Chapter 3

Dynamic Two-way Relationship between Exporting and Importing: Evidence from Japan

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CHAPTER 3

Dynamic Two-way Relationship between Exporting and Importing: Evidence from Japan[1]

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In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we examine the state dependence and cross effects in exporting and importing. Our findings are as follows. First, we found significant state dependence and cross effects in exporting and importing. Second, those diminish over time. Third, the state dependence and the cross effects are found to be market-specific. Furthermore, such market specificity is more significant in small- and medium-sized enterprises. Last, the past export/import intensity matters in the current trade status.

Keywords: Japan, firm-level, two-way relationship
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1. Introduction

Recently, within-industry firm heterogeneity in terms of internationalization has attracted many researchers' attention. For example, larger-sized firms are in a more advantageous position to gain the benefit from international activities such as exporting and importing. Since the entry into foreign markets requires firms to bear sunk costs, only productive firms, usually relatively large-sized enterprises (LEs) are able to sell their products to foreign markets or to source intermediate goods from foreign manufacturers. Especially, recent empirical studies (e.g., Vogel and Wagner, 2010) highlight that while most productive firms get engaged in both exporting and importing, less productive firms, most of which are small- and medium-sized enterprises (SMEs), become one-way traders or domestic firms. Namely, it is well revealed in the literature that according to the differences in productivity or sizes, there are various kinds of differences in firms' international activities.

Another important aspect in firms' international activities is the existence of their dynamic nature. For example, once firms bear sunk costs for starting exporting, they do not need to incur those costs in the following years and thus will be able to easily continue their exporting activities. This is called "state dependence" in exporting and has been empirically confirmed in several previous studies such as Das, *et al*. (2007) and Roberts and Tybout (1997). The same story can be applied in the context of importing. That is, firms with the past experience of importing will be more likely to be importers in the future. Such state dependence in importing is also found in Aristei, *et al*. (2013) and Muuls and Pisu (2009). However, the time persistency of such state dependence might be controversial. Namely, while the export experience one year ago has a positive effect on exporting in the current year,

the experience of last exporting in several years ago may not. Indeed, Roberts and Tybout (1997) found that the state dependence persists until two years after exporting and that the export experience in three years ago does not have significant effects on exporting in the current year.

Furthermore, such a dynamic nature is expected to exist between exporting and importing. As mentioned in Aristei, *et al*. (2013), common sunk costs arise when firms implement an organizational structure in charge of international operations or when firms acquire information on foreign markets, which may include both potential buyers (export) and suppliers of intermediate inputs (import). Therefore, the sunk costs for importing (exporting) will be lower for exporters (importers). Also, even if there are no common sunk costs between exporting and importing, productivity improvement through starting importing (exporting) may enable firms to bear the original amount of sunk costs of exporting (importing). As a result, firms with the past experience of exporting (importing) are expected to tend to start importing (exporting) activities as well. This is called "cross effects" between exporting and importing, which are empirically found in Aristei, *et al*. (2013), Kasahara and Lapham (2013), and Muuls and Pisu (2009).

In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we first examine whether state dependence and cross effects exist in Japanese firms or not. Second, it is explored whether or not the experience one year ago has different effects from that more than one years ago. This analysis is similar to that in Roberts and Tybout (1997), but they do not examine such time persistency for cross effects. Third, we also examine whether or not state dependence and cross effects differ by firm characteristics such as firm size. Buono and Fadinger (2012) examine the role of firm productivity (in addition to country

characteristics) in the state dependence in exporting but do not for that in importing and cross effects. Last, we investigate whether state dependence and cross effects are destination-specific or not. For example, it is examined whether or not the past experience in exporting to Asia has the stronger effects in exporting to Asia in the current year than the experience in exporting to other regions.

In addition to the above-mentioned self-selection into internationalization, the literature has investigated the impacts of internationalization on firm productivity.[2] For example, Wagner (2002) and De Loecker (2007) investigated exporters in Germany and Slovenia, respectively, and found the positive impacts of exporting on their productivity, i.e., learning-by-exporting. On the other hand, the results for the impacts of importing are mixed. For example, Amiti and Konings (2007) found for firms in Indonesia that the increase of imported inputs through tariff reduction enhances firm productivity. However, Vogel and Wagner (2010) did not find the learning-by-importing in Germany. One source for this different result is that while imported inputs have much better quality than domestic inputs in the case of developing countries, the difference in quality between imported and domestic inputs is not so significant in the case of developed countries. Thus, starting importing does not lead to the significant productivity enhancement in the case of developed countries.

If learning-by-importing is not available in the case of developed countries, it becomes more important to analyze the dynamic transition process of firm internationalization for Japanese case, a case of a developed country. Even if direct positive impacts on firm productivity are not available from importing, the existence

[2] As for the survey papers on this field, see, for example, Hayakawa et al. (2012) and Wagner (2012).

of such two-way relationship means that importing activities encourage firms to start exporting and yield positive impacts on productivity through learning-by-exporting. In other words, importing activities have not direct but indirect impacts on firm productivity. Thus, our analysis for Japanese case will contribute to enhancing our understanding on how firms particularly in developed countries obtain benefits from internationalization. Also, this dynamic transition process of importing and exporting activities will uncover why the gap in productivity between SMEs and LEs expands over time.[3] Namely, while the LEs starting only exporting enjoy immediately productivity enhancement through learning-by-exporting, those starting just importing also may enjoy productivity enhancement through starting exporting subsequently. On the other hand, SMEs cannot enjoy such productivity enhancement because they do not afford starting either exporting or importing.

The rest of this paper is organized as follows. The next section specifies our theoretical framework on state dependence and cross effects. Section 3 provides our empirical framework and data sources. After taking a brief look at trade status in Japanese firms in Section 4, we report our estimation results in Section 5. Section 6 concludes on this paper.

2. Theoretical Framework

In this section, we discuss the mechanism of the dynamic transition process of importing and exporting activities. In particular, we shed light on the state dependence and the cross effects. While the state dependence is the positive relationship between the current and past status of exporting/importing, the cross

[3] See Figure A1 in Appendix.

effects are that the past experience in importing (exporting) raises the probability of exporting (importing) at the current year. To make our discussion clearer, we suppose that total fixed costs for trading consist of sunk costs and the fixed costs relating to, for example, market uncertainty. The former costs are borne by firms only when they start trading while firms need to pay the latter fixed costs every time.[4]

The relationship between sunk costs for trading and firm productivity is crucial not only in the mechanism of firms' trading but also for the existence of state dependence and cross effects in trading. The literature has examined the mechanism of firms' trading. Melitz (2003) is the theoretical pioneering study on the selection mechanism in firms' exporting. The selection mechanism in firms' importing is examined in Kasahara and Lapham (2013). In either case, sunk costs for exporting and importing play a crucial role in the selection mechanism of exporting and importing, respectively. Those studies theoretically demonstrate that firms with relatively high productivity get engaged in exporting (importing) because the more productive firms have the larger operating profits from exporting (importing) and thus can still obtain non-negative gross profit even if they incur sunk costs for exporting (importing). Thus, since firms with the past experience of exporting (importing) do not need to incur sunk costs anymore, such firms will be able to continue exporting (importing) in the future.

Nevertheless, in reality, many exporters (importers) enter into and exit from exporting (importing) multiple times. For example, as formalized in Blum et al. (2013) and Eaton et al. (2011), fixed costs for trading and/or demand in foreign

[4] The former and latter costs are respectively called "entry fee" and "maintenance cost" in Baldwin and Krugman (1989), "entry cost" and "reentry cost" in Roberts and Tybout (1997), and "start-up costs" and "fixed costs" in Das et al. (2007).

market might include stochastic components. Then, the large negative shocks for the fixed costs and the demand may not enable even firms with the trade experience to continue trading. Under this case, "learning" plays an important role in encouraging firms to continue trading. As mentioned in the introductory section, exporting and importing contributes to enhancing firms' productivity through learning advanced knowledge in the foreign market or enjoying economies of scale. These are called learning-by-exporting and learning-by-importing though the learning-by-importing may not be available in the case of firms in developed countries. Also, as theoretically demonstrated in Albornoz, *et al*. (2012), Arkolakis and Papageorgiou (2009), and Buono and Fadinger (2012), firms that start trading learn about foreign market and thus may face the lower demand uncertainty from the next year. As a result, with the rise of productivity through trading or the decrease of market uncertainty, firms can obtain the larger benefits from trading and will be likely to continue trading.

Also, the productivity rise through learning-by-exporting (learning-by-importing) becomes one of the important sources for cross effects. The productivity rise through exporting (importing) increases the benefits from importing (exporting) and thus encourages firms to start importing (exporting). In addition, the existence of the common fraction in sunk costs between exporting and importing becomes another important source. The organizational division and system for international business in addition to the general knowledge on international business can be shared between exporting and importing. As a result, cross effects between exporting and importing will work.

There are some more issues on state dependence and cross effects. The first is their relationship with time. On the one hand, state dependence and cross effects may

diminish over time because the sunk costs for trading may recover to the original amount over time. On the other hand, as theoretically formalized in Arkolakis and Papageorgiou (2009), and Buono and Fadinger (2012), market uncertainty may decrease over time. In addtion, as empirically found in De Loecker (2007), the rise of productivity through trading increases over time. As a result, the relationship of state dependence and cross effects with time is an empirical question.

Second, the magnitude of state dependence may differ by firm characteristics. For example, the rise of productivity through trading differs by pre-trading productivity or sizes. Lileeva and Trefler (2010) and Serti and Tomasi (2008) found the larger productivity rise in low productive firms and medium- and large-sized firms, respectively. In addition, low productive or small-sized firms may be likely to stop trading. This stop might be because of knowing the real magnitude of demand uncertainty by trying trading (Albornoz, *et al*., 2012) or of the small capacity of production (i.e. small capital investments) (Blum, *et al*., 2013). Again, due to the heterogeneous effects of trading on productivity across firms, the cross effects may be different according to firm characteristics.

Third, the state dependence and the cross effects might be market-specific. The sunk costs and fixed costs in addition to market uncertainty might have some components specific to trading partner countries. In other words, even if having the experience of bearing sunk costs in exporting to a region, firms may need to again bear sunk costs in exporting to other regions. Furthermore, as shown in De Loecker (2007), the effects of trading on productivity differ by partner country. He found that the effects of exporting to high income countries on firm productivity are larger than those of exporting to low income countries. Buono and Fadinger (2012) also show the differences in the magnitude of state dependence according to partner

countries. As a result, the state dependence and the cross effects will be market-specific to some extent.

3. Empirical Framework

In the literature, to analyze empirically the state dependence and cross effects for exporting and importing, many previous papers such as Aristei, *et al*. (2013) estimate a model for the probability of exporting or importing as a function of previous status on both exporting and importing activities, in addition to several firm characteristics. Then they estimate the bivariate probit model and investigate whether trading status in previous period affects the current trading status. However, in this specification, it is difficult to distinguish the cross effects toward two-way traders from those of just switching between exporting and importing.

Instead, we use the category variable Y_{it} which takes 0 for no trading firms, 1 for export-only firms, 2 for import-only firms, and 3 for two-way-trading firms as a dependent variable and then estimate multinomial logit model by employing the following specification;

$$\text{Prob}(Y_{it} = j) = \frac{\exp(\alpha_{ij} + \mathbf{D}_{i,t-1}\boldsymbol{\beta}_{ij} + \mathbf{X}_{i,t-1}\boldsymbol{\gamma}_{ij})}{\sum_k \exp(\alpha_{ik} + \mathbf{D}_{i,t-1}\boldsymbol{\beta}_{ik} + \mathbf{X}_{i,t-1}\boldsymbol{\gamma}_{ik})},$$

where $\mathbf{D}_{i,t\text{-}1}$ is a vector of dummy variables on firm *i*'s status of internationalization, namely exporter, or importer in year *t*-1. α_{ij} represents choice specific random effects, which are unobserved firm heteronegeneity in total fixed costs for firm *i*. $\mathbf{X}_{i,t\text{-}1}$ represents several firm characteristics, listed later. In our estimation strategy, firms are assumed to decide whether they engage in only export, only import, or both in each period. This framework is consistent with the decision for internationalization discussed in Kasahara and Lapham (2013).

Following Todo (2011), to incorporate the correlation between random effects, we allow random variation in a vector of coefficients for the lagged status variables, $\boldsymbol{\beta}_{ij}$, and estimate so-called random effect mixed logit model. One of the advantages in using this specification lies in the relaxation of the interdependence from irrelevant alternative (IIA) assumption. The standard multinomial logit model assumes that the estimated coefficients are not changed even if we exclude one choice from the choice set due to the IIA assumption. However, it is known that this assumption is not always satisfied. Introducing random effects enables us to relax this assumption and obtain more reliable estimation results.

Our firm-level control variables include the average wage rates (Wage), the share of manufacturing workers in total workers (Share of Manu. Workers), the ratio of R&D to total sales (R&D-Sales Ratio), debt-asset ratio (Debt-Asset Ratio), and total factor productivity (TFP). We also introduce two Scale dummy variables. Scale (301-999) takes the value one if a firm has more than 300 and less than 1,000 employees and zero otherwise. Scale (>999) does the value one if a firm has over 1,000 employees. Thus, SMEs, which have less than 300 employees, have the value zero for these two Scale variables. This definition of SMEs is suggested by Small and Medium Enterprise Basic Law in Japan. In this paper, we obtain TFP by estimating production function with the Wooldridge (2009) modification of the Levinshon and Petrin (WLP). This method takes into account the potential collineality issue in the first stage of Levinshon and Petrin (2003) estimator suggested by Ackerberg, *et al*. (2006). We also include industry dummy and year dummy variables. All independent variables are lagged for one year.

Data for Japan are drawn from the confidential micro database of the Kigyou Katsudou Kihon Chousa Houkokusho (Basic Survey of Japanese Business Structure

and Activities: BSJBSA) prepared annually by the Research and Statistics Department, the Ministry of Trade, Economy and Industry (METI) (1994-2009). This survey was first conducted in 1991 and then annually from 1994. The main purpose of the survey is to capture statistically the overall picture of Japanese corporate firms in light of their activity diversification, globalization and strategies on research and development and information technology.

The strength of this survey is the sample coverage and reliability of information. It is compulsory for firms with more than 50 employees and with capital of more than 30 million yen in manufacturing and nonmanufacturing firms (some non-manufacturing industries such as construction, medical services and transportation services are not included). Another advantage lies in the rich information on global engagement, such as exporting, importing, outsourcing, and foreign direct investment. One limitation is that some information on financial and institutional features is not available. In 2002, the BSJBSA covered about one-third of Japan's total labour force excluding the public, financial and other services industries that are not covered in the survey (Kiyota, Nakajima, and Nishimura, 2009).

Our sample selection policy is as follows; first, we focus on manufacturing industry in this paper, although this survey covers non-manufacturing industries as well as manufacturing firms. This is because the coverage of non-manufacturing industry differs by years and is thus not consistent across years. Second, we restrict our sample period to that from 1994 to 2009 and exclude sample firms that appear in this survey only at once or twice since our estimation method, a dynamic random-effects multinomial logit model requires sample firms to appear in at least three consecutive years. Finally, basic statistics in our sample are reported in Table 1.

Table 1. Basic Statistics

	N	Mean	S.D.	p10	p90
Status	165,555	0.830	1.197	0.000	3.000
Export ($t-1$)	165,555	0.294	0.456	0.000	1.000
Export ($t-2$)	144,031	0.296	0.456	0.000	1.000
Export ($t-3$)	127,330	0.297	0.457	0.000	1.000
Export ($t-4$)	112,934	0.297	0.457	0.000	1.000
Export ($t-5$)	99,609	0.298	0.457	0.000	1.000
Export ($t-1$) * SME	165,555	0.199	0.400	0.000	1.000
Export ($t-2$) * SME	144,031	0.198	0.399	0.000	1.000
Export ($t-3$) * SME	127,330	0.197	0.398	0.000	1.000
Export ($t-4$) * SME	112,934	0.196	0.397	0.000	1.000
Export ($t-5$) * SME	99,609	0.195	0.396	0.000	1.000
Import ($t-1$)	165,555	0.260	0.439	0.000	1.000
Import ($t-2$)	144,031	0.260	0.439	0.000	1.000
Import ($t-3$)	127,330	0.259	0.438	0.000	1.000
Import ($t-4$)	112,934	0.258	0.437	0.000	1.000
Import ($t-5$)	99,609	0.255	0.436	0.000	1.000
Import ($t-1$) * SME	165,555	0.180	0.384	0.000	1.000
Import ($t-2$) * SME	144,031	0.177	0.382	0.000	1.000
Import ($t-3$) * SME	127,330	0.175	0.380	0.000	1.000
Import ($t-4$) * SME	112,934	0.172	0.378	0.000	1.000
Import ($t-5$) * SME	99,609	0.169	0.375	0.000	1.000
SME	165,555	0.846	0.361	0.000	1.000
ln TFP	165,555	2.995	0.760	2.111	3.920
ln Wage	165,555	1.548	0.389	1.080	1.984
R&D-Sales Ratio	165,555	0.010	0.029	0.000	0.032
Debt-Asset Ratio	165,555	0.681	0.281	0.322	0.945
Share of Manu. Workers	165,555	0.654	0.258	0.271	0.932
Scale (301-999)	165,555	0.180	0.384	0.000	1.000
Scale (>999)	165,555	0.064	0.244	0.000	0.000
Export Share ($t-1$)	163,740	0.037	0.109	0.000	0.111
Export Share ($t-1$) * SME	163,740	0.022	0.085	0.000	0.044
Import Share ($t-1$)	163,740	0.037	0.125	0.000	0.089
Import Share ($t-1$) * SME	163,740	0.027	0.110	0.000	0.041

Source: Authors' calculation

4. Data Overview

Before moving estimation results, we take a brief look at firms' trade status. Table 2 reports the share of the number of firms categorized into each status, in total number of firms. The status includes no trade (Domestic), only exporting (Export),

only importing (Import), and both exporting and importing (Two-way). The table shows the highest share in "Domestic", followed by "Two-way". It is interesting that the share of "Two-way" is higher than that of "Export" or that of "Import". In other words, a larger number of firms get engaged in both exporting and importing than in either exporting or importing. The table also shows the stable shares of "Export" (around 11%) and "Import" (around 8%) over time. On the other hand, while the share of "Domestic" declines steadily from 67% in 1994 to 59% in 2009, that of "Two-way" rises from 14% to 22%.

Table 2. Shares according to Trade Status

	Domestic	Export	Import	Two-way
1994	67%	11%	8%	14%
1995	65%	12%	8%	15%
1996	64%	11%	8%	16%
1997	67%	10%	8%	15%
1998	68%	10%	7%	15%
1999	67%	11%	7%	16%
2000	65%	11%	6%	18%
2001	64%	11%	7%	19%
2002	63%	11%	7%	20%
2003	61%	11%	8%	20%
2004	60%	11%	8%	21%
2005	60%	11%	8%	22%
2006	60%	11%	8%	22%
2007	59%	11%	9%	22%
2008	60%	11%	7%	22%
2009	59%	12%	7%	22%

Source: Authors' calculation

Next, Table 3 reports the transition matrices of trade status between 1994 and 2009. Most of the firms in each status keep the same status between two years. One exception is the firms who got engaged in only importing in 1994. The majority of those turned out to stop importing in 2009. Also, we can see that the share of firms changing from "Export" to "Two-way" is higher than that of those changing from

"Import" to "Two-way". Indeed, as is consistent with the above, the status of "Import" seems to be more unstable than that of "Export". Most of the firms in "Import" remain in the same status, i.e. "Import", or stop importing in the coming year. On the other hand, most of the firms in "Export" remain in the same status, i.e. "Export", or start also importing and thus change to "Two-way" in the coming year.

Table 3. Transition Matrix of Trade Status from 1994 to 2009

	2009				Total
1994	Domestic	Export	Import	Two-way	
Domestic	75%	8%	7%	10%	100%
Export	22%	35%	3%	39%	100%
Import	51%	7%	22%	21%	100%
Two-way	11%	13%	6%	70%	100%
Total	57%	13%	7%	24%	100%

Source: Authors' calculation

In the previous section, we discussed the heterogeneity across firms. To see it briefly, we take a look at the differences in trade status between SMEs and LEs. SMEs are defined as firms that have less than 300 employees. The share of each trade status is provided in Table 4. The case of SMEs seems to be similar to that in Table 2. Namely, the largest share can be found in "Domestic", followed by "Two-way". In particular, more than a half of SMEs are categorized into "Domestic". On the other hand, in the case of LEs, the largest share can be found in "Two-way", followed by "Domestic". Thus, SMEs and LEs are likely to be "Domestic" and "Two-way", respectively. In both cases of SMEs and LEs, "Import" has the lowest share.

Table 4. Shares according to Trade Status for SMEs and Large-sized Enterprises

	Domestic		Export		Import		Two-way	
	LE	SME	LE	SME	LE	SME	LE	SME
1994	35%	73%	18%	10%	6%	8%	40%	9%
1995	30%	71%	19%	10%	6%	8%	44%	10%
1996	30%	70%	18%	10%	7%	8%	45%	11%
1997	35%	73%	16%	9%	8%	8%	41%	10%
1998	35%	73%	16%	9%	6%	7%	43%	11%
1999	36%	72%	15%	10%	6%	7%	43%	11%
2000	33%	71%	16%	10%	6%	6%	45%	13%
2001	33%	70%	15%	10%	6%	7%	46%	14%
2002	31%	68%	14%	10%	6%	7%	48%	14%
2003	31%	66%	14%	10%	6%	9%	48%	15%
2004	31%	66%	14%	10%	6%	8%	49%	16%
2005	31%	65%	14%	10%	7%	8%	49%	17%
2006	31%	65%	15%	10%	7%	8%	48%	17%
2007	32%	64%	14%	10%	7%	9%	47%	17%
2008	31%	65%	15%	10%	6%	8%	47%	17%
2009	31%	64%	16%	11%	6%	8%	47%	18%

Source: Authors' calculation

In Table 5, the transition matrix is reported for SMEs and LEs separately. The transition pattern for SMEs in 1994 is similar to that shown in Table 3. Namely, most of the SMEs in each status keep the same status between two years. Then, "Import" firms are more likely to change to "Domestic" firms while "Export" firms are more likely to change to "Two-way". The probabilities for SMEs to be LEs are very low, 6% at highest. Compared with SMEs, LEs in 1994 have relatively high probability to switch their status between two years. For example, while 45% of large domestic firms in 1994 remain domestic firm in 2009, 15% and 16% of them become two-way traders and small domestic firms in 2009, respectively. And the probability for exporters to be two-way traders is amount to 46%.

Table 5. Transition Matrix of Trade Status: SME versus LE

		2009								Total
		SME				LE				
1994		Domestic	Export	Import	Two-way	Domestic	Export	Import	Two-way	
SME	Domestic	75%	7%	6%	8%	2%	1%	0%	1%	100%
	Export	24%	36%	3%	31%	2%	1%	0%	3%	100%
	Import	51%	7%	22%	18%	1%	0%	0%	1%	100%
	Two-way	12%	12%	6%	63%	1%	1%	0%	6%	100%
LE	Domestic	16%	2%	4%	2%	45%	10%	6%	15%	100%
	Export	4%	3%	1%	8%	10%	25%	2%	46%	100%
	Import	8%	1%	8%	7%	38%	4%	9%	24%	100%
	Two-way	2%	1%	1%	9%	7%	12%	4%	63%	100%
Total		51%	9%	6%	15%	6%	3%	1%	9%	100%

Source: Authors' calculation.

Last, we take a brief look at how SMEs and LEs have different performance indicators. Specifically, we examine three indicators including TFP, labor productivity, and the ratio of R&D to sales. There are two important findings in Table 6. First, in all indicators, LEs have the larger values/ratios than SMEs. Second, within each firm size category, Two-way has the largest values/ratios, followed by Export, Import, and Domestic. We also compare these differences by regressing simple equations (ordinary least squares, OLS). The results are reported in Table 7. Taking a look at the specification with industry and year dummy variables, we can see the similar differences with those confirmed in Table 6. One interesting finding in regression analysis is that since the interaction term between export and SMEs has positive and higher coefficients than that for export, exporter premium is larger within SMEs than within LEs. All in all, these results suggest that total sunk costs are larger in order of Two-way, Export, and Import.

Table 6. Performance Premium: Simple Average

	Domestic	Export	Import	Two-way
ln TFP				
SME	2.811	2.929	2.921	3.068
LE	3.557	3.574	3.668	3.791
ln Labor Productivity				
SME	1.758	1.929	1.802	2.003
LE	2.124	2.214	2.179	2.303
R&D-Sales Ratio				
SME	0.441	1.394	0.669	1.654
LE	1.06	2.895	1.735	3.504

Source: Authors' calculation

Table 7. Performance Premium: OLS

	ln TFP		ln Labor Productivity		R&D-Sales Ratio	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Export	0.023*	0.093***	0.102***	0.065***	0.018***	0.016***
	(0.013)	(0.011)	(0.011)	(0.011)	(0.000)	(0.000)
Import	0.098***	0.060***	0.046***	0.040***	0.006***	0.005***
	(0.019)	(0.016)	(0.016)	(0.015)	(0.001)	(0.001)
Two-way	0.235***	0.212***	0.186***	0.129***	0.025***	0.021***
	(0.010)	(0.008)	(0.008)	(0.008)	(0.000)	(0.000)
SME	-0.759***	-0.748***	-0.371***	-0.366***	-0.006***	-0.006***
	(0.008)	(0.007)	(0.007)	(0.006)	(0.000)	(0.000)
Export * SME	0.097***	0.055***	0.071***	0.055***	-0.009***	-0.009***
	(0.015)	(0.012)	(0.013)	(0.012)	(0.001)	(0.001)
Import * SME	0.019	0.016	0.001	0.026*	-0.004***	-0.003***
	(0.020)	(0.017)	(0.017)	(0.016)	(0.001)	(0.001)
Two-way * SME	0.024**	0.019**	0.059***	0.042***	-0.013***	-0.012***
	(0.011)	(0.009)	(0.010)	(0.009)	(0.000)	(0.000)
Constant	3.597***	3.918***	2.159***	2.139***	0.011***	0.015***
	(0.008)	(0.011)	(0.006)	(0.011)	(0.000)	(0.000)
Industry dummy	NO	YES	NO	YES	NO	YES
Year dummy	NO	YES	NO	YES	NO	YES
Observations	164,785	164,785	164,889	164,889	165,555	165,555
R-squared	0.169	0.443	0.084	0.191	0.120	0.185

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error.

5. Empirical Results

This section reports our estimation results. We first present our baseline estimation results and then the results for some additional analyses.

5.1. Baseline Results

Our estimation results in the random effect multinomial logit model are reported in Table 8. The results in firm characteristics are as follows. First, the highly productive firms get engaged in exporting and/or importing. These results are well known and are consistent with many previous papers including Aristei, *et al*. (2013) and Muuls and Pisu (2009). Second, firms with the higher wages are more likely to get engaged in exporting but are less likely to be engaged in importing. This symmetric result is very interesting though it is difficult to interpret it well. In Muuls and Pisu (2009), the coefficients for wage rates are estimated to be insignificant in both exporting and importing. Third, taking a look at the results in Scale, we can see that SMEs are less likely to get engaged in exporting, importing, and Two-way. It is interesting that the effects of Scale (>999) on importing is insignificantly estimated. This result will indicate that the very large-sized firms are more likely to get engaged in both exporting and importing than in importing only. Fourth, the non-production worker-intensive firms, R&D intensive firms, or firms with the less debt-asset ratio have the higher probability of expiring and importing.

Table 8. Baseline Results: Random Effect Multinomial Logit Model

	Export	Import	Two-way
(Mean)			
Export ($t-1$)	5.470***	-0.975***	4.420***
	(0.033)	(0.087)	(0.051)
Import ($t-1$)	-0.835***	5.066***	3.679***
	(0.079)	(0.032)	(0.058)
ln TFP	0.089***	0.100***	0.156***
	(0.030)	(0.031)	(0.031)
ln Wage	0.151***	-0.082*	0.075
	(0.050)	(0.049)	(0.052)
R&D-Sales Ratio	5.800***	2.867***	6.052***
	(0.602)	(0.763)	(0.608)
Debt-Asset Ratio	-0.330***	-0.070	-0.301***
	(0.055)	(0.052)	(0.058)
Share of Manu. Workers	-0.236***	-0.492***	-0.677***
	(0.059)	(0.056)	(0.061)
Scale (301-999)	0.281***	0.184***	0.642***
	(0.038)	(0.040)	(0.039)
Scale (>999)	0.469***	0.039	0.844***
	(0.065)	(0.075)	(0.066)
Intercept	-3.356***	-3.374***	-3.980***
	(0.136)	(0.139)	(0.156)
(Standard Deviation)			
Export ($t-1$)	0.025	0.271	0.002
	(0.093)	(0.272)	(0.122)
Import ($t-1$)	0.238	0.085	0.13
	(0.294)	(0.084)	(0.166)
Intercept	-0.018	0.018	-0.296
	(0.094)	(0.092)	(0.188)
Observations		662,220	
Log-likelihood		-61952	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

The results in the one-year lagged export or import variables are as follows. We can see the existence of state dependence from the results that the one-year lagged export (import) status in export (import) equation is positively associated with the current year status on export (import). The state dependence in exporting will be based on either or both incurring sunk costs for exporting and learning about the advanced technology and/or the uncertainty in foreign market[5]. In the case of

[5] To identify the source of state dependency, we add the interaction term between lagged trading

importing, taking into account the absence of learning-by-importing in developed countries, we may say that it is sourced mainly from incurring sunk costs for importing. On the other hand, while the lagged export (import) status in import (export) equation has significantly negative coefficients, the results in two-way equation show the significantly positive coefficients for both the lagged export and import variables. These results imply that the cross effects toward two-way traders exist rather than those encouraging switching between exporting and importing. The existence of cross effects in not only exporting but also importing will show that the significant fraction of sunk costs is common between exporting and importing.

From the results in standard deviations of coefficients, we can see that all of them are insignificant, suggesting that coefficients do not vary by firm and by mode of internationalization and that the results for multinomial logit model do not differ from the random effect multinomial logit estimation so much. Therefore, we focus on the results of multinomial logit model for further analysis. Indeed, the multinomial logit model greatly saves the computation time, compared with the random effect multinomial logit model.

5.2. Further Analysis

This subsection conducts some more estimation. First, we introduce some more-year-lagged export and import variables. Specifically, we do those up to five years. We also include the interaction terms of those lagged variables with SME dummy. The results are reported in Table 9. The results for the other firm characteristics variables are not reported to save spaces (available upon request). The coefficients for some lagged variables are significantly estimated and indicate that both state dependence and cross effects diminish over time. As a result, we may say that the sunk costs for trading steadily return to those original level over time. On the other hand, most of the coefficients for the interaction terms with SME dummy are insignificantly estimated, indicating little difference in the state dependence and the cross effects according to firm size.

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status dummy variable and TFP growth rate. However, we cannot get any plausible estimation results. Therefore, we would leave this issue for a future agenda.

Table 9. Estimation Results: Further Lagged Variables

	Export	Import	Two-way
Export ($t-1$)	0.477***	-0.086***	0.200***
	(0.025)	(0.006)	(0.020)
Export ($t-2$)	0.081***	-0.027***	0.064***
	(0.018)	(0.010)	(0.018)
Export ($t-3$)	0.006	0.009	0.020
	(0.015)	(0.013)	(0.017)
Export ($t-4$)	0.039**	-0.009	0.014
	(0.017)	(0.012)	(0.017)
Export ($t-5$)	0.046***	-0.023**	0.054***
	(0.015)	(0.009)	(0.017)
Export ($t-1$) * SME	-0.007	0.061***	0.006
	(0.011)	(0.019)	(0.013)
Export ($t-2$) * SME	0.007	0.009	0.017
	(0.015)	(0.014)	(0.018)
Export ($t-3$) * SME	0.023	-0.020*	0.009
	(0.019)	(0.011)	(0.019)
Export ($t-4$) * SME	0.001	0.001	0.004
	(0.017)	(0.014)	(0.019)
Export ($t-5$) * SME	-0.001	0.024	-0.001
	(0.014)	(0.015)	(0.015)
Import ($t-1$)	-0.100***	0.411***	0.224***
	(0.006)	(0.032)	(0.025)
Import ($t-2$)	-0.030***	0.027**	0.048***
	(0.012)	(0.013)	(0.018)
Import ($t-3$)	-0.008	0.026*	0.013
	(0.014)	(0.014)	(0.016)
Import ($t-4$)	-0.014	0.020	0.022
	(0.013)	(0.014)	(0.017)
Import ($t-5$)	-0.021*	0.038***	0.010
	(0.011)	(0.013)	(0.013)
Import ($t-1$) * SME	0.033**	-0.007	0.000
	(0.017)	(0.008)	(0.013)
Import ($t-2$) * SME	0.008	0.031**	0.016
	(0.016)	(0.016)	(0.017)
Import ($t-3$) * SME	-0.010	-0.008	0.006
	(0.015)	(0.011)	(0.018)
Import ($t-4$) * SME	0.006	-0.002	0.003
	(0.017)	(0.012)	(0.017)
Import ($t-5$) * SME	0.010	-0.012	0.024
	(0.015)	(0.009)	(0.017)
Observations		91,025	
Log-likelihood		-29295	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy. The results in the other firm-level variables are not reported in this table.

Next, we extend our model so as to capture the dimension of export destination and import source countries. Namely, we investigate whether state dependence and cross effects are market-specific or not. To this end, we define dependent variables and the trade experience variables regionally. In particular, we examine trades with Asia and Western countries (i.e. North American and European countries) separately. Furthermore, in order to control for the role of the past experience of trade with the other region, we also introduce the one-year lagged variables of the export and import with the other region (Other Export and Other Import). The results are reported in Table 10. There are three noteworthy points. First, it shows the region-specific state dependence and cross effects in both Asia and Western countries. Second, the region-specific state dependence and cross effects are larger than the effects of the past experience of trade with the other region. Third, the region-specific state dependence and cross effects are larger in SMEs. Also, we have some evidence that trading with one region discourages SMEs to start trading with the other region.

Table 10. Estimation Results: Region-specific Analysis

	Asia			Western Countries		
	Export	Import	Two-way	Export	Import	Two-way
Export ($t-1$)	0.561***	-0.050***	0.181***	0.563***	-0.019***	0.080***
	(0.011)	(0.002)	(0.008)	(0.014)	(0.001)	(0.006)
Import ($t-1$)	-0.087***	0.491***	0.195***	-0.029***	0.553***	0.076***
	(0.002)	(0.016)	(0.011)	(0.001)	(0.018)	(0.006)
Export ($t-1$) * SME	0.032***	0.023***	0.009**	0.020***	0.020***	0.003***
	(0.007)	(0.006)	(0.004)	(0.004)	(0.005)	(0.001)
Import ($t-1$) * SME	0.043***	0.019***	0.033***	0.017***	0.010***	0.008***
	(0.010)	(0.004)	(0.006)	(0.006)	(0.002)	(0.002)
Other Export ($t-1$)	0.114***	-0.006	0.072***	0.061***	0.002	0.014***
	(0.009)	(0.003)	(0.007)	(0.005)	(0.002)	(0.002)
Other Import ($t-1$)	0.018***	0.039***	0.048***	0.004	0.014***	0.007***
	(0.006)	(0.006)	(0.006)	(0.003)	(0.002)	(0.001)
Other Export ($t-1$) * SME	-0.008	0.006	-0.005	-0.006**	0.003	-0.001
	(0.006)	(0.005)	(0.004)	(0.003)	(0.002)	(0.001)
Other Import ($t-1$) * SME	0.005	-0.008***	-0.007*	0.002	-0.003*	-0.001
	(0.007)	(0.003)	(0.004)	(0.003)	(0.002)	(0.001)
ln TFP	0.005**	0.002*	0.003**	0.005***	0.003***	0.002***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
ln Wage	0.011***	-0.008***	-0.004*	0.005**	0.003***	0.002***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
R&D-Sales Ratio	0.217***	0.078***	0.109***	0.167***	0.033**	0.044***
	(0.038)	(0.020)	(0.028)	(0.021)	(0.013)	(0.005)
Debt-Asset Ratio	-0.021***	0.002	-0.009***	-0.010***	-0.002*	-0.005***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Share of Manu. Workers	-0.025***	-0.012***	-0.027***	-0.007***	-0.014***	-0.005***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Scale (301-999)	0.024***	0.009***	0.031***	0.019***	0.006***	0.007***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Scale (>999)	0.038***	0.005	0.040***	0.040***	0.013***	0.018***
	(0.007)	(0.003)	(0.006)	(0.005)	(0.003)	(0.002)
Observations		165,555			165,555	
Log-likelihood		-57685			-41597	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

Last, we also examine the role of "magnitude" of the past export/import. Specifically, in addition to the dummy variables on the past export and import experience, we include the share of exports in total sales and the share of imports in total inputs. The results are reported in Table 11 and show that not only the past experience of exporting and importing but also those intensities matter in the current trade status. That is, firms that got engaged more intensively in exporting (importing) in the previous year are more likely to export (import) in the current year. However, while the higher export intensity in the past leads to the higher probability of being two-way

traders, firms with the high import intensity in the past do not necessarily become two-way traders. Based on these results, we may say that the past export intensity is a more important determinant in the current trade status than the past import intensity. In addition, we can see from the results of the interaction terms of these intensity variables with SME dummy that the role of such intensities in the current trade status is not different according to firm size.

Table 11. Estimation Results: Export/Import Share

	Export	Import	Two-way
Export ($t-1$)	0.552***	-0.073***	0.248***
	(0.010)	(0.003)	(0.009)
Export ($t-1$) * SME	0.009*	0.032***	0.002
	(0.006)	(0.009)	(0.006)
Export Share ($t-1$)	0.136***	-0.170***	0.156***
	(0.027)	(0.044)	(0.028)
Export Share ($t-1$) * SME	-0.029	-0.022	-0.032
	(0.029)	(0.052)	(0.031)
Import ($t-1$)	-0.096***	0.496***	0.258***
	(0.003)	(0.015)	(0.013)
Import ($t-1$) * SME	0.035***	0.001	0.008
	(0.010)	(0.004)	(0.007)
Import Share ($t-1$)	-0.072**	0.045***	0.019
	(0.032)	(0.014)	(0.024)
Import Share ($t-1$) * SME	-0.055	-0.007	0.037
	(0.036)	(0.015)	(0.026)
ln TFP	0.005**	0.003**	0.008***
	(0.002)	(0.001)	(0.002)
ln Wage	0.012***	-0.007***	0.005
	(0.004)	(0.002)	(0.004)
R&D-Sales Ratio	0.332***	0.094***	0.363***
	(0.040)	(0.034)	(0.043)
Debt-Asset Ratio	-0.023***	-0.002	-0.021***
	(0.004)	(0.003)	(0.004)
Share of Manu. Workers	-0.011***	-0.014***	-0.044***
	(0.004)	(0.003)	(0.004)
Scale (301-999)	0.019***	0.006***	0.052***
	(0.003)	(0.002)	(0.004)
Scale (>999)	0.038***	-0.000	0.073***
	(0.007)	(0.004)	(0.009)
Observations		163,740	
Log-likelihood		-59883	

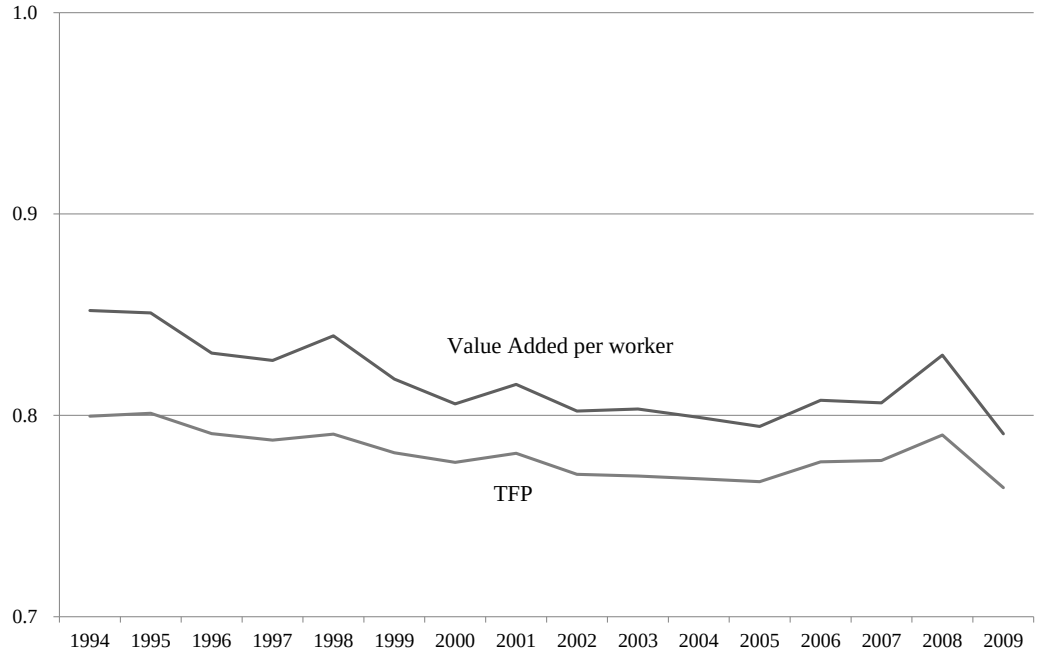
Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

6. Summary and Policy Implications

In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we examine the state dependence and cross effects in exporting and importing. Our findings are as follows. First, we found significant state dependence and cross effects in exporting and importing. Thus, even without any positive effects of starting importing on productivity, importers will be able to achieve productivity enhancement through inducing exporting. Second, those diminish over time. If this result indicates that the sunk costs for trading steadily return to those original level over time, it is important how firms maintain their know-how on trading particularly during the non-trading period. Third, the state dependence and the cross effects are found to be market-specific. This implies that it is more difficult to expand trading partners than to continue trading with the existing partners. Furthermore, such market-specific state dependence and cross effects are more significant in SMEs. We also find that trading with one region discourages SMEs to start trading with the other region. Last, the past export/import intensity matters in the current trade status.

The implication specific for SMEs in developed countries is as follows. Due to the more significant market specificity in the state dependence and cross effects, it is more difficult for SMEs to expand their trading partners. In the case of SMEs, trading with one region can even discourage to doing with the other region. These facts immediately imply that if firms can enjoy some amount of positive productivity effects from each trading partner, SMEs can obtain only the fewer amount of positive effects from trading than LEs. In other words, it is important for policy makers to encourage SMEs to expand their trading partners. The policy support is usually available particularly for starting trading for the first time. However, our claim is that it is important to support not only the beginners but also the firms trading with just a few partners.

Appendix. Performance Gap between LEs and SMEs



Source: Authors' calculation
Notes: The figure indicates the ratio of the average performance of SMEs to that of LEs.

References

Ackerberg, D., Caves, K., and Frazer, G., 2006, Structural Identification of Production Function, *MPRA paper*, 38349.

Albornoz, F., Calvo Pardo, H., Coros, G., and Ornelas, E., 2012. Sequential Exporting, *Journal of International Economics*, 88(1), 17-31.

Amiti, M. and Konings, J., 2007, Trade Liberalization, Intermediate Inputs, and Productivity, *American Economic Review*, 97(5), 1611-1638.

Arkolakis, C. and Papageorgiou, T., 2009, Selection, Growth and Learning, Mimeograph.

Aristei, D., Castellani, D., and Franco, C., 2013, Firms' Exporting and Importing Activities: Is There a Two-way Relationship?, *Review of World Economics*, 149(1), 55-84.

Baldwin, R., and Krugman, P., 1989, 1989, Persistent Trade Effects of Large Exchange Rate Shocks, Quarterly Journal of Economics, 104(4), 635-54.

Blum, B., Claro, S., and Horstmann, I., 2013, Occasional and Perennial Exporters, *Journal of International Economics*, 90(1), 65-74.

Buono, I. and Fadinger, H., 2012, The Micro-Dynamics of Exporting: Evidence from French Firms, Temi di Discussione, Number 880.

Das, S., Roberts, M., and Tybout, J., 2007, Market Entry Costs, Producer Heterogeneity, and Export Dynamics, *Econometrica*, 75(3), 837-873.

De Loecker, J., 2007, Do Exports Generate Higher Productivity? Evidence from Slovenia, *Journal of International Economics*, 73(1): 69-98.

Eaton, J., Kortum, S., and Kramarz, F., 2011, An Anatomy of International Trade: Evidence From French Firms, *Econometrica*, 79(5), 1453-1498.

Hayakawa, K., Kimura, F., and Machikita, T., 2012, Globalization and Productivity: A Survey of Firm-level Analysis, *Journal of Economic Surveys*, 26(2): 332-350.

Kasahara, H. and Lapham, B., 2013, Productivity and the Decision to Import and Export; Theory and Evidence, *Journal of International Economics*, 89(2), 297-316.

Kiyota, K., Nakajima, T., and Nishimura, K., 2009, Measurement of the Market Power of Firms: The Japanese Case in the 1990s, *Industrial and Corporate Change*, 18(3), 381-414.

Levinsohn, J., Petrin, A., 2003. Estimating Production Functions Using Inputs to Control for Unobservables, *Review of Economics and Studies*, (70), 317–341.

Lileeva, A. and Trefler, D., 2010, Improved Access to Foreign Markets Raises Plant-Level Productivity... for Some Plants, *Quarterly Journal of Economics*, 125(3), 1051-1099.

Melitz, M., 2003, The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71(6), 1695-1725.

Muuls, M. and Pisu, M., 2009, Imports and Exports at the Level of the Firm: Evidence from Belgium, *The World Economy*, 32(5), 692-734.

Roberts, M. and Tybout, J., 1997, The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs, *American Economic Review*, 87(4), 545-564.

Serti, F. and Tomasi, C., 2008, Self Selection and Post-entry Effects of Exports: Evidence from Italian Manufacturing Firms, *Review of World Economics*, 144(4), 660–94.

Todo, Y., 2011, Quantitative Evaluation of Determinants of Export and FDI: Firm-Level Evidence from Japan, *The World Economy*, 34(3), 355-381.

Vogel, A. and Wagner, J., 2010, Higher Productivity in Importing German Manufacturing Firms: Self-selection, Learning from Importing, or Both?, *Review of World Economics*, 145(4), 641-665.

Wagner, J., 2002, The Causal Effects of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach, *Economics Letters*, 77(2): 287-292.

Wagner, J., 2012, International Trade and Firm Performance: A Survey of Empirical Studies since 2006, *Review of World Economics*, 148(2), 235-267.

Wooldridge, J. M., 2009, On Estimating Firm-Level Production Function Using Proxy Variables to Control for Unobservables, *Economic Letters*, 104(3), 112-114.