Are There Trade-offs between the Existing and New Foreign Activities?

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Abstract

For each multinational firm, designing a new foreign activity is a sequential choice. In some cases, new foreign businesses complement existing entities. In other cases, new foreign businesses substitute for old entities. These intra-firm changes in allocations of corporate resources are not deeply considered in the literature. In our model, a multinational enterprise (MNE) determines a new location, if any, either as an addition to its existing ones, or as a replacement of an old one. The location is considered under hub-spoke spatial relations. Firms maximize the worldwide corporate profit, taking into account both trade costs and fixed costs. In the empirical analysis, we use a panel data on Japanese-owned foreign affiliates and their parents (Basic Survey of Overseas Business Activities from 1996 to 2012, by METI), supplemented by the Survey of Trends in Business Activities of Foreign Affiliates of the same periods. We measure some key factors to an event of entry and exit, given the network of existing foreign locations. We compare our results with Yeaple (2008), which analyzes "hub and spokes" (central and peripheral locations) of intra-firm networks for U.S. manufacturing. We show some differences between the U.S. MNEs and Japanese MNEs. We also discuss the difference in trade-offs of intra-firm network between manufacturing and the service sectors.

Keywords: Entry and exit, Hub and spoke, Spatial dependency

JEL classification: F23, F14, L25

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1 Introduction

According to the aggregate statistics of *the Basic Survey of Overseas Business Activity* (METI), we have on average 519 foreign affiliates (per year) that closed their operation from 1997 to 2011. However, the number is based on voluntary reports, so the exits unreported by their headquarters are out of the statistics. By amending such reporting bias, we show that there are on average 868 foreign entities (per year) that have closed the operation. Similarly, the aggregate data shows 614 entrants (per year) on average, but our investigation shows 663 entrants (per year) on average. [1]

Figure 1 shows the number of entry (from 1998 to 2012) and exit (from 1997 to 2011) of Japanese-owned foreign affiliates. It is clear that both entries and exits take place quite often. We have also found from the statistics that 82.3 percent of entries and exits are decided by parent firms that operate in two or more foreign economies. In addition, under the same parent firm, more than 52.1 percent of entries and exits are concurrent, occurring within less than two years interval.
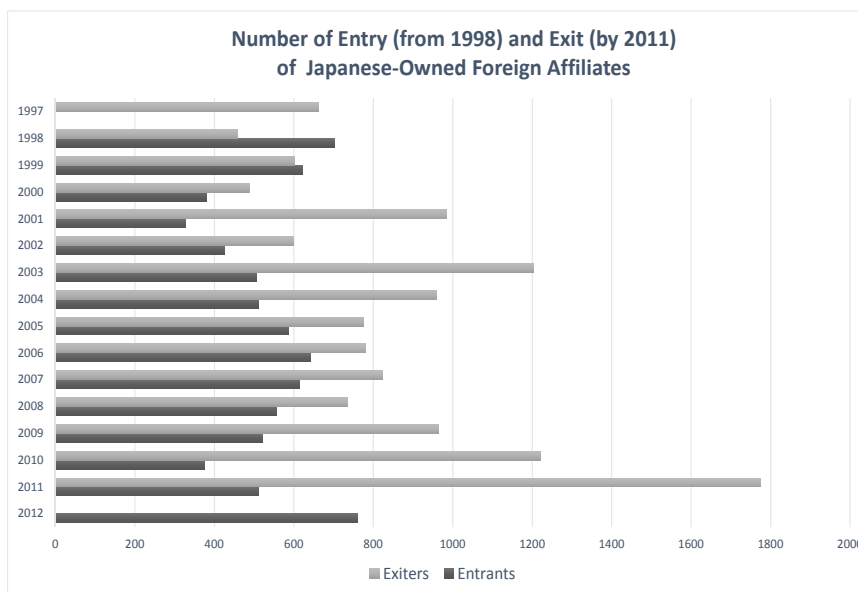
Figure 1: Entry and Exit of Japanese-owned Foreign Affiliates

In this paper, we therefore investigate why and how entries and exits happen at the same time. In our view, these intra-firm relocations of corporate resources have not been deeply considered in the literature.

For example, Helpman et al. (2004) shows the model of self-selection to

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[1] We have identified the number of exits/entry with reference to the Toyo Keizai's list of multinational corporations and their entities (*KAIGAI SINSHUTSU KIGYO SORAN*, in Japanese).

be a multinational firm. They argue that more productive firms can penetrate into more countries and they form networks with larger number of affiliates. The model gives a correspondence between the scope of network and the productivity of firms. The heterogeneity in productivity, in their theory, sorts the number of affiliates (or countries) in a pecking order. Although this prediction is tested heavily in empirical literatures for several countries, they have not yet fully explained the concurrence of entries and exits.

In this paper, we try to explain why the real patterns of entries and exits are more complicated than what the model conjectures. To this end, we assume that a firm has a predictable (not random) return on its investment based upon locations and firm-specific characteristics. Then, we argue that the concurrent entry and exit decision by a firm reflects the geographical dependence between the existing and opened/closed locations in a corporate network.

To investigate the geographical dependence, we examine how firms with multi-country operation face spatial substitutability or complementarity between new and incumbents. In some observations over Japanese multinational firms, we clearly see some "hubs" for overseas activities. We here define hubs as the locations through which transactions with Japan are most frequent.[2]

Figure 2 and Figure 3 show parent (multinational) firms' overseas operations in service and in manufacturing industries in 2012. The figures classify the parent firms by their scope of foreign countries with affiliates. For each category of parent firms, we count their locations (countries) of foreign affiliates. We see that service industries, in general, need more penetration (market-access channels) than manufacturing industries, in which firms sell tradable goods.

Some parent firms hold a large number of affiliates in a large number of countries. Such firms setup hubs first, then penetrate into spokes. In the data, 55.4 percent of service firms and 64.7 percent of manufacturing firms have affiliates in China. Similarly, 36.5 percent of service firms and 41.5 percent of manufacturing firms have affiliates in the U.S. Through these facts, we regard China and the U.S. as the two major "hubs" of overseas activities for Japanese firms, where transactions are most frequent and convenient.

For Japanese parent firms, 38.2 percent of service affiliates and 45.6 percent of manufacturing affiliates are in top 10 countries: China, U.S.A., Thailand, Hong Kong, Singapore, Taiwan, Malaysia, Indonesia, U.K., and Singapore. Except for the U.S. and the U.K., the east and south-east Asian countries are geographically close. Therefore, we view that a firm's decision to invest in one location (spoke) is dependent on its existing locations (hub

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[2]We only see them in aggregate-level data, although "hub" could be different for each firm. It is hard to identify the hub function by the financial reports we observe.

and/or spokes).

Industry	Number of Foreign Countries with Affiliates	Num. of Firms	Average Num. of Foreign Affiliates	Average Num. of Foreign Countries	Top 10 Host Countries of Japanese MNEs	China	U.S.A.	Thailand	Hong Kong	Singapore	Taiwan	Malaysia	Indonesia	U.K.	South Korea
Services	30 countries or more	12	163.6	41.2	Avg. Num. of Affiliates	21.3	24.4	7.1	4.0	6.2	2.4	3.5	4.8	16.3	1.8
					Num. of Firms	12	12	12	11	12	11	11	12	12	12
					Freq. of firms	100%	100%	100%	92%	100%	92%	92%	100%	100%	100%
	10 countries or more	66	26.6	14.2	Avg. Num. of Affiliates	5.2	2.7	1.9	1.8	1.6	1.3	1.6	1.5	1.6	1.3
					Num. of Firms	63	63	62	54	61	50	52	48	36	38
					Freq. of firms	95%	95%	94%	82%	92%	76%	79%	73%	55%	58%
	5 countries or more	158	8.8	6.5	Avg. Num. of Affiliates	2.2	1.3	1.2	1.2	1.2	1.1	1.1	1.2	1.1	1.1
					Num. of Firms	129.0	101	116	96	84	60	57	56	24	36
					Freq. of firms	82%	64%	73%	61%	53%	38%	36%	35%	15%	23%
	4 foureign countries	59	5.0	4.0	Avg. Num. of Affiliates	1.8	1.3	1.1	1.2	1.0	1.1	1.0	1.3	1.0	1.2
					Num. of Firms	44	26	26	26	25	14	12	4	6	9
					Freq. of firms	75%	44%	44%	44%	42%	24%	20%	7%	10%	15%
	3 foreign countries	115	3.6	3.0	Avg. Num. of Affiliates	1.6	1.3	1.1	1.1	1.1	1.0	1.0	1.3	1.0	1.1
					Num. of Firms	73	41	34	52	39	12	12	6	9	11
					Freq. of firms	63%	36%	30%	45%	34%	10%	10%	5%	8%	10%
	2 foreign countries	230	2.8	2.0	Avg. Num. of Affiliates	1.4	1.2	1.2	1.0	1.2	1.0	1.0	1.0	1.2	1.3
					Num. of Firms	128	76	45	49	25	16	8	12	9	19
					Freq. of firms	56%	33%	20%	21%	11%	7%	3%	5%	4%	8%
	1 foreign country	542	1.3	1.0	Avg. Num. of Affiliates	1.3	1.2	1.1	1.0	1.1	1.1	1.0	1.1	0	1.0
					Num. of Firms	206	113	45	30	19	18	9	8	0	11
					Freq. of firms	38%	21%	8%	6%	4%	3%	2%	1%	0%	2%
Services Total	7143 Affiliates (2730 of them are in Top10 countries)	1182	6.0	3.4	Num. of Firms	655	432	340	318	265	181	161	146	96	136
					Freq. of firms	55.4%	36.5%	28.8%	26.9%	22.4%	15.3%	13.6%	12.4%	8.1%	11.5%

Figure 2: Frequently chosen locations for service firms, by the size of overseas network

The question in this paper is to clarify how the incumbents (firm's existing entities) encourage/discourage entries and exits.[3] We focus on entries and exits of affiliates at time t given a firm-level hub-spoke formation at time $t-1$. We compare service and manufacturing industries as they have different transportability of intermediate goods.

To account for the existing locations and their spatial dependencies for a firm's new investment, we present a framework based closely on Yeaple (2008). If the production at a candidate location is for exports, a higher trade cost (distance and trade barriers) discourages investment. However, the existing plants in the hub mitigate this effect as the exportable market, if the new production is an intermediate good. If the production is for local sales, a higher trade cost encourages investment. However some existing plants may preempt this effect by serving through trade.

We use panel data on Japanese-owned foreign affiliates and their parents from 1997-2012. We measure "trade cost" (trade barriers) and "factor cost"

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[3]Compared to the entry decision, the exit decision is rarely analyzed. Javorcik and Poelhekke (2014) is one exception, to my knowledge. They focus on divestments, that is, foreign affiliates that are sold to local owners. They use plant-level panel data from the Indonesian Census of Manufacturing covering the period 1990-2009. They consider 157 cases of divestment and found the drop of productivity due to the loss of headquarters' support.

Industry	Number of Foreign Countries with Affiliates	Num. of Firms	Average Num. of Foreign Affiliates	Average Num. of Foreign Countries	Top 10 Host Countries of Japanese MNEs	China	U.S.A.	Thailand	Hong Kong	Singapore	Taiwan	Malaysia	Indonesia	U.K.	South Korea
Manufacturing	30 countries or more	12	81.4	35.8	Avg. Num. of Affiliates	14.1	7.2	3.7	2.8	3.1	1.9	3.0	2.4	3.9	2.1
					Num. of Firms	12	12	10	9	11	10	9	8	12	9
					Freq. of firms	100%	100%	83%	75%	92%	83%	75%	67%	100%	75%
	10 countries or more	158	27.3	14.5	Avg. Num. of Affiliates	5.3	4.1	2.1	1.5	1.6	1.5	1.6	1.6	1.6	1.5
					Num. of Firms	153	157	125	96	120	115	100	95	103	94
					Freq. of firms	96.8%	99.4%	79.1%	60.8%	75.9%	72.8%	63.3%	60.1%	65.2%	59.5%
	5 countries or more	330	9.2	6.4	Avg. Num. of Affiliates	2.4	1.7	1.3	1.2	1.3	1.2	1.2	1.1	1.2	1.2
					Num. of Firms	297	290	185	124	149	158	85	94	81	118
					Freq. of firms	90.0%	87.9%	56.1%	37.6%	45.2%	47.9%	25.8%	28.5%	24.5%	35.8%
	4 foureign countries	166	5.0	4.0	Avg. Num. of Affiliates	1.7	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.1	1.1
					Num. of Firms	126	116	64	43	36	40	22	22	15	36
					Freq. of firms	75.9%	69.9%	38.6%	25.9%	21.7%	24.1%	13.3%	13.3%	9.0%	21.7%
	3 foreign countries	247	3.7	3.0	Avg. Num. of Affiliates	1.6	1.2	1.2	1.1	1.1	1.0	1.1	1.2	1.1	1.0
					Num. of Firms	179	126	93	54	30	44	29	33	15	28
					Freq. of firms	72.5%	51.0%	37.7%	21.9%	12.1%	17.8%	11.7%	13.4%	6.1%	11.3%
	2 foreign countries	423	2.4	2.0	Avg. Num. of Affiliates	1.4	1.1	1.2	1.0	1.0	1.0	1.1	1.0	1.0	1.1
					Num. of Firms	260	135	96	71	18	35	34	34	8	25
					Freq. of firms	61%	32%	23%	17%	4%	8%	8%	8%	2%	6%
	1 foreign country	959	1.2	1.0	Avg. Num. of Affiliates	1.3	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
					Num. of Firms	458	116	89	43	18	33	37	41	2	27
					Freq. of firms	47.8%	12.1%	9.3%	4.5%	1.9%	3.4%	3.9%	4.3%	0.2%	2.8%
Manufacturing Total	12208 Affiliates (5572 of them are in Top10 countries)	2295	5.3	3.5	Num. of Firms	1485	952	662	440	382	435	316	327	236	337
					Freq. of firms	64.7%	41.5%	28.8%	19.2%	16.6%	19.0%	13.8%	14.2%	10.3%	14.7%

Figure 3: Frequently chosen locations for manufacturing firms, by the size of overseas network

(wage) for new locations. The measurements differ from previous research by incorporating multi-country features. We measure a location's cost relative to its trading partners. A location's relevant cost comparison is against a firm's existing locations. In addition, we calculate the export market size of each industry in each location as a function of costs of all locations. We incorporate these features into a basic Probit model (discrete choice for entry and exit) for empirical investigation.

The organization of the paper is as follows. In section 2, we briefly go over papers that deal with spatial dependencies and complex integration strategies, and we highlight what we add to the literature. In section 3, we provide the analytical framework, which is based on Yeaple (2008), but we add in the case of multiple regions (or multiple hubs). In section 4, we explain the datasets and results. The last section is for concluding remarks.

2 Literature Review

Carr et al. (2001) presents the "knowledge-capital" model of multinationals. They assume that knowledge-generating activities can be geographically separable from production. Thus, the knowledge-capital can be provided to multiple locations at negligible transfer costs. This firm-specific capital can be regarded as the driving force of firm heterogeneity.

Chaney (2014) applies this idea and explains the geographical distribution of firms and their export activities. He views that the source of heterogeneous ability to access foreign markets remains largely unexplained.[4] He develops a geographic extension of the model developed in Jackson and Rogers (2007), and states the heterogeneity of individual firms to access foreign markets is partially explained through their network of existing foreign contacts.

Yeaple (2003) presents a three-country model to analyze why firms mix vertical and horizontal integration (i.e. complex integration) depending on locations. He shows that the complex strategies allow potential host countries to be complementary. He also argues that falling transport costs between countries may increase the likelihood of complex integration strategies. Helpman et al. (2004) extends this idea into a multi-country, multi-sector general equilibrium model. However, here they only consider two channels for accessing host markets: "exporting versus horizontal MNEs." Yeaple (2008) goes further than Helpman et al. (2004) by adding a channel of vertical network formation. Specifically, he incorporates (i) the location of multinational affiliates, (ii) the procurement of intermediates from parent firms.

Baltagi et al. (2007) presents a three-country model with spatial interactions of FDI. There are two simultaneous effects that define the location choice: the "demand effect" and the "supply effect." The "supply effect" discourages a new setup of an affiliate, since the supply in the existing location is large enough to provide goods by trade and deter any new activities. The "demand effect," on the other hand, encourages a new setup of a firm as a satellite production site. A new operation may assist the existing operation by subdividing the production processes and providing intermediate inputs through trade. With these offsetting effects, a location choice changes over time.

Compared to the volume of theoretical insights, empirical works accounting for the interdependence within multiple affiliates, are relatively scarce and the results are diffused.[5]

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[4]Bernard et al. (2003b) and Melitz (2003) assume that this heterogeneity is entirely driven by productivity differences. However, Armenter and Koren (2010) points out that the productivity differences can only account for a fraction of the exposure to international markets.

[5]Unlike for the FDI flow, the gravity theory presents geographical substitutability and complementarity for the trade flow more comprehensively. Anderson and van Wincoop (2003) has developed a multi-country gravity theory of trade flows. They show that, in the presence of trade frictions, bilateral characteristics do not entirely determine bilateral trade; the characteristics of other nations also matter. Chaney (2008) revises the gravity model of trade, incorporating the distribution of productivity across firms. Crozet and Koenig (2010), based on Chaney (2008), clarify the two measurements of elasticity: elasticity of trade costs with respect to distance, and the elasticity of substitution between goods.

Baltagi et al. (2007) uses bilateral FDI stock data and foreign affiliate sales data of the U.S. in 1989-1999, covering 11 industries and 51 host countries, including both developed and developing destinations. Blonigen et al. (2007) uses the industry-level data of outbound FDI from the U.S. during 1983 to 1998. They find that bilateral determinants are robust even after considering spatial interdependence. They show positive spatial interdependence among European OECD groups, but negative results at other locations.

Alfaro and Charlton (2009) uses 568 MNE's from various countries (with 8135 affiliates in 53 countries) to clarify the motives and the locations of vertical FDI's and the locations of those. They find that the market sizes of neighboring countries are the most important factor. They also find that the factor costs, relative to those of other countries where the MNE's could alternatively invest, are also important.[6]

As for the empirical evidence about Japanese firms, Head and Mayer (2004) examines 452 Japanese affiliates in 9 European countries from 1984 to 1995.[7] They consider how the scale of demand in adjacent regions work to attract incoming FDI to a given region. They find that the location of affiliates are positively explained by the GDP of the region itself and the distance-weighted measure of the GDP of surrounding regions.

Head et al. (1995) uses 751 Japanese manufacturing plants in the U.S. in 1980-1984.[8] In this paper, they look for the evidence on the positive network externality. They test whether firms make the same location decision as previous firms with similar attributes (e.g. industry, national origin) do. Their conditional-logit specification provides some positive agglomeration effects between bordering states, especially for automobile industry's FDI in the U.S.[9]

To summarize, previous findings more or less support the complementary spatial dependence. The findings, however, are heavily dependent on the observation of entries. A firm, in general, enter the neighborhood only if it expects some complementary effects (positive expected gains). Otherwise, a firm does not dare to enter in the first place. Our research, therefore, incorporate the cross-check using the "exits", in addition to the "entries." We show that the complementary dependence found in the literature is overestimated when we only focus on the entry information. It is worthwhile to check whether the choice to shut down gives a mirror image of the choice of

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[6]Coughlin and Segev (2000) considers US FDI into provinces in China, using spatial maximum-likelihood estimation. They find that FDI into one location within China increases the FDI into other proximate Chinese provinces.

[7]The data are mainly extracted from *JETRO's survey of Current Manufacturing Operations of Japanese Firms in Europe*, in 1996.

[8]The data come from a survey of Japanese manufacturing investment in the U.S. conducted by the Japan Economic Institute.

[9]Head et al. (1995), using the same data shown above, describes how the investment promotion policies by US influence the inbound FDI.

entry. We, in addition, consider the firm-level spatial dependence, which depends on its own existing network. Therefore, the spatial variables here are not at the industry-level, nor at the country-level. We argue that these spatial variables are not the perfect measurement, but they do at least capture the firm-level conditions at investment and divestment.

3 Model

Our analytical framework is based on Yeaple (2008). The framework in Yeaple (2008) is influenced by the model of Helpman et al. (2004), but the central focus is not on the firm-productivity, but on the locations. He especially analyzes the role of central locations (Hubs) that allow for a rich pattern of vertical and horizontal FDI. To highlight the effects of geography (transportation costs between Home, Hubs, and Spokes), we assume other country-level, industry-level, and firm-level factors as uniformly fixed.

3.1 Production

The cost of producing one unit of the final good is the cumulative costs of intermediate goods:

$$C = \int_0^1 c(w)dw,$$

where $c(w)$ is the marginal cost of producing an intermediate good w. The fixed cost of building a plant for intermediate good w is assumed to be proportional to the level of w:

$$f(w) = fw.$$

On the other hand, the fixed cost of building an assembly plant (assembling intermediate goods to provide the final good) abroad is defined fixed as F_A.

3.2 Geography

We assume the following sets of countries: Home (1), Foreign Hub (1), Foreign Spokes (M symmetric countries) where all face the same factor prices. Therefore, the only remaining difference is the transportation costs. First, per-unit transportation costs from home to either of "Hub and Spokes" is τ. Second, per-unit transportation costs between "Hub and Spokes" is t. Third, per-unit transportation costs between a spoke and another spoke is too high to deliver. The last assumption highlights the significance of hubs. It is also consistent with some hub and spokes setting that occasionally appears in economic geography model. Although we admit that the assumption is unrealistic, but this simplification preempts the case of excessively complex choice of networks.

Without loss of generality, we assume $\tau > t$ (home-foreign delivery is more costly than hub-spoke delivery). We also let $\alpha \in [0,1]$ measure the transportability of intermediate goods relative to final goods.

3.3 Firm Strategies

We fix p, and assume that each firm has φ consumers who are willing to pay up to p. In contrast to Helpman et al. (2004), firms differ in the number of customers φ (size of foreign markets), not in their productivity. This assumption avoids computational mess but will yield similar results as Helpman et al. (2004).[10]

To serve a foreign market, a firm can either export the good from the home country or engage in FDI in the foreign region. There are three patterns of location choices. First, they could assemble the final goods exclusively in the home country and then export them to each of the foreign markets (Firm Strategy I: No FDI). Second, they could open a single assembly plant in the hub country and then serve the remaining M markets in the region by exporting the final goods (Firm Strategy II: Export Platform FDI at Hub). Third, they could open an assembly plant in each of the foreign markets and save shipping final goods across borders (Firm Strategy III: Market Access FDI at Hub and Spoke).

Firms are assumed to be "endowed" with a plant to produce each intermediate good in the home country, so that there are no fixed costs associated with exporting from home to a foreign market. This gives a reason for a firm to keep a part of their production at home.

- Export (no FDI)

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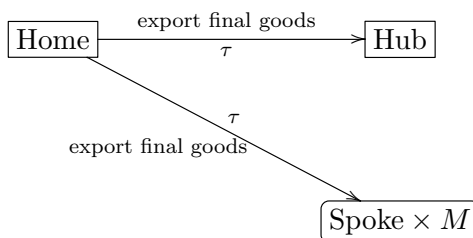
[10]The results become similar because more productive firms in Helpman et al. (2004) sell a larger number of units in any given market. In other words, they obtain larger foreign markets.

- Export-Platform FDI at Hub

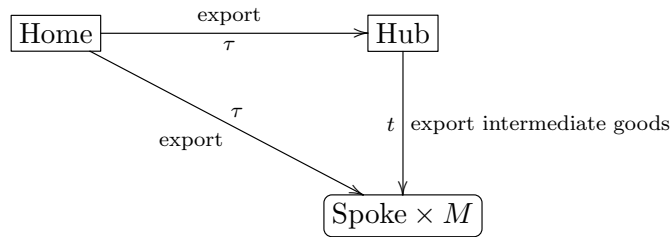$$\boxed{\text{Home}} \xrightarrow[\tau]{\text{export intermediate goods}} \boxed{\text{Hub}}$$

$$\text{export final goods} \mid t$$

$$\boxed{\text{Spoke} \times M}$$

- Market-Access FDI at Hub and Spoke:

$$\boxed{\text{Home}} \xrightarrow[\tau]{\text{export}} \boxed{\text{Hub}}$$
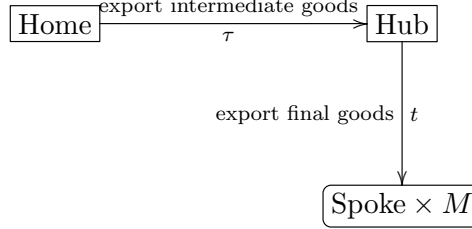
$$\tau \quad \text{export}$$

$$t \mid \text{export intermediate goods}$$

$$\boxed{\text{Spoke} \times M}$$

In Firm Strategy I (No FDI), both of an intermediate and an assembly stage take place within Home (without fixed costs or transportation costs of intermediates). A firm then exports final goods with a unit transportation cost of τ.

In Firm Strategy II (Export Platform FDI), a firm opens an export platform at the Hub, then exports final goods with a transportation cost of t, which is smaller than shipping from Home($\tau > t$). We assume that the transportation cost of intermediate goods is α times the transportation cost of the final goods. Since a lower index of w involves a lower fixed cost, it follows that the profitability of moving the production of an intermediate production abroad is decreasing in w. (A high w means high fixed cost fw of a new assembly plant. So there is an increasing difficulty of building a new plant with w.) To be specific, there is a threshold w^* where an intermediate w is produced at a foreign hub if $w < w^*$, and produced at home if $w^* \leq w$. A Home plant produces intermediate w satisfying $w^* \leq w$. A Hub plant produces intermediate w with $w < w^*$ (with new intermediate and assembly plants).

In Firm Strategy III (Market Access FDI), operations take place in all of the locations. The merit of the market access FDI is to save shipping costs of the final goods, instead pay a fixed cost at each location. Since the fixed cost is increasing in w, Home produces the intermediate with the highest range of w. Similarly, Spoke produces the intermediate with the lowest range of w. There are thresholds $0 < w_1 < w_2 < 1$ such that intermediates are produced at each spoke for $0 < w \leq w_1$ (spoke imports the other intermediates either from home or hub), intermediates are produced at hub for $w_1 < w < w_2$ (hub imports the other intermediates from home), and intermediates are

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produced at home for $w_2 < w$. To summarize, a Home plant will be in charge of intermediate goods $w \geq w_2$, and a Hub plant of intermediate goods $(w \in (w_1, w_2))$ and assembly plant. Then a Spoke produces intermediate good $(0 < w \leq w_1)$ with a new intermediate and assembly plant.

3.4 Profits and Thresholds of Strategies

In what follows, we describe a firm's profit in each strategy and derive thresholds conditions. In Firm Strategy I (No FDI),

$$\pi_{\mathrm{EX}}(\varphi) = (M+1)\varphi(p-\tau), \tag{1}$$

where the zero profit condition is $p = \tau$. (φ is given for each firm.)

In Firm Strategy II (Export Platform FDI at Hub),

$$\pi_{\mathrm{EP}}(w^*; \varphi) = (M+1)\varphi p - F_A - (M+1)\varphi(1-w^*)\alpha\tau - M\varphi t - f\int_0^{w^*} w\,dw, \tag{2}$$

where

$$(M+1)\varphi p: \text{ total revenue}$$
$$F_A: \text{ setup of assembly plant at hub}$$
$$(M+1)\varphi(1-w^*)\alpha\tau: \text{ transportation cost from home to all market via hub}$$
$$\varphi t: \text{ transportation cost from hub to spokes}$$
$$f\int_0^{w^*} w\,dw: \text{ setup of intermediate goods plant for}$$
$$0 < w < w^* \text{ at hub}$$

Here, the first order condition with respect to w^* is solved, and the cutoff level of φ and φ^* is defined as:

$$\min_{w^*}(M+1)\varphi(1-w^*)\alpha\tau + f\int_0^{w^*} w\,dw$$
$$= (M+1)\varphi\alpha\tau - w^*(M+1)\varphi\alpha\tau + \frac{fw^{*2}}{2}$$

The first order condition is $(M+1)\varphi\alpha\tau - fw^* = 0$, so

$$w^* = \frac{(M+1)\varphi\alpha\tau}{f}.$$

If $w^* = 1$, the optimal cutoff for export platform FDI at hub is

$$\varphi^* = \frac{f}{(M+1)\alpha\tau}.$$

It means that a firm completely shifts intermediate goods and assembles at hub. Now we observe, as the market size φ becomes larger (above φ^*), firm expands their production more at Hub, to export their final goods to spokes.

In Firm Strategy III (Market Access FDI at Hub and Spokes),

$$\pi_{\text{MA}}(w_1, w_2; \varphi) = (M+1)\varphi p - (M+1)F_A - (M+1)\varphi(1-w_2)\alpha\tau \quad (3)$$
$$- f \int_0^{w_2} w\,dw - M\varphi(w_2 - w_1)\alpha t - M \int_0^{w_1} w\,dw, \quad (4)$$

where each term shows the following features:

$(M+1)\varphi p$: total revenue

$(M+1)F_A$: setup of assembly plants at hub and spokes

$(M+1)\varphi(1-w_2)\alpha\tau$: transportation cost of intermediates from home

to all market via hub

$f \int_0^{w_2} w\,dw$: setup of intermediate plant at hub

$M\varphi(w_2 - w_1)\alpha t$: transportation cost of intermediate from hub to spokes

$f \int_0^{w_1} w\,dw$: setup of intermediate plant at spokes

The first-order condition (assuming interior solutions) with respect to w_2 and w_1 solves the cutoff of φ' and φ''. The interior solutions with respect to w_2 is:

$$\min_{w_2} (M+1)\varphi(1-w_2)\alpha\tau + f \int_0^{w_2} w\,dw + M\varphi(w_2 - w_1)\alpha t$$
$$\iff \min_{w_2} -w_2(M+1)\varphi\alpha\tau + \frac{fw_2^2}{2} + w_2 M\varphi\alpha t$$

By solving the first order condition of $\varphi\alpha\left[(M+1)\tau - Mt\right] - fw_2 = 0$,

$$w_2 = \frac{\left[(M+1)\tau - Mt\right]\varphi\alpha}{f},$$

obtaining the optimal cutoff level of intermediate goods for export platform FDI at hub. Next, the interior solutions with respect to w_1 is:

$$\min_{w_1} M\varphi(w_2 - w_1)\alpha t + Mf \int_0^{w_1} w\,dw$$
$$\iff \min_{w_1} -w_1 M\varphi\alpha t + M\frac{fw_1^2}{2}$$

By solving the first order condition of $\varphi\alpha t - fw_1 = 0$, we now have

$$w_1 = \frac{\varphi\alpha t}{f}$$

as the optimal cutoff for building plants for intermediate goods at spokes. If $w_2 = 1$,

$$\varphi' = \frac{f}{[(M+1)\tau - Mt]\,\alpha} = \frac{f}{[M(\tau-t)+\tau]\,\alpha},$$

$$\text{and if } w_1 = 1, \varphi'' = \frac{f}{t\alpha}.$$

Therefore, the assumption of $\tau > t$ (inter-region cost > intra-region cost) leads to $\varphi' < \varphi''$, and $w_1 < w_2$ (i.e. cutoff w between hub and spoke < cutoff w between home and hub).

In summary, the share of productions of intermediate goods productions depends on the value of φ. The share of each location is provided in the figure below.
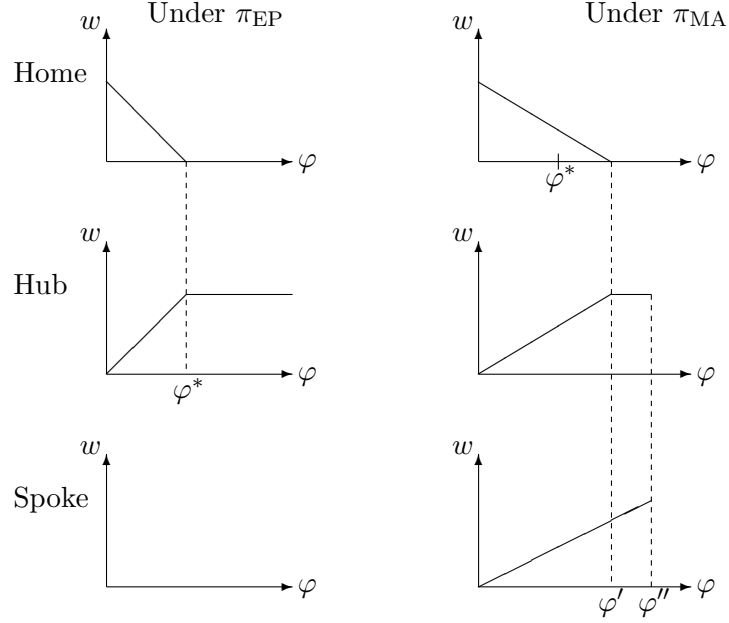
We here solve out each cutoff level of w^*, w_1, and w_2 where the optimal mode of FDI switches.

- Share of Intermediate Production under π_{EX}:

$$\varphi^* : \text{hub replace home}$$

$$w^*(\varphi) = \begin{cases} \frac{(M+1)\alpha\tau}{f} & \text{if } \varphi \leq \varphi^* \\ 1 & \text{otherwise} \end{cases} \qquad \text{where } \varphi^* = \frac{f}{(M+1)\alpha\tau}$$

- Share of Intermediate Production under π_{MA}:

$$\varphi' : \text{hub replaces home}$$
$$\varphi'' : \text{spokes replace hub (market access)}$$

$$w_1(\varphi) = \begin{cases} \frac{\alpha t}{f} & \text{if } \varphi \leq \varphi'' \\ 1 & \text{otherwise} \end{cases} \qquad \text{where } \varphi'' = \frac{f}{\alpha t}$$

$$w_2(\varphi) = \begin{cases} \frac{\alpha[\tau(M+1)-tM]}{f}\varphi & \text{if } \varphi \leq \varphi' \\ 1 & \text{otherwise} \end{cases}$$

$$\text{where } \varphi' = \frac{f}{\alpha\left[\tau(M+1)-tM\right]}$$

The two parameters are the key to the firm-level network formation. First, the location decision depends on the transportation costs of both the intermediate goods $(\alpha t, \alpha\tau)$ and the final goods (t, τ). Second, the location decision depends on the fixed costs fw for a foreign plant of intermediate goods w, and F_A for foreign assembly plants. The cutoff level of φ (market size) is implicitly defined by t, τ, α, when M, f, F_A are fixed.

- "Export or Export-Platform FDI"

$$\pi_{\mathrm{EX}}(\varphi_1) = \pi_{\mathrm{EP}}(\varphi_1) \quad \text{at } \varphi_1,$$

i.e. φ_1 satisfies

$$(M+1)\left[\frac{(M+1)(\alpha\tau\varphi_1)^2}{2f} - \tau\varphi_1(1-\alpha)\right] - M\varphi_1 t - F_A = 0.$$

- "Export-Platform FDI or Market-Access FDI"

$$\pi_{\mathrm{EP}}(\varphi_2) = \pi_{\mathrm{MA}}(\varphi_2) \quad \text{at } \varphi_2,$$

i.e. φ_2 satisfies

$$M\left[\varphi_2 t - \alpha^2 \frac{\varphi_2^2}{2}f(M+1)(2\tau-t)t - F_A\right] = 0.$$

3.5 Comparative Statics and Testable Predictions

According to the above equilibrium specification, we employ some comparative statics. There are two constant features: first, the marginal return on φ is

$$\frac{\partial \pi_{\mathrm{EX}}}{\partial \varphi} < \frac{\partial \pi_{\mathrm{EP}}}{\partial \varphi} < \frac{\partial \pi_{\mathrm{MA}}}{\partial \varphi}. \tag{5}$$

In addition, the fixed costs of plants is EX < EP < MA. Then these give us threshold conditions we show in the Figure 4 below.
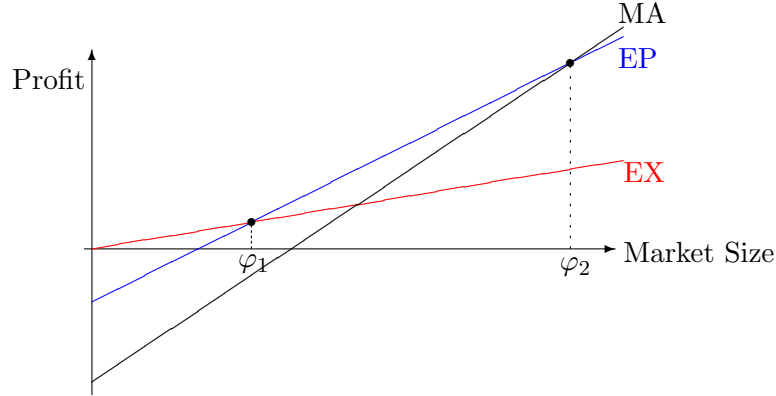
Figure 4: Market Size and Profits

We here discuss the comparative statics on α (relative transportation cost of intermediate goods), τ (transportation cost across regions), t (transportation cost within a region). If $\alpha \approx 0$ (intermediate inputs can be shipped at small cost), transportation costs of final goods are minimized at market-access FDI, where a firm incurs fixed costs $(M+1)F_A$. With high φ (market size), marginal benefits of doing market-access FDI exceeds the fixed cost of entry. This pattern is similar to Helpman et al. (2004). On the other hand, if $\alpha \approx 1$ (intermediates' shipping is as costly as final goods), transportation costs are minimized at export-platform FDI, where a firm incurs fixed cost F_A. With high φ, the marginal benefits of doing export-platform FDI exceeds the fixed cost of entry. In addition to horizontal FDI in Helpman et al. (2004), we incorporate a vertical FDI structure.

Next, we consider an increase in the inter-regional transport cost τ. It induces a decrease in φ_1 and an increase in φ_2. The higher inter-regional transport costs lead to a smaller share of firms engaged in exporting and a smaller share of those in market access FDI. The decrease in φ_1 shows the result of proximity and concentration trade-offs. The increase in φ_2 is due to the feature that the export platform type responds more sensitively to the inter-regional costs than market access FDI does. It follows that, the higher inter-regional transport costs are associated with a smaller number of foreign investors entering the region. This may imply why many studies find that the FDI is actually decreasing on average in bilateral distance. (To be more specific, as inter-regional distance increases, the FDI in Hub expands, while those in Spokes are reduced.)

Lastly, we consider an increase in intra-regional transportation cost t. We note that an increase in t results in an increase in the threshold φ_1. A reduction in the intra-regional trade costs reduces the volume of final good imports from Home, and increases the number of firms conducting FDI in the foreign region. An increase in t also leads to a decrease in the threshold

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φ_2.[11]

3.6   Case of Multiple Regions

Based on the comparative statics, we may also consider the case of multiple regions. We just need to consider the hub-to-hub cost δ, assuming that this transportation cost is higher than t (for intra-region) but lower than τ (for home-hub).
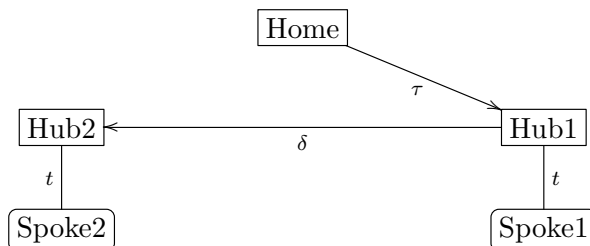
So we have $\tau > \delta > t$.

   We then consider the case where a firm has an existing hub (at Hub 1). In that case, two strategies are viable. If δ is small enough (close to t) the firm chooses FDI only at Hub1 and exports to Hub2 and Spoke2. If δ is large enough (close to t) the firm chooses FDI at Hub1 and Hub2. Then hubs export to spokes in each region. In the former case, the entry decision into Hub2 (proximately located to Hub1) is deterred due to the existence of incumbents. This is the case where the existing and the new plants are substitutes. In the latter case, the entry decision into Hub2 is promoted, since Hub1 is closer to Hub2 than from Home. This is the case where the existing and the new plants are complements.

   Through these specifications, we argue that given a hub and spoke geography, the location decision is not a "pecking order" decision any more. Firms do not necessarily enter from attractive locations to challenging locations. There exists a non-linear switch to exit and entry, based on the relative transportation costs and market sizes. In the empirical analysis, we then try to determine where and how much we can observe complementary or substitutable entry/exit.

   Yeaple (2008) uses 1999 Benchmark Survey of the BEA that requires all U.S. firms to list all of the countries in which they own foreign affiliates. He investigates the affiliates' location and trade for the U.S. manufacturing sector. First, he finds that the affiliates located in the hub export substantially more than affiliates located elsewhere, especially in terms of third-party exports. Here, he confirms that a hub as export platform does exist. Second, he asks whether firms with a small international network are more attracted to the hub than firms with a large network. He then shows that countries

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[11]For example, the reduction in t under an event like free trade agreement will expand the opportunity of export-platform FDI.

with larger GDPs or closer distances (i.e. hub countries) attract more small-sized multinationals than others (spokes). Although the second investigation is in line with a "pecking order" decision, the first investigation clarifies the substitutability (or the centrality) in the choice of foreign locations. While his analyses are based on the cross-section data, we will analyze the location choice based on the panel data of entry and exit.

4   Data

4.1   Firm Data

The main data for the analysis comes from *the Basic Survey of Overseas Business Activity*(METI) from 1997-2012. The database includes individual observations on around 6,000 parent firms in Japan and about 20,000 Japanese-owned foreign affiliates annually. (As of 2012, among the questioned firms, 74.6 percents of them answered to the questionnaire.) The data includes information on the location, industry, current sales, current employment, compensations to employees, net value of plant, property and equipment, and the year of establishments for each business. The subsidiaries and headquarters are reported separately. In every three years, detailed surveys are conducted and firms are asked to report their sources of purchase, and destinations of sales. The affiliates report how much they purchase locally from domestic markets, import from Japan, or import from third countries. Similarly, they report how much they sell locally, export to Japan, or export to third countries. The years of detailed survey are for 2010, 2007, 2004, 2001, and each reports the activities of the year before: 2009, 2006, 2003, and 2000. We measure industry-level wage and fixed plant cost for each foreign economy. To avoid the bias of using small number of observation, we select 38 industries with 100 or more of Japanese foreign affiliates. We also limit to 24 host foreign economies, in which 100 or more of Japanese owned foreign affiliates are in operation.

4.2   Trade costs

Let f_{hi} be the bilateral trade costs with iceberg form. We use CIF/FOB ratios of the country pairs, derived from the *Direction of Trade Statistics* by the IMF: $f_{hi} \equiv CIF_{hi}/FOB_{hi} = f(X_{hi}, X_h, X_i)$, where X_{hi} is the vector of characteristics relating country h and i, X_h, X_i are vectors of country characteristics.[12] This measure does not take into account the industrial differences in transport cost. We then deal with this problem by adjusting our transport cost using an industry-level weight derived from Bernard et al.

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[12]From OLS regression of $\ln(CIF/FOB-1)$ on bilateral country characteristics (border shares, landlocked, GDP per capita, infrastructure) we derive fitted values, $\tilde{f}_{hi}$, as our measure of bilateral transport costs.

(2003a). The authors compute average CIF/FOB ratios, t^s, for different industries using product level data on U.S. imports compiled by Feenstra (1998). We denote the relative trade costs compared to the industry-wide average, $\bar{t}^s$, as $\hat{t}^s = [1 + (t^s - \bar{t}^s)/\bar{t}^s]$. Finally, the industry-level trade costs for the countries h and i is defined to be:

$$\tilde{t}_{hi}^s = \tilde{f}_{hi}\hat{t}^s - 1. \tag{6}$$

For each firm with an entry or an exit event of affiliates, we use trade costs with other existing countries, if any. We also regard China and U.S. as the Hubs for Japanese parent firms. Then we also consider if a parent firm has any existing entities there.

4.3 Labor costs

Although we implicitly assume wage uniformity in the analytical framework, they are one of the key factors for the location decision in reality. Let w_i^s be the cost per unit of labor in country i for firms in industry s. We use the data of *Industrial Statistics Database* by UNIDO.[13] Here, at least 2-digit SIC level (coded from 20 to 39) wages are available to the countries we investigate. The average wage for each industry is calculated as the total compensation of employees divided by the total number of employees. We then denote the relative production cost of location h with respect to location i in industry s as

$$\omega_{hi}^s = v^s \left[1 - \left(\frac{w_h^s}{w_i^s} \right) \right], \tag{7}$$

where v^s is the share of the labor costs in total production costs for each industry, using Japanese industrial statistics. Therefore, ω_{hi}^s is a cost advantage weighted by cost shares. In the same manner with the trade costs, we use wage costs of other existing countries, if any. The value is positive if the relative wage is higher than that of host, and negative if lower than the host. In addition, to incorporate the direct impact of acquiring/losing access to the host location at the event of entry/exit, we regard a per capita GDP as an indication of the market size.

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[13]Although we also have the information of wage per worker of multinational firms, the figures may not reflect the local wage level, because the amounts include the compensation of both Japanese workers and local workers. As the wage data of UNIDO does not fully cover the information of the whole years we investigate, we supplement the data sets by using the compensation cost data of *the Direct Investment Abroad* by U.S. BEA (Bureau of Economic Analysis).

5 Estimation Methodology and Results

5.1 Entry and Exit Decision

We analyze the entry and exit in a separate manner. The entry and exit information are based on the *Basic Survey of Overseas Business Activities*(METI), where we check the record of the first year and the last year of affiliates.[14] For exit information, we have to be careful whether they actually shut down or they just skipped reporting. Therefore, we cross-check with firms' list of foreign affiliates, published by Toyo Keizai Inc.

We index an entry of firm i into a new host country j at year t. Similarly, we denote an exit of firm i from the existing host country k at year t. We employ a standard Logit estimation, as in Chen and Moore (2010) and Tanaka (2014).

$$\text{Entry} \quad \Pr(\text{Entry}_{ijt} = 1) \quad = \quad \Lambda(\alpha + x'_{i,(t-1)}\beta + z'_{j,(t-1)}\gamma + \delta_j + \mu_t)$$

$$\text{Exit} \quad \Pr(\text{Exit}_{ikt} = 1) \quad = \quad \Lambda(\alpha + x'_{i,(t-1)}\beta + z'_{k,(t-1)}\gamma + \delta_k + \mu_t)$$

- Λ logistic cumulative distribution
- $X_{i,(t-1)}$ firm-level characteristics
    - length of foreign market experience
    - labor cost (weighted average)
    - trade cost (weighted average)
- $z_{j,(t-1)}$ host country characteristics (entry)
- $z_{k,(t-1)}$ divested country characteristics (exit)
    - rule of law
    - exchange rate control
    - trade openness
    - per capita GDP
    - foreign market potential (GDP/Distance)

As explanatory variables, first, we use firm-level information (experience, weighted labor cost, weighted trade cost of existing network). Second, we use country-level characteristics. In this paper, we avoid measuring TFP as the indication of firm heterogeneity. [15] Instead, we take firm-level market access (network) into account. This is another firm-level heterogeneity measure in terms of its geographical network. This method is compatible with the analytical framework, too. Figures 5 and 6 show the list of constructed or applied variable for our analysis. The foreign market potential is calculated in the same manner as Yeaple (2008) in order to compare the results.

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[14]When firms declares the year of establishment or closure, we primarily apply their reports. As for the affiliate-level information, we use the information of their location, industry, and operating status (entry, exit, and stay).

[15]One reason is due to the data availability, since the initial or last operational data of an affiliate are not accurately reported. It is then difficult to figure out the affiliate-level productivity. The second reason is the issue of endogeneity. The current firm-level productivity is crucially dependent on existing activities of affiliates. Then it becomes quite challenging to use the information as an explanatory variable.

Wage (Weighted Average)	Labor costs for foreign firms in each industry in each country
	1 Basic Survey of Overseas Business Activity
	(Total Compensation/Number of Employees, weighted average per industry)
	2 US BEA's Direct Investment Abroad (Total Compensation/Number of Employees)
	3 UNIDO's INDSTAT4 (Hourly Compensation Costs)
	Share of labor costs in total production cost in each industry
	US BEA's Direct Investment Abroad (Total Compensation/Total Value Added)
Trade Cost (Weighted Average)	1.CIF/FOI *Source: Venables and Limao (2001)
	IMF's Direction of Trade Statistics
	2.Fitted values for bilateral trade costs
	Regressed on "border dummies", "minimum distance", "infrastructure", "landlocked dummies"
	"Real GDP per capita" * Source: Venables and Limao (2001)
	Aggregate costs for each country are converted into country industry trade costs using industry weights
	from Bernard, Jensen, Schott (2003)

Figure 5: Constructed Variables for Estimation I

Local Market Size	Log per capita GDP in real US Dollars *Source World Bank's "World Development Indicators"
Foreign Market Potential	The sum of log GDP of all countries (including home) where affiliates of a parent MNE are located, each divided by the distance between the home and the host.
Fixed Plant Cost	Industry Specific Fixed Cost of Investment
	Basic Survey of Overseas Business Activity
	(Net Plant, Property, and Equipment for all affiliates/Total Number of Affiliates)
MNE Size in Number	Total Number of Foreign Affiliates in MNE Network
MNE Size in Sales	Log average sales of MNE across all its affiliates
Years of Experience in Markets Abroad	*Basic Survey of Overseas Business Activity (surveyed year-oldest initial year of affiliates per firm)
Incoming Entrants to Japan from the host	*Survey of Trends in Business Activities of Foreign Affiliates (number of foreign-owned Japanese affiliates) as a proxy for bilateral connection.
Trade Openness	*Source: Sachs and Warner (1995), Dollar and Krray (2002)

Figure 6: Constructed Variables for Estimation II

5.2 Results

Figure 7 shows the baseline results for entry decision. The logistic indicator variable is denoted to be 1 if there is an entry of an affiliate by a multinational firm.

First, we check whether a firm has already started its operation in China or in the U.S., and investigate whether the status shows any difference in its propensity to a new entry. Then we see that, both in service and in manufacturing, firms with existing affiliates in China are induced to decide a new entry. Next, the experience of overseas operation positively influences a new entry in services, but not so much in manufacturing. Third, a high wage cost of the new location deters the entry both in services and manufacturing. When costs of productions are likely to be high, multinational firms are discouraged to expand. Trade costs are also found as the negative factor, which is consistent with previous literature. Although a tariff-jumping bilateral effect (to promote entry) is observed in services, the effects are offset when we take their existing network into account. Lastly, the local market size is a positive factor to entry. In addition, the impact is larger in the service sector, since they sell non-tradable goods and are more conscious on local market demand. In the second and the fourth columns, we consider a "foreign market potential" in j as a measure of "centrality" introduced in Yeaple (2008).[16] The values of FMP_j increase as the surrounding economies have larger sizes of GDP and closer distances with k. This measurement is found to be significantly positive for manufacturing firms. In addition, we measure the interaction between country k and Japan by the number of companies from k operating in Japan. [17] We observe that both the market potential and the bilateral interaction are promoting manufacturing firms to enter markets abroad.

Figure 8, on the other hand, shows the analysis of exit (from the divested country), applying the same explanatory variables with those of entry decisions. We denote 1 if we can identify that the entity closes, and denote 0 otherwise. Here, we investigate whether the exit motivations show any contrast with the entry motivations. The existence of incumbent firms in China has a significant influence to promote an entry, and deter an exit in manufacturing. The years of firm experiences abroad would only promote a service entity to enter, but would significantly sustain operations for both services and manufacturing. Next, we observe the influence of labor costs and trade costs. To highlight the difference between bilateral and multilateral influence, we separate the relative cost to the incumbents abroad and relative cost to home. If the labor costs are higher than the incumbents, these affect the entrants, but not necessarily the exits. The relative trade

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[16]The foreign market potential of the country j is $FMP_j = \ln \left(\sum_{j \neq k} \frac{GDP^k}{DIST_{jk}} \right)$.

[17]We employ the information of *the Survey of Trends in Business Activities of Foreign Affiliates* (METI) for each country and industry level from 1996-2012.

Baseline Specification for Entry Decision
Logistic Regression Results for Location Decision
We focus on the investment to a new country (along with an entry), or divestment from an existing country (along with an exit)
*We drop tax haven countries (Panama, Liberia) from our analysis

Entry Decision	Services		Manufacturing	
Dependent Variable at Year T	1=Entry of an affiliate by MNE (i) in SERVICES 0=No entry move by MNE(excl. i) in SERVICES		1=Entry of an affiliate by MNE (i) in MANUFACTURING. 0=No entry move by MNE(excl. i) in MANUFACTURING	
Firm Level at Year T-1				
Existing HUBs in China	**0.38** **(0.11)*****		**0.56** **(0.21)*****	
in U.S.A.	0.54 (0.35)		0.23 (0.26)	
Years of Experiences in Market Abroad	**0.02** **(0.004)*****	0.016 (0.008)	0.03 (0.03)	0.04 (0.05)
Wage Cost (weighted average of incumbents' labor cost share.)	**-0.29** **(0.06)*****	**-0.30** **(0.07)*****	**-0.34** **(0.09)*****	0.2 (0.23)
Wage Cost (compared to home)	0.37 (0.35)	0.45 (0.80)	0.49 (0.33)	-0.55 (1.23)
Trade Cost (weighted average of incumbents' DISTANCE)	**-0.98** **(0.34)****		**-0.65** **(0.29)****	
Trade Cost (bilateral with home)	**1.03** **(0.23) ****		0.30 (0.56)	
Fixed Plant Cost (Log)	-0.002 (0.001)	-0.003 (0.001)**	-0.09 (0.20)	-0.13 (0.54)
Invested Host Countries at Year T-1				
Foreign Market Potential (Proxy for "Centrality")		0.23 (0.14)		**0.29** **(0.07)*****
Local Market Size (ln_PCGDP)	**0.61** **(0.14)*****	**0.99** **'(0.31)*****	**0.44** **(0.22)****	0.45 (0.34)
Trade Openness	-0.16 (0.19)		0.5 (0.38)	
Incoming Entrants to Japan from the Host		0.55 (0.31)		0.42 (0.23)**
Number of Obs.	11045	11045	23823	23823
Year Dummies	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	No
Industry Dummies	No	Yes	No	Yes
Pseudo R Square	0.17	0.2	0.19	0.14

Figure 7: Baseline Entry Analysis

costs, too, matter upon entry but would become a minor issue for exit. In contrast, fixed plant cost is not significant in entry decision, but it is significant for the service exit. Therefore, the firm-level explanatory factors (labor cost, trade cost, and fixed cost) affect differently for entry and exit.

In addition, we measure the country-level effect for newly invested or divested country. Home and home ties (measured by incoming entrants to Japan) are compatible with the tendency of foreign operation by Japanese firms. The local market size is known as the primary reason to promote entry, but we have identified that local market size does not matter much for the exit.

Baseline Specification for Exit Decision
Logistic Regression Results for Location Decision
We focus on the investment to a new country (along with an entry), or divestment from an existing country (along with an exit)
*We drop tax haven countries (Panama, Liberia) from our analysis

Exit Decision	Services		Manufacturing	
Dependent Variable at Year T	1=Exit of an affiliate by MNE (i) in SERVICES 0=No exit move by MNE(excl. i) in SERVICES		1=Exit of an affiliate by MNE (i) in MANUFACTURING. 0=No exit move by MNE(excl. i) in MANUFACTURING.	
Firm Level at Year T-1				
Existing HUBs				
in China	1.25 (0.98)		**-0.87** **(0.31)***	
in U.S.A.	0.34 (0.35)		0.65 (0.46)	
Years of Experiences in Market Abroad	**-0.34** **(0.06)***	**-0.30** **(0.08)***	**-1.95** **(0.86)**	**-1.43** **(0.59)***
Wage Cost (weighted average of incumbents' labor cost share.)	0.008 (0.043)	0.000 (0.009)	**0.67** **(0.19)***	**0.45** **(0.20)**
Wage Cost (compared to home)	0.98 (0.78)	1.03 (2.30)	0.59 (0.39)	0.33 (0.56)
Trade Cost (weighted average of incumbents' DISTANCE)	0.55 (0.38)		-0.23 -0.19	
Trade Cost (bilateral with home)	0.34 -0.23		0.35 (0.59)	
Fixed Plant Cost (Log)	**-0.009** **(0.001)***	**-0.005** **(0.001)***	-0.09 (0.49)	0.001 (0.003)
Divested Host Countries at Year T-1				
Foreign Market Potential (Proxy for "Centrality")		**-0.25** **(0.12)**		**-0.34** **(0.08)***
Local Market Size (ln PCGDP)	**-1.25** **(0.19)***	-0.80 (0.80)	0.32 (0.47)	0.65 (0.90)
Trade Openness	-0.21 (0.24)		0.9 (1.31)	
Incoming Entrants to Japan from the Host		-0.34 (0.23)		-0.40 '(0.19)**
Number of Obs.	11045	11045	23823	23823
Year Dummies	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	No
Industry Dummies	No	Yes	No	Yes
Pseudo R Square	0.05	0.2	0.16	0.14

Figure 8: Baseline Exit Analysis

Figure 9 shows the entry analysis by picking up more than 2 concurrent entry at more than 2 host countries. Since, in general, entries are unstable

or random event, we focus our attention to more robust (and selected) cases. (For this analysis, we pick up two largest entrants in sales volume.) Similar to Figure 7, we observe negative impact of trade costs on entry. We also see differences between services and manufacturing: the entry in service is influenced by local market size and Asia region dummy. The result seems natural considering the characteristics of the service sector.

Estimation including More than 2 concurrent Entry, in more than 2 countries
We pick up two largest affiliates in sales volume.

	Entry only Decision	
Dependent Variable at Year T	1=Entry of an affiliate by MNE (i) in SERVICES 0=No move by MNE(excl. i) in SERVICES	1=Entry of an affiliate by MNE (i) in MANUFACTURING 0=No move by MNE(excl. i) in MANUFACTURING
Firm Level at Year T-1		
Existing HUBs		
in China (1/0)	0.28	**0.13**
	(0.15)	**(0.03)***
in U.S.A.(1/0)	0.45	0.32
	(0.78)	(0.99)
Trade Cost (Weighted)	**-0.95**	**-0.85**
	(0.41)*	**(0.34)***
Invested Largest Host Countries at Year T-1		
Local Market Size	**0.045**	0.41
(ln_PCGDP)	**(0.01)***	(0.09)
Region Dummies Asia	**0.87**	0.93
(U.S. baseline)	**(0.34)***	(0.54)
Europe	0.43	0.43
	(0.43)	(0.29)
Invested Second Host Countries at Year T-1		
Local Market Size	**0.067**	0.07
(ln_PCGDP)	**(0.034)****	(0.13)
Region Dummies Asia	**0.05**	0.88
(U.S. baseline)	**(0.01)***	(0,74)
Europe	0.67	**0.54**
	(0.54)	**(0.17)***
Number of Obs.	11943	24332
Year Dummies	Yes	Yes
Country Dummies	No	No
Industry Dummies	No	No
Pseudo R Square	0.03	0.03

Figure 9: Analysis for Concurrent Entry

Figure 10, as in Figure 9, shows the exit analysis of concurrent cases. The results here seem straightforward in the sense that they are overall consistent with the entry analysis. When multinationals setup affiliates in large market or in Asia, they are more or less committed to the location. As for the hub country effects, the existence of manufacturing in China now works to maintain the other network, too.

To summarize, we focus on firms' existing hub-spokes networks before the entry/exit occurs, in addition to other geographical factors. We compare services and manufacturing. The former has non-tradable inputs, which should deter export/import compared to manufacturing.

First, we find that the existing hub in China promotes an entry of services and manufacturing. The manufacturing affiliates are especially less likely to exit. The effect of hub in the U.S. is, however, inconclusive. Second, the high weighted average of trade costs among incumbents significantly discourages

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Estimation including More than 2 concurrent Exit, in more than 2 countries
We pick up two largest affiliates in sales volume.

Dependent Variable at Year T	Exit only Decision	
	1=Exit of an affiliate by MNE (i) in SERVICES 0=No move by MNE(excl. i) in SERVICES	1=Exit of an affiliates by MNE (i) in MANUFACTURING. 0=No move by MNE(excl. i) in MANUFACTURING.
Firm Level at Year T-1		
Existing HUBs		
in China (1/0)	0.54	**-0.82**
	(0.32)	**(0.33)***
in U.S.A.(1/0)	0.23	-0.43
	(0.33)	(0.54)
Trade Cost (Weighted)	0.24	**0.09**
	(0.23)	**(0.02)***
Divested Largest Host Countries at Year T-1		
Local Market Size	**-1.22**	0.43
(ln PCGDP)	**(0.22)***	(0.25)
Region Dummies Asia	**-0.56**	-0.35
(U.S. baseline)	**(0.23)**	(0.30)
Europe	**-0.12**	-0.02
	(0.04)	(0.03)
Divested Second Host Countries at Year T-1		
Local Market Size	**-0.04**	**-0.009**
(ln PCGDP)	**(0.02)**	**(0.004)***
Region Dummies Asia	**-0.003**	**-0.45**
(U.S. baseline)	**(0.001)**	**(0.19)**
Europe	0.001	0.05
	-0.001	(0.04)
Number of Obs.	12067	25001
Year Dummies	Yes	Yes
Country Dummies	No	No
Industry Dummies	No	No
Pseudo R Square	0.03	0.05

Figure 10: Analysis for Concurrent Exit

a new entry of service/manufacturing. In addition, we observe that the weighted cost among the existing foreign locations is more influential than the bilateral trade costs. Third, a large local market does encourage entry, and discourages exit. The influences are more significant in services than in manufacturing. Lastly, Asian region dummies are significantly positive for new entries. This may be because the large demand (market sizes) is enriching hubs-spokes relations.

6 Conclusion

In this paper, we consider how the existing overseas network of a firm affects the subsequent entry and exit decisions. This question is motivated in part by the desire to determine how efficiently Japanese MNE's have been expanding, as we have observed concurrent entry and exit of the same firm quite often. If the regression analyses of entry and exit are balanced, this would be viewed as an efficient relocation. Otherwise, it is important to identify the sources of distortion (failure).

We discuss the entry and exit of Japanese-owned foreign affiliates for the 15-year period: 1997-2012. For an analytical framework, we employ a partial equilibrium model to treat hub-spoke interdependence. We compare

entry and exit, for both services and manufacturing firms.

We find that the effects of corporate-level existing networks are significant, but the effects work in a different manner from previous research. First, the weighted trade costs from existing locations are more important factors than the bilateral (home-host) trade costs. The higher weighted costs significantly deter an entry for both manufacturing and services. This means that the farther the distance from the existing network, the less frequent the new entry occurs. Second, we see that the entry and exit are not mirror images of each other.[18]. Overall, the neighborhood effects work less in exits than they do in entries. By our analysis, the exit for relocation (comparing multiple existing locations) seems unlikely to happen.[19] Third, we compare the service and the manufacturing. Specifically, we find that the manufacturing hub in China induces an entry, and also prevents an exit, though this is not as evident for services. Instead, the service industries are heavily influenced by the local market size (at spokes) where their affiliates operate.

The extension we can work on in the near future is to incorporate the trade flow to a third party, where the parent firm does not have any preceding contacts. In this paper, we view that a firm has a transaction network only where it has at least one affiliate. But it becomes more realistic if we include arm's-length transactions.

The recent papers also put a high emphasis on multi-country FDI (or Multinational Production) model and solve long-run effects (including welfare effects) through some general equilibrium models. Tintelnot (2014) uses the firm-level data of German multinational firms. He estimates the variable efficiency losses to foreign production and the increasing returns at the plant-level and suggests that the characterization of multinationals as footloose is inaccurate. The differences in variable production costs and in fixed costs of establishing foreign plants both turn out to be important barriers to foreign production for German multinational firms.

Ramondo et. al. (2013), Arkolakis et.al. (2013) do superb research that deal with both trade and multinational production at the same time. They quantify, with some calibrated terms, the substitutable and complementary aspects of trade flows and capital flows (foreign direct investments and production of multinationals). Since their research present the corporate behavior in the aggregate manner by the general equilibrium model, we can contribute to their research by adding the micro-level evidence.

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[18]By a mirror-image, we mean an explanatory factor that works in an opposite direction of similar magnitude for entries and exits

[19]In an relocation, an exit induces an entry, and both activities share some same explanatory factors to do so.

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