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

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

Keywords: Japan, firm-level, two-way relationship
JEL Classification: F10; F13; F15

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1. Introduction

Recently, the effects of internationalization on within-industry firm heterogeneity have attracted many researchers' attention. For example, larger firms are in a more advantageous position to gain benefits from international activities such as exporting and importing than smaller firms. Since entry into foreign markets requires firms to bear sunk costs, only productive firms, usually relatively large 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) have highlighted that while more productive firms engage 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. It is clearly apparent from the literature that firms' international activities are determined by differences in their productivity or size.

Another important aspect in firms' international activities is how those activities change over time. For example, once firms incur 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 holds for importing. That is, firms with past experience of importing are more likely to be importers in future. Such state dependence in importing is also found in Aristei, *et al*. (2013) and Muuls and Pisu (2009). However, the longevity of state dependence is ambiguous. While the experience of exporting in the preceding year has a positive effect on exporting in the current year, the experience of last exporting several years ago may

not. Indeed, Roberts and Tybout (1997) found that state dependence persists for two years after exporting and that export experience three years previously does not have a significant effect on exporting in the current year.

Furthermore, a dynamic relationship is expected to exist between exporting and importing. As found by Aristei, *et al*. (2013), common sunk costs between exporting and importing arise when firms implement an organizational structure to manage 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 recover the original amount of sunk costs of exporting (importing). As a result, firms with past experience of exporting (importing) tend to start importing (exporting) activities as well. This is called "cross effects" between exporting and importing, empirical evidence of which can be 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 occur in Japanese firms. Second, it is explored whether the experience of exporting or importing one year ago has different effects from that more than one year ago. This analysis is similar to that in Roberts and Tybout (1997), but they do not examine the longevity of cross effects. Third, we also examine whether state dependence and cross effects differ depending on firm characteristics such as firm size. Buono and Fadinger (2012) examine the role of firm productivity (in addition

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

In addition to the above-mentioned self-selection into internationalisation, earlier studies investigated the impact of internationalisation on firm productivity.[1] For example, Wagner (2002) and De Loecker (2007) investigated exporters in Germany and Slovenia, respectively, and found a positive impact of exporting on their productivity, i.e., learning-by-exporting. But the results for the impact of importing are mixed. For example, Amiti and Konings (2007), studying firms in Indonesia, found that an increase in imported inputs as a result of tariff reduction increases firm productivity. However, Vogel and Wagner (2010) did not find evidence of learning-by-importing in Germany. One reason for these differing results is that, while imported inputs are of much higher 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 a significant productivity increase in the case of developed countries.

If learning-by-importing does not occur or is of little significance in the case of developed countries, it becomes more important to analyze the dynamic transition process of firm internationalisation in the case of a developed country. Even if there is no direct positive impact on firm productivity from importing, the existence of such a two-way relationship means that importing activities encourage firms to

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

start exporting, which yields a positive impact on productivity through learning-by-exporting. In other words, importing activities have no direct but an indirect impact on firm productivity. Our analysis of the Japanese case will contribute to enhancing our understanding of how firms, particularly in developed countries, obtain benefits from internationalisation. Also, studying this dynamic transition process of importing and exporting activities will uncover why the gap in productivity between SMEs and LEs expands over time.[2] While LEs that start only exporting immediately enjoy productivity enhancement through learning-by-exporting, those that start just importing may also enjoy productivity enhancement through starting exporting subsequently. However, SMEs cannot achieve such productivity enhancement as they can afford neither exporting nor 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 the 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 state dependence and cross effects. State dependence is the positive relationship between the current

[2] See Figure A1 in Appendix.

and past status of exporting/importing; cross effects are that past experience of importing (exporting) raises the probability of exporting (importing) in the current year. To make our discussion clearer, we assume that total fixed costs for trading consist of sunk costs and fixed costs relating to, for example, market uncertainty. The sunk costs are borne by firms only when they start trading, whereas firms need to pay the fixed costs all the time.[3]

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 pioneering theoretical 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 demonstrate theoretically that firms with relatively high productivity engage in exporting (importing) because the more productive firms have higher operating profits from exporting (importing) and therefore can still obtain non-negative gross profit even if they incur sunk costs for exporting (importing). Thus, since firms with past experience of exporting (importing) do not need to incur sunk costs any more, such firms will be able to continue exporting (importing) in 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

[3] 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).

markets might include stochastic components. Large negative shocks in terms of fixed costs and demand may not enable even firms with trade experience to continue trading. In this case, "learning" plays an important role in encouraging firms to continue trading. As mentioned in the introductory section, exporting and importing contribute 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 learning-by-importing may not occur in 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 markets and thus may face 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 larger benefits from trading and are likely to continue trading.

Also, the productivity rise through learning-by-exporting (learning-by-importing) becomes one of the important sources of 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 of cross effects. The organizational division and system for international business in addition to general knowledge on international business can be shared between exporting and importing. As a result, cross effects between exporting and importing will occur.

There are some other issues relating to state dependence and cross effects. The first is their relation to time. On the one hand, state dependence and cross effects may diminish over time because the sunk costs of trading may increase again up to the

amount before exporting. On the other hand, as theoretically formalized in Arkolakis and Papageorgiou (2009), and Buono and Fadinger (2012), market uncertainty may decrease over time. In addition, as empirically found in De Loecker (2007), the rise in productivity through trading increases over time. As a result, the relationship of state dependence and cross effects over time is an empirical question.

Second, the magnitude of state dependence may differ according to firm characteristics. For example, the rise of productivity through trading differs according to pre-trading productivity or firm size. Lileeva and Trefler (2010) and Serti and Tomasi (2008) found a larger productivity rise in low productivity firms and medium- and large-sized firms, respectively. In addition, low productivity or small-sized firms may be likely to stop trading. They may discontinue trading as a result of experiencing the actual extent of demand uncertainty by trying trading (Albornoz, *et al.*, 2012) or of the production capacity constraint (*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 differ according to firm characteristics.

Third, state dependence and 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 firms have already incurred sunk costs in exporting to a region, they may need to incur sunk costs again in exporting to other regions. Furthermore, as shown in De Loecker (2007), the effects of trading on productivity differ according to 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 magnitude of state dependence according to partner countries. As

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

3. Empirical Framework

To empirically analyze 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. They subsequently estimate the bivariate probit model and investigate whether trading status in the previous period affects the current trading status. However, in this specification, it is difficult to distinguish between cross effects of two-way traders and 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 the 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 internationalisation, 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 to internationalise 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 the so-called random effect mixed logit model. One of the advantages in using this specification lies in the relaxation of the independence from irrelevant alternative (IIA) assumptions. 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 research and development (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 on the value one if a firm has more than 300 and fewer than 1,000 employees, and zero otherwise. Scale (>999) takes on the value one if a firm has over 1,000 employees. Thus, SMEs with fewer 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 the production function with the Wooldridge (2009) modification of Levinsohn and Petrin (WLP). This method takes into account the potential collinearity issue in the first stage of the Levinsohn 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 of 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 non-manufacturing 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, *et al.*, 2009).

Our sample selection policy is as follows: First, we focus on manufacturing industry in this paper, although the survey covers non-manufacturing industries as well as manufacturing firms. This is because the coverage of non-manufacturing industry differs from year to year 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 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 to 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" and that of "Import". In other words, a higher number of firms engage in both exporting and importing than in either exporting or importing. The table also shows the stable shares of "Export" (around 11 percent) and "Import" (around 8 percent) over time. On the other hand, while the share of "Domestic" declines steadily from 67 percent in 1994 to 59 percent in 2009, that of "Two-way" rises from 14 percent to 22 percent.

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 of each status keep the same status from one year to the next. One exception is the firms that engaged only in importing in 1994. The majority of those had stopped importing by 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” keep 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 fewer 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—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—most of the SMEs of each status keep the same status from one year to the next. Then, "Import" firms are more likely to become "Domestic" firms whereas "Export" firms are more likely to become "Two-way". The probabilities of SMEs becoming LEs are very low—6 percent at most. Compared with SMEs, LEs in 1994 had a relatively high probability of switching their status from one year to the next. For example, whereas 45 percent of large domestic firms in 1994 had remained domestic firms in 2009, 15 percent and 16 percent of them had become two-way traders and small domestic firms in 2009, respectively. And the probability of exporters becoming two-way traders is 46 percent.

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 briefly compare performance indicators for SMEs and LEs. Specifically, we examine three indicators—total factor productivity (TFP), labor productivity, and the ratio of research and development (R&D) to sales. Table 6 has two important findings. First, for all indicators LEs have larger values or ratios than SMEs. Second, within each firm size category, Two-way has the largest values or 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 differences similar to those confirmed in Table 6. One interesting finding of the 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 for SMEs than for LEs. All in all, these results suggest that total sunk costs are larger in the 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 Labour 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 Labour 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 percent and 5 percent significance, respectively. The robust standard error is given in parentheses.
Source: Authors' calculation.

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 using the random effect multinomial logit model are reported in Table 8. The results for firm characteristics are as follows: First, highly productive firms engage 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 higher wages are more likely to engage in exporting, but are less likely to engage in importing. This symmetric result is very interesting but 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 engage in exporting, importing, and Two-way. It is interesting that the effects of Scale (>999) on importing are estimated to be insignificant. This result will indicate that very large-sized firms are more likely to engage in both exporting and importing than only in importing. Fourth, non-production worker-intensive firms, R&D intensive firms, or firms with lower debt–asset ratios are more likely to export and import.

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 percent and 5 percent significance, respectively. The robust standard error is given in parentheses. All specifications also include industry dummy and year dummy.
Source: Authors' calculation.

The results for the one-year lagged export or import variables are as follows: We can see the existence of state dependence from the result that the one-year lagged export (import) status in the export (import) equation is positively associated with the current year status on export (import). 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 of foreign markets[4]. In the case of importing, taking into account the absence of learning-by-importing in developed countries, we can say that it is sourced mainly from incurring sunk costs for importing. However, whereas the lagged export (import) status in the import (export) equation has significantly negative coefficients, the results in the two-way equation show the significantly positive coefficients for both the lagged export and import variables. These results imply that there are cross effects toward two-way traders, rather than toward encouraging switching between exporting and importing. The occurrence of cross effects not only in exporting but also in importing show that a 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 the multinomial logit model do not differ from the random effect multinomial logit estimation very much. Therefore, we focus on the results of the multinomial logit model for further analysis. Indeed, using the multinomial logit model greatly saves computation time compared with using the random effect multinomial logit model.

5.2. Further Analysis

This subsection conducts some further estimations. First, we introduce some more-year-lagged export and import variables. Specifically, we conduct those for 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 space (but they are available from the authors 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 can say that the sunk costs for trading steadily return to the original level over time. On the other hand, most of the coefficients for the interaction terms with

[4] To identify the source of state dependency, we add the interaction term between lagged trading status dummy variable and TFP growth rate. However, we cannot get any plausible estimation results. Therefore, will leave this issue for future research.

SME dummy are insignificantly estimated, indicating little difference in state dependence and cross effects according to firm size.

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 percent and 5 percent significance, respectively. The robust standard error is given in parentheses. All specifications also include industry dummy and year dummy. The results in the other firm-level variables are not reported in this table.
Source: Authors' calculation.

Next, we extend our model to capture the dimensions of export destination and import source countries, with a view to investigating whether state dependence and cross effects are market-specific. To this end, we define dependent variables and trade experience variables regionally. In particular, we examine trade with Asia and Western countries (i.e., North American and European countries) separately. Furthermore, in order to control for the role of past experience of trade with other regions, we also introduce one-year lagged variables for export to and import from other regions (Other Export and Other Import). The results are reported in Table 10. Three noteworthy points can be made: First, it shows region-specific state dependence and cross effects in both Asia and Western countries. Second, region-specific state dependence and cross effects are larger than the effects of past experience of trade with other regions. Third, region-specific state dependence and cross effects are larger for SMEs. Also, we have some evidence that trading with one region discourages SMEs to start trading with another 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 percent and 5 percent significance, respectively. The robust standard error is given in parentheses. All specifications also include industry dummy and year dummy.
Source: Authors' calculation.

Last, we also examine the role of "magnitude" of past export/import. Specifically, in addition to the dummy variables on 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 past experience of exporting and importing, but also the intensity matters in the current trade status. That is, firms that 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 a higher probability of becoming two-way traders, firms with high import intensity in the past do not necessarily become two-way traders. Based on these results, we can say that past export intensity is a more important determinant for current trade status than past import intensity. In addition, we can see from the results of the interaction terms of these intensity variables with the SME dummy that the role of such intensities in the current trade status does not differ 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 percent and 5 percent significance, respectively. The robust standard error is given in parentheses. All specifications also include industry dummy and year dummy.

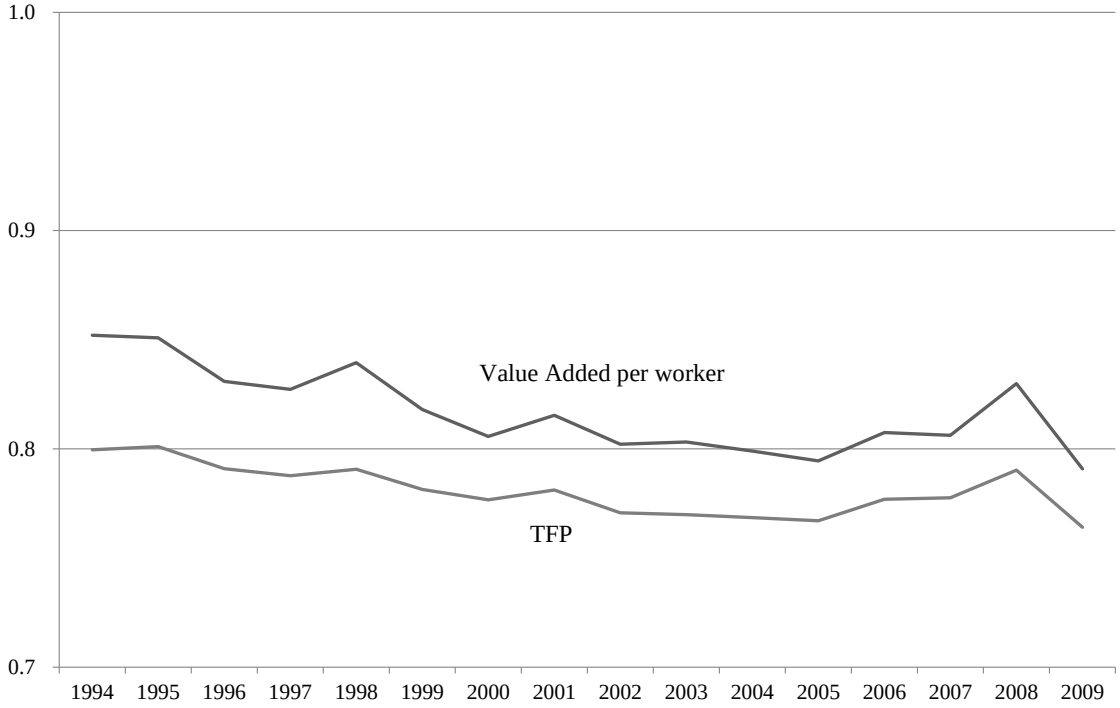
Source: Authors' calculation.

6. Summary and Policy Implications

In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we examine 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 an increase in productivity through inducing exporting. Second, those state dependence and cross effects in exporting and importing diminish over time. If this result indicates that the sunk costs for trading steadily return to the original level over time, it is important how firms maintain their know-how on trading particularly during a non-trading period. Third, state dependence and cross effects are found to be market-specific. This implies that it is more difficult to start trading with new trading partners than to continue trading with 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 from starting to trade with another region. Last, past export/import intensity matters for the current trade status.

The specific implications for SMEs in developed countries are as follows: Due to the more significant market specificity of state dependence and cross effects, it is more difficult for SMEs to start trading with new partners. In the case of SMEs, trading with one region can even discourage trading with another region. These facts imply that if firms can enjoy some degree of positive productivity effects from each trading partner, the degree of positive effects SMEs can obtain from trading is smaller than for LEs. In other words, it is important for policymakers to encourage SMEs to increase the number of their trading partners. Policy support is usually available, particularly for starting trading for the first time. However, we believe 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.

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