to have highly skilled employees, invest in intangible assets, such as R&D and advertising, and show higher probability of engaging in products/services innovation. Third, profitability for firms adopting quality competition strategies is higher than for firms using price competition strategies, but the difference in productivity by competition strategy is inconclusive.

It is difficult to draw policy implications from only the results of this study, but the finding that differentiation strategy is closely associated with innovation suggests that policies to mitigate market failures inherent to innovative activities may help firms pursuing quality competition strategies.

References

Bresnahan, Timothy F. (1989), "Empirical Studies of Industries with Market Power," in R. Schmalensee and R. D. Willig, eds. *Handbook of Industrial Organization, Vol. 2*, Amsterdam: Elsevier, pp.1012–1057.

De Loecker, Jan (2011), "Product Differentiation, Multiproduct Firms, and Estimating the Impact of Trade Liberalization on Productivity," *Econometrica*, Vol. 79, No. 5, pp. 1407–1451.

Eaton, B. Curtis and Richard G. Lipsey (1989), "Product Differentiation," in R. Schmalensee and R. D. Willig, eds. *Handbook of Industrial Organization, Vol. 1*, Amsterdam: Elsevier, pp. 724–768.

Foster, Lucia, John Haltiwanger, and Chad Syverson (2008), "Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability," *American Economic Review*, Vol. 98, No. 1, pp. 394–425.

Fukao, Kyoji and Hyeog Ug Kwon (2006), "Why Did Japan's TFP Growth Slowed Down in the Lost Decade? An Empirical Analysis Based on Firm-Level Data of Manufacturing Firms," *Japanese Economic Review*, Vol. 57, No. 2, pp. 195–228.

Haltiwanger, John (2015), "Job Creation, Job Destruction, and Productivity Growth: The Role of Young Businesses," *Annual Review of Economics*, Vol. 7, pp. 341–358.

Holmes, Thomas J. and James A. Schmitz, Jr. (2010), "Competition and Productivity: A Review of Evidence," *Annual Review of Economics*, Vol. 2, pp. 619–642.

Inui, Tomohiko, Atsushi Kawakami, and Tsutomu Miyagawa (2012), "Market Competition, Differences in Technology, and Productivity Improvement: An Empirical Analysis Based on Japanese Manufacturing Firm Data," *Japan and the World Economy*, Vol. 24, No. 3, pp. 197–206.

Katayama, Hajime, Shihua Lu, and James R. Tybout (2009), "Firm-Level Productivity Studies: Illusion and a Solution," *International Journal of Industrial Organization*, Vol. 27, No. 3, pp. 403–413.

Kato, Atsuyuki (2012), "Productivity, Returns to Scale and Product Differentiation in the Retail Trade Industry: An Empirical Analysis Using Japanese Firm-Level Data," *Journal of Productivity Analysis*, Vol. 38, No. 3, pp. 345–353.

Kawakami, Atsushi, Tsutomu Miyagawa, and Miho Takizawa (2011), "Revisiting Productivity Differences and Firm Turnover: Evidence from Product-Based TFP Measures in the Japanese

Manufacturing Industries," RIETI Discussion Paper, 11-E-064.

Kugler, Maurice and Eric Verhoogen (2012), "Prices, Plant Size, and Product Quality," *Review of Economic Studies*, Vol. 79, No. 1, pp. 307–339.

Morikawa, Masayuki (2015), "Are Large Headquarters Unproductive?" *Journal of Economic Behavior & Organization*, Vol. 119, November, pp. 422–436.

Morikawa, Masayuki (2016), "Factoryless Goods Producers in Japan," *Japan and the World Economy*, Vol. 40, December, pp. 9–15.

Morikawa, Masayuki (2019a), "Firm Heterogeneity and International Trade in Services," *The World Economy*, Vol. 42, No. 1, pp. 268–295.

Morikawa, Masayuki (2019b), "Dispersion and Volatility of TFPQ and TFPR: Findings from Three Service Industries," *Industrial and Corporate Change*, forthcoming.

Okada, Yosuke (2005), "Competition and Productivity in Japanese Manufacturing Industries," *Journal of the Japanese and International Economies*, Vol. 19, No. 4, pp. 586–616.

Porter, Michael E. (1980), *Competitive Strategy*, New York: The Free Press.

Syverson, Chad (2004a), "Product Substitutability and Productivity Dispersion," *Review of Economics and Statistics*, Vol. 86, No. 2, pp. 534–550.

Syverson, Chad (2004b), "Market Structure and Productivity: A Concrete Example," *Journal of Political Economy*, Vol. 112, No. 6, pp. 1181–1222.

Syverson, Chad (2011), "What Determines Productivity?" *Journal of Economic Literature*, Vol. 49, No. 2, pp. 326–365.

Table 1. Firm Competition Strategy by Year

	2011	2015	2018
Price competition	26.5%	26.4%	24.5%
Quality competition	46.3%	47.6%	47.7%
Neither	27.2%	26.0%	27.7%
Number of firms	3,346	3,280	2,502

Note: Tabulation result from the SCMEP.

Table 2. Firm Competition Strategy by Industry

	Manufacturing	Non-manufacturing	Wholesale	Retail	I&C	Service
Price competition	29.3%	23.2%	28.6%	19.4%	14.7%	20.3%
Quality competition	43.4%	50.2%	43.7%	55.5%	55.3%	55.3%
Neither	27.3%	26.5%	27.7%	25.1%	30.0%	24.4%
Observations	4,123	5,003	1,864	1,012	577	984

Note: Tabulation result from the pooled data of the SCMEP in 2011, 2015, and 2018.

Table 3. Competition Strategy and Firm Characteristics

	(1) Price competition	(2) Quality competition	(3) Difference		(4) Coefficient	
Firm size (log employment)	5.0340	5.2281	0.1941	***	0.1106	***
University of higher (%)	31.5576	38.5064	6.9488	***	5.5126	***
Postgraduate (%)	1.7619	3.0325	1.2706	***	1.1276	***
R&D intensity	0.0039	0.0054	0.0015	*	0.0015	***
Advertising intensity	0.0035	0.0070	0.0035	***	0.0018	***
Patents per employee	0.0009	0.0011	0.0002	*	0.0005	***
Exporter (dummy)	0.2456	0.2404	-0.0052		0.0299	**
Export intensity	0.0329	0.0281	-0.0048		0.0002	
Possession of foreign subsidiary	0.1774	0.1709	-0.0065		0.0066	
Foreign ownership (%)	1.3815	1.8251	0.4436		0.3067	

Notes: Difference in column (3) is the t-test results. The estimated coefficients in column (4) are those for a dummy of firms adopting quality competition strategy from OLS and probit estimations, controlling for three-digit industry, firm size, and survey years (industry and survey years in estimation for firm size). Probit estimation is applied for estimations of exporter and firms possessing a foreign subsidiary (marginal effects are presented in the table). ***: $p<0.01$, **: $p<0.05$, *: $p<0.1$.

Table 4. Competition Strategy and Innovation

	(1) Price competition	(2) Quality competition	(3) Difference	(4) Probit coefficient
New products/services development	36.7%	47.6%	10.9% ***	0.1068 ***
Products/services improvement	36.7%	45.8%	9.0% ***	0.1017 ***
New production or delivery methods	18.5%	18.2%	0.4%	0.0042

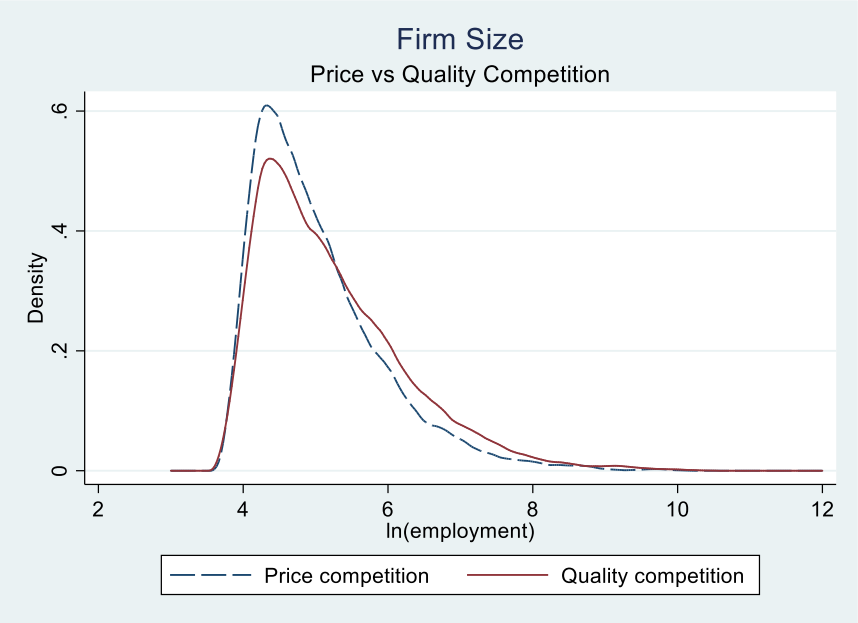
Notes: Difference in column (3) is the t-test results. Marginal effects in column (4) indicate probit estimation results controlling for three-digit industry, firm size, and survey years. *: $p<0.1$.

Table 5. Competition Strategy and Profitability/Productivity

	(1) Price competition	(2) Quality competition	(3) Difference	(4) OLS coefficient
ROS	0.0280	0.0345	0.0065 ***	0.0049 ***
ROA	0.0356	0.0442	0.0086 ***	0.0045 **
LP	1.1925	1.2096	0.0171	0.0284 *
TFP	-0.1087	-0.0837	0.0250 *	0.0256 *
LP growth	0.0172	0.0271	0.0099	0.0090
TFP growth	0.0141	0.0142	0.0001	0.0005

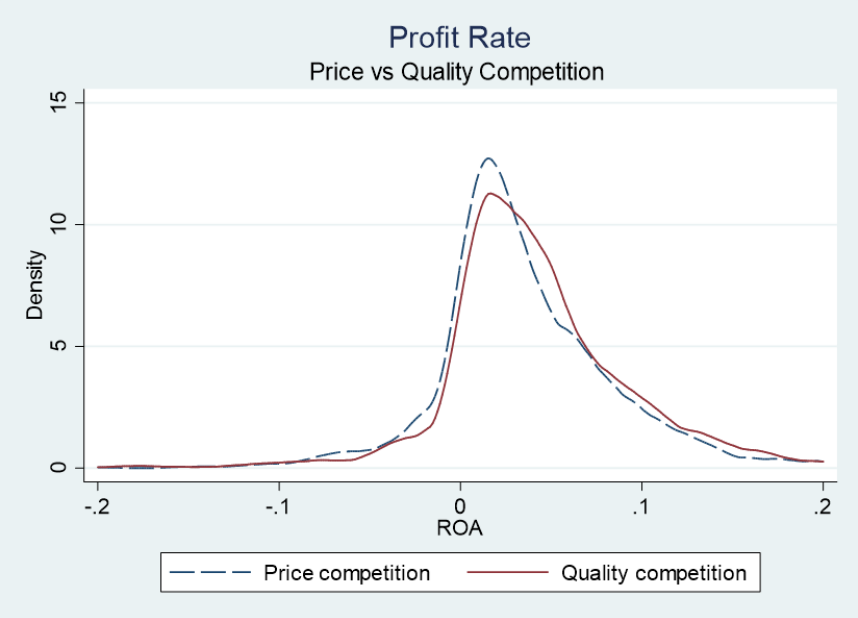
Notes: Difference in column (3) is the t-test results. OLS coefficients in column (4) indicate OLS estimation results controlling for three-digit industry, firm size, and survey years. ***: $p<0.01$, **: $p<0.05$, *: $p<0.1$. LP and TFP are expressed in logarithm.

Figure 1. Distribution of Firm Size by Competition Strategy



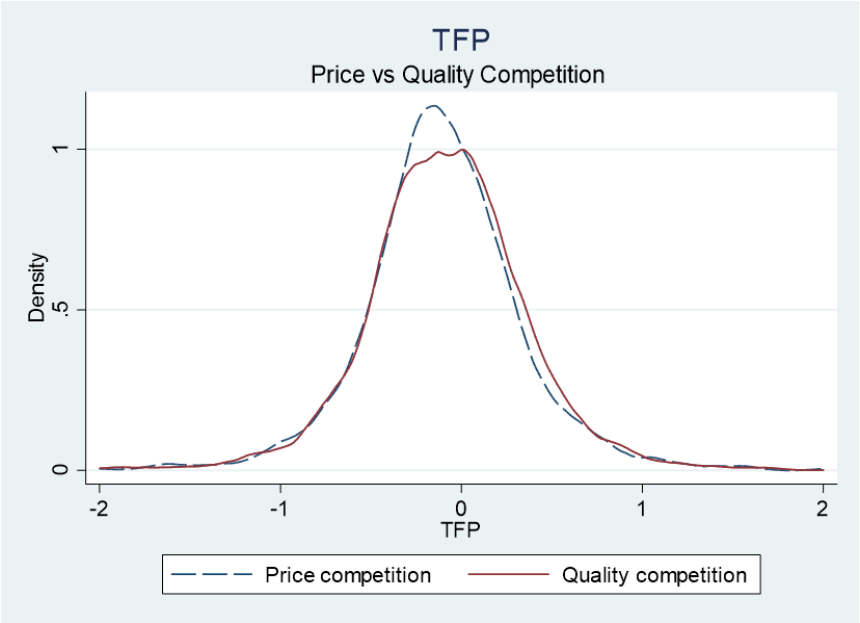
Note: Depicted from the pooled data of 2011, 2015, and 2018.

Figure 2. Distribution of ROA by Competition Strategy



Note: Depicted from the pooled data of 2011 and 2015.

Figure 3. Distribution of TFP by Competition Strategy



Note: Depicted from the pooled data of 2011 and 2015.

Appendix Table A1. Number of Observations and Distribution by Industry

	All	Manufacturing	Wholesale	Retail	I&C	Service	Other
2011	3,444	46.1%	20.9%	11.8%	5.7%	10.6%	4.9%
2015	3,437	41.1%	19.6%	10.9%	6.9%	11.6%	9.9%
2018	2,527	50.6%	21.0%	10.8%	7.2%	10.3%	0.2%
Total	9,408	45.5%	20.5%	11.2%	6.5%	10.9%	5.5%

Note: Industry classification is based on the BSJBSA.

Appendix Table A2. Major Variables and Summary Statistics

	Obs.	Mean	Std. Dev.	Min	Max
Firm size (log employment)	8,757	5.164	0.987	3.912	11.249
University of higher (%)	5,109	35.959	26.525	0.000	100.000
Postgraduate (%)	4,888	2.610	6.689	0.000	100.000
R&D intensity	6,230	0.008	0.255	0.000	20.024
Advertising intensity	6,230	0.005	0.019	0.000	0.635
Patents per employee	6,230	0.001	0.004	0.000	0.148
Exporter (dummy)	6,230	0.242	0.428	0.000	1.000
Export intensity	6,230	0.030	0.105	0.000	1.000
Possession of foreign subsidiary	6,230	0.176	0.381	0.000	1.000
Foreign ownership (%)	6,230	1.607	10.589	0.000	100.000
New products/services development	9,408	0.419	0.493	0.000	1.000
Products/services improvement	9,408	0.412	0.492	0.000	1.000
New production or delivery methods	9,408	0.177	0.381	0.000	1.000
ROS	6,223	0.032	0.057	-0.972	0.933
ROA	6,223	0.041	0.064	-0.819	0.652
LP	5,936	1.208	0.505	-2.081	3.719
TFP	5,907	-0.089	0.447	-3.341	2.098
LP growth	5,361	0.021	0.288	-3.227	2.242
TFP growth	5,335	0.012	0.301	-2.852	2.536

Notes: Number of employees and innovations are for the year 2011, 2015, and 2018. Education of employees is for the years 2015 and 2018. Other variables are for the years 2011 and 2015. For ROS and ROA, observations exceeding 100% are removed as outliers.