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Abstract

During the last decade, economists and policy makers have extensively discussed what types of firms can exploit external markets by exporting and what happens to domestic firms if external competitors penetrate into the home market. Although both theoretical and empirical studies have been dedicated to these issues, few have been carried out for the service sector. Since the service sector accounts for the lion's share of GDP, the lack of those studies indicates that a large part of the actual economy still remains veiled. Our study fills this gap. We examine whether or not the Melitz and Ottaviano (2008) model remains satisfied in the service sector, using data from Japanese SMEs. From our analysis, we confirm that larger market sizes are associated with higher productivity levels and lower markups. This finding also holds true for samples including firms that see simultaneity between production and consumption. These results reveal that further productivity growth in the service sector also requires markets to be larger and more integrated, and that the markup levels become lower in those markets.

Keywords: productivity, markup, and external market development.
JEL Classification: C81; D24; L11; L25

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1. Introduction

As economic globalization develops, many economists and policymakers have discussed what types of firms can exploit external markets by exporting or foreign direct investment (FDI) and what happens to domestic firms if their external rivals penetrate into the home market. This is because the survival of firms in the globalized economy is one of the most important issues related to modern growth and industrial policies. For the last decade, many theoretical and empirical studies have been dedicated to this issue. These include theoretical studies that incorporate heterogeneity of productivity between firms and also pricing into growth and trade models. These models yield various implications concerning the relationship between external and internal competition and firms' performance in imperfectly competitive markets. On the other hand, empirical studies have carefully examined those implications. Most of these studies, however, focus only on the manufacturing sector although the service sector accounts for the lion's share of GDP[1]. In addition, relatively larger firms have been examined in these studies while small and medium enterprises (SMEs) make up the majority in actual markets. This means that the issue may still be veiled for large parts of economy in spite of the great contributions by the existing literature. The current paper attempts to fill this gap. We examine whether or not some theoretical implications of the heterogeneous firm models are still true for SMEs in the service sector.

Theoretically, Melitz (2003) incorporates firm heterogeneity into a trade model in a general equilibrium framework. This model assumes that the productivity levels vary across firms while their markups are homogenous in the monopolistic competition, and

[1] In Japan, the service sector accounts for 72.6% to GDP in 2009.

suggests that productive firms explore foreign markets while less productive firms stay in the home market. It is expanded by Helpman, Melitz, and Yeaple (2004) (henceforth, HMY) and their model predicts that more productive firms join foreign markets by FDI while the others become exporters. Furthermore, Melitz and Ottaviano (2008) (henceforth, MO) incorporate endogenous differences in the toughness of competition across markets into the trade model with firm heterogeneity. In this model, the toughness of competition is formed by the number and average productivity of competing firms, and it suggests that larger, more integrated markets exhibit higher productivity and lower markups.

These models are carefully examined in various empirical studies. For example, Wakasugi et al. (2008) examine the implications of the Melitz (2003) and HMY models using data from Japanese manufacturing firms and compare the results from those for selected European countries. Their results indicate that productivity of internationalized firms is higher than that of non-internationalized ones as the models predict. FDI firms are relatively more productive than exporters as the model also predicts. On the other hand, the difference between them in Japan is considerably smaller than those in European countries. As another example, Bellone et al. (2008) examine the key micro-level predictions derived from the MO model; (1) negative relations between firm markups and the domestic market size; (2) positive relations between markups and firm productivity; (3) negative relations between firm markups and import penetration ratio; (4) positive relations between firm markups and firm export intensity. Their study also examines whether firm markups are higher in the export market under certain conditions. Using French manufacturing industry data, they obtain favourable evidence for these theoretical predictions.

These contributions, however, have not been well applied to the service sector[2]. This is partly because data availability for the service sector is poor, and also partly because development of the external markets has been considered as an issue mainly for the manufacturing sector. The service sector is, in fact, significantly involved in the economic globalization as well. For example, many firms in developed countries now utilize information technology outsourcing (ITO) and business process outsourcing (BPO) in China and India[3]. Or, one can purchase books either from a downtown bookstore or from Amazon.com. These examples indicate that these issues also apply to firms in the service sector. The current paper tries to fill this gap. Using firm-level data, we examine the relationships between the firm performance and the development of the external market for the Japanese service sector. Following recent development of these studies, both productivity levels and firm markup are investigated.

Studying the service sector also provides an additional contribution to productivity analysis. Although services are usually distinguished from the manufactured products by the key features such as intangibility, perishability, inseparability, simultaneity and variability, it is not well examined how these features are related to the conditions of the market competition and the firm-specific performance in productivity literature[4]. Among those features, this paper examines the role of "simultaneity of production and consumption" in development of the external markets.

In relation to these issues, other than the models in international economics, Syverson (2004) also proposes an interesting framework into which the demand density, output substitutability and the market productivity and size distribution are

[2] Kato (2010) discuss the service sector, but internationalization is examined only as difference in performances between domestic and foreign firms.
[3] Dalian in China and Bangalore in India are the centres of international ITO and BPO.
[4] Each of these characteristics is not always satisfied in all services.

simultaneously incorporated in productivity literature. He applies this approach to U.S. ready-mixed concrete plants, which need simultaneity of production and consumption, and concludes that higher substitutability of firms excludes less productive firms and improves the average productivity of the markets. It is also worthwhile to examine this implication for the service sector because it seems to be applicable to discussion of productivity and markup performance in the home markets with or without competition against the rivals.

The outline of this paper is as follows. In Section 2, we briefly explain the model and estimation method which we apply. In Section 3, we describe the data used. In Section 4, we discuss the empirical results. In Section 5, we conclude by considering policy implications.

2. Estimation Method

This section briefly describes the methodology used for estimating the firm-specific productivity and markup simultaneously. In the empirical literature, total sales ($output \times price$) or value added ($output \times price - intermediate$) is widely used as a proxy of output because neither quantity nor price data is usually available, in particular for the service sector. Thus, if we assume heterogeneous markups across firms, we need to estimate both productivity and markup of each firm from revenue functions instead of production functions without price information. In this paper, we rely on an approach proposed by Martin (2010) (details are in Martin (2010) and Kato (2010)).

In this approach, the revenue function is represented as follows,

$$r_i - \sum_{X \neq K} \bar{s}_{Xi}\left(x_i - k_i\right) = \tilde{r}_i = \gamma \frac{\overline{1}}{\mu_i} k_i + \frac{\overline{1}}{\mu_i}\left(\lambda_i + a_i\right) + \tilde{\varepsilon}_i \qquad (1)$$

where the subscript i means firm i, and $i = 1, \ldots n$[5]. Lower case variables denote log of deviation from the reference firm for each variable. r, s, γ and μ are the total revenue, the revenue share of variable, the degree of returns to scale and the firm-specific markup, respectively. Here γ > 0 and assumed to be constant across firms. In addition, x is inputs except for capital (k). Following various existing models, capital is assumed to be fixed for the short run while other inputs are temporarily adjustable. λ and a denote consumers' valuation of firm *i*'s product and technical efficiency. Using them, firm-specific quality adjusted productivity is represent as $\omega_i = \left(\lambda_i + a_i\right)$.

In equation (1), we cannot directly estimate ω because it is thought to be correlated with capital. Following the literature such as Olley & Pakes (1996), Levinsohn and Petrin (2003), Bond and Söderbom (2005), and Ackerberg et al. (2006), we estimate it by a control function approach. Here we use capital and net revenue to approximate ω. Because of data restriction, we can only estimate ω/γ. Since γ is assumed constant across firms, it gives no bias in discussion below. On the other hand, markup is represented as a function of revenue share and variable input factors without price information. That is,

[5] Our estimation implicitly assumes that the price of each input is identical across firms. Although this assumption is very restrictive and ad hoc, Eslava et al. (2005) reveals that ignoring input prices give little effects on productivity estimation using Columbian data.

$$\frac{1}{\mu_i} = s_{xi}\left(\frac{\partial \ln F_i}{\partial \ln X_i}\right)^{-1} = s_{xi}\Psi(\mathbf{X}_i) \qquad (2)$$

where F, X and $\mathbf{X}$ are the production function, temporary variable input factors and inputs, respectively. Since the functional form of $\Psi(\cdot)$ is also unknown, it is approximated in the same manner to ω. For markups, we obtain μ/γ as well as the firm-specific quality adjusted productivity.

Combining these estimates and results of questionnaire investigation, we examine the differences of the performances under varying conditions of competition.

3. Data

The data that we use in this analysis are obtained from *Basic Survey on Small and Medium Enterprises (BSSME)* and *Survey on Service Productivity Improvement (SSPI)*. Both surveys were conducted by the Small and Medium Enterprise Agency of Japan. BSSME is an annual survey targeting SEMs in almost all industry, while SSPI is a one-shot investigation targeting the companies in service industry in November, 2007. For temporal coincidence, we also use BSSME in 2007[6].

In estimation of equation (1), total sales are used as data of total revenues of firms. The proxies of capital and labour service inputs are the value of the tangible fixed assets and man hours, respectively[7]. We construct man-hour data of regular and part-time workers adjusted by average working hours respectively. In addition, the total wage is

[6] To control exit probability, we also use BSSME in 2008. We assume that the firms exited from the markets if we find them in 2007 BSSME but not in 2008. Thus, the firms that refused to answer to this survey are also considered as exited firms, and our exit probability can be overestimated.

[7] The data of working hours are available from Monthly Labour Survey.

used as the labour cost. Since it is difficult to obtain a reliable proxy of intermediate inputs and costs, we construct it using financial data as follows,

$$Intermediate = COGS + SGA - (TW + Dep + WF + R + TD) \qquad (3)$$

where *COGS*, *SGA*, *TW*, *Dep*, *WF*, *R* and *TD* are the cost of goods sold, the selling and general administrative expenses, the total wages, the depreciation, welfare expense, rent and the tax and dues, respectively. The net revenue is total revenue – variable costs, where the variable costs are defined as the sum of the labour and intermediate costs. For estimation, we also use the revenue share of variable costs.

The firm specific productivity and markup are estimated by two-digit industry in Japan Standard Industrial Classification (JSIC). The sample size is 1036. Table 1 presents descriptive statistics for the data. The averages of productivity and markup are respectively -0.44 and 1.53. The average number of workers is 28. Tables 2 and 3 show that concerning the location of the customers 51 firms (5 percent of the total) have their customers in both domestic and foreign markets. 219 (21% percent) firms have them in the entire domestic market. 404 (39 percent) and 362 (35 percent) firms find their customers in home and neighbouring prefectures and in home and neighbouring municipalities, respectively. On the other hand, for the location of the business competitors, 55 firms (5 percent) compete with them in both domestic and foreign markets. In addition, 182 firms (18 percent) find competitors in the entire domestic markets while 305 (29 percent) and 455 firms (44 percent) have rivals in home and neighbouring prefectures and municipalities, respectively.

Table 3 is a matrix of the locations of customers and competitors. It shows that

both customers and competitors are in foreign markets for 20 percent. 3 percent of firms have their customers in the domestic markets and rivals from the foreign markets. On the other hand, 2 percent of firms find their customers in the foreign markets while competitors in the domestic markets. For more local firms, the firms whose customers and competitors are in home and the neighbouring municipalities amount to 29 percent. The cases that customers are in home and the neighbouring municipalities while rivals in larger areas reach 4 percent. On the contrary, 15 percent of firms find their customers in larger areas while competitors in home and the neighbouring municipalities. It confirms that 59 percent of firms have their customers and competitors in the same markets. In addition, the case that the customers are found in the larger markets than rivals dominates the opposite one.

4. Empirical Results and Discussion

This section describes our empirical results and discusses the interpretations of them. Figures 1 and 2 show the kernel density plots of productivity and markups, by the location of the customers, respectively. According to Figure 1, the firms whose customers are in home and neighbouring municipalities obviously have the lower average and the larger distribution of productivity levels than the others. To the contrary, Figure 2 indicates that the firms who have their customers in the wider areas are likely to have the lower markups. This finding indicates that larger markets exhibit higher productivity and lower markups. It is also possibly interpreted that more productive firms develop the external markets.

We also confirm this finding by a statistical test. Tables 4 and 5 are the results of two sample t-test on the averages. From Table 4, compared from the firms whose

customers are in foreign markets, the average productivity levels of the firms whose customers are in the entire domestic market or in home and the neighbouring municipalities are statistically significantly lower. On the other hand, Table 5 reveals that firms whose customers are in the domestic markets have statistically significantly higher markups than those whose customers are in the foreign markets.

One may be concerned over whether or not our findings just reflect the differences in the industry-specific features rather than the differences in individual firms. That is, our findings just mean that the industries with wider markets are consistently more productive than those with narrower markets. In order to examine it, we control for the industry and the size of firms and carry out the test again. The result is in Tables 6 and 7. Those tables reveal that the firms whose customers are in home and neighboring municipalities are statistically significantly less productive than those whose customers are in both the domestic and foreign markets even after controlling for the industry and the size.

Even if we use the location of competitors, instead of the location of customers, it is still found that productivity is higher and markups are lower in larger markets. As for this finding, Table 8 presents the results of two sample t-test on the average productivity. In addition, table 10 is the result of regression analysis. The firms whose competitors are in the foreign markets are more productive than those whose rivals are in the home markets. On the other hand, two sample t-test on the average markup reveals that the firms whose competitors are in the home and neghbouring municipalities have higher markups than the firms with foreign competitors while regression analysis concludes that the firms with their competitors in the entire domestic market obtain higher market power than the firms with foreign rivals (Tables 9 and 11). This finding means that more

integrated markets are associated with higher productivity and lower markups. It possibly indicates that higher penetration of external competitors result in higher productivity and lower markups.

These findings may also imply that the prediction by Syverson (2004) is true even for the service sector. Suppose that the number of competitors which is thought to be equivalent to substitutability is positively correlated with the size of market. In that case, our result means that the higher substitutability there is, the higher the average productivity and the lower markups are as the Syverson model expects.

Next, we examine whether or not the distinguishing characteristics of services yield some effects on the relations examined. Among various characteristics, we examine simultaneity between production and consumption. In order to discuss it, we analyse the case that the areas of customers equal to those of competitors. We assume that firms in this case hold “simultaneity” because production and consumption are in the same market. According to Table 12, there is no firm in this case both of customers and competitors are in the home and neighbouring municipalities for the information and communication (ICT) industry while 66 percent of firms are included. Thus, it is thought that simultaneity is largely satisfied in the retail trade industry but not in the ICT industry.

Tables 13 and 14 are results of regressions of the market sizes on productivity and markups in case that location of the consumers is smaller than that of the competitors. The results of the regression for the case of the location of the consumers are the same as those of the competitors in tables 15 and 16. Tables 17 and 18 are also those when the location of the consumers is larger than that of the competitors. Table 15 shows that, in case that location of the consumers is same to that of the competitors, the firms in the

foreign markets have higher productivity levels than those in the home markets although the difference is not statistically significant. On the other hand, table 16 shows that the markup levels of firms in the foreign markets are lower than those in the entire domestic, in the home and neighbouring prefecture, and in the home and neighbouring municipality with statistical significance. Thus our finding is confirmed even in the case that firms have simultaneity between production and consumption. It implies that it is not reasonable to separately discuss the manufacturing and the service sector, in terms of the relation between competition and productivity.

5. Concluding Results

In this paper, we confirm that larger, more integrated markets exhibit higher productivity and lower markups as the HMY and the MO models predict even for the service sector. In the service sector, there is a higher barrier to obtain customers in the larger areas even in a certain country because of an intrinsic characteristics, simultaneity between production and consumption. Even in this condition, our results reveal that the productivity increases and markups decrease as the market size expands from the home municipality to the foreign markets. Our results also indirectly confirm that the average productivity levels are higher and the dispersion of them is smaller if the number of rivals is larger as Syverson finds for the ready-mixed concrete plants that also have simultaneity between production and consumption.

From these findings, we also discuss the validity of the report by McKinsey Global Institute (2000). The report said that the less productive local SMEs in the Japanese service sector have reduced aggregate productivity growth. Thus, liberalizing their markets and introducing competition-friendly policies to get rid of such inefficiency

should be carried out. Our findings seem to be supportive for this view although our study does not indentify what allows some firms to survive with higher markups in the local markets.

Our results suggest that larger, more integrated markets should be formed for productivity growth. Such markets are also useful for welfare improvement because markups are lower there. A remaining question is what allows some firms to manage their business in the narrow local market with higher markups although their productivity is poorer. If those firms successfully differentiate their service from their competitors and obtain market power in such narrow markets, it is just a result of fair market competition and there is no room for the administration to intervene with it. But if their monopolistic power stems from anti-competition regulation or lack of appropriate business models, the government possibly play an important role to remove such obstacles.

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Table 1. Descriptive Statistics			
Variable	Obs	Mean	Std. Dev.
omega	1036	-0.44	1.95
markup	1036	1.53	0.70
Number of Employees	1036	28.37	38.76
Ratio of Firms with 1-5 Employees	1036	0.20	0.40
6-20	1036	0.40	0.49
21-50	1036	0.24	0.42
51-100	1036	0.12	0.32
101-300	1036	0.04	0.20
301-	1036	0.00	0.06
Informationa and Communications	1036	0.09	0.28
Transport	1036	0.27	0.45
Wholesale Trade	1036	0.33	0.47
Retail Trade	1036	0.15	0.36
Real Estate	1036	0.08	0.27
Business Services	1036	0.08	0.27

Table 2. Matrix of Location of the customers and business competitors (Number)

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	20	21	12	2	55
	Group 2	13	85	63	21	182
	Group 3	12	62	208	23	305
	Group 4	4	38	112	301	455
	Group 5	2	13	9	15	39
	Total	51	219	404	362	1036

Note: "Gropu 1", "Group 2", "Group 3", "Group 4", and "Group 5" are "Both domestic and foreign markets", "Entire domestic markets", "Home and neighbouring prefectures", "Home and neighbouring municipalities", and "No competitor", respectively.

Table 3. Matrix of Location of the customers and business competitors (Ratio)

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.02	0.02	0.01	0.00	0.05
	Group 2	0.01	0.08	0.06	0.02	0.18
	Group 3	0.01	0.06	0.20	0.02	0.29
	Group 4	0.00	0.04	0.11	0.29	0.44
	Group 5	0.00	0.01	0.01	0.01	0.04
	Total	0.05	0.21	0.39	0.35	1.00

Note: "Gropu 1", "Group 2", "Group 3", "Group 4", and "Group 5" are "Both domestic and foreign markets", "Entire domestic markets", "Home and neighbouring prefectures", "Home and neighbouring municipalities", and "No competitor", respectively.

Table 4. Two Smaple T-test of the Productivity (Location of the Customers)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	0.19	0.14	0.99
Group 2	219	-0.16	0.10	1.49
combined	270	-0.09	0.09	1.41
diff		0.35	0.22	

diff = mean(1) - mean(2) t = 1.5920

Ho: diff = 0 degrees of freedom = 268

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.9437 Pr(|T| > |t|) = 0.1126 Pr(T > t) = 0.0563

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	0.19	0.14	0.99
Group 3	404	-0.37	0.09	1.78
combined	455	-0.30	0.08	1.72
diff		0.56	0.25	

diff = mean(1) - mean(3) t = 2.1833

Ho: diff = 0 degrees of freedom = 453

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.9852 Pr(|T| > |t|) = 0.0295 Pr(T > t) = 0.0148

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	0.19	0.14	0.99
Group 4	362	-0.77	0.12	2.37
combined	413	-0.65	0.11	2.26
diff		0.96	0.34	

diff = mean(1) - mean(4) t = 2.8573

Ho: diff = 0 degrees of freedom = 411

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.9978 Pr(|T| > |t|) = 0.0045 Pr(T > t) = 0.0022

Table 5. Two Smaple T-test of the Mark-up (Location of the Customers)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	1.23	0.05	0.33
Group 2	219	1.41	0.04	0.57
combined	270	1.38	0.03	0.54
diff		-0.18	0.08	

diff = mean(1) - mean(2) t = -2.1744

Ho: diff = 0 degrees of freedom = 268

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0153 Pr(|T| > |t|) = 0.0305 Pr(T > t) = 0.9847

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	1.23	0.05	0.33
Group 3	404	1.50	0.03	0.67
combined	455	1.47	0.03	0.65
diff		-0.26	0.10	

diff = mean(1) - mean(3) t = -2.7235

Ho: diff = 0 degrees of freedom = 453

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0034 Pr(|T| > |t|) = 0.0067 Pr(T > t) = 0.9966

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	51	1.23	0.05	0.33
Group 4	362	1.67	0.04	0.80
combined	413	1.61	0.04	0.77
diff		-0.43	0.11	

diff = mean(1) - mean(4) t = -3.8116

Ho: diff = 0 degrees of freedom = 411

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0001 Pr(|T| > |t|) = 0.0002 Pr(T > t) = 0.9999

Table 6. Differences of Productivity by Market Size(Location of the Customers)				
omega	Coef.	Std. Err.	t	P>|t|
Group 2	-0.25	0.25	-0.99	0.32
Group 3	-0.37	0.24	-1.53	0.13
Group 4	-0.48	0.25	-1.89	0.06
_cons	-1.10	0.31	-3.51	0.00
Number of obs	1036			
F	22.94			
Prob > F	0.00			
Adj R-squared	0.34			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Table 7. Differences of Mark-up by Market Size(Location of the Customers)				
markup	Coef.	Std. Err.	t	P>|t|
Group 2	0.02	0.07	0.32	0.75
Group 3	0.09	0.06	1.42	0.16
Group 4	0.08	0.07	1.18	0.24
_cons	1.36	0.08	16.25	0.00
Number of obs	1036			
F	74.72			
Prob > F	0.00			
Adj R-squared	0.63			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Table 8. Two Smaple T-test of the Productivity (Location of the Competitors)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	-0.14	0.13	0.96
Group 2	182	-0.22	0.13	1.72
combined	237	-0.20	0.10	1.58
diff		0.08	0.24	

diff = mean(1) - mean(2) t = 0.3247

Ho: diff = 0 degrees of freedom = 235

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.6271 Pr(|T| > |t|) = 0.7457 Pr(T > t) = 0.3729

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	-0.14	0.13	0.96
Group 3	305	-0.15	0.09	1.50
combined	360	-0.15	0.08	1.43
diff		0.01	0.21	

diff = mean(1) - mean(3) t = 0.0685

Ho: diff = 0 degrees of freedom = 358

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.5273 Pr(|T| > |t|) = 0.9454 Pr(T > t) = 0.4727

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	-0.14	0.13	0.96
Group 4	455	-0.77	0.11	2.28
combined	510	-0.70	0.10	2.19
diff		0.63	0.31	

diff = mean(1) - mean(4) t = 2.0379

Ho: diff = 0 degrees of freedom = 508

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.9790 Pr(|T| > |t|) = 0.0421 Pr(T > t) = 0.0210

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	-0.14	0.13	0.96
Group 5	39	-0.20	0.36	2.22
combined	94	-0.16	0.16	1.60
diff		0.06	0.34	

diff = mean(1) - mean(5) t = 0.1808

Ho: diff = 0 degrees of freedom = 92

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.5716 Pr(|T| > |t|) = 0.8569 Pr(T > t) = 0.4284

Table 9. Two Smaple T-test of the Mark-up (Location of the Competitors)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	1.34	0.06	0.41
Group 2	182	1.42	0.05	0.68
combined	237	1.40	0.04	0.63
diff		-0.08	0.10	

diff = mean(1) - mean(2) t = -0.8440

Ho: diff = 0 degrees of freedom = 235

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.1998 Pr(|T| > |t|) = 0.3995 Pr(T > t) = 0.8002

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	1.34	0.06	0.41
Group 3	305	1.44	0.03	0.60
combined	360	1.42	0.03	0.57
diff		-0.10	0.08	

diff = mean(1) - mean(3) t = -1.1992

Ho: diff = 0 degrees of freedom = 358

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.1156 Pr(|T| > |t|) = 0.2313 Pr(T > t) = 0.8844

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	1.34	0.06	0.41
Group 4	455	1.67	0.03	0.74
combined	510	1.63	0.03	0.72
diff		-0.33	0.10	

diff = mean(1) - mean(4) t = -3.2641

Ho: diff = 0 degrees of freedom = 508

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0006 Pr(|T| > |t|) = 0.0012 Pr(T > t) = 0.9994

Group	Obs	Mean	Std. Err.	Std. Dev.
Group 1	55	1.34	0.06	0.41
Group 5	39	1.30	0.15	0.95
combined	94	1.32	0.07	0.68
diff		0.04	0.14	

diff = mean(1) - mean(5) t = 0.2489

Ho: diff = 0 degrees of freedom = 92

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.5980 Pr(|T| > |t|) = 0.8040 Pr(T > t) = 0.4020

Table 10. Differences of Productivity by Market Size(Location of the Competitors)				
omega	Coef.	Std. Err.	t	P>|t|
Group 2	-0.24	0.25	-0.98	0.33
Group 3	-0.19	0.24	-0.78	0.43
Group 4	-0.43	0.24	-1.79	0.07
Group 5	0.04	0.34	0.11	0.91
_cons	-1.21	0.30	-4.08	0.00
Number of obs	1036			
F	22.15			
Prob > F	0.00			
Adj R-squared	0.34			
Note: "Group 1", "Group 2", "Group 3", "Group 4" and "Group 5" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", "Home and neighbouring municipalities", and "No competitors", respectively. Reference group is "Group 1". All specifications include industry and size variable.				

Table 11. Differences of Mark-up by Market Size(Location of the Competitors)				
markup	Coef.	Std. Err.	t	P>|t|
Group 2	0.11	0.07	1.65	0.10
Group 3	0.04	0.06	0.60	0.55
Group 4	0.08	0.06	1.31	0.19
Group 5	0.00	0.09	0.04	0.97
_cons	1.36	0.08	17.16	0.00
Number of obs	1036			
F	71.75			
Prob > F	0.00			
Adj R-squared	0.63			
Note: "Group 1", "Group 2", "Group 3", "Group 4" and "Group 5" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", "Home and neighbouring municipalities", and "No competitors", respectively. Reference group is "Group 1". All specifications include industry and size variable.				

Table 12. Matrix of Location of the customers and business competitors by industry (Ratio)

Informationa and Communications

		Location of the customers				
	DQ6	Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.04	0.08	0.02	0.00	0.14
	Group 2	0.03	0.19	0.06	0.02	0.30
	Group 3	0.03	0.17	0.19	0.01	0.40
	Group 4	0.00	0.07	0.02	0.00	0.09
	Group 5	0.01	0.03	0.01	0.01	0.07
	Total	0.12	0.53	0.30	0.04	1.00

Transport

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.02	0.01	0.00	0.00	0.02
	Group 2	0.01	0.07	0.05	0.00	0.13
	Group 3	0.01	0.07	0.24	0.02	0.34
	Group 4	0.01	0.05	0.16	0.24	0.46
	Group 5	0.00	0.01	0.01	0.01	0.04
	Total	0.05	0.21	0.47	0.27	1.00

Wholesale Trade

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.03	0.01	0.02	0.00	0.06
	Group 2	0.02	0.11	0.09	0.02	0.24
	Group 3	0.01	0.05	0.24	0.02	0.32
	Group 4	0.00	0.03	0.10	0.22	0.36
	Group 5	0.00	0.01	0.00	0.01	0.02
	Total	0.06	0.21	0.45	0.27	1.00

Retail Trade

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.00	0.01	0.01	0.01	0.03
	Group 2	0.00	0.04	0.00	0.04	0.08
	Group 3	0.00	0.03	0.08	0.03	0.13
	Group 4	0.00	0.03	0.05	0.66	0.74
	Group 5	0.00	0.00	0.00	0.02	0.02
	Total	0.00	0.10	0.14	0.76	1.00

Real Estate

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.00	0.04	0.01	0.00	0.05
	Group 2	0.01	0.04	0.10	0.04	0.18
	Group 3	0.00	0.05	0.17	0.06	0.28
	Group 4	0.00	0.01	0.11	0.30	0.42
	Group 5	0.00	0.00	0.02	0.05	0.07
	Total	0.01	0.13	0.41	0.45	1.00

Business Services

		Location of the customers				
		Group 1	Group2	Group 3	Group 4	Total
Location of the business competitors	Group 1	0.02	0.04	0.02	0.00	0.09
	Group 2	0.00	0.04	0.05	0.01	0.10
	Group 3	0.01	0.05	0.19	0.00	0.25
	Group 4	0.00	0.00	0.14	0.36	0.49
	Group 5	0.01	0.04	0.01	0.01	0.07
	Total	0.05	0.16	0.41	0.38	1.00

Note: "Gropu 1", "Group 2", "Group 3", "Group 4", and "Group 5" are "Both domestic and foreign markets", "Entire domestic markets", "Home and neighbouring prefectures", "Home and neighbouring municipalities", and "No competitor", respectively.

Table 13. Differences of Productivity by Market Size:				
In case that Location of the Consumers is smaller than that of the Competitors				
omega	Coef.	Std. Err.	t	P>|t|
Group 2	-0.47	0.46	-1.03	0.31
Group 3	-0.60	0.33	-1.82	0.07
Group 4	(omitted)			
_cons	-0.65	0.55	-1.17	0.24
Number of obs	142			
F	2.27			
Prob > F	0.01			
Adj R-squared	0.10			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Table 14. Differences of Mark-up by Market Size:				
In case that Location of the Consumers is smaller than that of the Competitors				
markup	Coef.	Std. Err.	t	P>|t|
Group 2	0.26	0.19	1.37	0.17
Group 3	0.18	0.14	1.32	0.19
Group 4	(omitted)			
_cons	1.19	0.23	5.19	0.00
Number of obs	142			
F	4.78			
Prob > F	0.00			
Adj R-squared	0.24			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

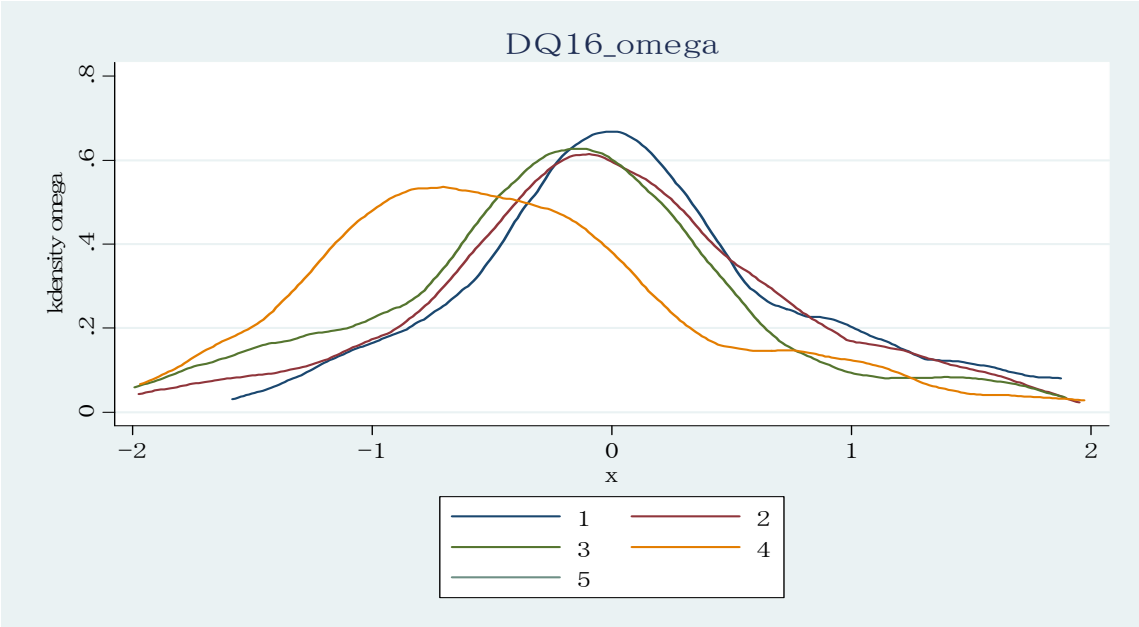
Table 15. Differences of Productivity by Market Size:				
In case that Location of the Consumers is sama as that of the Competitors				
omega	Coef.	Std. Err.	t	P>|t|
Group 2	-0.54	0.46	-1.18	0.24
Group 3	-0.42	0.43	-0.96	0.34
Group 4	-0.71	0.43	-1.63	0.10
_cons	-1.16	0.51	-2.30	0.02
Number of obs	614			
F	14.55			
Prob > F	0.00			
Adj R-squared	0.21			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Table 16. Differences of Mark-up by Market Size:				
In case that Location of the Consumers is sama as that of the Competitors				
markup	Coef.	Std. Err.	t	P>|t|
Group 2	0.32	0.15	2.13	0.03
Group 3	0.34	0.14	2.42	0.02
Group 4	0.59	0.14	4.25	0.00
_cons	1.04	0.16	6.36	0.00
Number of obs	614			
F	18.19			
Prob > F	0.00			
Adj R-squared	0.25			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Table 17. Differences of Productivity by Market Size:				
In case that Location of the Consumers is larger than that of the Competitors				
omega	Coef.	Std. Err.	t	P>|t|
Group 2	-0.32	0.36	-0.87	0.39
Group 3	-0.65	0.37	-1.77	0.08
Group 4	(omitted)			
_cons	0.03	0.48	0.06	0.95
Number of obs	241			
F(12, 228)	3.80			
Prob > F	0.00			
Adj R-squared	0.12			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

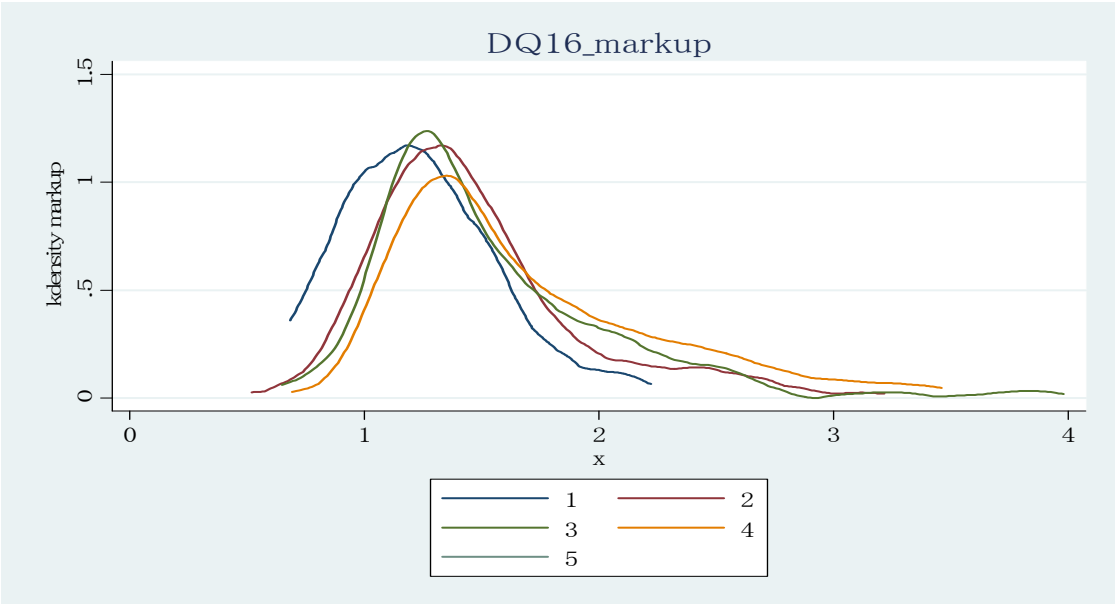
Table 18. Differences of Mark-up by Market Size:				
In case that Location of the Consumers is larger than that of the Competitors				
markup	Coef.	Std. Err.	t	P>|t|
Group 2	-0.01	0.12	-0.06	0.95
Group 3	0.17	0.12	1.46	0.15
Group 4	(omitted)			
_cons	1.20	0.16	7.72	0.00
Number of obs	241			
F(12, 228)	8.30			
Prob > F	0.00			
Adj R-squared	0.27			
Note: "Group 1", "Group 2", "Group 3", and "Group 4" are "Both domestic and foreign markets","Entire domestic markets", "Home and neighbouring prefectures", and "Home and neighbouring municipalities", respectively.				
Reference group is "Group 1". All specifications include industry and size variable.				

Figure 1. Kernel Density of Productivity by Location of the Customers



Note: The groups of 1, 2, 3, 4 and 5 indicate “Both domestic and foreign markets”, “Entire domestic markets”, “Home and neighbouring prefectures”, “Home and neighbouring municipalities”, and “No competitor”, respectively

Figure 2. Kernel Density of Mark-up by Location of the Customers



Note: The groups of 1, 2, 3, 4 and 5 indicate “Both domestic and foreign markets”, “Entire domestic markets”, “Home and neighbouring prefectures”, “Home and neighbouring municipalities”, and “No competitor”, respectively