Does Exporting Increase Wage, Labor, and Non-regular Workers?: A Firm-Level Analysis using Japanese Data

(*Old title is* Exporters and Multinationals pay Higher Wage?: A Firm-Level Analysis using Japanese Data)

Ayumu Tanaka[†]

August 29, 2011

Abstract

Japan has experienced low or negative annual growth of wage and GDP and rapid growth of non-regular workers under the globalization since 1990s. This study seeks to identify the causal effect of exporting on wage, labor, and workforce composition in Japanese manufacturing and wholesale, using an extensive firm-level data. I employ propensity score matching technique and investigate whether firms that start exporting experience wage and labor growth and changes in workforce composition compared with non-exporters. I find positive effects on labor growth in manufacturing and wage growth in wholesale but no effect on the ratio of non-regular workers in both sectors.

Keywords: exporting; wage; labor; firm heterogeneity
JEL Classification: F16, J31, L81

[†]Research Institute of Economy, Trade and Industry (RIETI).
E-mail: tanaka-ayumu<at>rieti.go.jp

1 Introduction

People in Japan have suffered from low or negative growth rate of GDP and wage since 1990s under the globalization[*1]. During the same period, the number of the non-regular workers, that is, part-time and dispatched workers, has grown rapidly from 20.2% of 1990 to 33.7% of 2010[*2]. Some argued that the severe economic situation and 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 wage, labor, and workforce composition, using an extensive Japanese firm-level data. I employ propensity score matching technique and investigate whether firms that start exporting experience wage and labor growth and changes in workforce composition 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].

I reveal that Japanese firms that started exporting during the period, 2003–2005, experienced higher growth of labor but not of wage than non-exporters in manufacturing. In stark contrast to manufacturing, in wholesale they experienced higher growth of wage but not of labor. Against the above argument, they have not increased share of non-regular workers than non-exporters in both sectors.

The remainder of this paper is divided into six sections. In Section 2, I discuss possible link between exporting, wage, labor, 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, annual growth rate of per-capita GDP has shown low or negative values, ranging from -2.3 to 2.7% for the years, 1992–2008, while the share of exports in GDP has grown to 17.60% of 2007, from 10.50% of 1990. The Japanese Ministry of Health, Labor and Welfare reported that growth rate of real wage also has shown negative or low values since 1990s.

[*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 The effect of exporting on wage, labor, and worker composition in Japanese labor market

Recent theoretical studies insist that exporters pay higher wage by assuming imperfect labor market[*4]. Among others, Helpman et al. (2010) incorporate labor market friction into the standard firm heterogeneity model by Melitz (2003) and predict that exporting bring about increase in wage in exporting firms[*5]. The theoretical predictions are consistent with empirical findings such as Bernard and Jensen (1997). The common key of the theoretical literature is firm-worker rent sharing. In particular, Helpman et al. (2010) consider the situation where firms that obtain export sales must pay high wage to prevent workers from quitting.

The situation in Japanese labor market is different from the one assumed by the recent theoretical literature. In Japan, firms can employ three kinds of workers: (i) regular workers, (ii) part-time workers, and (iii) dispatched workers, even in manufacturing after deregulation in 2004[*6]. Hiring costs are relatively low for non-regular workers. Dispatched workers are workers whom firms can indirectly employ from intermediary agents by paying fees to the agents[*7]. In some firms, dispatched workers have the same tasks as regular workers but they earns much lower wage. 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.

The situation in Japan can weaken firm-regular worker rent sharing, since firms can replace regular workers with non-regular workers. Even if their regular workers suddenly quit, firms can relatively easily employ new dispatched workers from the intermediary agents. Japanese exporting firms, therefore, have less incentive to pay high wage to share profit from foreign markets. In other words, the theoretically predicted link between exporting

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

[*5] Helpman et al. (2010) introduce standard Diamond-Mortensen-Pissarides search and matching frictions and Stole and Zwiebel strategic bargaining into a firm heterogeneity model of exporting. While Helpman et al. (2010) rely on a search model with ex post bargaining, other papers employ efficiency wage or fair wage models, as in Amiti and Davis (2008), to explain exporter wage premia.

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

[*7] 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*.

Table 1: Predicted sign of impacts of exporting

		wage	L	share of non-regular worker
Theory		+	+	−
Japan	Manufacturing	unclear	+	unclear
	Wholesale	unclear	unclear	unclear

and wage is rather weak in Japan.

Exporting may bring about increase in labor as a whole in manufacturing, as suggested by the standard firm heterogeneity model such as Melitz (2003). 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 the meantime, the relationship between exporting and workforce composition is unclear in Japan. Helpman et al. (2010) predict that exporting firms have workforce of higher average ability because they are productive and obtain higher profit due to export sales. If this prediction is true and non-regular workers are less skilled or have lower ability than regular workers[*8], exporting may results in decrease in the ratio of non-regular workers in total labor. However, 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[*9].

In sum, Japanese labor market consists of dual markets and exporting may have different impacts on wage and workforce composition from those predicted by the theory, even in manufacturing. Labor market for regular workers are frictional and non-neoclassical as assumed in the recent theoretical literature, while labor market for non-regular workers are less frictional. This duality may weaken theoretically predicted link between exporting and wage/workforce composition, although exporting may increase labor as a whole in manufacturing as predicted by the theory. Table 1 summarize the discussion here. Thus, the impacts of exporting on wage, labor, and work-

[*8] This is plausible because average wage of non-regular workers are much lower than those of regular workers, as shown in Section 4.

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

force composition 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 wage, labor, and workforce composition, 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 wage, log of labor, and workforce composition in my analysis. Superscript 0 refers to the case of non-treatment or non-exporting, and 1 to treatment or 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) or average effect of exporting on export starters 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} 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 or probability to start exporting:

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

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 the nearest-neighbor (one-to-one) matching method with replacement. Non-exporter, $c(i)$, which has the closest propensity score or estimated probability 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).

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 2 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.

Table 2: The number of non-exporters, switchers, and exporters in Japan (switch year: 2003–2005)

	Non-exporter	Switcher	Exporter	Total
Agriculture, etc.	102	0	6	108
Manufacturing	16,382	318	6,940	23,640
Wholesale	7,623	80	2,211	9,914
Retail	5,955	7	98	6,060
Services	5,799	20	141	5,960
Other services	1,598	2	63	1,663
Total	37,459	427	9,459	47,345

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. Switchers 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.

Exporting and switching, i.e., 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 switchers in manufacturing and 80 in wholesale.

4.2 Labor and wage 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 3 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 workers 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

Table 3: 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*.

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 subscript 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*.

Assuming that both part-time and dispatched workers' wage are determined by labor market outside individual firm[*10], I concentrate my analysis on firm-level wage of regular workers. I construct the firm-level hourly real wage of regular workers, W_r, as follows:

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

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[*11].

The firm-level average wage, W_r, may reflect the skill composition of regular workers. In other words, an increase in the firm-level wage, W_r, may

[*10] 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.

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

Table 4: 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
Switcher	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

reflect an increase in the ratio of high skilled workers to the total regular workers. This means that my study cannot identify "pure wage premia," defined as wages above what workers would receive elsewhere in the labor market. Recently, several studies, such as Schank et al. (2007), Schank et al. (2010), Munch and Skaksen (2008), and Frías et al. (2009), use linked employer-employee data to identify the pure wage premia by controlling for characteristics of the employees. The data used in my study lacks the information on characteristics of employees to identify the pure wage premia.

Tables 4 and 5 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

$$\begin{aligned} NONREGR &= \frac{N_p \times H_p + N_d \times H_d}{L} \times 100, \\ DISPATCHR &= \frac{N_d \times H_d}{L} \times 100, \text{ and} \\ PARTR &= \frac{N_p \times H_p}{L} \times 100, \end{aligned} \tag{7}$$

respectively.

In both sectors, wage of regular workers is on average highest in exporters, followed by switchers. The wage is lowest in non-exporters. Sim-

Table 5: 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
Switcher	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

ilarly, exporters are on average the largest in terms of labor, switchers are the second largest, and non-exporters are the smallest. Both results are consistent with the theory 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 ratio of dispatched workers are lower but ratio of part-time workers in labor are higher in non-exporters than switchers and exporters in both sectors. These tendency results in the fact that ratio of non-regular workers are on average higher in non-exporters than switchers 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[*12]. For output, I use Japanese parent firms' real value added, which is deflated using the industry-level deflator. The value added

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

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.

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 switchers. Table 6 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. This may imply that technological advantage is important for exporting. This may also reflect that fixed cost for exporting have been partly incurred when firms had become multinational enterprise by establishing foreign affiliates, since fixed cost for exporting and one for foreign direct investment (FDI) are common in costs of exploring foreign markets and making distribution networks.

As for productivity, the positive coefficients on TFP is statistically significant in wholesale[*13], 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. On the other hand statistically significant coefficients on TFP suggest that we need a theory which incorporates heterogeneity of intermediary firms into the existing theory of intermediation in international trade. Akerman (2010) and Ahn et al. (2011) recently developed firm heterogeneity models which explain the role of intermediary firms in trade but they both assume that intermediary firms are homogeneous and face perfect competition, while manufacturing firms are heterogeneous and face monopolistic competition as in Melitz (2003).

In wholesale, both capital-labor ratio and firm size, measured as labor, have negative coefficients. I cannot provide any reasonable explanation to this puzzling results, although the result may possibly just indicate multicollinearity between the two variables.

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

Table 6: Decision to start exporting

	(1) Manufacturing	(2) Wholesale
ln TFP (t-2)	0.045	0.952***
	[0.129]	[0.236]
ln KAPINT (t-2)	0.036	-0.220***
	[0.065]	[0.078]
RDINT (t-2)	12.060***	42.737***
	[2.410]	[14.680]
ln AGE (t-2)	0.135	0.058
	[0.112]	[0.206]
FOREIGN (t-2)	0.081	0.611
	[0.404]	[0.548]
MNE (t-2)	1.508***	1.151***
	[0.158]	[0.390]
ln L (t-2)	0.083	-1.015***
	[0.154]	[0.281]
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.

6 Causal effect of exporting

6.1 Wage and labor growth

Constructing the counterfactual based on estimated propensity score, I examine causal effect of exporting[*14]. First, I investigate the effect on wage and labor growth. Tables 7 and 8 report the results in manufacturing and wholesale, respectively. The matched results make a striking contrast between the two sectors. In manufacturing, I find positive effect of exporting on labor growth one year later after switching but not on firm-level wage growth. On the other hand, in wholesale, I find positive effect of exporting on wage growth, with low significance level (10% level), two year later after switching, but no effect on labor growth.

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.

I cannot provide sufficient interpretation for the difference in the effect on wage growth between the two sectors. One possible reason for the no effect on wage growth in manufacturing is that exporting firms have less incentive to pay high wage since they can employ non-regular workers instead of regular workers. On the other hand, the positive effect on wage growth in wholesale may imply that wholesalers that started exporting have strong incentive to prevent their regular workers from quitting. I conduct robustness check to reexamine the results by excluding wholesale firms that have positive number of employees in their manufacturing department. This robustness check yields no effect on both labor and wage growth in wholesale. Again, I cannot provide reasonable interpretation for this[*15].

[*14] I present the results only from the one nearest neighbor matching but all results are qualitatively same as those from the two or three nearest neighbor matching. The balancing property is satisfied for all matching.

[*15] To explore this issue in more detail, I need a matched employer-employee data to control for skill intensity of regular workers. As already discussed in Section 4, the wage measure used in this study may reflect skill intensity of regular-workers.

Table 7: The causal effect of exporting on wage and labor growth in manufacturing

Variable		Sample	(1) Treated	(2) Controls	(3) Difference	(4) S.E.	(5) T-stat	(6) Balancing property
W_r	t+1	Unmatched	0.08	-0.01	0.09	0.07	1.43	
		Matched	0.08	-0.03	0.11	0.11	0.96	Yes
	t+2	Unmatched	0.10	-0.03	0.13	0.07	1.93	
		Matched	0.10	-0.09	0.19	0.11	1.66	Yes
	t+3	Unmatched	0.06	-0.08	0.14	0.08	1.76	
		Matched	0.06	-0.13	0.19	0.11	1.76	Yes
L	t+1	Unmatched	0.05	0.01	0.04	0.02	1.88	
		Matched	0.05	0.03	0.02	0.03	0.62	Yes
	t+2	Unmatched	0.06	0.02	0.04	0.02	1.70	
		Matched	0.06	0.06	0.00	0.03	0.06	Yes
	t+3	Unmatched	0.06	0.02	0.04	0.03	1.46	
		Matched	0.06	0.08	-0.02	0.04	-0.55	Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables. All matched results are from one-to-one nearest neighbor matching. The number of matched firms are 315.

Table 8: The causal effect of exporting on wage and labor growth in wholesales

Variable		Sample	(1) Treated	(2) Controls	(3) Difference	(4) S.E.	(5) T-stat	(6) Balancing property
W_r	t+1	Unmatched	0.08	-0.01	0.09	0.07	1.43	
		Matched	0.08	-0.03	0.11	0.11	0.96	Yes
	t+2	Unmatched	0.10	-0.03	0.13	0.07	1.93	
		Matched	0.10	-0.09	0.19	0.11	1.66	Yes
	t+3	Unmatched	0.06	-0.08	0.14	0.08	1.76	
		Matched	0.06	-0.13	0.19	0.11	1.76	Yes
L	t+1	Unmatched	0.05	0.01	0.04	0.02	1.88	
		Matched	0.05	0.03	0.02	0.03	0.62	Yes
	t+2	Unmatched	0.06	0.02	0.04	0.02	1.70	
		Matched	0.06	0.06	0.00	0.03	0.06	Yes
	t+3	Unmatched	0.06	0.02	0.04	0.03	1.46	
		Matched	0.06	0.08	-0.02	0.04	-0.55	Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the log of variables. All matched results are from one-to-one nearest neighbor matching. The number of matched firms are 80.

Table 9: The causal effect of exporting on worker composition in manufacturing

Variable		Sample	(1) Treated	(2) Controls	(3) Difference	(4) S.E.	(5) T-stat	(6) Balancing property
$DISPATCHR$	t+1	Unmatched	1.55	1.20	0.36	0.39	0.91	
		Matched	1.56	1.57	-0.01	0.62	-0.01	Yes
	t+2	Unmatched	1.93	1.73	0.20	0.46	0.44	
		Matched	1.94	2.13	-0.18	0.74	-0.25	Yes
	t+3	Unmatched	1.67	1.25	0.42	0.50	0.84	
		Matched	1.69	1.01	0.68	0.75	0.90	Yes
$PARTR$	t+1	Unmatched	0.39	0.26	0.13	0.47	0.28	
		Matched	0.39	0.25	0.14	0.43	0.32	Yes
	t+2	Unmatched	0.32	0.58	-0.26	0.50	-0.52	
		Matched	0.33	1.12	-0.79	0.53	-1.51	Yes
	t+3	Unmatched	0.84	1.08	-0.24	0.52	-0.47	
		Matched	0.85	0.96	-0.11	0.53	-0.21	Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the variables (percentage). All matched results are from one-to-one nearest neighbor matching. The number of matched firms are 315.

6.2 Workforce composition

Next, I examine causal effects of exporting on workforce composition. Tables 9 and 10 report the results in manufacturing and wholesale, respectively. I do not find any effects of exporting on workforce composition in both sectors. Both ratios of dispatched workers to total labor and of part-time workers in export starters did not show statistically significant relative increase after switching year, compared with those in non-exporting control group.

The results are contrary to the theoretical prediction of Helpman et al. (2010) if the non-regular workers have lower ability than regular workers. As discussed in Section 2, one possible interpretation is that export starters' have strong incentive to employ non-regular workers under uncertainty of export sales and this incentive weaken theoretically predicted link between exporting and high skilled composition of workforce.

Table 10: The causal effect of exporting on worker composition in wholesales

Variable		Sample	(1) Treated	(2) Controls	(3) Difference	(4) S.E.	(5) T-stat	(6) Balancing property
$DISPATCHR$	t+1	Unmatched	0.37	0.47	-0.10	0.41	-0.25	
		Matched	0.37	0.07	0.29	0.51	0.58	Yes
	t+2	Unmatched	0.90	0.55	0.35	0.47	0.75	
		Matched	0.90	0.05	0.86	0.56	1.53	Yes
	t+3	Unmatched	0.71	0.53	0.18	0.49	0.36	
		Matched	0.71	0.25	0.46	0.71	0.64	Yes
$PARTR$	t+1	Unmatched	0.09	0.48	-0.39	0.83	-0.47	
		Matched	0.09	-0.62	0.71	0.61	1.15	Yes
	t+2	Unmatched	0.21	0.97	-0.76	0.89	-0.85	
		Matched	0.21	-0.40	0.62	0.72	0.85	Yes
	t+3	Unmatched	0.78	1.51	-0.73	0.95	-0.77	
		Matched	0.78	-0.16	0.94	0.82	1.15	Yes

Notes: The figures in columns (1) and (2) are the change from $t-1$ in the variables (percentage). All matched results are from one-to-one nearest neighbor matching. The number of matched firms are 80.

7 Conclusion

This study investigates whether exporting raises wage and labor growth and the ratio of non-regular workers in Japan. I find positive effect on labor growth in manufacturing and wage growth in wholesale. I, however, find no other significant effect. Exporting boost neither wage growth in manufacturing nor labor growth in wholesale. This study shows that exporting does not increase the ratio of non-regular workers in both manufacturing and wholesale against public fears.

Acknowledgment

I thank Isao Kamata for his helpful discussion, Toshiyuki Matsuura for his guidance on Japanese labor market, and Joachim Wagner for providing me with the information on the propensity score matching. 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] Ahn, JaeBin, Amit K. Khandelwal, and Shang-Jin Wei. (2011) "The Role of Intermediaries in Facilitating Trade," *Journal of International Economics*, 84(1): 73–85.

[2] Akerman, Anders. (2010) "A Theory on the Role of Wholesalers in International Trade based on Economies of Scope," *Research Papers in Economics*, Department of Economics, Stockholm University, available at `http://people.su.se/~ank/`.

[3] Amiti, Mary and Donald Davis. (2008) "Trade, Firms, and Wages: Theory and Evidence," *NBER Working Paper*, No.14106.

[4] 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.

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

[6] Bernard, Andrew B. and J. Bradford Jensen. (1997) "Exporters, Skill Upgrading, and the Wage Gap," *Journal of International Economics*, 42(1-2):3–31

[7] Bernard, Andrew B., Stephen J. Redding, and Peter K. Schott. (2010) "Wholesalers and Retailers in US Trade," *American Economic Review: Papers & Proceedings*, 100(2): 408–413.

[8] Frías, Judith A. and David S. Kaplan and Eric A. Verhoogen. (2009) "Exports and Wage Premia: Evidence from Mexican Employer-Employee Data," Unpublished Paper, available at `http://works.bepress.com/david_kaplan/15/`.

[9] Girma, Sourafel, David Greenaway, and Richard Kneller. (2004) "Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms," *Review of International Economics*, 12(5): 855–866.

[10] Harrison, Ann, John McLaren, and Margaret S. McMillan. (2010) "Recent Findings on Trade and Inequality," *NBER Working Paper*, No.16425.

[11] Helpman, Elhanan, Oleg Itskhoki and Stephen Redding. (2010) "Inequality and Unemployment in a Global Economy," *Econometrica*, 78(4): 1239–1283.

[12] 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.

[13] 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.

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

[15] Kimura, Fukunari and Hyun-Hoon Lee. (2006) "The Gravity Equation in International Trade in Services." *Review of World Economics*, 142(1): 92–121.

[16] Melitz, Marc J. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6): 1695–1725.]

[17] Munch, Jakob Roland and Jan Rose Skaksen. (2008) "Human Capital and Wages in Exporting Firms," *Journal of International Economics*, 75(2): 363–372.

[18] 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.

[19] Schank, Thorsten, Claus Schnabel, and Joachim Wagner. (2011) "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-Employee Data," *Journal of International Economics*, 72(1): 52–72.

[20] Schank, Thorsten, Claus Schnabel, and Joachim Wagner. (2011) "Higher Wages in Exporting Firms: Self-selection, Export effect, or Both? First Evidence from Linked Employer-Employee Data," *Review of World Economics*, 146:303–322.

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

[22] Wagner, Joachim. (2002) "The Causal Effects of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach," *Economics Letters*, 77:287–292.

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

[24] 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.