



How do exporters respond to exogenous shocks: Evidence from Japanese firm-level data[☆]



Ayumu Tanaka^{a,d,*}, Banri Ito^{b,d}, Ryuhei Wakasugi^{c,d}

^a Faculty of Commerce, Chuo University, 742-1 Higashinakano, Hachioji-shi, Tokyo 192-0393, Japan

^b Department of Economics, Aoyama Gakuin University, 4-4-25 Shibuya, Shibuya-ku, Tokyo 150-8366, Japan

^c University of Niigata Prefecture, 471 Ebigase, Higashi-ku, Niigata 950-8680, Japan

^d Research Institute of Economy, Trade and Industry, 1-3-1, Kasumigaseki, Chiyoda-ku, Tokyo 100-8901, Japan

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ABSTRACT

This study examines how exporters respond to an exogenous shock, using an export shock that occurred after the 2012 political conflict over the East China Sea's islands. Because of the political conflict, Japanese firms faced considerable decrease in exports to China. By using Japanese firm-level data for the period 2011–2013 and by employing the difference-in-differences method, we analyze the impact of the conflict on employment in Japan. The estimation results provide evidence that Japanese firms exporting to China tended to respond to the exogenous trade shock by reducing their number of temporary workers. This finding suggests that trade shocks due to the international conflict hit the most insecure workers.

1. Introduction

When the Japanese government announced the nationalization of three privately-owned islands, which are part of a group of islands known as the Senkaku islands¹ in Japan and the Diaoyu islands in China in September 2012, a territorial row over the islands dramatically escalated into a political conflict between Japan and China.² The political conflict led to nationwide anti-Japanese demonstrations and boycott of Japanese products in China. Several Japanese firms temporarily shut down their factories to avoid attacks from anti-Japanese protesters. The conflict affected Japanese exporters to China.³ For instance, facing sluggish car sales in China, Nissan Motor Corporation decided to discontinue car exports to China until January 2013.⁴ Toyota Motor

Corporation intended to stop its production in China in October 2012 and to discontinue all vehicle exports to China.⁵

Many studies on trade have demonstrated the extent to which international trade is affected by external demand shocks. For example, analyses of the effects of the 2008 global financial crisis on international trade have shown how seriously the reduction in global demand damaged international trade.⁶ In addition to these demand shocks, the recent increase in political tension and conflict may bring about external shocks to global demand and consequently disturb the sound development of international trade. Many economists have attempted demonstrating the extent to which demand shocks due to political conflict affect international trade by using country- and industry-level trade data.⁷

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^{*} Corresponding author at: Faculty of Commerce, Chuo University, 742-1 Higashinakano, Hachioji-shi, Tokyo 192-0393, Japan.

E-mail addresses: a-tanaka@tamacc.chuo-u.ac.jp (A. Tanaka), bito@aoyamagakuin.jp (B. Ito), wakasugi@unii.ac.jp (R. Wakasugi).

¹ The Senkaku islands are consisted of eight uninhabited islands and rocks in the East China Sea. They are controlled by Japan but Chinese and Taiwanese governments claim that the islands are part of their territory.

² BBC NEWS, “How uninhabited islands soured China-Japan ties.” (November 10, 2014); The Asahi Shimbun, “Firms in China anxious about prolonged anti-Japan protests.” (September 19, 2012)

³ The Asahi Shimbun, “Exporters braced to lose as China strikes back in Senkaku standoff.” (September 12, 2012)

⁴ The Asahi Shimbun, “Nissan to suspend car exports to China until January.” (October 27, 2012)

⁵ The Asahi Shimbun, “Toyota to suspend production in China next month.” (September 26, 2012)

⁶ See Levchenko et al. (2010), Bricongne et al. (2012) and Behrens et al. (2013).

⁷ See Martin et al. (2008) and Armstrong (2012).

With regard to the firm level, it is natural to expect firms to change their production and supply to match the demand, as a reaction to demand shocks caused by the fluctuation of international trade. However, to the best of the authors' knowledge, analyses of the impact of political tension and conflict on corporate behavior have been limited. In particular, there have been few attempts to investigate such impacts based on firm-level data compared with aggregated data. To bridge this research gap, this study uses Japanese manufacturing firm-level data to examine the extent to which firms react to demand shocks caused by political conflict.

Consumer boycott against products of a counterpart's economy and a political conflict may negatively affect bilateral trade. Empirical studies have examined the impact of consumer boycotts in the aftermath of the 2003 Iraq War on the bilateral trade between the United States and France (Chavis and Leslie, 2009; Michaels and Zhi, 2010; Davis and Meunier, 2011). A comprehensive study on this topic is presented by Heilmann (2016), who examines the impact of consumer boycotts on international trade by using political incidents such as the boycott of Danish products by Muslim countries after the 2005–2006 Jyllands-Posten Muhammad cartoons controversy, the boycott of Japanese products in China after the 2012 Senkaku Islands conflict, the boycott of Israeli products by Turkey over the 2014 Gaza conflict, and the boycott of French products in the United States over the 2003 Iraq War. By using monthly product-level trade data, he shows that consumer boycotts depress bilateral trade and that the negative effects are more pronounced in consumer goods than in intermediate goods.

Considering domestic market and multilateral trade, firms respond to external demand shocks in several ways; for instance, exporting firms may adjust their supply destinations across domestic and export markets to match production to lower foreign demand. Certainly, such firms may respond to a shock by “substituting” output between their domestic and export markets when they face demand shocks in a foreign market. Vannoorenbergh (2012) provides evidence supporting this view, using French firm-level data for the period 1998–2007. By contrast, empirical results support that variations in domestic sales are positively correlated with those in exports. For instance, Berman et al. (2015) show complementarity between domestic and export sales when firms face exogenous shocks in foreign markets, according to the French firm-level data combined with destination-specific export data for 1995–2001. However, how firms adjust their production and supply destinations to respond to demand shocks remains an empirical question.

Firms may adjust not only their supply destination but also the size of production and input factors. To clarify this, we evaluate the impact on both output and input factors. It should be noted that few attempts have been made to adjust input factors when firms face foreign demand shocks. In particular, how the exporter's employment changes in response to unexpected demand shocks remains to be examined. When the effect of demand shocks on exporting is overwhelmingly large and beyond the adjustment of the destination, firms may reduce their employment to adjust their production. Therefore, this study presents a standard labor demand model and empirically investigates the effect of demand shocks brought about by political conflict in export markets on domestic employment at the firm level.

Furthermore, little is known about which type of workers firms dismiss when they face an unexpected negative demand shock. This study also investigates this empirical question. Theoretically, we can posit the hypothesis that firms tend to dismiss temporary workers to absorb the negative shock, while they avoid the dismissal of permanent workers for the following two reasons: First, firms are expected to protect permanent workers who have accumulated firm-specific human capital, as discussed in Yokoyama et al. (2019). Second, firms have the incentive to minimize the adjustment cost when they reduce their employment. Thus, given the fact that firing costs for permanent workers are higher than those for temporary workers, firms tend to

dismiss temporary workers rather than the permanent ones.⁸

We focus on the behavior of Japanese firms after the 2012 political conflict over the Senkaku islands between Japan and China, which resulted in Chinese consumer boycott of Japanese products. Political conflict is considered an unexpected and exogenous shock that enables us to identify the causal effect as a natural experiment. Although economic relations between Japan and China have deepened over the past three decades, political conflict has been exposed over the territorial rights of the East China Sea islands. The consumer boycotts of Japanese products in China after Japan's nationalization of the Senkaku Islands in September 2012 is the most typical case of political tension affecting bilateral economic relations. To examine how firms respond to such a consumer boycott, we employed the difference-in-differences (DID) technique. We constructed a model for the empirical estimation wherein the treatment group comprised firms exporting to China, which are more susceptible to the demand shock caused by the political conflict than those that do not export to China.⁹

The main findings of this study are threefold. First, we found negative impacts of the political conflict on Japanese firms' exports and employment. In particular, the intensive margin—measured as the responses of exporting firms that continued to export to China after the shock—is dominant in the decrease in exports and employment. Second, the DID estimates indicated that Japanese firms reallocate their outputs to countries other than China but that this action cannot offset the negative export shock in the Chinese market. Third, we found that firms tend to reduce the number of employees by adjusting the composition of permanent and temporary workers after the demand shock. Specifically, firms with higher export exposure to China experienced a greater reduction in their domestic employment by decreasing their temporary workforce in response to the shock. The results from quantile regressions also reveal that firms in almost all quantiles reduced their temporary workforce following the international conflict. These results suggest that demand shocks in foreign markets transmit to the labor market in Japan.

The remainder of this study is organized as follows. Section 2 describes the Japanese firm-level data and presents descriptive statistics on the changes in firms' exports and employment around the demand shock in China. Section 3 describes empirical specification based on the DID technique. Section 4 examines whether firms reallocate their output to countries other than China to mitigate their negative export shocks. Section 5 presents the results from the DID analysis of the political conflict as a natural experiment for the effect of demand shocks on labor demand. Section 6 concludes the study.

2. Data and descriptive analysis

2.1. Data

The firm-level data used in this study are taken from a mandatory enterprise survey—the Basic Survey of Japanese Business Structure and Activities conducted by the Japanese Ministry of Economy, Trade and Industry (METI). The targets of this survey are firms with more than 50 employees and more than 30 million yen in capital. The METI survey is not designed for consolidated firms but for individual firms, even if a firm has a subsidiary or affiliate. It is obliged to report the financial information in the previous year on a firm basis. Firms are required to provide the previous year's financial information. In most cases, the 2013 survey contains FY2012 information (i.e., between April 2012 and

⁸ Matsuura et al. (2011) address the view that an increase in volatility forces firms to shift from permanent to temporary workers to save labor adjustment costs.

⁹ This idea is also employed by Fisman et al. (2014), who examine the impact of negative shocks to the China–Japan relationship on stock value and report that firms with high exposure in terms of sales are more likely to lose stock value.

March 2013). However, in the case of employment, firms are required to state the number of workers as of March 2013. We refer to FY2012 as 2012 and to the data from the 2013 survey as the data of 2012.

2.2. Exports

The 2012 political conflict had a large impact on Japan's exports to China. Total exports decreased by 11% from the previous year.¹⁰ The firm-level data used in this study also show that manufacturing firms' total exports to China decreased by -1.93% in our sample. Before the regression analysis, this subsection shows the descriptive statistics with respect to exporters to China. Table 1 presents the number of firms by export status in 2011, showing that non-exporters represent 66% of the 13,533 manufacturing firms. Firms that export to China but not to other countries account for 4% of manufacturing firms, while firms that do not export to China but to other countries account for 11%. Firms that export to China as well as other countries account for 19% of all manufacturing firms. Table 1 also shows that more than 3000 manufacturing firms export to China, representing 23% of the total number. These figures indicate that exporting to China is prevalent in Japanese manufacturing and imply that any shocks in trade with China would affect many Japanese manufacturing firms.

Table 2 decomposes the change in exports to China between 2001 and 2012 into intensive and extensive margins to investigate the mechanism behind the drastic decline in Japan's exports to China. This shows that the intensive margin (i.e., continuing exporters) accounts for most of the change in exports to China during this period, in terms of the change in both total exports and intra-firm and arm's length exports. It also suggests that arm's length exports are more vulnerable to political shocks than intra-firm trade.¹¹

2.3. Employment

Next, we explore the impacts of international conflict on domestic employment. In this subsection, we provide a descriptive analysis of changes in employment between 2011 and 2012 to examine how firms respond to export shocks. Table 3 presents the changes in the number of workers between 2011 and 2012. It is indicated that among exporters to China, continuing exporters that decreased their exports ("Cont. decrease") accounted for the largest decrease in the number of workers and that, on average, they faced the largest decrease in the number of workers. This finding corresponds to the fact that the intensive margin

¹⁰ Although the annual trade statistics indicate a significant decline in 2012, the monthly data suggest that total exports to China actually tended to decrease from October 2011. This downward trend is attributed to the Great East Japan Earthquake, the European debt crisis, and the downturn in China. The volume of exports to China between September and December immediately after the conflict significantly decreased in the range of 12–16% year on year, which is remarkable as compared to the 9.5% average rate of decrease from October 2010 to August 2011. Heilmann (2016) uses the synthetic control method to control for any endogenous factors and finds that the consumer boycott due to the 2012 political conflict had significantly negative impacts on Japan's exports to China.

¹¹ Previous studies, such as Bernard et al. (2009), reveal that arm's length exports are more vulnerable to exogenous shocks and more volatile than intra-firm exports. In our case, we expect that intra-firm exports to Japanese-owned subsidiaries in China are less sensitive to the shock. Therefore, we classify each firm as belonging to one of the following four types: (i) firms that conduct neither intra-firm exports nor arm's length exports to China; (ii) firms that conduct intra-firm exports but do not conduct arm's length exports to China; (iii) firms that conduct arm's length exports but do not conduct intra-firm exports to China; and (iv) firms that conduct both intra-firm and arm's length exports to China. In terms of the number of firms under each type, arm's length exports are found to be more prevalent than intra-firm exports among Japanese manufacturing exporters to China. Additionally, arm's length exporters without intra-firm exports are the largest group of exporters to China.

Table 1
Number of firms by export status (2011).

Export region	Number	Percentage
Non-exporter	8,987	66
China only	498	4
Non-China only	1,442	11
Both	2,606	19
Total	13,533	100

Note: Data are taken from the METI survey.

Table 2
Change in exports to China between 2011 and 2012: intensive versus extensive margins.

Exporter type	No. of firms	All (billion yen)	Intra-firm (billion yen)	Arm's length (billion yen)
<i>Intensive margin</i>				
Cont. increase	1,131	1,065.8	836.6	229.2
Cont. decrease	1,403	-1,313.5	-383.2	-930.3
Cont. unchanged	82	0.0	0.6	-0.6
<i>Extensive margin</i>				
Exit	278	-152.2	-56.7	-95.5
Entry	388	244.4	142.7	101.7
No exports	9,131	0.0	0.0	0.0
Total	12,413	-155.5	540.1	-695.6

Notes: Data are taken from the METI survey. "Cont. increase," "Cont. decrease," and "Cont. unchanged" indicate continuing exporters that increased, decreased, and retained their exports to China between 2011 and 2012, respectively. "Exit" indicates firms that stopped exporting to China between 2011 and 2012 and "Entry" indicates firms that started exporting to China. "No exports" indicate firms that did not export to China during 2011–2012.

accounts for most of the changes in exports to China, and it offers indirect evidence of the negative impact of export shocks due to international conflict on employment.

This table also shows that firms tend to reduce the number of temporary workers rather than that of permanent workers after a shock. The number of temporary workers decreased between 2001 and 2012, whereas the number of permanent workers increased. This striking result indicates that temporary workers are used as a buffer against an exogenous shock.

Fig. 1 confirms the aforementioned finding that temporary workers are used as a buffer to shocks. This indicates that firms exporting to China in 2011 increased the number of permanent workers but decreased the number of temporary workers more than the firms that did not export to China in 2011.

3. Empirical specification

To examine the impacts of the export shock—post nationalization of the islands—on the employment of Japanese firms, we employed a standard DID estimator. In our case, treated firms are those that exported to China in 2011 while control firms are those that did not. In the main estimation, we exclude non-exporters from the estimation sample but include them in the sample as a robustness check in Section 5.4. The DID variables comprise an interaction term between the dummy for treated firms and a dummy for the year 2012, *DID2012*, and an interaction term between the dummy for treated firms and a dummy for the year 2013, *DID2013*. We focus on the number of total workers (*L*), permanent workers (*PERM*), and temporary workers (*TEMP*)¹² as our outcome variables (*O*).

Following the standard framework of Hamermesh (1993), we derive

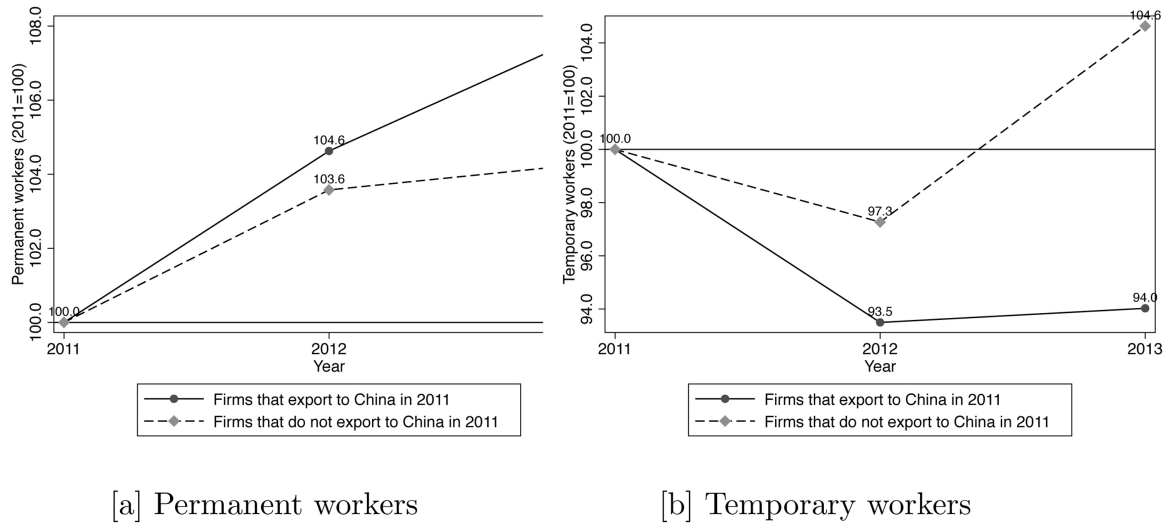
¹² Temporary workers are called "non-standard workers" in Japan. In our data, the number of temporary workers is the sum of the number of part-time workers, dispatched workers, and day laborers.

Table 3

Change in the number of workers between 2011 and 2012 by exporter type.

Exporter type	No. of firms	Sum			Average		
		ALL	PERM	TEMP	ALL	PERM	TEMP
Cont. increase	1,131	1,904	5,629	−3,725	1.7	5.0	−3.3
Cont. decrease	1,403	−15,947	3,342	−19,289	−11.4	2.4	−13.7
Cont. unchanged	82	−345	−396	51	−4.2	−4.8	0.6
Exit	278	−1,231	−1,168	−63	−4.4	−4.2	−0.2
Entry	388	5,654	3,935	1,719	14.6	10.1	4.4
No exports to China	9,131	−12,959	6,173	−19,132	−1.4	0.7	−2.1
Total	12,413	−22,924	17,515	−40,439	−1.8	1.4	−3.3

Notes: Data are taken from the METI survey. “ALL” indicates all workers in Japan while “PERM” and “TEMP” indicate permanent and temporary workers in Japan, respectively. “Cont. increase,” “Cont. decrease,” and “Cont. unchanged” indicate continuing exporters that increased, decreased, and retained their exports to China between 2011 and 2012, respectively. “Exit” indicates firms that stopped exporting to China between 2011 and 2012 and “Entry” indicates firms that started exporting to China. “No exports” indicate firms that did not export to China during 2011–2012.

**Fig. 1.** Change in the number of workers: exporters versus non-exporters. Notes: Data are taken from the METI survey. 2011 = 100.

the labor demand equations from the production function. We consider a firm using three factors of production: permanent workers, temporary workers, and capital (K). The production function is

$$Y = f(\text{PERM}, \text{TEMP}, K) \quad (1)$$

where we omit the firm and time subscripts for brevity. We assume that the first-order derivatives of the production function are positive and the second-order derivatives are negative. In an equilibrium, the size of production is determined by the demand level such that

$$Y^* = D(\text{DEMAND}, \theta) \quad (2)$$

where DEMAND is the sum of domestic and foreign demand for a firm's product. Firm-specific demand shock θ is included to capture demand shocks that are exogenous to a firm.

The cost function is

$$C = g(WAGE, WAGE_{\text{TEMP}}, r, Y^*) \quad (3)$$

where $WAGE$ and $WAGE_{\text{TEMP}}$ are the wages for permanent workers and temporary workers, respectively, and r is the price of capital services. We assume that the first-order derivatives of the cost function are positive. By using Shephard's lemma, the following labor demand equations can be derived:

$$\begin{aligned} \text{PERM} &= X^{\text{PERM}}(WAGE, WAGE_{\text{TEMP}}, r, Y^*) \quad \text{and} \\ \text{TEMP} &= X^{\text{TEMP}}(WAGE, WAGE_{\text{TEMP}}, r, Y^*). \end{aligned} \quad (4)$$

In the model, the negative demand shocks caused by the political conflict could decrease the production level of the treated firms through Eq. (2) and, thus, decrease their employment, as expressed in Eq. (4). However, how the firms adjust their employment is an empirical question. In particular, the model does not tell us which type of workers the firms decrease more. They might decrease either permanent or temporary workers, or they might decrease both. Therefore, we use the DID framework to empirically investigate this issue. For the estimation, we employ the following log–linear form of Eq. (4) with the DID dummies:

$$\begin{aligned} \ln O_{it} &= \beta_0 + \beta_1 \text{DID2012}_{it} + \beta_2 \text{DID2013}_{it} + \beta_3 \ln WAGE_{it} + \beta_4 \ln VA_{it} \\ &\quad + \beta_5 \ln R_{it} + \beta_6 \text{YEAR}_t + \beta_7 \text{INDUSTRY}_{it} + \beta_8 \text{YEAR} \times \text{INDUSTRY}_{it} \\ &\quad + FE_i + \epsilon_{it} \end{aligned} \quad (5)$$

where the subscripts i and t index the firm and year, respectively. O is our outcome variable. We employ the number of temporary workers TEMP , number of permanent workers PERM , and total number of workers L as our outcome variables. As already explained, our DID variables are an interaction term between the dummy for treated firms and year dummies. We include the yearly DID dummies in Eq. (5) because the treatment effect could vary over time. These DID dummies aim to capture the exogenous demand shocks θ caused by the conflict between Japan and China.

Permanent workers' hourly wages $WAGE$, value added VA , and

rental of capital services,¹³ R , are included in the equation. We use value added VA as a proxy for a firm's production level.¹⁴ $YEAR$ and $INDUSTRY$ are the year and industry dummies, respectively. Their interaction terms $YEAR \times INDUSTRY$ are included to control for the wages for temporary workers because their wages $WAGE_{TEMP}$ are unavailable and assumed to exhibit no exogenous variation across industries. Finally, FE_i and ϵ_{it} are firm fixed effects and an error term, respectively.

We estimate Eq. (5) by the fixed-effects model to control for time-invariable firm characteristics FE_i . Moreover, we include year dummies into Eq. (5). Therefore, the “treatment” and “after” terms are not included in Eq. (5).

4. Substitutability between markets

Before assessing the impacts of the 2012 political conflict on Japanese firms' employment, this section briefly analyzes the impacts on Japanese firms' exports to examine whether firms reallocate their output to countries other than China. As discussed in Section 1, firms can reallocate their output to other markets if they face negative exogenous shocks in a particular market (Berman et al., 2015; Hiller et al., 2014). Thus, they can mitigate the impact of the shocks on domestic employment. In our case, Japanese firms that face negative export shocks in China can reallocate their output to countries other than China. To examine whether firms reallocate their output to countries other than China, we employ the following equation:

$$\ln X_{it} = \gamma_0 + \gamma_1 DID2012_{it} + \gamma_2 DID2013_{it} + \gamma_3 \ln TFP_{it} + \gamma_4 \ln CI_{it} + \gamma_5 MNE_{CHN,it} + \gamma_6 MNE_{NONCHN,it} + \gamma_7 FOR_{it} + \gamma_8 YEAR_t + \gamma_9 INDUSTRY_{it} + \gamma_{10} YEAR \times INDUSTRY_{it} + FE_i + \eta_{it} \quad (6)$$

where X_{it} is either domestic sales ($\ln DOMESTIC_SALES$) or exports to countries other than China ($\ln EX_NONCHN$). We also investigate the impacts on total exports ($\ln EXPORT$) by using it as an additional dependent variable. $\ln TFP$ is total factor productivity. $\ln CI$ is capital intensity (capital over value added). MNE_{CHN} is a dummy for multinational enterprises (MNEs) that have a foreign subsidiary in China, MNE_{NONCHN} is a dummy for MNEs that have a foreign subsidiary outside China, and FOR is a dummy for foreign-owned firms. η_{it} is an error term.

Table 4 presents the estimation results of Eq. (6). Column (1) reports the results using domestic sales as the dependent variable, and column (2) reports the results using exports to countries other than China as the dependent variable. The DID dummies are insignificant in column (1) but significantly positive in column (2). The significantly positive coefficients of the DID dummy on the log of exports to countries other than China in column (2) indicate that firms reallocate their output to other markets. This result suggests that there is substitutability between exports to China and sales in other foreign markets. The insignificant coefficients of the DID dummies in column (1) suggest that there is no substitutability between exports to China and domestic sales.

Lastly, in column (3), the DID dummies are negatively significant, implying that total exports reacted negatively to the boycott in China. This finding suggests that negative export shocks in China are not fully offset by increasing exports to other countries.

In sum, the findings suggest that Japanese firms facing negative export shocks partly reallocate their output to other countries. Such a

Table 4
Substitutability between markets.

Dependent variable	(1)	(2)	(3)
	$\ln DOMESTIC_SALES$	$\ln EX_NONCHN$	$\ln EXPORT$
DID2012	−0.009 [0.020]	0.187*** [0.041]	−0.051* [0.029]
DID2013	−0.016 [0.021]	0.239*** [0.041]	−0.052* [0.030]
Log TFP	−0.003 [0.039]	0.042 [0.079]	0.151*** [0.056]
Log Capital Intensity	−0.419*** [0.061]	−0.215* [0.121]	−0.021 [0.087]
MNEs with Foreign Subsidiary in China	0.022 [0.033]	−0.003 [0.067]	0.061 [0.048]
MNEs without Foreign Subsidiary in China	−0.039 [0.032]	0.290*** [0.064]	0.046 [0.046]
Foreign-owned Firms	0.003 [0.051]	−0.065 [0.101]	−0.013 [0.073]
YEAR	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes
YEAR × INDUSTRY	Yes	Yes	Yes
Observations	10,909	10,909	10,909
R-squared	0.030	0.017	0.012

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises exporters that did not export to China in 2011.

* Significance at the 10% level.

**Significance at the 5% level.

*** Significance at the 1% level.

reallocation can mitigate the negative impacts on domestic employment, but it does not fully offset the negative shock on exports to China.

5. Results

5.1. Impacts on employment: DID

This section presents the DID estimation results to discuss the impacts of the export shock caused by the nationalization of the islands. Table 5 shows the estimation results of Eq. (5).¹⁵ Columns (1), (4), and (7) report the DID estimation results without any controls. The columns show that the shock has significantly negative impacts on total employment but are insignificant when the data is segregated into permanent and temporary workers, suggesting firm heterogeneity of workforce composition. Further, columns (2), (5), and (8) present results with the full set of fixed effects and covariates but excluding value added. The DID dummies are negative but insignificant for both permanent and temporary workers, although $DID2013$ for all workers is significantly negative. Finally, columns (3), (6), and (9) report the baseline results with full covariates and fixed effects. Again, $DID2013$ for all workers remains significantly negative, indicating the significantly negative impacts on domestic employment in Japan after a year following the nationalization, although other DID dummies are insignificantly negative.

We obtained insignificant coefficients on the DID dummies for both permanent and temporary workers. The standard DID analysis in Table 5 reveals the average impacts on the treated Japanese exporters to China. However, the impacts can be heterogeneous across firms. Therefore, the study examines whether the political conflict has heterogeneous impacts on Japanese firms using continuous DID

¹³ Based on Hall and Jorgenson (1967), the rental of capital services is calculated as $R = q(d + i)$, where q is the price of new investment goods, d the rate of depreciation, and i the interest rate. All variables are at the firm level.

¹⁴ Value added is potentially endogenous in the sense that we cannot fully separate value added from the exogenous shock θ . Therefore, we have conducted regressions with and without value added and confirm the results as qualitatively unchanged.

¹⁵ In the DID analysis, we did not find significant differences in the impacts of the political conflict on employment between arm's length exporters and intra-firm exporters, as shown in Table A.4.

Table 5
Impacts on Japanese manufacturers' employment.

Outcome:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	lnL			lnPERM			lnTEMP		
DID2012	−0.009 [*] [0.005]	−0.006 [0.005]	−0.006 [0.004]	−0.007 [0.005]	−0.005 [0.005]	−0.005 [0.005]	−0.013 [0.029]	−0.014 [0.030]	−0.014 [0.030]
DID2013	−0.015 ^{***} [0.005]	−0.013 ^{***} [0.005]	−0.012 ^{***} [0.004]	−0.008 [0.005]	−0.006 [0.005]	−0.006 [0.005]	−0.047 [0.030]	−0.046 [0.030]	−0.045 [0.030]
Log Rental of Capital Services		0.014 ^{***} [0.001]	0.009 ^{***} [0.001]		0.013 ^{***} [0.001]	0.008 ^{***} [0.001]		0.033 ^{***} [0.008]	0.027 ^{***} [0.008]
Log Permanent Workers' Wages		−0.088 ^{***} [0.005]	−0.183 ^{***} [0.006]		−0.112 ^{***} [0.006]	−0.206 ^{***} [0.006]		0.063 [*] [0.035]	−0.035 [0.040]
Log Value Added			0.159 ^{***} [0.005]			0.158 ^{***} [0.005]			0.164 ^{***} [0.034]
YEAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
YEAR * INDUSTRY	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	11,092	11,092	11,092	11,092	11,092	11,092	11,092	11,092	11,092
R-squared	0.006	0.064	0.185	0.002	0.075	0.186	0.002	0.016	0.019

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises exporters that did not export to China in 2011.

* Significance at the 10% level.

**Significance at the 5% level.

*** Significance at the 1% level.

specifications and quantile regressions technique.

The coefficients of the other explanatory variables have theoretically predicted signs. Wages of permanent workers are negatively significant in columns (5)–(6); significantly positive in column (8); and insignificant in column (6), implying that employing temporary workers is either positively related or insensitive to wages of permanent workers. The positively significant coefficients of value added in all columns simply indicate that firms with higher growth employ more workers. The coefficients of the rental of capital services are positively significant in all the columns. This result reflects the substitutability between capital and labor, as described in standard production theory.

5.2. Impacts on employment: continuous DID

It is naturally predicted that the impact of the shock depends on the extent to which firms depend on China. This subsection presents the continuous DID estimation results by using export exposure to China rather than the dichotomous exporter dummy. Export exposure to China is defined as the share of exports to China in total sales of 2011. By using this variable, we construct the continuous DID variables *SALESSH_CHN2012* and *SALESSH_CHN2013*. *SALESSH_CHN2012* is an interaction term between export exposure to China and a dummy for the year 2012, and *SALESSH_CHN2013* is an interaction term between export exposure to China and a dummy for the year 2013.

Table 6 presents the continuous DID estimation results. The coefficients of export exposure to China are significantly negative in columns (1) and (3), implying that firms with a higher share of exports to China experienced a larger reduction in their domestic employment after a year following the nationalization by decreasing their number of temporary workers.

5.3. Impacts on employment: non-MNEs

To eliminate any effects through the activity of foreign affiliates, we ran a regression excluding MNEs. Table 7 reports the results of the standard and continuous DID estimations. Columns (2), (3), (5), and (6) show that temporary workers received negative impacts, while permanent workers received no impact. This implies that firms adjust their worker composition by reducing their number of temporary workers. Column (6) shows that a significantly negative impact on the number of temporary workers appears in the year of the nationalization.

Table 6

Impacts on Japanese manufacturers' employment: Chinese export share.

Outcome	(1)	(2)	(3)
	lnL	lnPERM	lnTEMP
Export Exposure to China	−0.011 [0.026]	−0.013 [0.027]	−0.055 [0.176]
× Year 2012			
Export Exposure to China	−0.055 ^{**} [0.026]	−0.040 [0.027]	−0.299 [*] [0.177]
× Year 2013			
Log Rental of Capital Services	0.009 ^{***} [0.001]	0.008 ^{***} [0.001]	0.027 ^{***} [0.008]
Log Permanent Workers' Wages	−0.183 ^{***} [0.006]	−0.205 ^{***} [0.006]	−0.032 [0.040]
Log Value Added	0.159 ^{***} [0.005]	0.158 ^{***} [0.005]	0.164 ^{***} [0.034]
YEAR	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes
YEAR × INDUSTRY	Yes	Yes	Yes
Observations	11,092	11,092	11,092
R-squared	0.185	0.186	0.019

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises exporters that did not export to China in 2011. Export exposure to China is defined as the share of exports to China in total sales of 2011.

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

Additionally, column (1) shows that reducing the number of temporary workers results in significantly negative impacts on the total number of workers.

5.4. Impacts on employment: all firms

In the above estimation, we excluded non-exporters from the sample. In this subsection, we include non-exporters in the estimation sample and confirm the main results. Table 8 demonstrates that significantly negative impacts on the number of workers are prevalent regardless of worker type after a year following the nationalization. Columns (4)–(6) indicate that higher export exposure to China results in a larger reduction in the number of both temporary and permanent

Table 7
Impacts on Japanese manufacturers' employment: non-MNEs.

	(1)	(2)	(3)	(4)	(5)	(6)
	DID			Continuous DID		
	lnL	lnPERM	lnTEMP	lnL	lnPERM	lnTEMP
DID2012	−0.008 [0.006]	0.001 [0.006]	−0.114*** [0.041]			
DID2013	−0.010* [0.006]	0.006 [0.006]	−0.143*** [0.042]			
Export Exposure to China × Year 2012				−0.041 [0.040]	0.007 [0.042]	−0.849*** [0.291]
Export Exposure to China × Year 2013				−0.067 [0.042]	0.033 [0.044]	−1.071*** [0.307]
Log Permanent Workers' Wages	−0.139*** [0.008]	−0.155*** [0.009]	0.009 [0.062]	−0.138*** [0.008]	−0.155*** [0.009]	0.013 [0.061]
Log Value Added	0.144*** [0.007]	0.134*** [0.008]	0.165*** [0.054]	0.142*** [0.007]	0.135*** [0.008]	0.149*** [0.054]
Log Rental of Capital Services	0.003** [0.002]	0.003* [0.002]	0.008 [0.012]	0.004** [0.002]	0.004** [0.002]	0.010 [0.012]
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
YEAR × INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,555	4,555	4,555	4,555	4,555	4,555
R-squared	0.169	0.158	0.036	0.157	0.143	0.017

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises exporters that did not export to China in 2011. MNEs are excluded from the estimation sample.

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

workers.

5.5. Quantile regression

To avail enough benefit of the firm data, we conducted semi-parametric quantile regression (QR). QRs enabled us to evaluate

distributional impacts that could hide massive effects on particular firms in the overall data. Thus, we reveal which firms are more resilient to political shocks.

A QR is semi-parametric in that it avoids assumptions regarding the parametric distribution of regression errors. As discussed in [Koenker and Hallock \(2001\)](#), QRs have several attractive features and have been

Table 8
Impacts on Japanese manufacturers' employment: all firms.

	(1)	(2)	(3)	(4)	(5)	(6)
	DID			Continuous DID		
	lnL	lnPERM	lnTEMP	lnL	lnPERM	lnTEMP
DID2012	−0.003 [0.003]	−0.004 [0.003]	−0.002 [0.019]			
DID2013	−0.012*** [0.003]	−0.010*** [0.003]	−0.041** [0.019]			
Export Exposure to China × Year 2012				−0.029 [0.023]	−0.018 [0.027]	−0.095 [0.155]
Export Exposure to China × Year 2013				−0.091*** [0.023]	−0.075*** [0.027]	−0.377** [0.156]
Log Permanent Workers' Wages	−0.140*** [0.003]	−0.207*** [0.004]	0.069*** [0.020]	−0.141*** [0.003]	−0.207*** [0.004]	0.065*** [0.020]
Log Value Added	0.152*** [0.003]	0.177*** [0.004]	0.114*** [0.020]	0.152*** [0.003]	0.177*** [0.004]	0.114*** [0.020]
Log Rental of Capital Services	0.006*** [0.001]	0.006*** [0.001]	0.013*** [0.005]	0.007*** [0.001]	0.006*** [0.001]	0.014*** [0.005]
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
YEAR × INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,623	30,623	30,623	30,623	30,623	30,623
R-squared	0.148	0.170	0.013	0.143	0.167	0.009

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises firms that do not export to China in 2011.

*Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

Table 9
Impacts on total employment: QR.

Outcome: dlnL	q10	q25	q50	q75	q90
DID2012	−0.042*** [0.016]	−0.018** [0.008]	−0.022*** [0.006]	−0.019*** [0.007]	−0.023*** [0.007]
DID2013	−0.053*** [0.016]	−0.031*** [0.010]	−0.026*** [0.009]	−0.026*** [0.006]	−0.050** [0.022]
dln Permanent Workers' Wages	0.049*** [0.007]	0.065*** [0.010]	0.074*** [0.006]	0.104*** [0.020]	0.140*** [0.027]
dln Value Added	0.566*** [0.018]	0.596*** [0.013]	0.616*** [0.007]	0.608*** [0.022]	0.588*** [0.030]
dln Rental of Capital Services	−0.001 [0.005]	0.000 [0.002]	−0.001 [0.002]	−0.002 [0.002]	−0.005 [0.005]
YEAR	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes
Observations					11,092

Notes: First-differenced models are estimated. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises firms that did not export to China in 2011.

*Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

Table 10
Impacts on permanent workers: QR.

Outcome: dlnPERM	q10	q25	q50	q75	q90
DID2012	−0.042*** [0.006]	−0.013* [0.007]	−0.018*** [0.004]	−0.026** [0.011]	−0.016 [0.023]
DID2013	−0.051*** [0.014]	−0.036*** [0.010]	−0.019*** [0.007]	−0.014 [0.010]	−0.053 [0.037]
dln Permanent Workers' Wages	0.046*** [0.006]	0.046*** [0.010]	0.064*** [0.007]	0.074*** [0.013]	0.085*** [0.026]
dln Value Added	0.534*** [0.012]	0.589*** [0.014]	0.602*** [0.009]	0.616*** [0.014]	0.622*** [0.023]
dln Rental of Capital Services	−0.000 [0.005]	−0.001 [0.002]	−0.001 [0.003]	−0.004 [0.003]	−0.008* [0.004]
YEAR	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes
Observations					11,092

Notes: First-differenced models are estimated. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises firms that did not export to China in 2011.

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

used in previous studies, such as Arnold and Hussinger (2010).¹⁶ One of the attractive features of QRs is that they allow us to estimate the impact of the covariates on any particular percentile of the distribution, whereas OLS allows estimating only the average relationship. The estimation of the impact of the covariates on the percentiles enables us to examine whether the impact of the political shock differed according to the employment level.¹⁷

Using the QRs, we obtain the q^{th} QR estimator (β_q) that minimizes over $Q(\beta_q)$, which is expressed as the objective function in Eq. (7):

$$Q(\beta_q) = \sum_{it: \text{dln}O_{it} \geq x'_{it}\beta_q} q |\text{dln}O_{it} - x'_{it}\beta_q| + \sum_{it: \text{dln}O_{it} < x'_{it}\beta_q} (1 - q) |\text{dln}O_{it} - x'_{it}\beta_q| \quad (7)$$

where $0 < q < 1$; and x_i is a vector of the following covariates: $DID2012_{it}$, $DID2013_{it}$, $\text{dln}WAGE_{it}$, $\text{dln}VA_{it}$, $\text{dln}R_{it}$, $YEAR_{it}$, and $INDUSTRY_{it}$. We estimate the first-differenced model to control for time-invariable firm characteristics because it is impossible to include firm fixed effects owing to computational limitations. For the same reason, we did not include the interaction term $YEAR_{it} \times INDUSTRY_{it}$. We obtained the coefficients by using the linear programming method because the objective function was not differentiable. All of the data were used for each QR. The weights (q) varied across each QR. Because QRs can provide parameter estimates at different quantiles, the estimated coefficients can be interpreted as partial derivatives of the conditional quantile of the dependent variable with regard to a particular covariate. For instance, in our case, the estimated coefficient indicates that the marginal change in the log of employment at the q^{th} conditional quantile is attributable to a marginal change in the log of wages of permanent workers.

¹⁶ For a brief introduction to QRs, see Koenker and Hallock (2001). One of the advantages of QRs is that QR estimates are more robust to outliers compared to ordinary least squares (OLS) estimates because the normality assumption is relaxed in the former.

¹⁷ Table A.5 presents the number of employees in each quantile by type of workers.

Table 11
Impacts on temporary workers: QR.

Outcome: dlnTEMP	q10	q25	q50	q75	q90
DID2012	−0.056 [0.091]	−0.038** [0.020]	−0.025** [0.010]	−0.034* [0.021]	−0.065 [0.056]
DID2013	−0.120 [0.095]	−0.075** [0.032]	−0.040*** [0.011]	−0.060** [0.030]	−0.113* [0.066]
dln Permanent Workers' Wages	0.006 [0.034]	0.008 [0.023]	0.033*** [0.009]	0.056*** [0.015]	0.078*** [0.026]
dln Value Added	0.156*** [0.049]	0.264*** [0.035]	0.356*** [0.018]	0.420*** [0.019]	0.427*** [0.030]
dln Rental of Capital Services	0.057** [0.026]	0.024*** [0.008]	0.006** [0.003]	0.006 [0.008]	0.009 [0.025]
YEAR	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes
Observations					11,092

Notes: First-differenced models are estimated. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises firms that did not export to China in 2011.

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

Table 9 presents the estimation results of QRs when using total employment as the dependent variable. The results indicate that the negative impacts caused by the political conflict on the total employment are prevalent across firm size because DID dummies *DID2012* and *DID2013* are negatively significant in all quantiles. Other variables such as *dlnWAGE* and *dlnVA* are statistically significant, except *dlnR*, which is insignificant.

Tables 10 and 11 present the results for permanent workers and temporary workers, respectively. Tables 10 demonstrates that significantly negative impacts on the employment of permanent workers are remarkably found in lower quantiles, implying that smaller firms have had a higher tendency to dismiss their permanent workers after the political conflict, while the largest of the firms in top quantile did not dismiss their permanent workers. Table 11 shows that the DID dummies have significantly negative coefficients in all quantiles except in the lowest one. This suggests that firms with a larger number of temporary workers tend to dismiss their temporary workers, while firms with a smaller number of temporary workers do not dismiss their temporary workers after such a shock.¹⁸

6. Conclusion

This study analyzed the impact of a political conflict on the employment in Japanese manufacturing firms by using Japanese firm-level data. The political incident that occurred between Japan and China in 2012 went on to become an economic issue in the form of a sudden decrease in Japan's export to China. We have used this exogenous incident as a natural experiment to identify the causal effect. In contrast to the past research on this subject that has focused on the impact on bilateral trade, we have conducted a richer observation that incorporates impacts on domestic production and labor demand. Thus, we identified the said impact by using the DID technique, assuming that firms exporting to China were more likely to be exposed by the demand shock.

Based on the Japanese manufacturing firm-level data, we found that the exogenous trade shock caused by the political conflict affected the domestic labor market. The demand shock decreased the labor demand of manufacturing firms in Japan by 1.2%. Specifically, our empirical

results suggest that such firms reduced labor demand for temporary workers rather than for permanent workers, which implies that firms tend to respond to the demand shock by reducing their number of temporary workers. This result might reflect that the firing costs of temporary workers are lower than those of permanent workers. It also suggests the possibility that firms tend to hoard permanent workers because they have higher firm-specific human capital than temporary workers. In either case, our empirical results imply that the burden incurred by the bilateral political conflict and the resulting negative demand shock is leading to workers having less stable job security in the labor market.¹⁹ They also indicate that firms tend to lay off temporary workers rather than permanent workers because they foresee that the demand shock will not be persistent.

We also investigated how the impact of the political conflict varies among firms by estimating QR models. Although the magnitude of the impact on total employment is almost the same regardless of firm size, there is a difference in the magnitude of the impact when workers are classified as permanent and temporary workers. The negative impact on permanent workers is concentrated on small- and medium-sized firms, whereas for temporary workers, firms are evenly affected except at both tails of the distribution. Thus, intuitively, larger firms are more resilient to such a shock, while smaller firms are forced to lay off permanent workers.

Although we observed labor adjustment (i.e., reducing the number of temporary workers) in response to the political conflict, it may be necessary to qualify this result, considering the rigidity of the labor market. In Japan, the dismissal of permanent workers is strictly regulated by labor law, which results in high firing costs for permanent workers. This background may urge firms to adjust their employment of temporary workers. Finally, we note that there is an empirical challenge involved in the estimation of the labor demand equations. In our empirical strategy, we obtained results by using the standard DID estimation technique to identify the impacts of the political conflict on domestic labor market. However, covariates such as wages and value added are also likely to be affected by the shock. Therefore, dealing with the potential endogeneity problems in the labor demand equation remains to be addressed in future research.

¹⁸ This might be because firms in the lowest quantile of temporary workers employ no temporary workers, as shown in Table A.5.

¹⁹ Our results are consistent with Yokoyama et al. (2019)'s findings that Japanese exporters tend to dismiss temporary workers and retain permanent workers who cannot be easily hired from the labor market when they face a negative shock because of exchange-rate fluctuations.

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Appendix A

Tables [A.1](#), [A.2](#), [A.3](#), [A.4](#), [A.5](#)

Table A.1

Japanese manufacturing firms' exports to China (2011).

Industry name	No. of firms	All (billion yen)	Intra-firm (%)	Arm's length (%)
Food products and beverages	1,747	17.9	19.6	80.4
Textiles	233	33.9	50.2	49.8
Clothing	275	16.7	67.9	32.1
Wood and wood products	140	0.8	0.3	99.7
Furniture	129	1.4	61.8	38.2
Paper and paper products	407	11.8	58.7	41.3
Publishing and printing	822	34.6	10.5	89.5
Leather	25	0.5	25.2	74.8
Rubber products	151	43.3	55.3	44.7
Chemicals and chemical products	931	758.1	27.0	73.0
Coke, refined petroleum, and plastics products	852	421.0	15.8	84.2
Other non-metallic mineral products	441	82.5	49.2	50.8
Basic iron and steel	446	388.8	8.6	91.4
Non-ferrous metals	376	312.5	28.0	72.0
Fabricated metal products	1,068	54.0	27.9	72.1
Machinery and equipment	1,681	1,245.0	39.6	60.4
Electrical machinery and apparatus	1,837	2,232.4	35.6	64.4
Motor vehicles	1,270	2,117.9	58.6	41.4
Precision instruments	344	153.7	69.9	30.1
Other manufacturing	389	135.0	47.6	52.4
Total	13,564	8,061.7	39.9	60.1

Note: Data are taken from the METI survey.

Table A.2

Change in Japanese manufacturing firms' exports to China (2011–2012).

Industry name	No. of firms	All (billion yen)	Intra-firm (billion yen)	Arm's length (billion yen)
Food products and beverages	1,575	2.0	−0.6	2.6
Textiles	216	−5.2	−5.2	0.1
Clothing	252	−2.7	−2.0	−0.7
Wood and wood products	130	0.1	0.0	0.1
Furniture	113	1.3	0.1	1.2
Paper and paper products	369	1.3	−2.2	3.6
Publishing and printing	736	−9.8	1.1	−10.9
Leather	21	0.0	0.0	0.0
Rubber products	138	−7.2	−2.4	−4.9
Chemicals and chemical products	876	−36.9	23.8	−60.7
Coke, refined petroleum, and plastics products	790	4.1	7.2	−3.1
Other non-metallic mineral products	413	0.6	−0.5	1.1
Basic iron and steel	421	−62.8	34.3	−97.1
Non-ferrous metals	348	−45.0	−26.0	−19.1
Fabricated metal products	982	−9.2	0.6	−9.8
Machinery and equipment	1,559	−179.5	−127.2	−52.3
Electrical machinery and apparatus	1,641	549.5	746.9	−197.4
Motor vehicles	1,182	−369.2	−113.9	−255.3
Precision instruments	312	19.7	6.6	13.1
Other manufacturing	339	−6.5	−0.5	−6.0
Total	12,413	−155.5	540.1	−695.6

Note: Data are taken from the METI survey.

Table A.3
China's share in Japanese manufacturing firms (2011).

Industry name	2011		2012	
	Exports (%)	Sales (%)	Exports (%)	Sales (%)
Food products and beverages	14.0	0.1	14.1	0.1
Textiles	38.3	1.9	29.6	1.6
Clothing	61.7	1.8	60.4	1.5
Wood and wood products	17.1	0.1	9.6	0.1
Furniture	10.8	0.1	24.8	0.3
Paper and paper products	19.3	0.2	19.9	0.3
Publishing and printing	16.5	0.4	13.1	0.3
Leather	66.2	0.9	7.4	0.1
Rubber products	5.6	1.6	4.6	1.3
Chemicals and chemical products	21.7	2.4	20.7	2.3
Coke, refined petroleum, and plastic products	27.9	1.8	30.5	1.8
Other non-metallic mineral products	16.8	2.0	18.1	1.9
Basic iron and steel	12.7	2.6	15	2.4
Non-ferrous metals	24.4	3.1	21.6	2.9
Fabricated metal products	24.9	0.7	22.3	0.6
Machinery and equipment	16.9	5.0	14	3.9
Electrical machinery and apparatus	19.3	4.5	22.4	6
Motor vehicles	11.6	3.7	9.2	2.9
Precision instruments	10.2	3.3	9.3	3
Other manufacturing	22.6	3.2	21.6	2.8
Total	22.9	2.0	19.4	1.8

Note: Data are taken from the METI survey.

Table A.4
Impacts on Japanese manufacturers' employment.

Treated outcome	Arm's length exporters to China		
	lnL	lnPERM	lnTEMP
DID2012	−0.007 [0.005]	−0.005 [0.005]	−0.019 [0.031]
DID2013	−0.013*** [0.005]	−0.006 [0.005]	−0.051 [0.032]
Log Rental of Capital Services	−0.191*** [0.007]	−0.212*** [0.007]	−0.069 [0.045]
Log Permanent Workers' Wages	0.159** [0.005]	0.155*** [0.006]	0.185*** [0.037]
Log Value Added	0.010** [0.001]	0.008*** [0.001]	0.031** [0.009]
YEAR	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes
YEAR × INDUSTRY	Yes	Yes	Yes
Observations	9,588	9,588	9,588
R-squared	0.193	0.187	0.021

Notes: Firm fixed-effects models are estimated. We present within estimators. Standard errors are presented in square brackets. Constants are suppressed. The control group comprises exporters that did not export to China in 2011. Firms that conducted intra-firm exports to China but not arm's length exports were excluded from the estimation sample.

*Significance at the 10% level.

**Significance at the 5% level.

*** Significance at the 1% level.

Table A.5
Number of employees in quantiles in the estimation sample of QRs (2011).

	q10	q25	q50	q75	q90	Mean
L	78	116	219	519	1,332	764.6
PERM	66	100	190	457	1,178	685.6
TEMP	0	6	21	61	158	79.0

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