The Causal Effects of Exporting on Domestic Workers: A Firm-Level Analysis using Japanese Data

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January 30, 2012

Abstract

Japan has experienced rapid growth of non-regular workers under the globalization in 2000s. This study seeks to identify the causal effects of exporting on growth of labor and growth of the share of non-regular workers in Japanese manufacturing and wholesale sectors, using an extensive firm-level data. I employ propensity score matching technique and investigate whether firms that start exporting experience higher growth of labor and higher growth of the share of non-regular workers than non-exporters. I find positive effects of exporting on labor growth in manufacturing but I find little evidence for the effects on the share of non-regular workers in both sectors.

Keywords: exporting; non-regular workers; firm heterogeneity
JEL Classification: F16, J31, L81

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1 Introduction

Japan has experienced rising share of the non-regular workers in 2000s under the globalization[*1]. The share of the non-regular workers has grown rapidly from 26.0% of 2000 to 33.7% of 2010[*2]. Some argued that this rapid growth of non-regular workers were partly caused by the globalization.

To examine the argument, this study seeks to identify the causal effect of exporting on the share of non-regular workers, using an extensive Japanese firm-level data. I employ propensity score matching technique and investigate whether firms that start exporting experience increase in the share of non-regular workers, compared with non-exporters. Unlike previous studies, I examine the effect of exporting in not only manufacturing but also wholesale sector, where many firms conduct exporting[*3].

Against the above argument, I find little evidence that export-starters have increased share of non-regular workers than non-exporters in both sectors. Japanese firms that started exporting during the period, 2003–2005, experienced higher growth of labor but not of the share of non-regular workers than non-exporters in manufacturing. In contrast to manufacturing, in wholesale they have not experienced higher growth of labor. They have increased share of dispatched workers than non-exporters but the effect of exporting on the share of dispatched workers disappeared three years after starting exporting.

The remainder of this paper is divided into six sections. In Section 2, I discuss possible link between exporting and workforce composition under the current situation in Japanese labor market. In Section 3, I introduce my empirical strategy. In Section 4, I briefly describe the data and variables used in this paper and present descriptive statistics of the data. In Section 5, I present the estimation result of firms' decision to start exporting. In Section 6, I report the causal effect of exporting. The summary and conclusion are presented in the final section.

[*1] According to the World Bank's *World Development Indicators 2010*, in Japan, the share of exports in GDP has grown to 17.60% of 2007, from 10.99% of 2000.

[*2] *Labour Force Survey* by the Japanese Statistics Bureau of the Ministry of Internal Affairs and Communications.

[*3] Bernard et al. (2010) revealed that wholesalers accounted for 10% of the 2002 U.S. exports.

2 Japanese labor market and the effects of exporting

In Japan, firms can employ both regular and non-regular workers. Non-regular workers consists of part-time and dispatched workers. Firms can employ dispatched workers, even in manufacturing after deregulation in 2004[*4]. Hiring costs are relatively low for both types of non-regular workers, compared with regular workers. Firms can easily fire non-regular workers since their employment terms are short. Thus, labor market for the non-regular workers can be regarded as less frictional, compared with one for regular workers.

Dispatched workers are different from part-time workers in several dimensions. Most important difference is that dispatched workers are employed indirectly by firms from intermediary agents by paying fees to the agents[*5], while part-time workers are employed directly by firms. Another difference is that dispatched workers work for longer hours per day than part-time workers. In some firms, dispatched workers have the same tasks as regular workers but they earn much lower wage.

The relationship between exporting and the share of non-regular workers is theoretically unexplored. Recently, several theoretical studies such as Helpman et al. (2010) considers the relationship between exporting and workers at home, assuming imperfect labor market[*6]. However, those studies did not consider the relationship between exporting and the share of non-regular workers. In addition, no studies examine the effects of exporting in wholesale sector. This study tries to provide first evidence on the relationship between exporting and the share of non-regular workers in both manufacturing and wholesale sectors.

The relationship between exporting and the share of non-regular workers is unclear. Exporting may results in decrease in the ratio of non-regular workers in total labor since it requires the skilled workers while non-regular workers are less skilled than regular workers[*7].

[*4] Asano et al. (2011) provide more detailed explanation.

[*5] The agents pay wage to dispatched workers from the fee. The average ratio of the fee to the wage received by the workers is around 1.47 in 2008, which is calculated, based on the Japanese Ministry of Health, Labor and Welfare's *General Survey on Dispatched Workers*.

[*6] Research on the relationship between trade and wage has long tradition. Recent development was surveyed by Harrison et al. (2010).

[*7] Average wage of non-regular workers are much lower than those of regular workers, as shown in Section 4.

On the other hand, exporting firms may need higher ratio of non-regular workers since they face high volatility of export sales. They may prefer non-regular workers since they can fire non-regular workers easily once their export sales drop[*8].

The effects of exporting on growth of labor is also unclear. Exporting may bring about increase in labor as a whole in manufacturing. This is just because exporting firms need more labor to produce products for foreign markets. However, I cannot predict whether exporting increases labor in wholesale. Most wholesale firms may not need additional labor for exports because they do not produce products by themselves but instead they procure and export products produced by manufacturing firms.

In sum, Japanese labor market consists of different kinds of workers and the effects of exporting on domestic workers are theoretically unclear. Thus, the impacts of exporting on labor and the share of non-regular workers in Japan are empirical questions requiring the analysis of disaggregate firm-level data.

3 Empirical strategy: propensity score matching

To evaluate the causal effect of exporting on growth of labor and growth of the share of non-regular workers, I use propensity score matching. Many previous studies in trade literature have employed this technique, including Wagner (2002) and Girma et al. (2004).

The causal effect of firm i's exporting 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 labor and the share of non-regular workers in my analysis. Superscript 0 refers to the case of non-treatment (non-exporting), and 1 to treatment (switching to exporting). t is the year of switching.

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

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

[*8]Indeed, exporting firms have fired many dispatched workers in Japan during the Great Recession, 2008–2009. This became an object of public concern.

where D_{it} is an indicator variable of whether firm i started exporting for the first time at year t. Using the 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 exporting:

$$\begin{aligned} P(D_{it}=1) &= F(\ln TFP_{i,t-2}, \ln KAPINT_{i,t-2}, RDINT_{i,t-2}, \\ &\quad \ln AGE_{i,t-2}, FOREIGN_{i,t-2}, MNE_{i,t-2}, \\ &\quad \ln L_{i,t-2}, year, industry) \end{aligned} \tag{3}$$

where F is logistic cumulative distribution function. TFP, $KAPINT$, $RDINT$, AGE, $FOREIGN$, MNE, and L are total factor productivity, capital intensity (capital-labor ratio), R&D intensity (R&D-sales ratio), firm age, share of foreign owner in stock, indicator variable for multinational enterprise, and labor, respectively. *year* and *industry* are year and industry fixed effects. The choice of explanatory variables follows the previous studies such as Hijzen et al. (2007) and Ito (2007).

Firms are matched using several matching method. In the case of the nearest-neighbor (one-to-one) matching method with replacement, non-exporter, $c(i)$, which has the closest propensity score to start exporting, is selected for each export starter i, as follows:

$$c(i) = \min_{j \in \{D_{jt}=0\}} ||\hat{P_{it}} - \hat{P_{jt}}||. \tag{4}$$

After constructing the control group by this matching, the ATT will be estimated.

4 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 for my study among the surveys currently available in Japan, and it has been used by many studies including Nishimura et al. (2005), Kimura and Kiyota (2006), and Wakasugi et al.(2008).

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

	Non-Exporters	Starters	Exporters	Others	Total
Manufacturing	16,382	318	6940	15699	39,339
Wholesale	7623	80	2211	7548	17462
Total	24,005	398	9,151	23,247	56,801

Notes: The number of firms are based on three years balanced panel of cohort, which is originally constructed from Japanese firms' panel data for the period 2001–2008. Starters are defined by firms that started exporting during 2003–2005. Non-exporters are firms that did not export during the all 6 years, $[t-2, t+3]$, while exporters are firms that exported during the all 6 years.

4.1 Panel of cohort

Following Hijzen et al. (2011), I construct a three years panel of cohort of switchers, i.e. firms that start exporting, and non-switchers from Japanese firms' panel data for the period 2001–2008. Cohorts are defined as 6-year windows, $[t-2, t+3]$, where t is the year in which domestic non-exporters may start exporting. In my data, switch year t is in $[2003, 2005]$. I impose the condition that within a 6-year window the panel is balanced.

Table 1 reports the total number of non-exporters, switchers, and exporters in my data. Switchers are firms that started exporting during the period 2003–2005. Non-exporters are firms that did not export during the all 6 years, $[t-2, t+3]$, while exporters are firms that exported during the all 6 years.

Exporting and first-time exporting, are prevalent in manufacturing and wholesale sectors. I, therefore, restrict my analysis on these two sectors. My data set includes a total of 318 erxport-starters in manufacturing and 80 in wholesale.

4.2 Labor variables

As already mentioned, in Japan, firms can employ three kinds of workers: (i) regular workers, (ii) part-time workers, and (iii) dispatched workers. These three kinds of workers' wage and hours worked are substantially different from each other. Table 2 reports the country average wage and hours worked of the three kinds of workers. It shows that regular workers work for longer hours and obtain more than twice higher hourly wage than part-time or dispatched workers. The difference between part-time and dispatched work-

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 *Monthly Labour Survey*, while the data on dispatched workers are from *General Survey on Dispatched Workers*.

ers is that dispatched workers works for much longer hours than part-time workers. Dispatched workers works for a little shorter hours than regular workers.

I use total hours worked by all kinds of workers in Japan as 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 substantially vary across the three kinds of workers.

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

$$L = N_r \times H_r + N_p \times H_p + N_d \times H_d \tag{5}$$

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

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

$$\begin{aligned} NONREGR &= \frac{N_p \times H_p + N_d \times H_d}{L} \times 100, \\ DISPATCHR &= \frac{N_d \times H_d}{L} \times 100, \text{ and} \\ PARTR &= \frac{N_p \times H_p}{L} \times 100, \end{aligned} \tag{6}$$

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

		W_r (yen)	L	$NONREGR$ (%)	$DISPATCHR$ (%)	$PARTR$ (%)
Non-exporter	Mean	2804.4	548552.3	13.1	5.2	8.0
	SD	1201.9	1877998.0	16.3	9.6	13.7
	N	5412	5451	5451	5451	5451
Export-starter	Mean	3103.2	621310.2	11.8	6.3	5.6
	SD	1299.1	822760.9	12.2	10.4	8.1
	N	95	95	95	95	95
Exporter	Mean	3578.4	1991312.0	11.1	5.8	5.3
	SD	1364.8	6713637.0	11.6	8.7	8.6
	N	2311	2364	2364	2364	2364
Total	Mean	3036.8	980612.4	12.5	5.4	7.1
	SD	1301.8	4042340.0	15.0	9.4	12.4
	N	7818	7910	7910	7910	7910

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

		W_r (yen)	L	$NONREGR$ (%)	$DISPATCHR$ (%)	$PARTR$ (%)
Non-exporter	Mean	2707.0	422859.8	10.0	2.0	8.0
	SD	825.2	870287.9	13.8	5.1	13.0
	N	2512	2516	2516	2516	2516
Export-starter	Mean	3276.2	735634.7	7.9	3.0	4.9
	SD	1084.8	2390070.0	7.9	4.9	7.2
	N	28	28	28	28	28
Exporter	Mean	3365.2	859055.1	7.2	3.7	3.6
	SD	995.7	3679521.0	8.6	5.3	7.3
	N	723	726	726	726	726
Total	Mean	2857.7	522381.4	9.4	2.4	7.0
	SD	910.7	1914609.0	12.9	5.2	12.1
	N	3263	3270	3270	3270	3270

respectively. Assuming that both part-time and dispatched workers' wage are determined by labor market outside individual firm[*9], I construct the firm-level hourly real wage of regular workers, W_r, as follows:

$$W_r = \frac{WC - N_p \times H_p \times W_p}{N_r \times H_r} \tag{7}$$

where WC is real wage cost of a firm from the METI survey and W_p is industry average hourly real wage of part-time workers from *Monthly Labor Survey*. WC includes real wage cost of regular and part-time workers only[*10].

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

As for workforce composition, standard deviation is too large to judge any ordering but, on average, share of dispatched workers are lower but share of part-time workers in labor are higher in non-exporters than export-starters and exporters in both sectors. These tendency results in the fact that share of non-regular workers are on average higher in non-exporters than export-starters and exporters.

4.3 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 Levinsohn and Petrin (2003) techniques. I use transportation and package costs to proxy unobserved productivity shocks[*11]. 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 parent firms' 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.

[*9] This assumption is plausible but it is well known that hourly wage of part-time workers varies across regions in Japan. I, however, cannot control this region-effect due to lack of the data.

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

[*11] My data does not contain costs for electricity or materials or fuels.

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

5 Decision to start exporting

In order to construct the control group, I, first, estimate the propensity score to start exporting, using a sample of non-exporters and export-starters. Table 5 shows the estimation result of equation (3).

In both manufacturing and wholesale, R&D intensity and multinational status has large impacts on the decision to start exporting. As for productivity, the positive coefficients on TFP is statistically significant in wholesale[*12], but not in manufacturing against the standard firm heterogeneity model. Insignificant coefficient on TFP in manufacturing is surprising but it can be interpreted that R&D intensity and multinational status reflect technological advantage required for exporting.

In wholesale, both capital-labor ratio and firm size, measured as labor, have negative coefficients. This suggests that smaller and labor-intensive firms are more likely to start exporting in wholesale.

6 Causal effects of exporting

6.1 Growth of labor

Constructing the counterfactual based on estimated propensity score, I examine causal effects of exporting. I present the results from one and three nearest neighbor matching and kernel matching [*13]. First, I investigate the effects on growth of labor. Tables 6 and 7 report the results in manufacturing and wholesale, respectively. The results make a striking contrast between the two sectors. In manufacturing, I find positive effect of exporting on labor growth in following three years after starting exporting. On the other hand, in wholesale, I find no significant effects on labor growth.

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

[*13] The balancing property is satisfied for all matching.

Table 5: Decision to start exporting

	(1) Manufacturing	(1) Wholesales
ln TFP (t-2)	0.045	0.952***
	[0.151]	[0.266]
ln KAPINT (t-2)	0.036	-0.220***
	[0.069]	[0.082]
RDINT (t-2)	12.060***	42.737***
	[2.441]	[14.259]
ln AGE (t-2)	0.135	0.058
	[0.113]	[0.301]
FOREIGN (t-2)	0.081	0.611
	[0.493]	[0.645]
MNE (t-2)	1.508***	1.151**
	[0.183]	[0.466]
ln L (t-2)	0.083	-1.015***
	[0.173]	[0.336]
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	15876	7589
Pseudo-R-squared	0.108	0.077

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

Table 6: The causal effect of exporting on growth of labor in manufacturing

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value		(6) Balancing property
One nearest neighbour	t+1	0.080	0.034	0.046	3.14	**	2.58	**	Yes
	t+2	0.117	0.056	0.062	3.57	**	2.82	**	Yes
	t+3	0.113	0.050	0.063	2.93	**	2.51	**	Yes
Three nearest neighbours	t+1	0.080	0.037	0.042	3.51	**	3.16	**	Yes
	t+2	0.117	0.066	0.051	3.62	**	3.07	**	Yes
	t+3	0.113	0.058	0.055	3.18	**	2.86	**	Yes
Kernel matching (bwith = 0.01)	t+1	0.080	0.034	0.046	3.14	**	2.58	**	Yes
	t+2	0.117	0.056	0.062	3.57	**	2.82	**	Yes
	t+3	0.113	0.050	0.063	2.93	**	2.51	**	Yes
Kernel matching (bwith = 0.03)	t+1	0.080	0.034	0.046	3.14	**	2.58	**	Yes
	t+2	0.117	0.056	0.062	3.57	**	2.82	**	Yes
	t+3	0.113	0.050	0.063	2.93	**	2.51	**	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the log of variables. The number of treated firms are 315. 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 7: The causal effect of exporting on growth of labor in wholesales

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value	(5) Bootstrapped t-value	(6) Balancing property
One nearest neighbour	t+1	0.050	0.016	0.034	1.34	1.14	Yes
	t+2	0.061	0.060	0.001	0.03	0.02	Yes
	t+3	0.061	0.058	0.003	0.08	0.07	Yes
Three nearest neighbours	t+1	0.050	0.046	0.004	0.20	0.17	Yes
	t+2	0.061	0.077	-0.017	-0.64	-0.51	Yes
	t+3	0.061	0.089	-0.028	-1.03	-0.70	Yes
Kernel matching (bwith = 0.01)	t+1	0.050	0.016	0.034	1.34	1.14	Yes
	t+2	0.061	0.060	0.001	0.03	0.02	Yes
	t+3	0.061	0.058	0.003	0.08	0.07	Yes
Kernel matching (bwith = 0.03)	t+1	0.050	0.016	0.034	1.34	1.14	Yes
	t+2	0.061	0.060	0.001	0.03	0.02	Yes
	t+3	0.061	0.058	0.003	0.08	0.07	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the log of variables. The number of treated firms are 80. 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.

This sharp contrast between the two sectors in the effect of exporting on labor growth can be explained by the fundamental difference between manufacturing firms and wholesale ones. Basically, pure wholesale firms export goods purchased from manufacturing firms, while pure manufacturing ones export goods produced by themselves. Thus, manufacturing firms need additional labor to produce goods for exports, while wholesale firms need not such additional labor for production. This story is consistent with the result that the significantly positive effect of exporting on labor growth is found only in manufacturing.

6.2 Share of non-regular workers

Next, I examine causal effects of exporting on the share of non-regular workers. First, Tables 8 and 9 report the effects on the share of dispatched workers in manufacturing and wholesale, respectively. In manufacturing, I do not find any effects of exporting on the share of dispatched workers. In wholesale, the effects of exporting on the share of dispatched workers are found to be positive in some cases two years after starting exporting. However, the statistical significance level is low and the effects disappeared next year.

Table 8: The causal effect of exporting on growth of share of dispatched workers in manufacturing

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value	(5) Bootstrapped t-value	(6) Balancing property
One nearest neighbour	t+1	1.563	1.255	0.308	0.47	0.40	Yes
	t+2	1.942	1.999	-0.057	-0.08	-0.07	Yes
	t+3	1.685	2.268	-0.582	-0.77	-0.59	Yes
Three nearest neighbours	t+1	1.563	1.237	0.327	0.61	0.51	Yes
	t+2	1.942	1.922	0.020	0.03	0.03	Yes
	t+3	1.685	2.251	-0.565	-0.91	-0.70	Yes
Kernel matching (bwith = 0.01)	t+1	1.563	1.255	0.308	0.47	0.40	Yes
	t+2	1.942	1.999	-0.057	-0.08	-0.07	Yes
	t+3	1.685	2.268	-0.582	-0.77	-0.59	Yes
Kernel matching (bwith = 0.03)	t+1	1.563	1.255	0.308	0.47	0.40	Yes
	t+2	1.942	1.999	-0.057	-0.08	-0.07	Yes
	t+3	1.685	2.268	-0.582	-0.77	-0.59	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the variables (percentage). The number of treated firms are 315. 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 9: The causal effect of exporting on growth of share of dispatched workers in wholesale

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value		(5) Bootstrapped t-value	(6) Balancing property
One nearest neighbour	t+1	0.367	-0.106	0.474	0.97		0.73	Yes
	t+2	0.903	-0.151	1.054	1.95	*	1.34	Yes
	t+3	0.709	0.064	0.644	0.89		0.74	Yes
Three nearest neighbours	t+1	0.367	0.437	-0.070	-0.16		-0.13	Yes
	t+2	0.903	0.641	0.262	0.54		0.40	Yes
	t+3	0.709	0.666	0.043	0.06		0.06	Yes
Kernel matching (bwith = 0.01)	t+1	0.367	-0.106	0.474	0.97		0.73	Yes
	t+2	0.903	-0.151	1.054	1.95	*	1.34	Yes
	t+3	0.709	0.064	0.644	0.89		0.74	Yes
Kernel matching (bwith = 0.03)	t+1	0.367	-0.106	0.474	0.97		0.73	Yes
	t+2	0.903	-0.151	1.054	1.95	*	1.34	Yes
	t+3	0.709	0.064	0.644	0.89		0.74	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the variables (percentage). The number of treated firms are 80. 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.

Second, Tables 10 and 11 report the effects of exporting on the share of part-time workers. Again, I do not find any effects of exporting on the share of part-time workers in both sectors. Share of part-time workers in total labor in export starters did not show statistically significant relative increase after export-starting year, compared with those in non-exporting control group.

To summarize, there are little evidence that exporting cause the increase in the share of non-regular workers in both manufacturing and wholesale sectors. This result suggests that export-starters need high skilled workers even under the high volatility of export sales, therefore, they do not increase the share of non-regular workers.

Table 10: The causal effect of exporting on growth of share of part-time workers in manufacturing

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value	(5) Bootstrapped t-value	(6) Balancing property
One nearest neighbour	t+1	0.393	-0.294	0.687	1.41	1.20	Yes
	t+2	0.327	0.002	0.325	0.58	0.44	Yes
	t+3	0.847	0.220	0.627	1.01	0.84	Yes
Three nearest neighbours	t+1	0.393	0.231	0.162	0.40	0.31	Yes
	t+2	0.327	0.430	-0.102	-0.21	-0.17	Yes
	t+3	0.847	0.565	0.281	0.61	0.46	Yes
Kernel matching (bwith = 0.01)	t+1	0.393	-0.294	0.687	1.41	1.20	Yes
	t+2	0.327	0.002	0.325	0.58	0.44	Yes
	t+3	0.847	0.220	0.627	1.01	0.84	Yes
Kernel matching (bwith = 0.03)	t+1	0.393	-0.294	0.687	1.41	1.20	Yes
	t+2	0.327	0.002	0.325	0.58	0.44	Yes
	t+3	0.847	0.220	0.627	1.01	0.84	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the variables (percentage). The number of treated firms are 315. 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 11: The causal effect of exporting on growth of share of part-time workers in wholesale

Matching		(1) Treated	(2) Controls	(3) ATT	(4) t-value	(5) Bootstrapped t-value	(6) Balancing property
One nearest neighbour	t+1	0.088	0.640	-0.552	-0.72	-0.51	Yes
	t+2	0.214	0.921	-0.707	-0.87	-0.62	Yes
	t+3	0.779	0.996	-0.217	-0.28	-0.17	Yes
Three nearest neighbours	t+1	0.088	0.142	-0.053	-0.08	-0.06	Yes
	t+2	0.214	0.645	-0.431	-0.62	-0.46	Yes
	t+3	0.779	0.786	-0.007	-0.01	-0.01	Yes
Kernel matching (bwith = 0.01)	t+1	0.088	0.640	-0.552	-0.72	-0.51	Yes
	t+2	0.214	0.921	-0.707	-0.87	-0.62	Yes
	t+3	0.779	0.996	-0.217	-0.28	-0.17	Yes
Kernel matching (bwith = 0.03)	t+1	0.088	0.640	-0.552	-0.72	-0.51	Yes
	t+2	0.214	0.921	-0.707	-0.87	-0.62	Yes
	t+3	0.779	0.996	-0.217	-0.28	-0.17	Yes

Notes: The figures in columns (1) and (2) are the change from t-1 in the variables (percentage). The number of treated firms are 80. 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.

7 Conclusion

This study investigates whether exporting raises growth of labor and the share of non-regular workers in Japan. I employ propensity score matching technique and investigate whether firms that started exporting experienced higher growth of labor and higher growth of the share of non-regular workers than non-exporters, using an extensive Japanese firm-level data. First, I find positive effects on growth of labor in manufacturing but not in wholesale. Second, against public fears, I find little evidence that exporting results in the increase in the share of non-regular workers in both manufacturing and wholesale.

Acknowledgment

I thank Toshiyuki Matsuura for his guidance on Japanese labor market, and Yasuyuki Todo and Joachim Wagner for providing me with the information on the propensity score matching. I also thank Taiji Furusawa, Naoto Jinji, James R. Markusen, Kamal Saggi, Ryuhei Wakasugi, and other participants in the 2011 annual conference of the Japan Society of International Economics at Keio University, fall 2011 Midwest International Economics Conference at Vanderbilt University, and seminars at RIETI for 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).

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Appendix 1: descriptive statistics

Table 12: descriptive statistics for logit estimation in manufacturing (2003-2005)

variable	mean	sd	N	min	max
ln TFP (t-2)	-1.274	1.070	16460	-7.315	4.950
ln KAPINT (t-2)	-5.726	1.138	16460	-14.780	-0.669
RDINT (t-2)	0.004	0.014	16460	0.000	0.593
ln AGE (t-2)	3.531	0.602	16460	0.000	4.625
FOREIGN (t-2)	0.011	0.103	16460	0.000	1.000
MNE (t-2)	0.057	0.233	16460	0.000	1.000
ln L (t-2)	12.626	0.799	16460	11.316	18.373

Table 13: descriptive statistics for logit estimation in wholesale (2003-2005)

variable	mean	sd	N	min	max
ln TFP (t-2)	-0.894	0.905	7633	-6.590	4.106
ln KAPINT (t-2)	-5.904	1.380	7633	-12.886	-1.145
RDINT (t-2)	0.001	0.003	7633	0.000	0.057
ln AGE (t-2)	3.576	0.589	7633	0.000	4.654
FOREIGN (t-2)	0.013	0.115	7633	0.000	1.000
MNE (t-2)	0.036	0.187	7633	0.000	1.000
ln L (t-2)	12.512	0.753	7633	11.306	17.186