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TANAKA Ayumu
RIETI

ITO Banri
RIETI

WAKASUGI Ryuhei
RIETI



The Research Institute of Economy, Trade and Industry
<http://www.rieti.go.jp/en/>

How Do Exporters Respond to Exogenous Shocks: Evidence from Japanese firm-level data*

TANAKA Ayumu[§] ITO Banri[†] WAKASUGI Ryuhei[‡]

Abstract

This study investigates how exporters respond to an exogenous shock, using the 2012 customer boycott of Japanese products in China that occurred after a political conflict over the islands in the East China Sea. By using Japanese firm-level data for 2011-2013 and employing the difference-in-differences method, we conduct an assessment of the boycott. We find that Japanese firms faced a large decrease in exports to China after the 2012 boycott and that the decrease in exports was more pronounced for arm's length exports than intra-firm exports. In addition, the estimation results provide evidence that Japanese firms exporting to China responded to the exogenous trade shock by reducing their number of temporary workers. This finding suggests that trade shocks due to international conflicts hit the most insecure workers.

Keywords: Exports, Temporary workers, Boycott, Difference-in-differences estimation

JEL classification: F14; F16; F51.

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§ Corresponding author. Chuo University and RIETI. E-mail: a-tanaka@tamacc.chuo-u.ac.jp.

† Aoyama Gakuin University and RIETI. E-mail: bito@aoyamagakuin.jp.

‡ University of Niigata Prefecture and RIETI. E-mail: wakasugi@unii.ac.jp.

1 Introduction

Many studies in the trade literature have demonstrated the extent to which international trade is affected by external demand shocks. For example, the analysis of the effect of the global financial crisis in 2008 on international trade showed how seriously the reduction in world demand damaged international trade.¹ In addition to these demand shocks, the recent rise in political tension and conflict globally may bring about external shocks to global demand and disturb the sound development of international trade. Indeed, many economists have attempted to demonstrate the extent to which demand shocks due to political conflict affect international trade, using country- and industry-level trade data.²

Turning to the firm level, it is natural to expect firms, reacting to demand shocks owing to the fluctuation of international trade, to change their production and supply to match demand. However, analyses of the impact of political tension and conflict on corporate behavior have been limited to the best of the authors' knowledge. In particular, there have been few attempts to investigate the impact based on firm-level data compared with aggregated data. To bridge this gap in the literature on this topic, this study examines the extent to which firms react to demand shocks caused by political conflict, using Japanese manufacturing firm-level data.

Consumer boycott against the products of a counterpart's economy is one political conflict that may negatively affect bilateral trade. Empirical studies have examined the impact of consumer boycotts in the aftermath of the Iraq War of 2003 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 of this topic is presented by Heilmann (2016), who examines the impact of consumer boycotts on international trade by using various political incidents such as the boycott of Danish products by Muslim countries after the Muhammad comic crisis in 2005 and 2006, the boycott of Japanese products in China after the Senkaku islands conflict in 2012, the boycott of Israeli products by Turkey over the Gaza conflict in 2014, and the boycott of French products in the United States over the Iraq War in 2003. 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 intermediate goods.

Considering the domestic market and multilateral trade, firms respond to external demand shocks in several ways. Exporting firms may adjust their supply destinations across domestic and export markets to match production to lower foreign demand. Indeed, exporting firms may respond to a shock by "substituting" output between their domestic and export markets when they face demand shocks in a foreign market. Vannoorenberghe (2012) provides evidence supporting this view, using French firm-level data for 1998 to 2007. By

¹See Levchenko et al. (2010); Bricongne et al. (2012); Behrens et al. (2013)

²See Martin et al. (2008); Armstrong (2012)

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, based on French firm-level data combined with destination-specific export data for 1995–2001. However, the way in which 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 issue, we evaluate the impact not only on output but also on input factors. Few attempts have been made to adjust input factors when firms face foreign demand shocks. 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. If firms reduce labor inputs, they may minimize the adjustment cost by replacing the composition of permanent workers that have high firing costs and temporary workers that have low firing costs.³ However, the degree to which the exporter’s production and employment changes in response to unexpected demand shocks remains to be examined. Our study thus empirically investigates the effect of demand shocks brought about by political conflict in export markets on domestic production and employment at the firm level.

We focus on Japanese firms’ behavior after the Chinese consumer boycott of Japanese products in 2012. Political conflict is considered to be 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 islands in the East China Sea. The most typical case of political tension that affects bilateral economic relations is that of the consumer boycotts of Japanese products in China after Japan’s nationalization of the Senkaku Islands in September 2012. To examine how firms respond to such a consumer boycott, we employ the difference-in-differences (DID) technique. We construct a model for the empirical estimation in which the treatment group comprises firms exporting to China, which are more susceptible to the demand shock caused by the consumer boycott of Japanese goods in China than firms that do not export to China.⁴

The main findings of this study are threefold. First, we find negative impacts of the Chinese boycott 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 indicate 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 find

³Matsuura et al. (2011) address the view that the increase in volatility forces firms to shift from permanent to temporary workers to save labor adjustment costs.

⁴This idea is also used 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.

that firms reduce the number of employees by adjusting the composition of permanent and temporary workers after the demand shock. Specifically, firms that carry out arm's length exports to China decrease the number of temporary workers in response to the shock. 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 the 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 consumer boycott against Japanese products 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 (the METI survey). The survey is conducted by the Japanese Ministry of Economy, Trade, and Industry (METI). The targets of the METI survey are firms with more than 50 employees and more than 30 million yen in capital. Firms are required to answer the previous financial year's information. In most cases, the 2013 survey contains the FY2012 information between April 2012 and March 2013. In the case of employment, however, firms are required to answer the number of workers as of March 2013. We simply call FY2012 as 2012 and refer to the data from the 2013 survey as the data on 2012.

2.2 Exports

Before the regression analysis, this section shows the descriptive statistics. 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 do not export to other countries account for 4% of manufacturing firms, while firms that do not export to China but export 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.

Arm's length exports are more vulnerable to exogenous shocks and more volatile than intra-firm exports.⁵ We therefore classify all firms into four types: (i) firms that conduct

⁵See Bernard et al. (2009).

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.

neither intra-firm exports to China nor arm’s length exports to China, (ii) firms that conduct intra-firm exports to China but do not conduct arm’s length exports to China, (iii) firms that conduct arm’s length exports to China but do not conduct intra-firm exports to China, and (iv) firms that conduct both intra-firm and arm’s length exports to China. Table 2 presents the number of firms of each type, showing that arm’s length exports are more prevalent than intra-firm exports among Japanese manufacturing exporters to China. It further shows that arm’s length exporters without intra-firm exports are the largest group of exporters to China.

Table 2: Number of firms by export status (2011): intra-firm versus arm’s length exports

Arm’s length exports to China	Intra-firm exports to China		
	No	Yes	Total
No	10,460	659	11,119
Yes	1,579	866	2,445
Total	12,039	1,525	13,564

Note: Data are taken from the METI survey.

Table 3 presents the change in exports to China between 2001 and 2012. It shows the striking result that arm’s length exports decrease, while intra-firm exports increase during that period. The largest decrease in arm’s length exports is observed among firms that conduct arm’s length exports to China but do not conduct intra-firm exports (“Arm’s length only”). Firms that conduct both arm’s length exports and intra-firm exports to China (“Both”) experience the largest decrease in exports to China.

Table 4 decomposes the change in exports to China between 2001 and 2012 into the intensive and extensive margins. It 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.

2.3 Employment

Next, we explore the impacts of international conflict on domestic employment. The descriptive analysis in the previous subsection suggests that arm’s length exports are more vulnerable to political shocks and that the intensive margin accounts for most change in

Table 3: Change in exports to China between 2011 and 2012 by export mode

Export mode in 2011	No. of firms	All (billion yen)	Intra-firm (billion yen)	Arm's length (billion yen)
No exports	9519	244.4	142.7	101.7
Arm's length only	1483	98.6	725.1	-626.5
Intra-firm only	601	-39.1	-77.3	38.2
Both	810	-459.4	-250.4	-209.0
Total	12413	-155.5	540.1	-695.6

Notes: Data are taken from the METI survey. “No exports” indicate firms that do not export to China. “Arm’s length only” indicates firms that conduct arm’s length exports to China but do not conduct intra-firm exports, while “Intra-firm only” indicates firms that conduct intra-firm exports to China but do not conduct arm’s length exports. “Both” indicates firms that conduct both arm’s length exports and intra-firm exports to China.

Table 4: Change in exports to China between 2011–2012: intensive versus extensive margins

Exporter type	No. of firms	All (billion yen)	Intra-firm (billion yen)	Arm's length (billion yen)
Intensive margin				
Cont. increase	1131	1065.8	836.6	229.2
Cont. decrease	1403	-1313.5	-383.2	-930.3
Cont. unchanged	82	0.0	0.6	-0.6
Extensive margin				
Stop	278	-152.2	-56.7	-95.5
Start	388	244.4	142.7	101.7
No exports	9131	0.0	0.0	0.0
Total	12413	-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 increase, decrease, and keep their exports to China between 2011 and 2012. “Stop” indicates firms that stop exporting to China between 2011 and 2012, while “Start” indicates firms that start exporting to China. “No exports” indicate firms that do not export to China during 2011–2012.

exports to China. In this subsection, we provide a descriptive analysis of the employment change between 2011 and 2012 to examine how firms respond to export shocks.

Table 5 presents the changes in the number of workers between 2011 and 2012. It shows that among exporters to China, continuing exporters that decrease their exports (“Cont. decrease”) account for the largest decrease in the number of workers and that they, on average, face the largest decrease in the number of workers. This finding corresponds to the fact that the intensive margin accounts for most of the change in exports to China and 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 decreases between 2001 and 2012, while the number of permanent workers increases. This striking result indicates that temporary workers are used as a buffer against an exogenous shock.

Table 5: 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
Stop	278	-1,231	-1,168	-63	-4.4	-4.2	-0.2
Start	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 increase, decrease, and keep their exports to China between 2011 and 2012. “Stop” indicates firms that stop exporting to China between 2011 and 2012, while “Start” indicates firms that start exporting to China. “No exports” indicate firms that do not export to China during 2011–2012.

Figure 1 confirms the previous results that temporary workers are used as a buffer to shocks. It shows that firms that export to China in 2011 increase their number of permanent workers but decrease their number of temporary workers more than firms that do not export to China in 2011 do.

Table 6 presents the employment change after the shock by export mode. Firms that conduct both arm’s length and intra-firm exports to China (“Both”) account for the largest decrease in the number of temporary workers, while they increase the total and average number of permanent workers. In addition, their average reduction of temporary workers is by far the largest. These results suggest that they adjust their worker composition by raising their share of permanent workers.

Firms that conduct arm’s length exports to China but do not conduct intra-firm exports (“Arm’s length only”) and firms that conduct intra-firm exports to China but do not conduct

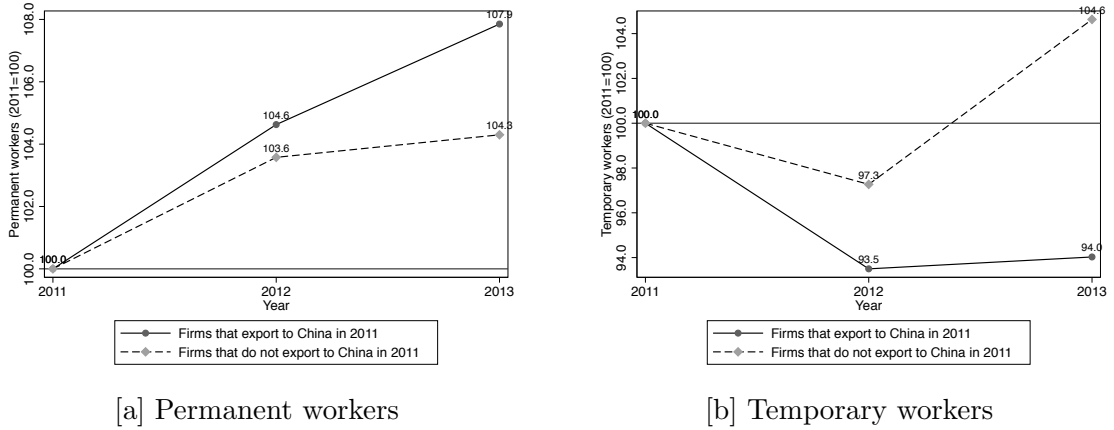


Figure 1: Change in the number of workers: exporters versus non-exporters

Notes: Data are taken from the METI survey. 2011 = 100.

arm’s length exports (“Intra-firm only”) decrease the total and average number of both permanent and temporary workers.

Table 6: Change in the number of workers between 2011 and 2012 by export mode in 2011

Export mode in 2011	No. of firms	Sum			Average		
		ALL	PERM	TEMP	ALL	PERM	TEMP
Arm’s length only	1,483	-7,359	-4,041	-3,318	-5.0	-2.7	-2.2
Intra-firm only	601	-4,005	-2,442	-1,563	-6.7	-4.1	-2.6
Both	810	-4,255	13,890	-18,145	-5.3	17.1	-22.4
No exports to China	9,519	-7,305	10,108	-17,413	-0.8	1.1	-1.8
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. “No exports” indicate firms that do not export to China. “Arm’s length only” indicates firms that conduct arm’s length exports to China but do not conduct intra-firm exports, while “Intra-firm only” indicates firms that conduct intra-firm exports to China but do not conduct arm’s length exports. “Both” indicates firms that conduct both arm’s length exports and intra-firm exports to China.

3 Empirical specification

To examine the impacts of the export shock after the nationalization of the islands on Japanese firms’ employment, we employ a standard DID estimator. In our case, treated firms are those that export to China in 2011, while control firms are those that do 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. Our DID variables are an interaction term between the dummy for treated firms and a dummy for the year 2012, DID_{2012} , and an interaction term between the dummy for treated firms and a dummy for the year 2013,

DID2013. We focus on the number of workers (L), number of permanent workers ($PERM$), and number of temporary workers ($TEMP$)⁶, as our outcome variables (O).

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

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

where we omit the firm and time subscripts for brevity. We assume that the first-order derivatives of the production function are positive, while the second-order derivatives are negative. The associated cost function is

$$C = g(WAGE, WAGE_{TEMP}, r, Y) \quad (2)$$

where $WAGE$ and $WAGE_{TEMP}$ are the wages for permanent workers and temporary workers, respectively, while 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, we can derive the following labor demand equations:

$$PERM = X^{PERM}(WAGE, WAGE_{TEMP}, r, Y) \text{ and} \quad (3)$$

$$TEMP = X^{TEMP}(WAGE, WAGE_{TEMP}, r, Y). \quad (4)$$

For the estimation, we employ the following log-linear form with the DID dummies:

$$\begin{aligned} \ln O_{it} = & \beta_0 + \beta_1 DID2012_{it} + \beta_2 DID2013_{it} + \beta_3 \ln WAGE_{it} \\ & + \beta_4 \ln VA_{it} + \beta_5 \ln R_{it} + \beta_6 YEAR_t + \beta_7 INDUSTRY_{it} \\ & + \beta_8 YEAR * INDUSTRY_{it} + \epsilon_{it} \end{aligned} \quad (5)$$

where the subscripts i and t index firm and year. O is our outcome variable. We employ the number of temporary workers, $TEMP$, number of permanent workers, $PERM$, and total number of workers, L . Permanent workers' hourly wages, $WAGE$, value added, VA , and rental of capital services,⁷ R , are included. $YEAR$ and $INDUSTRY$ are the year and industry dummies, respectively. Their interaction terms are included to control for the wages for temporary workers since temporary workers' wages, $WAGE_{TEMP}$, are unavailable and assumed to exhibit no exogenous variation across industries.

⁶Temporary workers are called "non-standard workers" in Japan. The number of temporary workers is the sum of the number of part-time workers, dispatched workers, and day laborers in our data.

⁷Based 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.

4 Substitutability between markets

Before assessing the impacts of the boycotts in China on Japanese firms' employment, this section analyzes the impacts on Japanese firms' exports to examine whether firms reallocate their output to countries other than China. 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). By so doing, 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:

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

where X_{it} is either domestic sales ($\ln DOMESTIC_SALES$) or exports to countries other than China ($\ln EX_NONCHN$). Exports to countries other than China are further divided into intra-firm exports ($\ln EX_NONCHN_AL$) and arm's length exports ($\ln EX_NONCHN_AL$). We also investigate the impacts on total exports ($\ln EXPORT$), using it as an additional dependent variable. $\ln TFP$ is total factor productivity, $\ln CI$ is capital intensity (capital over valued 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.

Table 7 presents the estimation results of Equation (6). Column (1) reports the results using domestic sales as the dependent variable, while 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.

Columns (3) and (4) present the contrasting results that there are positive impacts on arm's length exports to countries other than China but no impacts on intra-firm exports. This finding shows that firms reallocate their output by increasing arm's length exports rather than intra-firm exports to countries other than China. Finally, in column (5), the DID dummies are negatively significant, implying that total exports have negative impacts on the boycott in China. This finding suggests that negative export shocks in China are not fully offset by increasing exports to other countries.

To summarize, the results suggest that Japanese firms that face negative export shocks partly reallocate their output to other countries. Such a reallocation can mitigate the negative impacts on domestic employment but it does not fully offset the negative shock on exports to China.

Table 7: Substitutability between markets

	(1)	(2)	(3)	(4)	(5)
	lnDOMESTIC_SALES	lnEX_NONCHN	lnEX_NONCHN_IN	lnEX_NONCHN_AL	lnEXPORT
DID2012	-0.009 [0.020]	0.187*** [0.041]	0.019 [0.052]	0.128** [0.055]	-0.051* [0.029]
DID2013	-0.016 [0.021]	0.239*** [0.041]	0.065 [0.052]	0.202*** [0.056]	-0.052* [0.030]
lnTFP	-0.003 [0.039]	0.042 [0.079]	-0.067 [0.100]	0.071 [0.106]	0.151*** [0.056]
lnCI	-0.419*** [0.061]	-0.215* [0.121]	-0.340** [0.153]	-0.020 [0.164]	-0.021 [0.087]
MNE.CHN	0.022 [0.033]	-0.003 [0.067]	0.387*** [0.084]	-0.210** [0.090]	0.061 [0.048]
MNE_NON_CHN	-0.039 [0.032]	0.290*** [0.064]	0.833*** [0.081]	0.090 [0.087]	0.046 [0.046]
FOREIGN	0.003 [0.051]	-0.065 [0.101]	0.050 [0.128]	-0.075 [0.137]	-0.013 [0.073]
Observations	10909	10909	10909	10877	10909
R-squared	0.030	0.017	0.033	0.006	0.012

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Estimation method: FE model

Notes: Firm fixed effects models are estimated. Standard errors are given in square brackets. Constants are suppressed. The control group are exporters that do not export to China in 2011.

*** Indicates significance at the 1% level.

** Indicates significance at the 5% level.

* Indicates significance at the 10% level.

5 Results

5.1 Impacts on employment: DID

This section presents the DID estimation results to discuss the impacts of the export shock due to the nationalization of the islands.⁸ Table 8 shows the estimation results of Equation (5). Columns (1)–(3) report the baseline results, while columns (4)–(6) report the results when using arm’s length exporters to China as the treated firms. In columns (4)–(6), firms that conduct intra-firm exports to China but do not conduct arm’s length exports are excluded from the estimation sample. Columns (4)–(6) reflect the severe impact of the shock more than columns (1)–(3) since the descriptive analysis in the previous section suggests that arm’s length exports are more vulnerable to exogenous shocks.

Columns (1) and (4) show the significantly negative impacts on domestic employment in Japan one year after the nationalization since the DID dummies, $DID2013$, are significantly negative. In columns (2) and (3) as well as (5) and (6), the coefficient of the DID dummies are negative but insignificant. In addition, against our prediction, we do not find any difference between arm’s length exporters and other exporters in Table 8.

The coefficients of the other explanatory variables have the theoretically predicted signs. Permanent workers’ wages are negatively significant in columns (1), (2), (4), and (5) and are insignificant in columns (3) and (6), implying that employing temporary workers is insensitive to permanent workers’ wages. This finding suggests that temporary workers’ role is different from that of permanent workers in Japanese firms. 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 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, using export exposure to China instead of the dichotomous exporter dummy. Export exposure to China is defined as the share of exports to China in total sales in 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

⁸We also examine whether the impacts on employment differ by firm size, using the quantile regression technique. The results reveal no systematic difference in impacts on temporary workers by firm size since the negative impacts are universally significant in all quantiles. They also reveal that smaller firms receive significantly negative impacts on permanent workers, while largest firms receive no impacts on permanent workers.

Table 8: Impacts on Japanese manufacturers' employment

Treated:	(1)	(2)	(3)	(4)	(5)	(6)
	Exporters to China			Arm's length exporters to China		
	lnL	lnPERM	lnTEMP	lnL	lnPERM	lnTEMP
DID2012	-0.006 [0.004]	-0.005 [0.005]	-0.014 [0.030]	-0.007 [0.005]	-0.005 [0.005]	-0.019 [0.031]
DID2013	-0.012*** [0.004]	-0.006 [0.005]	-0.045 [0.030]	-0.013*** [0.005]	-0.006 [0.005]	-0.051 [0.032]
lnWAGE	-0.183*** [0.006]	-0.206*** [0.006]	-0.035 [0.040]	-0.191*** [0.007]	-0.212*** [0.007]	-0.069 [0.045]
lnVA	0.159*** [0.005]	0.158*** [0.005]	0.164*** [0.034]	0.159*** [0.005]	0.155*** [0.006]	0.185*** [0.037]
lnR	0.009*** [0.001]	0.008*** [0.001]	0.027*** [0.008]	0.010*** [0.001]	0.008*** [0.001]	0.031*** [0.009]
YEAR	YES	YES	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES	YES	YES
YEAR*INDUSTRY	YES	YES	YES	YES	YES	YES
Observations	11092	11092	11092	9588	9588	9588
R-squared	0.185	0.186	0.019	0.193	0.187	0.021

Notes: Firm fixed effects models are estimated. Standard errors are given in square brackets. Constants are suppressed. The control group are exporters that do not export to China in 2011. In columns (4)–(6), firms that conduct intra-firm exports to China but do not conduct arm's length exports to China are excluded from the estimation sample.

*** Indicates significance at the 1% level.

** Indicates significance at the 5% level.

* Indicates significance at the 10% level.

term between export exposure to China and a dummy for the year 2013.

Table 9 presents the continuous DID estimation results. The coefficients of export exposure to China are significantly negative in all columns, implying that firms with a higher share of exports to China experience a larger reduction in their domestic employment one year after the nationalization, regardless of whether they employ permanent and/or temporary workers.

Table 9: Impacts on Japanese manufacturers' employment: Chinese export share

	(1)	(2)	(3)
	lnL	lnPERM	lnTEMP
SALESSH_CHN2012	-0.017 [0.025]	-0.015 [0.026]	-0.063 [0.172]
SALESSH_CHN2013	-0.065** [0.026]	-0.051* [0.027]	-0.308* [0.174]
lnWAGE	-0.183*** [0.006]	-0.206*** [0.006]	-0.037 [0.040]
lnVA	0.159*** [0.005]	0.159*** [0.005]	0.158*** [0.034]
lnR	0.009*** [0.001]	0.008*** [0.001]	0.028*** [0.008]
YEAR	YES	YES	YES
INDUSTRY	YES	YES	YES
YEAR*INDUSTRY	YES	YES	YES
Observations	11092	11092	11092
R-squared	0.179	0.180	0.011

Notes: Firm fixed effects models are estimated. Standard errors are given in square brackets. Constants are suppressed. The control group are exporters that do not export to China in 2011.

*** Indicates significance at the 1% level.

** Indicates significance at the 5% level.

* Indicates significance at the 10% level.

5.3 Impacts on employment: non-MNEs

To eliminate any effects through the activity of foreign affiliates, we run a regression that excludes MNEs. Table 10 reports the results of the standard DID and continuous DID estimations. Columns (2), (3), (5), and (6) show that temporary workers receive negative impacts, while permanent workers receive no impact. This finding implies that firms adjust their worker composition by reducing their number of temporary workers. Column (6) further shows that a significantly negative impact on the number of temporary workers appears in the year of the nationalization. In addition, column (1) shows that reducing the number of temporary workers results in significantly negative impacts on the total number of workers.

Table 10: Impacts on Japanese manufacturers' employment: Non-MNEs

	(1)	(2)		(3)	(4)	(5)		(6)
		DID				Continuous DID		
	lnL	lnPERM	lnTEMP		lnL	lnPERM	lnTEMP	
DID2012 (SALESSH CHN2012)	-0.008 [0.006]	0.001 [0.006]	-0.114*** [0.041]		-0.041 [0.040]	0.007 [0.042]	-0.849*** [0.291]	
DID2013 (SALESSH CHN2013)	-0.010* [0.006]	0.006 [0.006]	-0.143*** [0.042]		-0.067 [0.042]	0.033 [0.044]	-1.071*** [0.307]	
lnWAGE	-0.139*** [0.008]	-0.155*** [0.009]	0.009 [0.062]		-0.138*** [0.008]	-0.155*** [0.009]	0.013 [0.061]	
lnVA	0.144*** [0.007]	0.134*** [0.008]	0.165*** [0.054]		0.142*** [0.007]	0.135*** [0.008]	0.149*** [0.054]	
lnR	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	4555	4555	4555		4555	4555	4555	
R-squared	0.169	0.158	0.036		0.157	0.143	0.017	

Notes: Firm fixed effects models are estimated. Standard errors are given in square brackets. Constants are suppressed. In columns (4)–(6), *SALESSH_CHN* are used instead of the *DID* dummy. The control group are exporters that do not export to China in 2011. MNEs are excluded from the estimation sample.

*** Indicates significance at the 1% level.

** Indicates significance at the 5% level.

* Indicates significance at the 10% level.

5.4 Impacts on employment: All firms

In the above estimation, we exclude non-exporters from the estimation sample. In this subsection, we include non-exporters in the estimation sample and confirm the main results. Table 11 shows that significantly negative impacts on the number of workers are prevalent regardless of worker type one year after 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 workers.

Table 11: Impacts on Japanese manufacturers' employment: All firms

	(1)	(2)	(3)	(4)	(5)	(6)
	lnL	lnPERM	lnTEMP	lnL	lnPERM	lnTEMP
DID2012 (SALESSH_CHN2012)	-0.003 [0.003]	-0.004 [0.003]	-0.002 [0.019]	-0.029 [0.023]	-0.018 [0.027]	-0.095 [0.155]
DID2013 (SALESSH_CHN2013)	-0.012*** [0.003]	-0.010*** [0.003]	-0.041** [0.019]	-0.091*** [0.023]	-0.075*** [0.027]	-0.377** [0.156]
lnWAGE	-0.140*** [0.003]	-0.207*** [0.004]	0.069*** [0.020]	-0.141*** [0.003]	-0.207*** [0.004]	0.065*** [0.020]
lnVA	0.152*** [0.003]	0.177*** [0.004]	0.114*** [0.020]	0.152*** [0.003]	0.177*** [0.004]	0.114*** [0.020]
lnR	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	30623	30623	30623	30623	30623	30623
R-squared	0.148	0.170	0.013	0.143	0.167	0.009

Notes: Firm fixed effects models are estimated. Standard errors are given in square brackets. Constants are suppressed. In columns (4)–(6), *SALESSH_CHN* are used instead of the *DID* dummy. The control group are firms that do not export to China in 2011.

*** Indicates significance at the 1% level.

** Indicates significance at the 5% level.

* Indicates significance at the 10% level.

6 Conclusion

This study analyzes the impact of demand shocks caused by political conflict on employment by using Japanese firm-level data. The political incident that occurred between Japan and China in 2012 moved to an economic issue in the form of a boycott of Japanese products in China. We use this exogenous incident as a natural experiment to identify the causal effect. In contrast to previous studies of this topic that have focused on the impact on bilateral

trade, we conduct a richer observation that incorporates impacts on domestic production and labor demand. We identify the impact by using the DID technique, assuming that firms that export to China are more likely to be exposed by China's consumer boycott.

Based on Japanese manufacturing firm-level data, we find that the exogenous trade shock due to the consumer boycott of Japanese products in China affects the domestic market. The demand shock decreases the labor demand of manufacturing firms in Japan by 1.2%, and this negative impact is concentrated in firms that conduct arm's length exports to China. Specifically, those firms reduce labor demand for temporary workers rather than permanent workers, suggesting that firms respond to the demand shock by reducing their number of temporary workers. This result is most likely to reflect the lower firing costs of temporary workers compared with those of permanent workers. Our empirical results imply that the burden incurred by bilateral political conflict and the resulting consumer boycott is leading to workers having less stable job security in the labor market.

Although we observe a labor adjustment (i.e., reducing the number of temporary workers) in response to the demand shock, 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 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 consumer boycott on the domestic labor market. However, covariates such as wages and value added are also likely to be affected by the demand shock. Dealing with the potential endogeneity problems in the labor demand equation therefore remains to be addressed in a future study.

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Appendix

Table 12: Japanese manufacturing firms' exports to China (2011)

Industry name	No. of firms	All (billion yen)	Intra-firm (%)	Arm's length (%)
Food products and beverages	1747	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, 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	1068	54.0	27.9	72.1
Machinery and equipment	1681	1245.0	39.6	60.4
Electrical machinery and apparatus	1837	2232.4	35.6	64.4
Motor vehicles	1270	2117.9	58.6	41.4
Precision instruments	344	153.7	69.9	30.1
Other manu.	389	135.0	47.6	52.4
Total	13564	8061.7	39.9	60.1

Note: Data are taken from the METI survey.

Table 13: 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	1575	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, 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	1559	-179.5	-127.2	-52.3
Electrical machinery and apparatus	1641	549.5	746.9	-197.4
Motor vehicles	1182	-369.2	-113.9	-255.3
Precision instruments	312	19.7	6.6	13.1
Other manu.	339	-6.5	-0.5	-6.0
Total	12413	-155.5	540.1	-695.6

Note: Data are taken from the METI survey.

Table 14: 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, 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 plastics 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 manu.	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.