The Effects of FDI on Domestic Workers: Firm-level Evidence from Japan

Ayumu Tanaka[†]

May 11, 2012

Abstract

Based on propensity score matching techniques, this paper examines the effects at home of starting foreign direct investment (FDI). The analysis covers manufacturing and services firms in Japan during the period 2001–2008. Japanese FDI starters have experienced higher growth of labor in both manufacturing and services sectors and higher growth of the share of non-regular workers in manufacturing than do non-multinational enterprises (MNEs). At the same time, they also have experienced higher growth of overall and exports sales in most cases. These results suggest that foreign affiliates tend to play a complementary role for their parent firms.

Keywords: foreign direct investment; multinationals; propensity score matching; services; non-regular workers
JEL Classification: F16, F21, F23

[†]Fellow, Research Institute of Economy, Trade and Industry (RIETI).
E-mail: tanaka-ayumu<at>rieti.go.jp, Tel: +81-3-3501-8577
Adress: RIETI, 1-3-1, Kasumigaseki Chiyoda-ku, Tokyo, 100-8901 JAPAN

1 Introduction

Increasing number of Japanese firms became multinational enterprises (MNEs) through foreign direct investment (FDI). The public and policy makers fear that relocation of activities to foreign countries will reduce domestic employment in the firms that invest abroad.

Previous studies already have examined the link between starting FDI and employment at home.[*1] The contribution of this paper to the literature is threefold. First, this paper analyzes the effects of FDI on the growth of share of non-regular workers. Non-regular workers can be relatively easily hired and fired by firms. They, therefore, may play an important role for FDI starters facing rapid change in their sales.

Second, this paper covers not only manufacturing sector but also services sector. As Hijzen et al. (2011) pointed out, the evidence on the effects of FDI by firms in services sector is scanter, although the FDI by them has become more important in recent years.

Third, this paper employ hours worked as firm-level measure of employment rather than the number of workers used by previous studies including Edamura et al. (2011). By so doing, this paper can estimate more precise impacts of FDI on employment at home than previous studies because hours worked substantially vary across types of workers.

Against the public fear, this paper provides econometric evidence that activities in foreign countries increase domestic employment in the parent firms that started FDI relative to firms that remained national. This tendency can be explained by the facts that FDI starters have experienced remarkably higher growth of exports and overall sales than non-MNEs. Facing rapid increase in overall and exports sales, FDI starters in manufacturing also have experienced higher growth of share of non-regular workers. These results suggest that foreign activities are positively associated with parent firms' activities at home, presumably reflecting the importance of parent firms activities as intermediate inputs for their foreign affiliates. In other words, the results suggest that activities of foreign affiliates tend to play a complementary role for their parent firms at home.

The remainder of this paper is divided into six sections. In Section 2, I introduce my empirical strategy. In Section 3, I briefly describe the data and variables used in this paper and present descriptive statistics of the data. In Section 4, I present the estimation result of firms' decisions to start FDI. In

[*1] Recent studies include Castellani et al. (2008) for Italian firms, Debaere et al. (2010) for South Korean firms, Edamura et al. (2011) for Japanese firms, Hijzen et al. (2011) for French firms, and Wagner (2011) for German firms.

Section 5, I report the causal effects of FDI. The summary and conclusion are presented in the final section.

2 Empirical strategy: propensity score matching

To evaluate the causal effects of FDI on the growth of labor and the growth of the share of non-regular workers as well as the growth of overall and export sales, I use propensity score matching. Many previous studies in trade literature have employed this technique, including Wagner (2011) and Hijzen et al. (2011).

The causal effects of firm i's FDI on the outcome variables, Δy, can be written as follows:

$$\Delta y^1_{i,t+s} - \Delta y^0_{i,t+s} \tag{1}$$

where y are log of sales, log of exports, log of labor, and the share of non-regular workers in my analysis. Superscript 0 refers to the non-treatment (non-MNEs) case, and 1 refers to the treatment (switching to MNEs) case. t is the year of switching.

The fundamental problem of the causal inference is that $\Delta y^0_{i,t+s}$ is unobservable. I adopt propensity score matching techniques to construct an appropriate counterfactual that can be used instead of $\Delta y^0_{i,t+s}$. Using such techniques, I examine the average effect of treatment on the treated (ATT) as

$$\begin{aligned} \delta &= E(\Delta y^1_{i,t+s} - \Delta y^0_{i,t+s} | D_{it} = 1) \\ &= E(\Delta y^1_{i,t+s} | D_{it} = 1) - E(\Delta y^0_{i,t+s} | D_{it} = 1), \end{aligned} \tag{2}$$

where D_{it} indicates whether firm i started FDI for the first time in year t. Using propensity score matching techniques, I construct the counterfactual for the last term, $E(\Delta y^0_{i,t+s} | D_{it} = 1)$.

To construct the counterfactual, I first estimate the propensity score to start FDI. Then, firms are matched with several matching methods. In the case of the nearest-neighbor (one-to-one) matching method with replacement, the non-MNEs $c(i)$ that has the closest propensity score to start FDI is selected for each switcher i as follows:

$$c(i) = \min_{j \in \{D_{jt}=0\}} ||\hat{P}_{it} - \hat{P}_{jt}||. \tag{3}$$

Firms are matched separately for each year and each two-digit industry. After constructing the control group by this matching, the ATT is estimated.

Table 1: Firm types in Japan (2003–2005 cohorts)

	Non-MNEs	Switcher	MNEs	Others	Total
Agriculture, etc.	80	2	22	8	112
Manufacturing	19,647	292	5,139	2,034	27,112
Services	21,950	143	2,095	1,377	25,565
Total	41,677	437	7,256	3,419	52,789

Notes: The number of firms are based on three years panel of cohort of treated and control firms from Japanese firms' panel data for the period 2001–2008. Switchers are defined by firms that started FDI during 2003–2005. Non-MNEs are firms that did not have foreign affiliates during the all 6 years, $[t-2, t+3]$, while MNEs are firms that have foreign affiliates during the all 6 years.

3 Data

I use firm-level data from *the Basic Survey of Japanese Business Structure and Activities* (BSJBSA) by the Japanese Ministry of Economy, Trade, and Industry (METI). In this study, I refer to this survey as "the METI survey." The survey covers both manufacturing and non-manufacturing industries. The targets of the METI survey are firms with more than 50 employees and more than 30 million yen in capital. The survey, therefore, excludes small firms. Nevertheless, it is the most comprehensive survey available for the purposes of my study, and it has been used by many studies including Nishimura et al. (2005), Kimura and Kiyota (2006), and Wakasugi et al. (2008).

3.1 Panel of cohort

Following Hijzen et al. (2011), I construct a three-year panel of cohort of switchers (i.e., firms that start FDI) and non-switchers from Japanese firms' panel data for the period of 2001 to 2008. Cohorts are defined as six-year windows, $[t-2, t+3]$, where t is the year in which non-MNEs may start FDI. In my data, the switch year t is in the range $[2003, 2005]$. I impose the condition that within a six-year window the panel is balanced.

Table 1 reports the total number of non-MNEs, switchers, and MNEs in my data. Switchers are firms that started FDI between 2003 and 2005. Non-MNEs are firms that did not have a foreign subsidiary during any of the six years, $[t-2, t+3]$, while MNEs are firms that have a foreign subsidiary during all six years.

Table 2: Country average of wage and hours worked in Japan (2008)

	(A) wage per hour	(B) hours worked per year	(B) / 260 days hours worked per day
Regular worker	2,712.1	1,995.1	7.7
Part-time worker	1,082.0	1,167.1	4.5
Dispatched worker	1,290.0	1,829.5	7.0

Notes: The data on regular and part-time workers are from the *Monthly Labour Survey*, while the data on dispatched workers are from the *General Survey on Dispatched Workers*.

MNEs and switchers are prevalent in manufacturing and services sectors. I therefore restrict my analysis to these two sectors. My data set includes a total of 292 switchers in manufacturing and 143 in services.

3.2 Labor variables

In Japan, firms can employ three types of workers: (i) regular workers, (ii) part-time workers, and (iii) dispatched workers.[*2] The wages of and hours worked by these three types of workers differ substantially. Table 2 reports the country average wage and hours worked of the three types of workers. It shows that regular workers work for longer hours than do part-time or dispatched workers and obtain more than twice the hourly wages. The difference between part-time and dispatched workers is that dispatched workers work for much longer hours than part-time workers. Regular workers, in turn, work for longer hours than dispatched workers.

I use total hours worked by all types of workers in Japan as a firm-level measure of labor, L. Labor does not include hours worked by employees in foreign affiliates. I use hours worked rather than the number of workers because hours worked vary substantially across the three types of workers.

I define the firm-level total hours worked (L) as the number of each type of workers multiplied by its average yearly hours worked as follows:

$$L = N_r \times H_r + N_p \times H_p + N_d \times H_d, \tag{4}$$

where N and H are the number of workers and the yearly total hours worked, respectively. The subscripts r, p, and d indicate regular, part-time, and dispatched workers, respectively. The industry average yearly hours worked for regular employees and part-time workers are provided by the Japanese

[*2] See Asano et al. (2011) for more detailed explanation.

Table 3: Descriptive statistics of labor variables in manufacturing (2005)

		W_r (yen)	L	$NONREGR$ (%)	$DISPATCHR$ (%)	$PARTR$ (%)
Non-MNEs	Mean	2907.0	460608.3	12.6	5.2	7.5
	SD	1251.6	840245.5	15.5	9.6	12.9
	N	6499	6550	6550	6550	6550
Switcher	Mean	3081.1	867234.6	14.4	8.4	6.0
	SD	1268.5	968941.9	14.6	11.6	8.5
	N	88	88	88	88	88
MNEs	Mean	3530.3	2822935.0	11.4	6.0	5.5
	SD	1360.0	8167912.0	11.5	8.5	8.8
	N	1744	1789	1789	1789	1789
Others	Mean	3243.8	944600.1	12.6	5.8	6.8
	SD	1320.7	2194436.0	14.4	9.5	11.3
	N	637	648	648	648	648
Total	Mean	3053.8	964808.1	12.4	5.4	7.0
	SD	1302.5	3856445.0	14.8	9.4	12.1
	N	8968	9075	9075	9075	9075

Ministry of Health, Labor and Welfare's *Monthly Labor Survey*, while the country average hours worked for dispatched workers are calculated as yearly wage divided by hourly wage, both of which are taken from the Ministry's *General Survey on Dispatched Workers*.

Tables 3 and 4 present the descriptive statistics of wage, labor, and workforce composition in manufacturing and services for 2005. $NONREGR$, $DISPATCHR$, and $PARTR$ are defined as

$$\begin{aligned} NONREGR &= \frac{N_p \times H_p + N_d \times H_d}{L} \times 100, \\ DISPATCHR &= \frac{N_d \times H_d}{L} \times 100, \text{ and} \\ PARTR &= \frac{N_p \times H_p}{L} \times 100, \end{aligned} \tag{5}$$

respectively. Assuming that both part-time and dispatched workers' wages are determined by the labor market outside any individual firm,[*3] I construct

[*3]This assumption is plausible, but it is well known that the hourly wages of part-time

Table 4: Descriptive statistics of labor variables in services (2005)

		W_r (yen)	L	$NONREGR$ (%)	$DISPATCHR$ (%)	$PARTR$ (%)
Non-MNEs	Mean	2734.7	652922.7	14.8	2.6	12.3
	SD	989.1	1373292.0	20.5	6.8	20.2
	N	7350	7383	7383	7383	7383
Switcher	Mean	2976.0	940987.4	9.9	2.6	7.2
	SD	1037.6	1744317.0	16.4	3.8	16.8
	N	42	42	42	42	42
MNEs	Mean	3410.0	2449430.0	10.6	4.1	6.5
	SD	1095.1	7396605.0	14.3	6.5	13.8
	N	724	734	734	734	734
Others	Mean	3085.4	2142464.0	15.7	4.2	11.5
	SD	1107.6	7939118.0	21.7	9.0	21.2
	N	451	457	457	457	457
Total	Mean	2811.4	886378.5	14.5	2.8	11.7
	SD	1024.5	3155981.0	20.1	6.9	19.8
	N	8567	8616	8616	8616	8616

the firm-level hourly real wage of regular workers, W_r, as follows:

$$W_r = \frac{WC - N_p \times H_p \times W_p}{N_r \times H_r} \tag{6}$$

where WC is the real wage cost of a firm from the METI survey and W_p is the industry average hourly real wage of part-time workers from the *Monthly Labor Survey*. WC only includes the real wage cost of regular and part-time workers.[*4]

In both sectors, wage of regular workers is on average highest in MNEs, followed by switchers. The wage is lowest in non-MNEs. Similarly, MNEs are on average the largest in terms of labor, switchers are the second largest, and non-MNEs are the smallest. Both results are consistent with the firm heterogeneity model of FDI but do not imply the causal effects of FDI on wage and labor.

As for the share of non-regular workers, the standard deviation is too large to determine any ordering, but on average, the share of dispatched workers is lower and share of part-time workers is higher in non-MNEs than in switchers and MNEs in both sectors. This tendency results in a higher average share of non-regular workers in non-MNEs than in switchers and MNEs.

3.3 The measurement of firm productivity

Next, I explain the measure of total factor productivity (TFP) used later in this study. I obtain Japanese parent firms' TFP from an estimated two-digit industry-specific production function, using techniques from Levinsohn and Petrin (2003). I use transportation and package costs to proxy unobserved productivity shocks.[*5] For output, I use Japanese parent firms' real value added, which is deflated using the industry-level deflator. The value added in my data reflects a parent firm's domestic and export sales but not foreign affiliates' sales in host countries. I employ Japanese parent firms' hours worked (L) and fixed tangible assets (K) as inputs.

Following Arnold and Hussinger (2010), I use the relative TFP obtained by dividing the TFP estimates by the average TFP in the corresponding industry and year because I use TFP from various industries.

---

workers vary across regions in Japan. I, however, cannot control this region-effect because of a lack of the data.

[*4]Wages and wage cost are deflated by the industry deflator, which is taken from the Cabinet Office's *System of National Accounts (SNA) Statistics*.

[*5]My data do not contain the costs of electricity or materials or fuels.

4 Decision to start FDI

To construct the control group, I estimate the propensity score to start FDI using a sample of non-MNEs and switchers:

$$\begin{aligned} P(D_{it}=1) &= F(\ln TFP_{i,t-2}, \ln L_{i,t-2}, \ln KAPINT_{i,t-2}, \\ &\quad RDINT_{i,t-2}, \ln AGE_{i,t-2}, FOREIGN_{i,t-2}, \\ &\quad \ln EXPORTS_{i,t-2}, year, industry), \end{aligned} \tag{7}$$

where F is a logistic cumulative distribution function. TFP, L, $KAPINT$, $RDINT$, AGE, $FOREIGN$, and $EXPORTS$ are total factor productivity, labor, capital intensity (capital-labor ratio), R&D intensity (R&D-sales ratio), firm age, share of foreign owners in stock, and export sales, respectively. *year* and *industry* are year and industry fixed effects. The choice of explanatory variables follows from previous studies such as Hijzen et al. (2007) and Ito (2007). Table 5 shows the estimation result of equation (7).

In both manufacturing and wholesale, R&D intensity and exports sales have large impacts on the decision to start exporting. As for productivity, the positive coefficients on TFP are statistically significant in services,[*6] but not in manufacturing against the standard firm heterogeneity model. The insignificant coefficient of TFP in manufacturing is surprising, but it can be interpreted that R&D intensity reflect the technological advantage required for exporting.

In manufacturing, the firm size, measured as labor, capital-labor ratio, and firm age have positive coefficients. This result suggests that larger, capital-intensive, older firms are more likely to start FDI in manufacturing sectors.

[*6] This result is consistent with Tanaka (2010).

Table 5: Decision to start FDI

	(1) Manufacturing	(1) Services
ln TFP (t-2)	0.002	0.521***
	[0.144]	[0.191]
ln L (t-2)	0.672***	-0.056
	[0.172]	[0.209]
ln KAPINT (t-2)	0.174**	0.059
	[0.071]	[0.065]
RDINT (t-2)	7.040***	4.493***
	[2.361]	[1.312]
ln Age (t-2)	0.237*	-0.036
	[0.127]	[0.181]
FOREIGN (t-2)	-0.853**	-0.966
	[0.427]	[0.686]
ln Exports (t-2)	0.191***	0.272***
	[0.026]	[0.038]
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	18485	16416
Pseudo-R-squared	0.119	0.114

Notes: Standard errors are shown in brackets. Constants are suppressed. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

5 Causal effects of FDI

Constructing the counterfactual based on an estimated propensity score, I examine the causal effects of FDI. Here, I present the results from the one neighbor matching only but results from other matching, including three nearest neighbors matching and the kernel matching, are reported in Tables 10–15 of the Appendix 2.

The balancing property is satisfied for all matching. Namely, the difference in means of the variables used to compute the propensity score is never statistically significant between the FDI starters and the matched non-starters. The common support condition is imposed by dropping the FDI starters whose propensity score is higher than the maximum or lower than the minimum propensity score of the non-FDI starters.

Tables 6 and 7 report the results in manufacturing and services, respectively. First, in manufacturing, FDI starters have experienced significantly higher growth of labor at home and higher growth of overall sales after starting FDI than firms that remained national. They, on average, have experienced 8.6% higher growth of labor and 6.1% higher growth of overall sales three years after starting FDI, relative to non-MNEs.

At the same time, they have experienced extremely large impacts of FDI on their growth of exports sales. The three-years-after average impact of starting FDI on the growth of exports sales is 130.7%. This large increase in the growth of exports sales is accompanied by the increase in the growth of the share of dispatched workers. The three-years-after average impact of starting FDI on the growth of the share of dispatched workers is around 1.7%. This average impact is large enough because the average share of dispatched workers in manufacturing in 2005 is just 5.4%. The impact of FDI on the growth of the share of part-time workers, on the other hand, is insignificant. These results imply that first-time investors in manufacturing have strong incentive to employ temporary workers that can work for longer hours.

Second, in services, the first-time investors have experienced higher growth of labor and higher growth of exports sales. The average effect of starting FDI on the growth of labor and the growth of exports sales is 9.3% and 35.3%, respectively, three years after investing. The average effects of FDI on the growth of overall and exports sales are insignificant in some cases of one-nearest neighbor matching but significant in all cases of three-nearest neighbors and kernel matching reported in Table 13–15 of the Appendix 2. The average effects of starting FDI on the share of non-regular workers are insignificant in services.

To summarize, for Japanese parent firms in manufacturing and services, I find complementary relationship between foreign affiliates and parent firms at home in the sense that starting FDI increases the growth of sales and growth of labor at home after investing. There is no evidence for negative effect of starting FDI on parent firms' employment and sales at home in both manufacturing and services sectors.

Table 6: The causal effect of FDI in manufacturing: one nearest neighbour matching

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.220	0.176	0.044	1.90	*	1.80	*	Yes
	t+2	0.303	0.244	0.058	2.16	**	2.64	**	Yes
	t+3	0.360	0.299	0.061	1.78	*	1.53		Yes
ln Exports	t+1	0.930	0.045	0.885	5.87	**	4.17	**	Yes
	t+2	1.184	0.103	1.081	6.73	**	4.66	**	Yes
	t+3	1.371	0.064	1.307	7.32	**	4.21	**	Yes
ln Labor	t+1	0.103	0.037	0.066	3.84	**	3.19	**	Yes
	t+2	0.141	0.061	0.080	4.21	**	3.79	**	Yes
	t+3	0.139	0.052	0.086	3.78	**	3.32	**	Yes
Share of dispatched workers	t+1	2.518	0.799	1.718	2.56	**	2.84	**	Yes
	t+2	2.968	1.059	1.909	2.58	**	2.71	**	Yes
	t+3	2.213	0.520	1.692	2.14	**	1.65		Yes
Share of part-time workers	t+1	-0.109	0.080	-0.189	-0.26		-0.24		Yes
	t+2	-0.094	0.025	-0.118	-0.18		-0.14		Yes
	t+3	-0.079	0.842	-0.921	-1.31		-1.12		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 287. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 7: The causal effect of FDI in services: one nearest neighbour matching

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.125	0.090	0.035	1.12		0.62		Yes
	t+2	0.162	0.118	0.044	1.19		0.71		Yes
	t+3	0.161	0.139	0.022	0.52		0.32		Yes
ln Exports	t+1	0.553	0.171	0.381	1.63		1.87	*	Yes
	t+2	0.589	0.159	0.430	1.73	*	1.52		Yes
	t+3	0.471	0.118	0.353	1.40		1.04		Yes
ln Labor	t+1	0.064	0.009	0.056	1.83	*	1.56		Yes
	t+2	0.111	0.010	0.101	3.02	**	2.89	**	Yes
	t+3	0.138	0.045	0.093	2.58	**	2.03	**	Yes
Share of dispatched workers	t+1	0.616	0.590	0.026	0.06		0.03		Yes
	t+2	1.055	0.541	0.513	1.05		0.68		Yes
	t+3	0.621	1.031	-0.410	-0.67		-0.43		Yes
Share of part-time workers	t+1	0.158	-0.656	0.814	0.95		0.72		Yes
	t+2	-0.120	-0.961	0.840	0.64		0.43		Yes
	t+3	0.956	0.073	0.883	0.79		0.59		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from t-1 in the variables (percentage) for the shares. The number of treated firms are 141. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. ** and * indicate significance at the 5% and 10% levels, respectively.

6 Conclusion

This study investigates the causal effects of the first-time FDI on parent firms at home, using extensive Japanese firm-level data. I employ a propensity score matching technique and find complementary relationship between foreign affiliates and their parent firms at home, against public concerns about relocation. Specifically, Japanese parent firms that open affiliates in foreign countries have experienced higher growth of labor in both manufacturing and services sectors and higher growth of the share of dispatched workers in manufacturing than national firms that do not. In addition, FDI starters also have experienced higher growth of overall sales and extremely higher growth of export sales in most cases. These results suggest that foreign affiliates tend to play a complementary role for their parent firms.

Acknowledgments

I thank Eiichi Tomiura and Ryuhei Wakasugi and other participants in a workshop in Yokohama for their helpful comments. I gratefully acknowledge the financial support from the Japan Society for the Promotion of Science's Grants-in-Aid for Scientific Research (No. 22830134).

References

[1] Arnold, Jens M. and Katrin Hussinger. (2010) "Exports versus FDI in German Manufacturing: Firm Performance and Participation in International Markets," *Review of International Economics*, 18(4): 595–606.

[2] Asano, Hirokatsu, Takahiro Ito, and Daiji Kawaguchi. (2011) "Why Has the Fraction of Contingent Workers Increased? A Case Study of Japan," *RIETI Discussion Paper Series*, No. 11-E-021.

[3] Castellani, Davide, Ilaria Mariotti, and Lucia Piscitello. (2008) "The Impact of Outward Investments on Parent Company's Employment and Skill Composition: Evidence From the Italian Case," *Structural Change and Economic Dynamics*, 19: 81–94.

[4] Debaere, Peter, Hongshik Lee, and Joonhyung Lee. (2010) "It Matters Where You Go: Outward Foreign Direct Investment and Multinational Employment Growth at Home," *Journal of Development Economics* 91: 301–309.

[5] Edamura, Kazuma, Laura Hering, Tomohiko Inui, and Sandra Poncet. (2011) "The Overseas Subsidiary Activities and Their Impact on the Performance of Japanese Parent Firms," *RIETI Discussion Paper Series*, No.11-E-069.

[6] Hijzen, Alexander, Tomohiko Inui, and Yasuyuki Todo. (2007) "The Effects of Multinational Production on Domestic Performance: Evidence from Japanese firms," *RIETI Discussion Paper*, No. 07-E-006.

[7] Hijzen, Alexander, Sébastien Jean, and Thierry Mayer. (2011) "The Effects at Home of Initiating Production Abroad: Evidence from Matched French Firms," *Review of World Economics*, 147:457–483.

[8] Ito, Yukiko. (2007) "Choice for FDI and Post-FDI Productivity," *RIETI Discussion Paper Series*, No.07-E-049.

[9] Kimura, Fukunari and Kozo Kiyota. (2006) "Exports, FDI, and Productivity of Firm: Dynamic Evidence from Japanese Firms." *Review of World Economics*, 142(4): 695-719.

[10] Nishimura, Kiyohiko G., Takanobu Nakajima and Kozo Kiyota. (2005) "Does the Natural Selection Mechanism still Work in Severe Recessions?: Examination of the Japanese Economy in the 1990s," *Journal of Economic Behavior & Organization*, 58(1): 53–78.

[11] Tanaka, Ayumu. (2011) "Multinationals in the Services and Manufacturing Sectors: A Firm-level Analysis using Japanese Data," *RIETI Discussion Paper Series*, No.11-E-059, July 2011.

[12] Wagner, Joachim. (2011) "Offshoring and Firm Performance: Self-selection, Effects on Performance, or Both?," *Review of World Economics*, 147:217–247.

[13] Wakasugi, Ryuhei, Yasuyuki Todo, Hitoshi Sato, Shuichiro Nishioka, Toshiyuki Matsuura, Banri Ito, and Ayumu Tanaka. (2008) "Internationalization of Japanese Firms: New Findings Based on Firm-Level Data," *RIETI Discussion Paper*, 08-E-036.

Appendix 1: descriptive statistics for logit estimation

Table 8: Descriptive statistics for logit estimation in manufacturing (2003-2005)

variable	mean	sd	N	min	max
FDI starters dummy	0.015	0.121	19637	0.000	1.000
ln TFP (t-2)	-1.304	1.008	19637	-7.315	3.669
ln L (t-2)	12.607	0.743	19637	11.316	17.218
ln KAPINT (t-2)	-5.731	1.110	19637	-14.780	-0.669
RDINT (t-2)	0.007	0.018	19637	0.000	0.593
ln Age (t-2)	3.531	0.619	19637	0.000	4.625
FOREIGN (t-2)	0.020	0.138	19637	0.000	1.000
ln Exports (t-2)	0.799	1.948	19637	0.000	11.712

Table 9: Descriptive statistics for logit estimation in services (2003-2005)

variable	mean	sd	N	min	max
FDI starters dummy	0.006	0.080	21721	0.000	1.000
ln TFP (t-2)	-0.975	1.042	21721	-6.590	4.634
ln L (t-2)	12.755	0.909	21721	11.183	17.704
ln KAPINT (t-2)	-6.236	1.785	21721	-14.157	0.043
RDINT (t-2)	0.001	0.012	21721	0.000	1.005
ln Age (t-2)	3.409	0.658	21721	0.000	4.654
FOREIGN (t-2)	0.016	0.125	21721	0.000	1.000
ln Exports (t-2)	0.330	1.322	21721	0.000	13.278

Appendix 2: causale effects of FDI

Table 10: The causal effect of FDI in manufacturing: three nearest neighbours matching

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.220	0.188	0.032	1.61		1.49		Yes
	t+2	0.303	0.260	0.043	1.83	*	1.76	*	Yes
	t+3	0.360	0.316	0.044	1.52		1.47		Yes
ln Exports	t+1	0.930	0.138	0.792	6.07	**	4.92	**	Yes
	t+2	1.184	0.163	1.021	7.04	**	5.22	**	Yes
	t+3	1.371	0.116	1.255	7.81	**	4.95	**	Yes
ln Labor	t+1	0.103	0.031	0.072	5.05	**	3.43	**	Yes
	t+2	0.141	0.053	0.088	5.51	**	4.03	**	Yes
	t+3	0.139	0.049	0.090	4.70	**	3.71	**	Yes
Share of dispatched workers	t+1	2.518	0.885	1.633	3.04	**	2.54	**	Yes
	t+2	2.968	1.310	1.658	2.64	**	2.75	**	Yes
	t+3	2.213	0.964	1.248	1.93	*	1.66	*	Yes
Share of part-time workers	t+1	-0.109	0.391	-0.501	-0.94		-0.69		Yes
	t+2	-0.094	0.487	-0.581	-1.11		-0.71		Yes
	t+3	-0.079	0.846	-0.925	-1.72	*	-1.43		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 287. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 11: The causal effect of FDI in manufacturing: kernel matching (bwith = 0.01)

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.220	0.160	0.060	3.39	**	2.97	**	Yes
	t+2	0.303	0.236	0.067	3.23	**	3.84	**	Yes
	t+3	0.360	0.284	0.076	2.97	**	3.68	**	Yes
ln Exports	t+1	0.930	0.062	0.867	7.12	**	7.08	**	Yes
	t+2	1.184	0.082	1.102	8.20	**	8.38	**	Yes
	t+3	1.371	0.075	1.297	8.79	**	8.49	**	Yes
ln Labor	t+1	0.103	0.035	0.068	5.38	**	5.33	**	Yes
	t+2	0.141	0.057	0.084	5.93	**	5.16	**	Yes
	t+3	0.139	0.045	0.094	5.51	**	5.20	**	Yes
Share of dispatched workers	t+1	2.518	1.428	1.089	2.30	**	2.32	**	Yes
	t+2	2.968	2.042	0.926	1.68	*	1.76	*	Yes
	t+3	2.213	1.471	0.741	1.31		1.59		Yes
Share of part-time workers	t+1	-0.109	0.177	-0.287	-0.60		-0.79		Yes
	t+2	-0.094	0.415	-0.509	-1.07		-1.00		Yes
	t+3	-0.079	0.681	-0.760	-1.58		-1.44		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 287. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. Kernel matching uses the Epanechnikov kernel. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 12: The causal effect of FDI in manufacturing: kernel matching (bwith = 0.03)

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.220	0.154	0.066	3.76	**	3.29	**	Yes
	t+2	0.303	0.226	0.076	3.70	**	4.11	**	Yes
	t+3	0.360	0.273	0.087	3.44	**	4.04	**	Yes
ln Exports	t+1	0.930	0.055	0.874	7.19	**	7.42	**	Yes
	t+2	1.184	0.071	1.113	8.29	**	8.32	**	Yes
	t+3	1.371	0.069	1.303	8.85	**	9.40	**	Yes
ln Labor	t+1	0.103	0.033	0.070	5.57	**	5.56	**	Yes
	t+2	0.141	0.053	0.089	6.28	**	5.30	**	Yes
	t+3	0.139	0.040	0.099	5.85	**	5.74	**	Yes
Share of dispatched workers	t+1	2.518	1.386	1.132	2.40	**	2.37	**	Yes
	t+2	2.968	1.968	1.000	1.82	*	1.85	*	Yes
	t+3	2.213	1.452	0.761	1.35		1.94	*	Yes
Share of part-time workers	t+1	-0.109	0.200	-0.309	-0.65		-0.91		Yes
	t+2	-0.094	0.459	-0.553	-1.17		-1.11		Yes
	t+3	-0.079	0.784	-0.863	-1.81	*	-1.64		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 287. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. Kernel matching uses the Epanechnikov kernel. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 13: The causal effect of FDI in services: three nearest neighbours matching

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.125	0.079	0.046	1.76	*	0.93		Yes
	t+2	0.162	0.101	0.061	2.05	**	1.19		Yes
	t+3	0.161	0.104	0.057	1.66	*	1.11		Yes
ln Exports	t+1	0.553	0.124	0.429	2.26	**	2.42	**	Yes
	t+2	0.589	0.099	0.490	2.33	**	2.45	**	Yes
	t+3	0.471	0.039	0.432	2.12	**	1.61		Yes
ln Labor	t+1	0.064	0.011	0.053	1.96	*	1.35		Yes
	t+2	0.111	0.028	0.084	2.75	**	1.85	*	Yes
	t+3	0.138	0.039	0.099	3.08	**	2.18	**	Yes
Share of dispatched workers	t+1	0.616	0.232	0.384	0.80		0.70		Yes
	t+2	1.055	0.517	0.538	1.11		0.78		Yes
	t+3	0.621	0.755	-0.134	-0.24		-0.20		Yes
Share of part-time workers	t+1	0.158	-0.390	0.548	0.85		0.66		Yes
	t+2	-0.120	0.055	-0.175	-0.16		-0.09		Yes
	t+3	0.956	0.948	0.008	0.01		0.01		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 141. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 14: The causal effect of FDI in services: kernel matching (bwith = 0.01)

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.127	0.057	0.070	2.97	**	2.10	**	Yes
	t+2	0.162	0.082	0.080	3.01	**	2.26	**	Yes
	t+3	0.160	0.084	0.077	2.51	**	2.14	**	Yes
ln Exports	t+1	0.553	-0.021	0.574	3.26	**	2.86	**	Yes
	t+2	0.589	-0.042	0.631	3.26	**	3.31	**	Yes
	t+3	0.519	-0.053	0.572	3.21	**	3.24	**	Yes
ln Labor	t+1	0.066	0.020	0.045	1.79	*	1.29		Yes
	t+2	0.112	0.038	0.074	2.57	**	1.84	*	Yes
	t+3	0.140	0.051	0.089	2.97	**	2.16	**	Yes
Share of dispatched workers	t+1	0.612	0.615	-0.003	-0.01		-0.01		Yes
	t+2	1.043	0.794	0.249	0.67		0.55		Yes
	t+3	0.604	0.908	-0.304	-0.76		-0.58		Yes
Share of part-time workers	t+1	0.161	0.238	-0.077	-0.15		-0.22		Yes
	t+2	-0.272	0.752	-1.023	-1.00		-0.69		Yes
	t+3	0.821	1.344	-0.523	-0.61		-0.51		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 141. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. Kernel matching uses the Epanechnikov kernel. ** and * indicate significance at the 5% and 10% levels, respectively.

Table 15: The causal effect of FDI in services: kernel matching (bwith = 0.03)

Outcome		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
ln Sales	t+1	0.125	0.051	0.074	3.21	**	2.38	**	Yes
	t+2	0.162	0.073	0.089	3.42	**	2.44	**	Yes
	t+3	0.161	0.072	0.089	2.96	**	2.58	**	Yes
ln Exports	t+1	0.553	-0.008	0.561	3.23	**	2.72	**	Yes
	t+2	0.589	-0.016	0.605	3.17	**	2.81	**	Yes
	t+3	0.471	-0.021	0.492	2.71	**	2.27	**	Yes
ln Labor	t+1	0.064	0.021	0.043	1.73	*	1.20		Yes
	t+2	0.111	0.038	0.074	2.60	**	1.81	*	Yes
	t+3	0.138	0.047	0.091	3.07	**	2.17	**	Yes
Share of dispatched workers	t+1	0.616	0.513	0.103	0.30		0.23		Yes
	t+2	1.055	0.660	0.395	1.07		0.85		Yes
	t+3	0.621	0.731	-0.110	-0.28		-0.23		Yes
Share of part-time workers	t+1	0.158	0.311	-0.153	-0.31		-0.47		Yes
	t+2	-0.120	0.922	-1.042	-1.02		-0.71		Yes
	t+3	0.956	1.645	-0.689	-0.80		-0.67		Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables for sales, exports, and labor, while they are the change from $t-1$ in the variables (percentage) for the shares. The number of treated firms are 141. The common support condition is imposed. ATT is the average treatment effect on the treated; bootstrapped t-values are based on 100 replications. Kernel matching uses the Epanechnikov kernel. ** and * indicate significance at the 5% and 10% levels, respectively.