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Intermediaries in transaction networks: location of wholesalers' headquarters and other establishments◆

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Abstract

Using establishment-level data in Japan, this paper analyzes the role of information and geographical location of establishments, and the location of wholesalers' headquarters and establishments as factors in determining export behavior, especially focusing on regional economies. There are two main findings. First, regarding export probability of wholesalers' establishments, whether headquarters are located in urban areas matters more than the location of the establishments themselves; and the export probability is higher when there are other exporting establishments within the same firm, which suggest that information (exporting know-how held by headquarters and other export establishments within the same firm) is more important than infrastructure (access to trade hubs such as ports). Second, regarding domestic transaction networks between wholesalers and manufacturers, manufacturing firms in rural areas　sell to exporting wholesaler firms in distant urban areas for indirect export, but the transaction distance measured between the closest establishments is significantly shorter than the distance between headquarters, at approximately one-third to one-quarter. The number of establishments per wholesaler firm is much larger than that of manufacturers and the distance between establishment and headquarters for wholesalers is much larger than that for manufacturers, which suggests that exporting wholesaler firms in urban areas reduce search costs by setting up other establishments in various regions, from which they search for suppliers.

Keywords: Intermediaries, Location, Transaction networks
JEL classification: R10, F10

◆ This study is conducted as a part of the Project "Dynamics of Inter-organizational Network and Firm Lifecycle" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This study utilizes the micro data of the questionnaire information based on the "Census of Manufacture" and "Census of Commerce", which are conducted by the Ministry of Economy, Trade and Industry (METI). The authors are grateful for helpful comments and suggestions by Discussion Paper seminar participants at RIETI. The authors acknowledge financial supports for a part of this study by the Japan Society for Promotion of Science (JSPS) KAKENHI grant numbers 17K03707 and 18H00859.
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1 Introduction

The regional economy is losing its vitality because of shrinking population and migration from regional areas to urban cities. On the other hand, neighboring Asian countries, especially China, have achieved strong economic growth. With the domestic market shrinking, taking in the vitality of the Asian economy is one of the important issues for Japan. However, it is difficult for firms in regional areas to export directly. But by utilizing wholesalers they can export their goods indirectly. This paper analyzes the location and transaction networks of manufacturers and wholesalers, and examine the possibility of indirect export for manufacturers through wholesalers, using firm-level and establishment-level data.

In recent years, in the international trade literature, there has been a growing interest on indirect trade through intermediary firms (typically, wholesaler firms). Blum et al. (2010) show more than 40% of imports from Argentina to Chile were done through wholesalers during the period 2004-2008. Bernard et al. (2010) demonstrate that 42% of US importers in 2002 were wholesalers and it accounts for 15% of the total US import values. From a theoretical research perspective, Antras and Costinot (2011) and Fernández-Blanco (2012) construct theoretical models of matching in trade through wholesalers and discuss the impact of indirect trade on welfare. Ahn et al. (2011) builds a model that wholesalers facilitate access to markets which are hard to enter, and the empirical studies with Chinese data support this hypothesis. Crozet et al. (2013) also suggest in addition to this hypothesis that wholesalers make low-productivity firms more accessible to foreign markets. They confirm these hypotheses using French firm level data.

The argument common to these existing studies is that the fixed costs of indirect trade are relatively lower than those of direct trade. High-productivity firms can afford high fixed costs for direct trade, and middle-productivity firms that have high enough productivity to cover the fixed costs for indirect trade but not to cover the fixed costs for direct trade engage in indirect trade. Low-productivity firms that cannot afford the fixed costs for either direct or indirect trade engage in domestic transactions only. This productivity sorting has also been confirmed using Japanese data (Fujii et al., 2017).

Therefore, promoting indirect trade as a policy initiative allows firms that are not productive enough to trade directly to reap the benefits of trade through indirect trade. In addition, the effect is considered to be greater in regional areas where there are fewer manufacturing firms which are productive enough to trade directly. From such a viewpoint, it is important to analyze the characteristics of exporting wholesalers that support indirect trade and the characteristics of wholesalers' domestic transaction networks in order to take advantage of overseas growth.

In this paper, we present the observations on exporting patterns of wholesalers, which takes a fundamental role in indirect trade, and on domestic transaction networks between wholesalers and manufacturing firms. We attempt to elicit some policy implications from the observations. An existing study using transaction data between firms, Okubo et al. (2015), focused on the domestic transactions between wholesalers and manufacturing firms. They find that, compared with the transactions between manufacturing firms, wholesalers purchase products from farther-located firms and sell them to nearby customers. However,

the existing research uses the firm-level data (observation unit is a headquarter), and the transaction distance between establishments (observation unit is an establishment, typically, plant or affiliate office) has not been observed. This paper explores the transaction costs in more detail by conducting establishment-level analyses.

The main findings in terms of export probability of wholesale establishments are as follows: Geographical factors matters to the export probability of wholesale establishments. Especially, it is important whether the headquarters is located in an urban area, which is larger than the effect of the location of the establishments themselves. The export probability is higher when there are other exporting establishments within the same firm. The main finding in terms of domestic trading networks between wholesale and manufacturing industries is as follow: Manufacturing firms in regional areas sell to exporting wholesale firms in distant urban areas for indirect export, but the distance measured between the closest establishments is significantly shorter than the distance between headquarters, becoming one-third to one-quarter. These findings, especially the roles of headquarters and establishments, cannot be examined by the analysis based on the firm-level data. We contribute to the literature by clarifying these facts using the establishment-level data.

The structure of this paper is as follows. The next chapter explains the data used for the analysis. Chapter 3 confirms explores the export probability of wholesalers' establishments and the difference of the probability between urban and regional areas, and conducts quantitative analysis. In addition, this chapter analyzes the trade distance between manufacturing and wholesale firms and establishments. Number of establishment for each firm and the geographic distribution of the establishments and headquarters, are also provided Chapter 4 concludes.

2 Data

In this paper, we use the firm-to-firm transaction data for 2014, compiled by Tokyo Shoko Research (TSR), one of the few largest credit-rate agencies in Japan, and also use the Census of Manufacture and the Census of Commerce for the information of the attributes of manufacturers and wholesalers, respectively. These censuses are conducted by the Ministry of Economy, Trade and Industry (METI), Japan. More details on these data sets are described below.

Tokyo Shoko Research (TSR): This database includes approximately 1.3 million firms' information (firm address, year of establishment, number of employees, sales, profits, etc.) and information on business transaction (suppliers, customers, whether they export/import). The information about each firm is updated when a survey is conducted, and the update time differs depending on the firm. We check the latest end of fiscal year of financial information to verify approximate update time. For a firm's business transactions, a maximum of 24 partner firms are reported for each of their buyer and seller. However, there are many firms, especially large firms, that actually have more than 24 buyers/sellers. In addition to the business transaction information that they report, by using the business transaction information that other firms report, it is possible to augment the transaction information.

For example, those firms that are reported as partner firms by many reporting firms, such as Toyota, have more than 24 transactions. In addition, by using the information of whether a firm imports or exports, it is possible to identify which firms have business transactions with importing/exporting firms, and thus which firms trade indirectly. In this paper, we define manufacturing firms that sell to wholesaler firms that export directly as "indirect exporters".

Census of Manufacture: This data contains information on approximately 200,000 manufacturing establishments with 4 or more employees in 2014, consisting of firm name, address, headquarter address, industry classification, number of employees, sales, export value, etc. In this paper, the firm name and headquarter address were used to merge with the TSR data. The merge rate is about 73% (about 150,000 establishments).

Census of Commerce: Among the approximately 1.4 million wholesale and retail establishments in the 2014 data, we use information on approximately 380,000 wholesaler establishments. It includes the name of the firm, address, headquarter address (only if the headquarter is a wholesale or retail establishment), industry classification, number of employees, sales, export value, etc. In this paper, we merged them with the TSR data by the firm name and address in the case of a single establishment, and by the firm name and headquarter address in the case of multiple establishment. The merge ratio is approximately 58% (approximately 220,000 establishments), 68% when the headquarter is a wholesaler or retailer establishment, and 87% for multiple establishments.

Tables 1 and 2 show descriptive statistics for firm-level data (TSR) and establishment-level data (Census of Manufacture and Census of Commerce), respectively. The manufacturing firms/establishments are larger than wholesale firms/establishments in terms of sales and number of employees, and exporting firms/establishments are particularly large in the manufacturing sector. When comparing urban and regional areas[1], both firms and establishments are larger in urban areas, and the difference is more pronounced in the wholesale industry.[2]

Table 3 shows the number of establishments for each firm by manufacturing and wholesale industry. The average number of establishments per firm is higher for wholesalers. Compared with the case of all firms, the average number of establishments for exporting firms is higher for both manufacturers and wholesalers. Table 4 shows the distribution of the number of establishments for each firm. The first row shows the number of firms for each category in terms of number of establishments. The second and third row show the ratio of firms by PDF and CDF, respectively. For example, there are 164,557 (92.02%) manufacturing firms with one establishment and 185,951 (31.61%) wholesaler firms with one establishment. In particular, 7.64% and 18.37% of wholesaler firms have more than 10 and 5 establishments, respectively, while 9.51% and 22.85% of exporting wholesale firms have more than 10 and 5 establishments, respectively. In summary, wholesaler firms tend to be smaller in size but have more offices than manufacturing firms, and this is especially true for exporting wholesaler firms.

[1]Here, urban area is defined as prefectures, Saitama, Chiba, Tokyo, Kanagawa, Aichi, Kyoto, Osaka and Hyogo.

[2]Age of firm is not our focus in this research. But, we found interesting characteristics regarding firm age, that is, the manufacturing industry, especially exporting firms, are older. On the other hand, the exporting wholesaler firms, especially in regional areas, are younger.

3 Analysis result

3.1 Export ratio

Figure 1 shows the export ratio of establishments by prefectures. Wholesaler establishments are more likely to export in all regions than manufacturing establishments, especially in urban areas. Figures 2 and 3 show the difference by prefecture in the export ratio of establishments whether their headquarters are located in urban or regional areas. In both manufacturing and wholesale industries, establishments in regional areas with headquarters in urban areas have a higher propensity to export. For example, in the case of manufacturing establishments located in Hokkaido, the export rate for establishments with headquarters in regional areas is about 0.01, while the export rate for establishments with headquarters in urban areas is about 0.04. For wholesaler establishments located in Hokkaido, the figures are approximately 0.09, compared to approximately 0.15, respectively.

As wee see in Tables 1 and 2, both firms and establishments are larger in urban areas, which imply higher probability of export. In order to examine what causes the regional differences, we should control firms size as in Ishikawa et al. (2017), which shows the ratio of export and import firms by firm size and location from firm-level data (TSR). They conclude that location, rather than size, is likely to be more important to the export rate of the wholesale industry. We apply similar analysis at establishment-level to see location of establish matters in addition to location of headquarter after controlling firm size, as we see in next subsection.

3.2 Estimation result

In order to statistically confirm the observed facts from the above descriptive statistics, we perform an estimation analysis using probit model about the exports of the establishments. The estimation equation is:

$$\Pr(y = 1|x) = \int_{-\infty}^{\beta' x} \phi(v)dv = \Phi(\beta' x)$$

If the establishment is exporting, y takes 1, otherwise 0. x is the vector of explanatory variables including a dummy variable (core) of whether the location of the establishment is in an urban area, a dummy variable (core_k) of whether the headquarters of the establishment is located in an urban area, and also variables representing the size of establishment and that of firm such as the log of the number of workers of establishment (lnemp) and the log of the number of establishments of the firm (lnest_k). β is a vector of coefficients. $\phi(v)$ is a normal density function. Table 5 shows the estimation results. As is seen in Ishikawa et al. (2017) at the firm level, wholesalers have a smaller effect of size (lnemp) than manufacturers. The location of the headquarters (whether they are located in an urban area (core_k)) matters more than the location of the establishment itself (core). In particular, the sub-sample analysis with establishments located in regional areas shows that the urban dummy of the

headquarter (core_k) is significant and the estimated coefficient (0.305) is relatively large. This indicates that it is more important in regional areas that the headquarters are located in urban areas. The geographic nature of the export probability of wholesale establishments observed in the previous section are shown to be statistically significant, even after controlling for firm size and other factors.

For establishments of firms with headquarters in regional areas, establishments located in urban areas are more likely to engage in exports (0.160 with high statistical significance). On the other hand, for establishments of firms with headquarters in urban areas, establishments in regional areas have higher export rates (-0.146 with high statistical significance). It indicates that the establishments' location to be in urban area doesn't have an advantage for export.

Furthermore, in Table 6, by using the information of whether other establishments within the same firm export (d_est_other_export_k), we estimate whether it is relevant to the export probability of the establishment by headquarter/establishment location. The estimated coefficients show large positive values with high statistical significance. Namely, if other establishments within the same firm are exporting, it is more likely that these establishments are exporting as well. The results suggest that know-how on exports in other establishments may be shared within the firm.

The above results suggest that the observed facts about the export probability of wholesale establishments suggest that information (information held by headquarters or other exporting establishments in the firm) is more important than infrastructure and other factors (access from establishments).

3.3 Geographical aspect

3.3.1 Geographical distribution of headquarters and establishments

This section provides an overview of the geographic distribution of headquarters and establishments. First, Figures 4a and 4b show the distribution of manufacturing and wholesale firms' headquarters, respectively. The color of each mesh is determined by what percentage of all firms are present within that mesh. These heat maps graphically show that wholesaler headquarters agglomerate more than manufacturer ones. As Figure 5 shows, there is a similar trend for the distribution of establishments.

In order to better understand the distribution, Figures 6 and 7 show the share of the number of firms and establishments in each prefecture, respectively. These figures again indicate that firms have similar distribution with establishments. For both firms and establishments, wholesaler are more concentrated in urban areas, especially Tokyo.

We also find that the distribution of establishments are different between the firms headquartered in Tokyo and the ones headquartered in Osaka. As Figure 8 shows, manufacturing establishments headquartered in Tokyo are concentrated in Kanto region which surrounds Tokyo, while manufacturing establishments headquartered in Osaka are highly concentrated only in Osaka. On the other hand, both wholesale establishments headquartered in Tokyo and Osaka have broader distribution over Japan.

We also calculate distance between each establishments and their headquarter. Figure 10 shows the cumulative distribution function of the distance. The cumulative density of wholesaler is higher, indicating that the distance between wholesale establishments and their headquarter is longer. Manufacturing firms tend to locate the establishments around the headquarter, while wholesale firms tend to locate the establishments in many places including remote places from the headquarter.

3.3.2 Transaction distance of manufacturers and wholesalers

Existing studies such as Okubo et al. (2015) analyzed transaction distances with firm-level data. In this section, we reanalyze the distances with establishment-level data that are closer to the real transactions. Table 7 shows the distances from the seller to the buyer by firm level and establishment level. In this paper, we assume that establishments-to-establishments transactions are between the closest establishments within each transacting firm. For example, 63.75 km in the first matrix represents the median distance from seller manufacturing firm's headquarter to buyer maunufacturing firm's headquarter in the firm-level data.

Looking at the business transactions between wholesalers and manufacturers, the median distance of headquarters from wholesalers (seller) to manufacturers (buyer) is 37.91km. Compared with this number, the distance from manufacturers (seller) to wholesalers (buyers) is 194.70km, four times longer. As observed in Okubo et al. (2015), we see that wholesale firms have manufacturing buyers far away and manufacturing sellers close by.

At the establishment level, the distance will be reduced to 19.46 km and 64.83 km, respectively. In particular, for transaction from manufacturers to wholesalers, the distance has been reduced by about a third (from 194.70 km to 64.83 km)[3]. This is a greater change than the reduction in the transaction distance between manufacturing firms from 63.75 km to 41.29 km.

Moreover, if we focus on the distance from manufacturers to exporting wholesalers to observe the distance of transactions in indirect trade, the distance is shortened by about a quarter from the firm level to the establishment level (from 177.97 km to 38.23 km). The distance when manufacturers export indirectly is shorter (38.23 km compared to 64.83 km), and this phenomenon is more pronounced in regional manufacturing sector (38.38 km compared to 131.61 km). This difference can be attributed to the fact that exporting wholesalers have their establishments in various areas. Wholesale firms seem to be bearing the transaction costs of the manufacturing industry as they set up establishments in different places. Thus, the costs of indirect exports have fallen for manufacturing firms. This finding indicates that the development of wholesale establishments allows less productive firms in regional areas to be involved in indirect trade, indicating the important role of establishment development in regional indirect trade.

[3]CDF of transaction distance at firm-level and establishment-level are shown in Figures 11 and 12. In these figures, *c_manu_s_whole* indicates the transaction where manufacturer is customer and wholesaler is supplier. *c_whole_s_manu* indicates the transaction where wholesaler is customer and manufacturer is supplier

3.3.3 Indirect trade in local manufacturing establishments

This section analyzes in more detail the role of wholesalers in indirect trade of local manufacturing, which was observed in the previous section. Specifically, we compare establishments with headquarters located in urban areas with those headquartered in regional areas to see which wholesale establishments make a greater contribution to indirect trade. We study if there is difference in transaction distance by the location of headquarters of partner wholesalers, through the lenses of the number of transactions and the number of trading firms. As it is more costly to make transactions with distant firms, many business relationships are done with nearby firms. Therefore, in addition to all trading relationships, we show the numbers limited to transactions within a distance of 50 km or less and 30 km or less to see the local trading network. It shows the size of wholesaler establishments' trading network in local areas. Then, we focus on the case of indirect exports and analyze them only for the case with the exporting wholesalers.

As shown in Table 8, in terms of all trading relationships between manufacturers in local areas (sellers) to wholesalers (buyers), the number of business relationships with wholesale establishments whose headquarters are located in regional areas (resp. urban areas) is 28,366 (resp. 31,207). If we focus on the number of wholesale firms instead of the number of business relationships, we find 11,601 firms headquartered in regional areas and 12,779 firms headquartered in urban areas, respectively. There is no substantial difference depending on the wholesalers' location, i.e., in urban or regional areas. However, when it comes to short-distance transactions (transactions within 50 km or 30 km), wholesalers headquartered in regional areas are more likely to be higher in both the number of transactions and the number of firms (14,544 vs. 8,981, 12,265 vs. 5,723, and 8,599 vs. 5,390, and 7,670 vs. 3,889, respectively). Wholesale establishments whose headquarters are located in regional areas are doing local deals.

On the other hand, if we focus on indirect trade and analyze the transactions with exporting wholesale firms, the number of trading relationships and the number of trading firms are higher in wholesale establishments headquartered in urban areas (the number of business relationships is 1,254 in regional areas versus 10,404 in urban areas, and the number of trading firms is 809 versus 3,486). In terms of local trading relationships, the number of business relationships and the number of trading firms are higher in wholesale establishments headquartered in urban areas, indicating that the establishment location of the urban headquartered wholesalers is important for local manufacturers' indirect exports.

4 Conclusion

This paper presents observational facts on the intermediary role of wholesalers in manufactures' indirect trade, especially focusing on regional economies and the location of wholesalers' establishments. We use establishment level data in Japan (Census of Manufacture and Census of Commerce) and business-to-business transaction data (Tokyo Shoko Research Data). The main findings are two folds. First, regarding export probability of wholesalers' establishments: (1) In terms of geographical location, whether headquarters are located in

urban areas matters more than the location of the establishments themselves, (2) the export probability is higher when there are other exporting establishments within the same firm. Second, regarding domestic transaction networks between wholesalers and manufacturers and location of headquarters and establishments: (3) manufacturing firms in regional areas sell to exporting wholesaler firms in distant urban areas for indirect export, but the distance measured between the closest establishments is significantly shorter than the distance between headquarters, becoming one-third to one-quarter. Second, regarding location of headquarters and establishments, (4) the number of establishments per firm of wholesalers is much larger than that of manufacturers and the distance between establishments and headquarter for wholesalers is much larger than that for manufacturers.

The above observations on the export probability of wholesale establishments suggest that information (exporting know-how held by headquarters and other export establishments within the same firm) is more important than infrastructure (access from establishments to trade hubs such as ports). The observed facts about the domestic trading network suggests that exporting wholesaler firms in urban areas reduce search costs by setting up establishments in regional areas, from which they search for suppliers.

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Table 1: Summary descriptive for manufacturing and wholesale firms

		(a)	(b)	(c)		(d)		(e)		(f)	
				Mean	Median	Mean	Median	Mean	Median	Mean	Median
All areas	Manufacturer	158101	0.046	2324959	130000	43.44	9	287501381548582		363.55	55
	Wholesaler	134960	0.058	2263216	175000	18.44	5	14179081550152		47.93	8
Urban areas	Manufacturer	75949	0.070	3813993	153799	58.37	9	354805001699500		421.06	58
	Wholesaler	70979	0.094	3496776	200000	23.34	5	16138824608249		50.33	8
regional areas	Manufacturer	82152	0.024	964009	110000	29.66	8	108741301269340		209.26	50
	Wholesaler	63981	0.018	914533	145000	13.02	5	3115086	364773	34.18	8

[1] (a) Number of establishments, (b) Export probability, (c) Sales, (d) Number of employees, (e) Sales (exporting establishments), and (f) Number of employees (exporting establishments).
[2] Source: Authors' computation from the TSR (Tokyo Shoko Research) database.

Table 2: Summary descriptive for manufacturing and wholesale establishment

		(a)	(b)	(c)		(d)		(e)		(f)	
				Mean	Median	Mean	Median	Mean	Median	Mean	Median
All areas	Manufacturer	202410	0.045	150753	13880	36.58	12	1349582	135071	178.50	52
	Wholesaler	382354	0.115	92626	4000	10.28	4	254722	25898	14.31	6
Urban areas	Manufacturer	84418	0.051	156613	13369	34.65	11	1382291	103866	171.25	41
	Wholesaler	184717	0.136	136220	3635	12.68	5	381982	28700	18.14	6
regional areas	Manufacturer	117992	0.040	146561	14260	37.95	13	1320116	170161	185.04	64
	Wholesaler	197637	0.095	51881	4463	8.05	4	84820	23121	9.21	5

[1] (a) Number of establishments, (b) Export probability, (c) Sales, (d) Number of employees, (e) Sales (exporting establishments), and (f) Number of employees (exporting establishments)
[2] Source: Authors' computation from Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Table 3: Summary of number of establishments for manufacturing and wholesale firms

	All firms					Exporting firms				
	# of firms	# of establishments		# of exporting establishments		# of firms	# of establishments		# of exporting establishments	
		Mean	Median	Mean	Median		Mean	Median	Mean	Median
Manufacturer	7397	1.62	1	0.05	0	178,818	1.13	1	1.23	1
Wholesaler	11861	5.06	2	0.46	0	58546	4.54	2	2.28	1

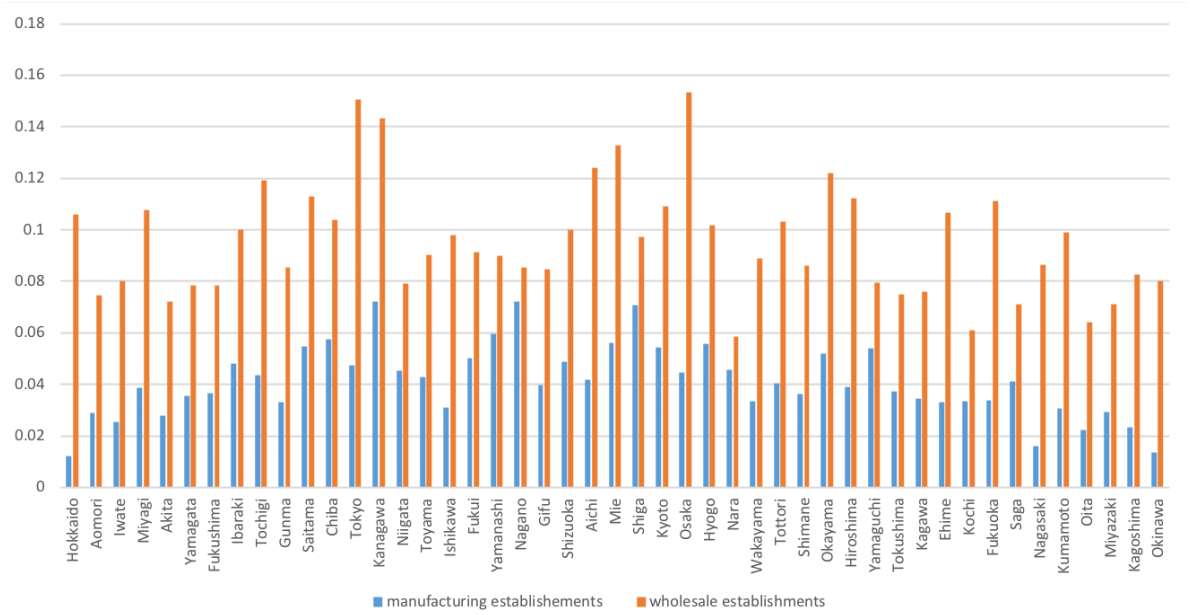
[1] Exporting firms are firms that have exporting establishments.
[2] Source: Authors' computation from Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Table 4: Distribution of number of establishments for manufacturing and wholesale firms

			0	1	2	3	4	5-9	10-19	20-39	40-79	80-159	160-319	320-
All firms	Manufacturer	Frequency		164557	10025	2398	868	834	119	14	2	1	0	0
		PDF		92.02%	5.61%	1.34%	0.49%	0.47%	0.07%	0.01%	0.00%	0.00%	0.00%	0.00%
		CDF		100.00%	7.98%	2.37%	1.03%	0.54%	0.08%	0.01%	0.00%	0.00%	0.00%	0.00%
	Wholesaler	Frequency		18505	19571	6297	3416	6282	2710	1076	459	145	53	32
		PDF		31.61%	33.43%	10.76%	5.83%	10.73%	4.63%	1.84%	0.78%	0.25%	0.09%	0.05%
		CDF		100.00%	68.39%	34.96%	24.21%	18.37%	7.64%	3.01%	1.18%	0.39%	0.15%	0.05%
Exporting firms	Manufacturer	Frequency		5310	1179	408	195	256	45	3	1	0	0	0
		PDF		71.79%	15.94%	5.52%	2.64%	3.46%	0.61%	0.04%	0.01%	0.00%	0.00%	0.00%
		CDF		100.00%	28.21%	12.28%	6.76%	4.12%	0.66%	0.05%	0.01%	0.00%	0.00%	0.00%
	Wholesaler	Frequency		3073	3739	1511	828	1582	675	277	132	27	13	4
		PDF		25.91%	31.52%	12.74%	6.98%	13.34%	5.69%	2.34%	1.11%	0.23%	0.11%	0.03%
		CDF		100.00%	74.09%	42.57%	29.83%	22.85%	9.51%	3.82%	1.48%	0.37%	0.14%	0.03%

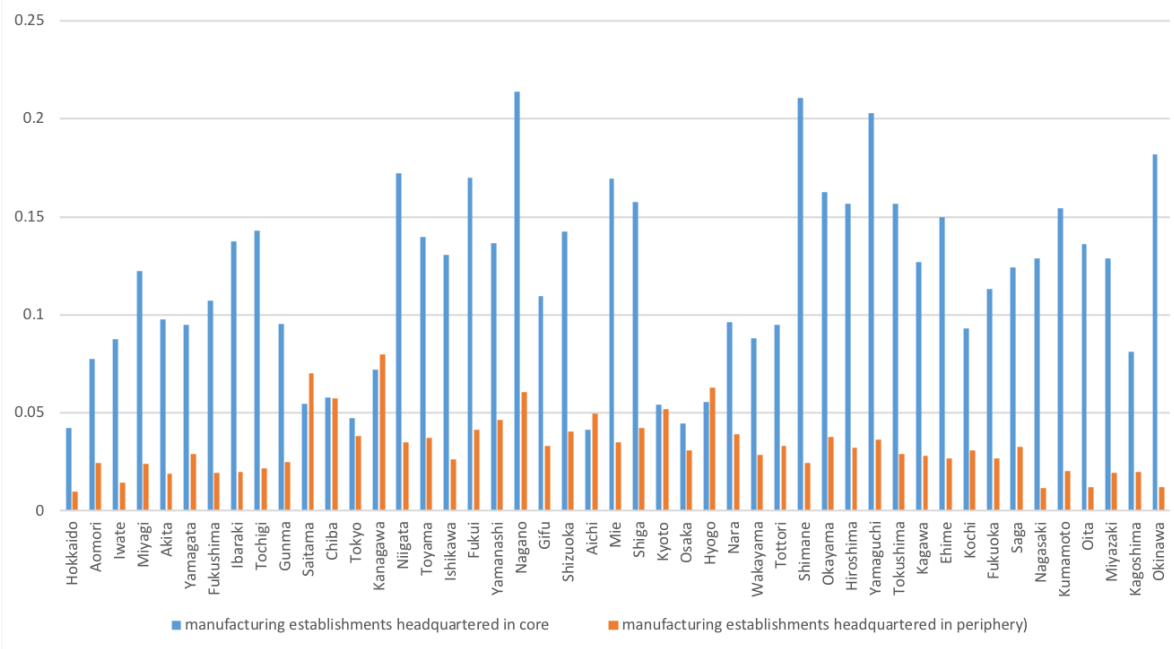
[1] Frequency: the number of firms, PDF: probability density function, CDF: cumulative distribution function.
[2] Source: Authors' computation from Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 1: Export probability of establishments by prefectures



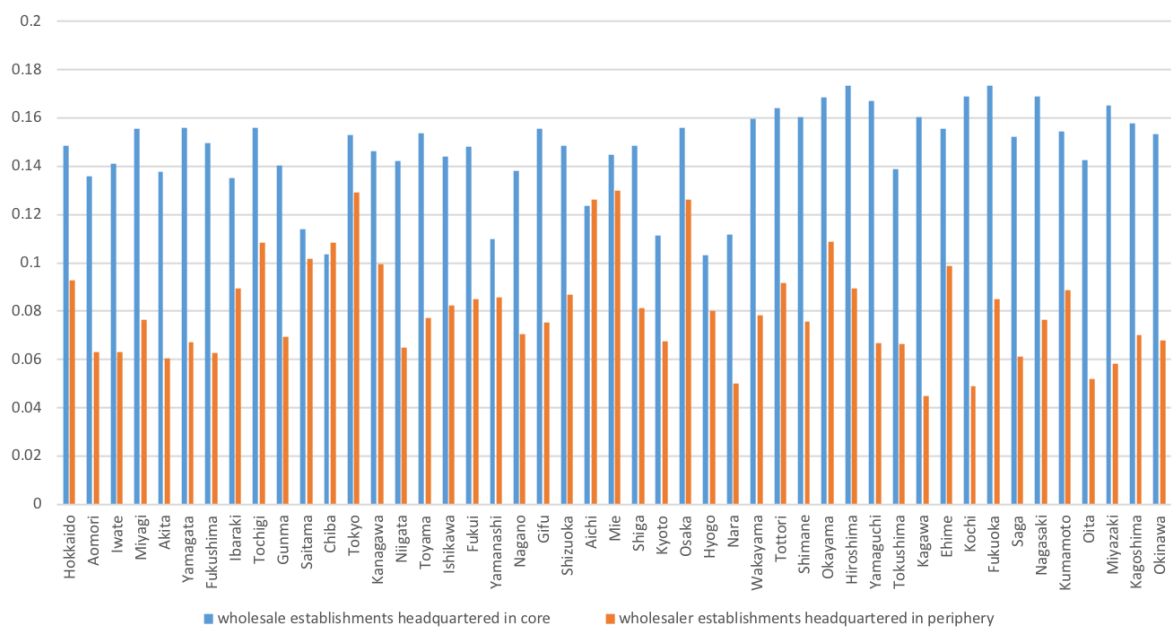
Source: Authors' computation from Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 2: Export probability of manufacturing establishments by location of headquarter



Source: Authors' computation from Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 3: Export probability of wholesale establishments by location of headquarter



Source: Authors' computation from Census of Commerce (the Ministry of Economy, Trade and Industry, Japan).

Table 5: Probit analysis of establishments' export (location of establishments/headquarters)

	Wholesaler						Manufacturer					
location of headquarters	all areas		all areas		regional areas	urban areas	all areas		all areas		regional areas	urban areas
location of establishments			regional areas	urban areas	all areas				regional areas	urban areas	all areas	
core	0.207***	0.0123			0.160***	-0.146***	0.211***	-0.0805***			0.200***	-0.131***
	(-0.00545)	(-0.00811)			(-0.0148)	(-0.0103)	(-0.0109)	(-0.0179)			(-0.0633)	(-0.0189)
core_k		0.273***	0.305***	0.0770***				0.368***	0.411***	0.043		
		(-0.0084)	(-0.012)	-0.0143)				(-0.0182)	(-0.0199)	(-0.0626)		
lnemp	0.101***	0.108***	0.0863***	0.130***	0.107***	0.116***	0.439***	0.433***	0.428***	0.437***	0.428***	0.436***
	(-0.00259)	(-0.00261)	(-0.0041)	(-0.00342)	(-0.00445)	(-0.00326)	(-0.00475)	(-0.00477)	(-0.00643)	(-0.00717)	(-0.00743)	(-0.00624)
lnest_k	0.0432***	0.0164***	0.0328***	-0.0153***	0.0870***	-0.0293***	0.0394***	-0.0135	-0.0354***	-0.00532	0.0786***	-0.0613***
	(-0.00194)	(-0.00213)	(-0.00355)	(-0.00298)	(-0.00407)	(-0.00276)	(-0.0093)	(-0.00974)	(-0.0132)	(-0.0148)	(-0.0177)	(-0.0119)
Observations	379,800	379,800	196,149	183,651	169,758	210,042	202,410	202,410	117,992	84,418	107,038	95,372

[1] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[2] Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan) and the TSR (Tokyo Shoko Research) database.

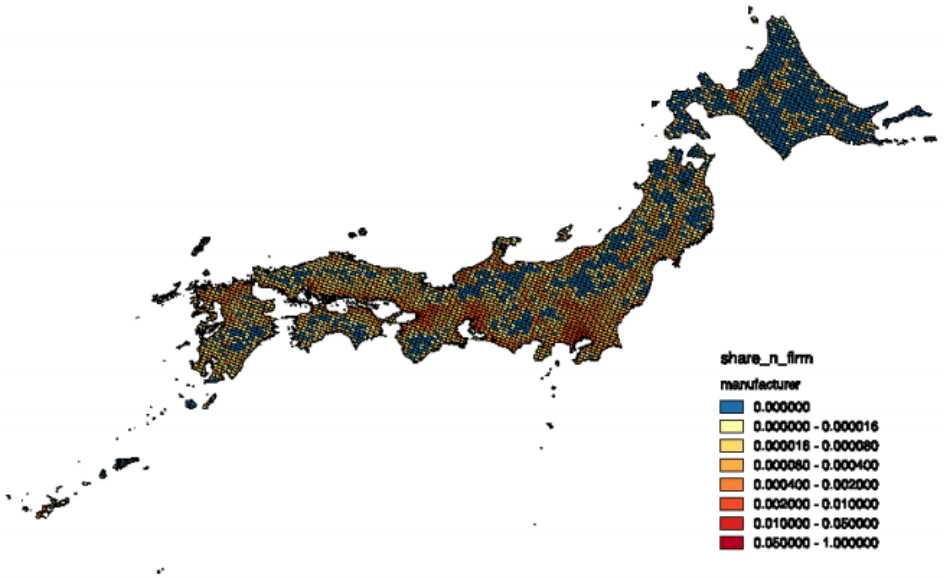
Table 6: Probit analysis of establishments' export (other establishments' export status)

	Wholesaler				Manufacturer			
location of headquarters	regional areas		urban areas		regional areas		urban areas	
location of establishments	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas
d_est_other_export_k	2.096***	2.268***	2.356***	1.759***	1.921***	1.475***	1.531***	1.765***
	(-0.0201)	(-0.0435)	(-0.0264)	(-0.0145)	(-0.047)	(-0.186)	(-0.0447)	(-0.0394)
lnemp	0.146***	0.0481***	0.0338***	0.137***	0.429***	0.230***	0.350***	0.432***
	(-0.00517)	(-0.0168)	(-0.0115)	(-0.0039)	(-0.00783)	(-0.0608)	(-0.0141)	(-0.00762)
lnest_k	-0.258***	-0.195***	-0.163***	-0.283***	-0.405***	-0.274**	-0.552***	-0.467***
	(-0.00736)	(-0.0179)	(-0.00818)	(-0.00509)	(-0.0267)	(-0.114)	(-0.027)	(-0.0219)
Constant	-1.727***	-1.678***	-1.977***	-1.381***	-3.251***	-2.403***	-2.462***	-2.961***
	(-0.00959)	(-0.0343)	(-0.0313)	(-0.00755)	(-0.0273)	(-0.186)	(-0.0567)	(-0.0246)
Observations	155,678	14,080	40,471	169,571	105,777	1,261	12,215	83,157

[1] * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[2] Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan) and the TSR (Tokyo Shoko Research) database.

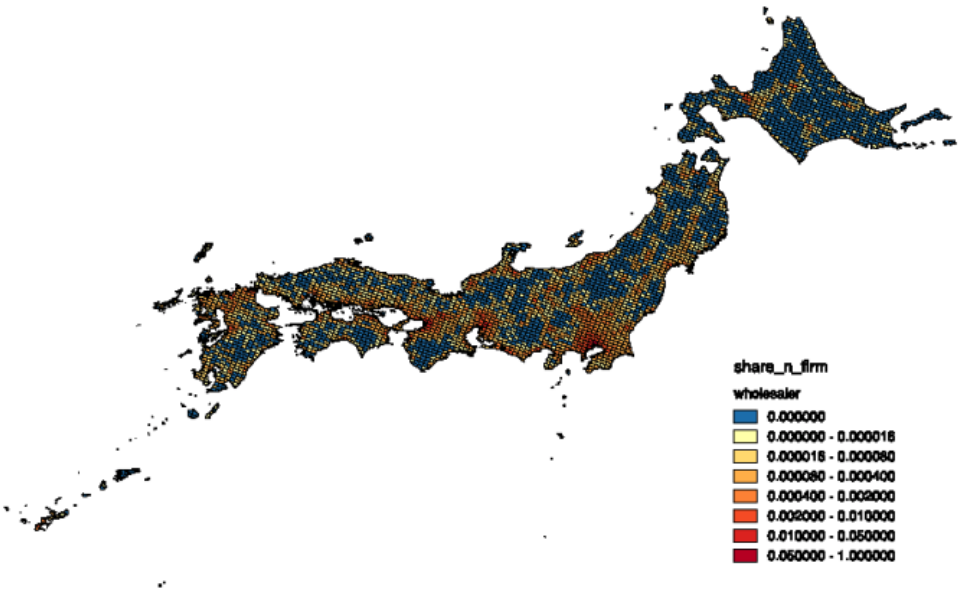
Figure 4: Distribution of wholesale and manufacturing firms' headquarters

(a) Manufacturer



Source: Authors' analyses using Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

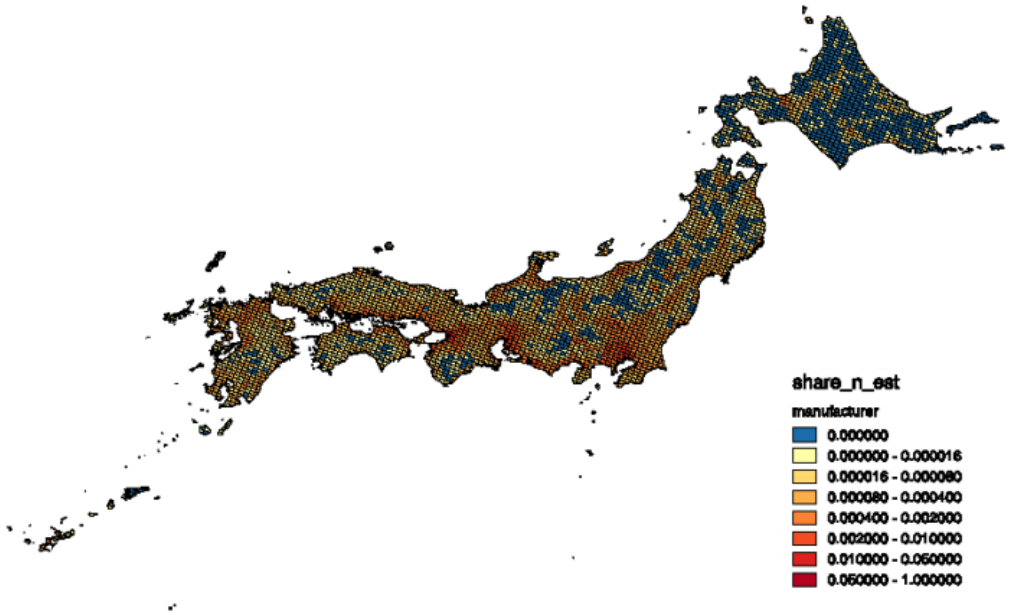
(b) Wholesaler



Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan).

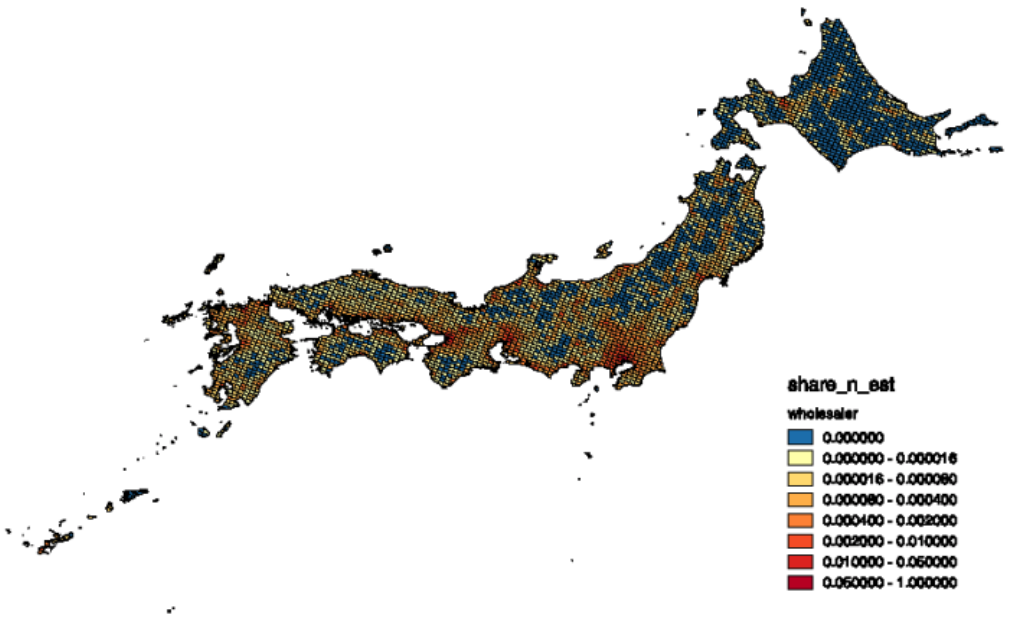
Figure 5: Distribution of wholesale and manufacturing firms' establishments

(a) Manufacturer



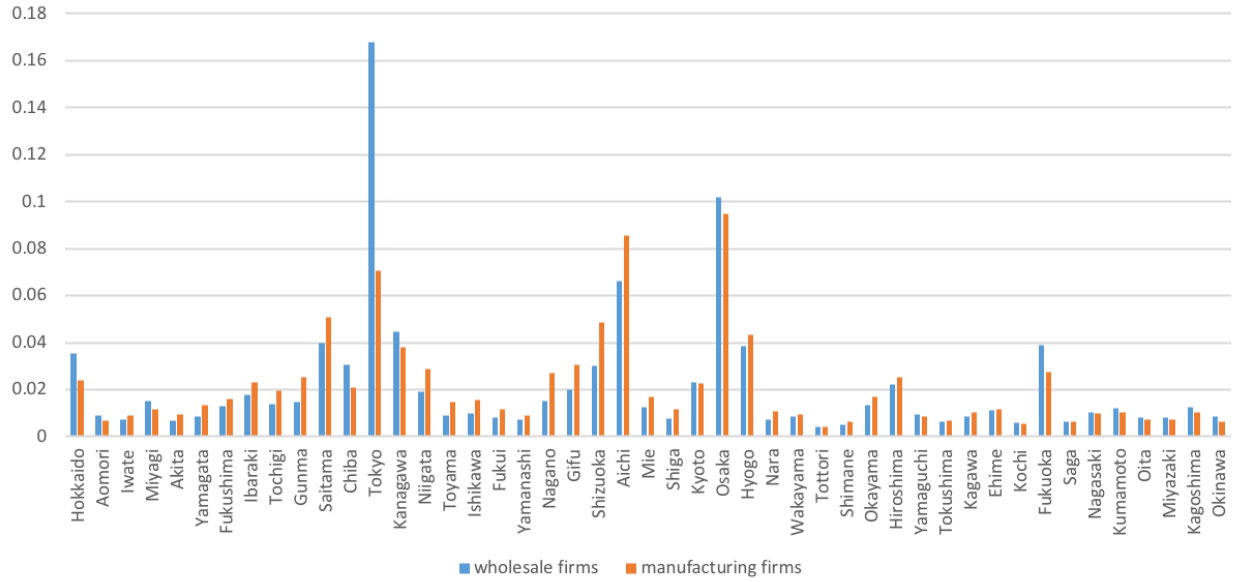
Source: Authors' analyses using Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

(b) Wholesaler



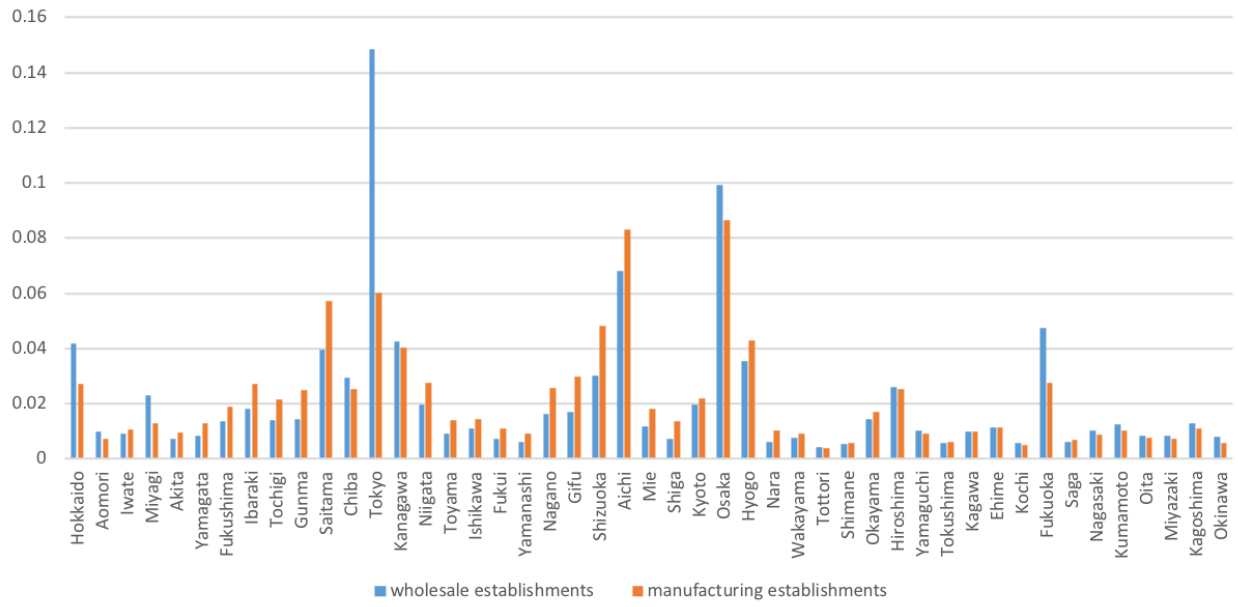
Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan)).

Figure 6: Share of the number of wholesale and manufacturing firms by prefecture



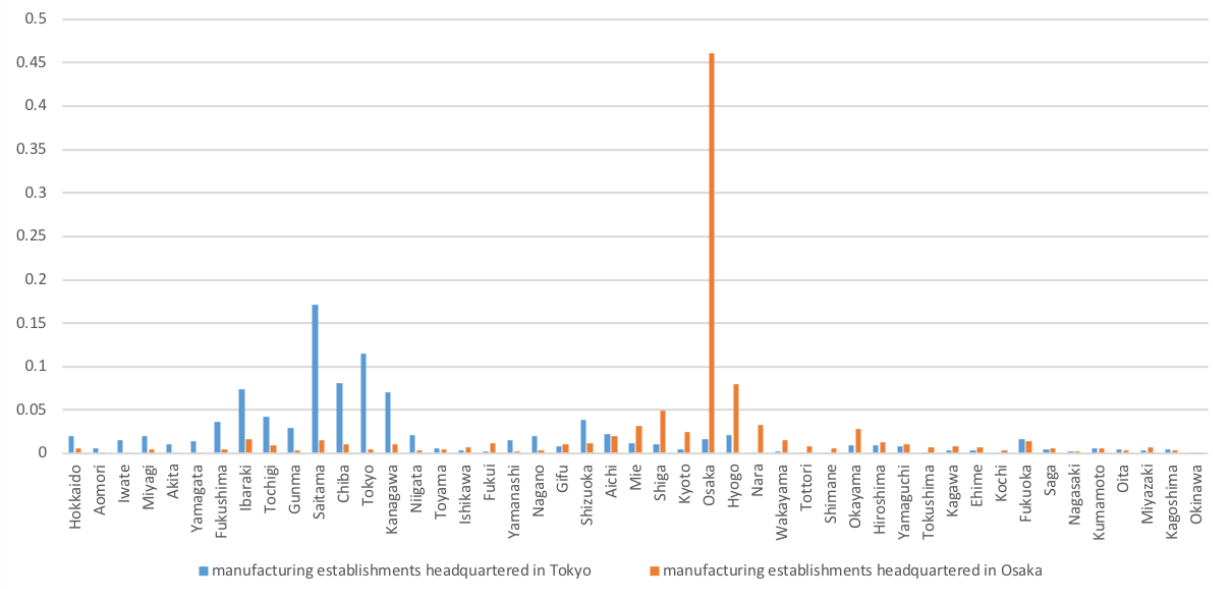
Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 7: Share of the number of wholesale and manufacturing establishments by prefecture



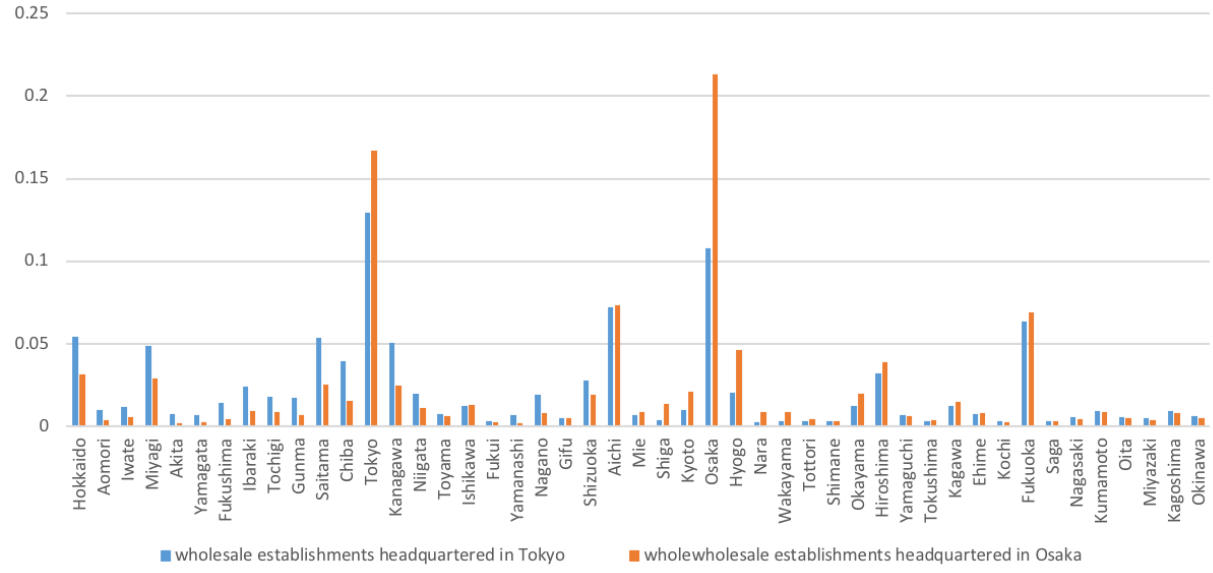
Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 8: Share of the number of manufacturing establishments by prefecture (headquartered in Tokyo and Osaka)



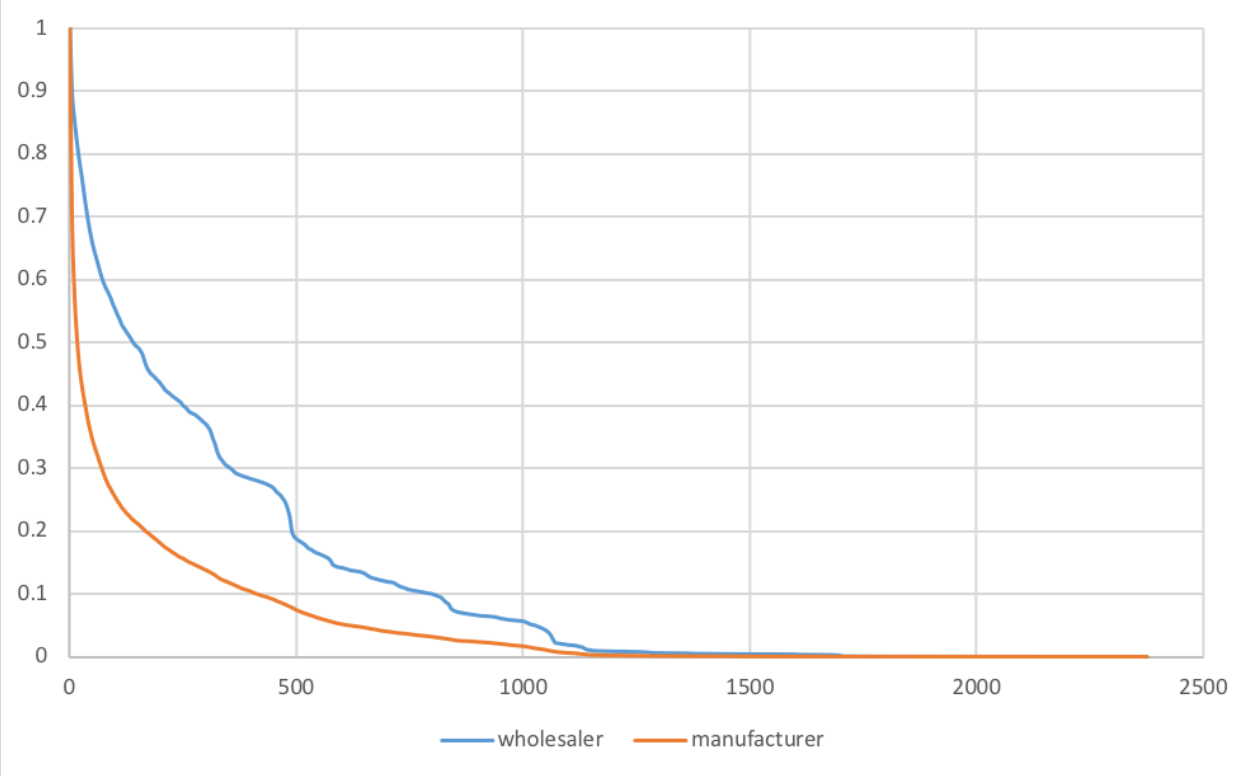
Source: Authors' analyses using Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 9: Share of the number of wholesale establishments by prefecture (headquartered in Tokyo and Osaka)



Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan).

Figure 10: CDF of distance between headquarters and establishments



Source: Authors' analyses using Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Table 7: Transaction distance between wholesalers and manufacturers

		Firm-level Customer		Establishment-level Customer		Firm-level Exporting customer		Establishment-level Exporting customer	
		Manufacturer	Wholesaler	Manufacturer	Wholesaler	Manufacturer	Wholesaler	Manufacturer	Wholesaler
Supplier	Manufacturer	63.75	194.7	41.29	64.83	88.19	177.97	44.74	38.23
	Wholesaler	37.91	116.5	19.46	12.1	38.95	72.86	21.12	6.02

		Firm-level Customer		Establishment-level Customer		Firm-level Exporting customer		Establishment-level Exporting customer	
		Manufacturer	Wholesaler	Manufacturer	Wholesaler	Manufacturer	Wholesaler	Manufacturer	Wholesaler
Manufacturing supplier	Urban areas	58.45	157.83	41.27	46	92.67	180.09	44.94	38.23
	Regional areas	70.83	262.09	41.33	131.61	74.69	165.24	43.63	38.38

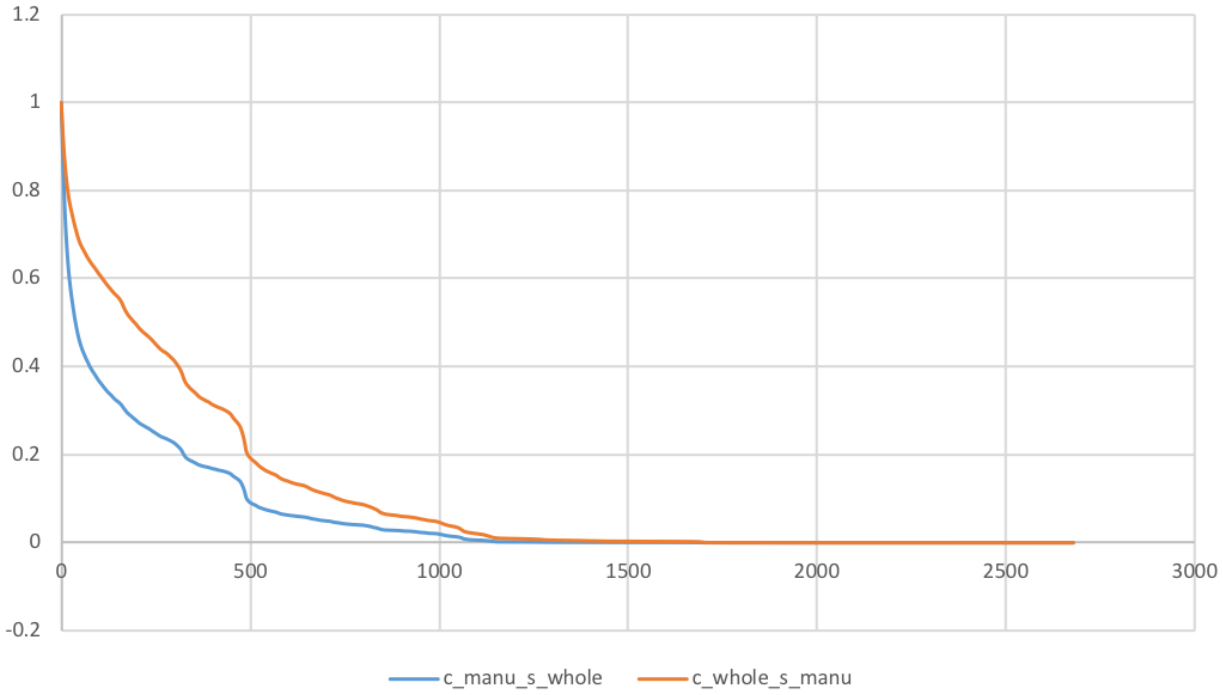
[1] Source: Authors' analyses using the TSR (Tokyo Shoko Research) database, Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Table 8: Wholesale firms that are customers of regional manufacturing firms

	Number of transactions						Number of firms					
	All transacts		Transacts within 50km		Transacts within 30km		All transacts		Transacts within 50km		Transacts within 30km	
Location of wholesaler's headquarters	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas	regional areas	urban areas
Sale to wholesaler	28,366	31,207	14,544	8,981	12,265	5,723	11601	12779	8599	5390	7670	3889
Sale to exporting wholesaler	1,254	10,404	809	3,486	711	2,203	1139	6554	747	2595	657	1735

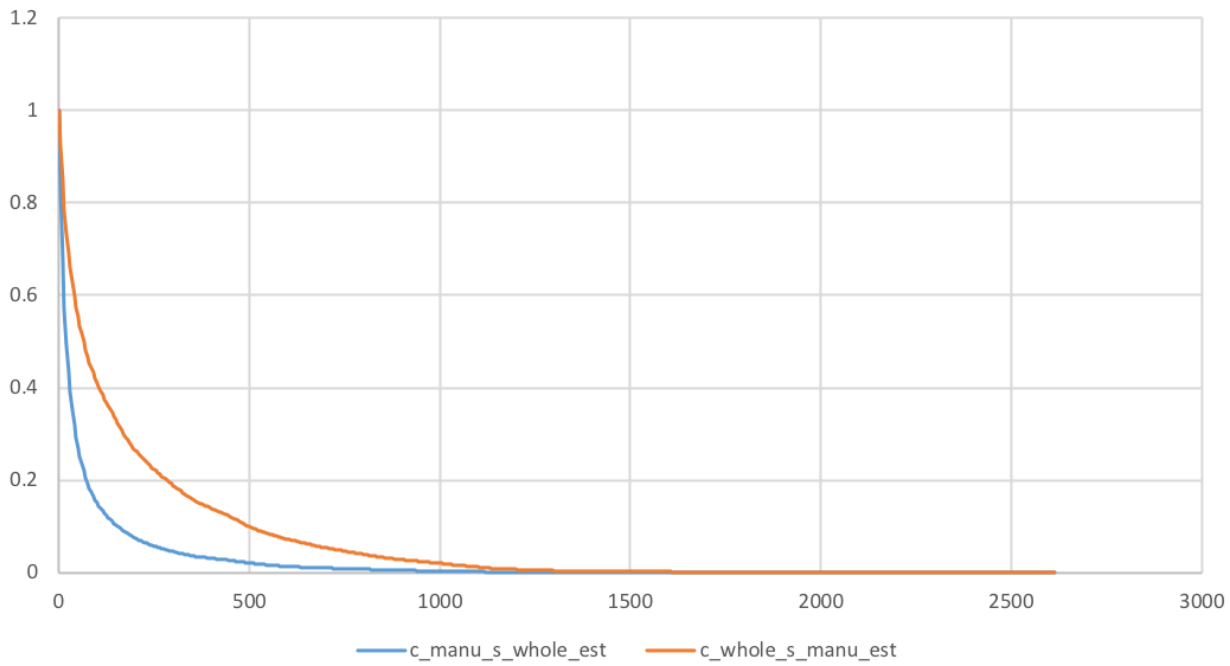
[1] Source: Authors' analyses using the TSR (Tokyo Shoko Research) database, Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 11: Transaction distance between wholesalers and manufacturers (firm level)



Source: Authors' analyses using the TSR (Tokyo Shoko Research) database, Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).

Figure 12: Transaction distance between wholesalers and manufacturers (establishment level)



Source: Authors' analyses using the TSR (Tokyo Shoko Research) database, Census of Commerce (the Ministry of Economy, Trade and Industry, Japan), and Census of Manufacture (the Ministry of Economy, Trade and Industry, Japan).