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# Multinationals, Intrafirm Trade, and Employment Volatility\*

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## Abstract

This paper examines the theoretically ambiguous relationship between the volatility of employment growth and the foreign exposure of firms. We employ unique Japanese firm-level data over the period 1994–2012. This allows us to investigate any differences in this relationship across multinational firms and trading and non-trading firms, manufacturing and wholesale trade, and intrafirm and interfirm trade. One major finding is that in manufacturing, employment volatility increases as the share of intrafirm exports to total sales increases. In contrast, in wholesale trade, employment volatility declines as the share of intrafirm imports to total imports increases. The results suggest that a greater share of intrafirm trade could magnify foreign demand shocks in manufacturing, whereas it could mitigate foreign supply shocks in wholesale trade.

**Key words:** Employment volatility; Multinational firm; Intrafirm trade; Wholesale trade

**JEL classification codes:** F1; F16; L25; L81

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*“In an economy that is more open to foreign trade and investment, the demand for labor will generally be more responsive to changes in the price of labor, or more elastic. ... The flattening of labor demand curves as a consequence of globalization results in greater instability in labor market outcomes.” – Rodrik (1997, p. 16 and p. 19)*

## **1 Introduction**

Increased labor demand elasticities have important labor market consequences. As Rodrik (1997) noted, one of the main concerns is the relationship between foreign exposure and employment volatility, such that firms exposed to foreign demand and/or supply are expected to have higher labor demand elasticities. For example, trade liberalization could result in greater product market competition, which results in higher labor demand elasticities (e.g., Rodrik, 1997). Offshoring could also increase the substitution between foreign and domestic workers, which further flattens the labor demand curve (e.g., Senses, 2010). Thus, it is widely believed by the public that employment in firms with greater foreign exposure tends to be more volatile than the employment of domestic firms.

If firms are risk neutral, whether employment volatility is high does not seem to be a problem, providing that there are no labor adjustment costs. However, when firms face high labor adjustment costs, higher employment volatility will certainly be an issue because it will generate large adjustment costs to the economy as a whole. Indeed, OECD (2005) featured labor adjustment costs as one of its concerns relating to the expansion of international trade and foreign direct investment (FDI). The adjustment of labor in response to foreign exposure is then an important concern for policy makers.

Despite this, the relationship between foreign exposure and employment volatility is theoretically ambiguous. In the case of exports, employment volatility will be higher for exporters than for nonexporters if the volatility of shocks is significantly higher for the trading

partners than for the home country (in this analysis, Japan), or if the export activity itself is volatile owing to changes in the exchange rate, for example. Conversely, exporters may be able to absorb demand shocks in one country by diversifying their activities across other countries.

Similarly, in the case of imports, a firm that sources inputs from many countries can more easily absorb shocks to a particular input by switching its sources to another country compared with a firm that sources inputs only from the domestic market. In contrast, importers could have higher employment volatility if imported intermediate inputs are easily substitutable for labor inputs. A similar argument applies to the case of FDI. Because the effects of foreign exposure on employment volatility are theoretically ambiguous, there is a need for empirical analysis to clarify the effects that appear strongest in reality.

A number of studies have examined the causes and effects of sales volatility.<sup>1</sup> For example, Comin et al. (2009) examined the relationship between sales and wage volatilities among US firms and found a positive relationship. However, they did not distinguish between domestic sales and exports. Elsewhere, Buch et al. (2009) examined the relationship between export openness and output volatility using firm-level data on German manufacturing firms for the period 1980–2011. They found that exporters had a lower volatility of sales than non-exporters, although they did not focus on employment volatility. Lastly, Vannoorenberghe (2012) examined the relationship between sales volatility and the export intensity of firms, as measured by the share of exports to total sales. Using French firm-level data, they found that export intensity had a positive and substantial effect on sales volatility. Nevertheless, they did not address the labor market consequences.

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<sup>1</sup>Another related strand of study is the estimation of labor demand functions, usually by focusing on the differences between multinational and domestic firms (e.g., Barba Navaretti et al., 2003; Fabbri et al., 2003; Kiyota and Matsuura, 2006; Murakami and Fukao, 2007; Buch and Lipponer, 2010). However, it should be noted that increases in labor demand elasticity are not necessarily sufficient to explain increases in employment volatility because high volatility in output (for instance, through productivity shocks) could also result in high employment volatility.

To our knowledge, only Kurz and Senses (2016) have examined the relationship between foreign exposure and employment volatility. Using firm- and transaction-level data from U.S. manufacturing firms between 1991 and 2005, they found that the employment of exporters was less volatile than that of domestic firms, whereas that of importers was more volatile. Their study also identified a nonmonotonic relationship between export status and employment volatility, such that the effects of exports could be more or less volatile, depending on the share of exports to total sales. On this basis, they concluded that “as long as a firm’s overall exposure is not too large, exporting affords firms the ability to diversify their demand sources across countries and products” (p. 174).

Building upon Kurz and Senses (2016), this paper examines the effects of international trade and FDI on employment volatility using large-scale, firm-level data from Japan. The major contributions of the paper are threefold. First, we distinguish between multinational firms, trading and nontrading firms in analyzing the relationship between foreign exposure and employment volatility. Although Kurz and Senses (2016) made significant contributions to this literature, the scope of their study is limited in that they did not consider the effects of FDI, even though it is an important globalization channel for most firms. Our study therefore examines the heterogeneous effects of foreign exposure on employment volatility in a much more comprehensive manner.

Second, we expand the industry coverage of the analysis. Our data cover not only manufacturing, but also wholesale trade firms. As Bernard et al. (2010a) emphasized, not only producers, but also wholesale traders engage in international trade. In addition, they found that wholesale traders behaved differently from producers. For example, trade by wholesale traders was less sensitive to market size compared with trade by manufacturing firms. Similarly, Comin et al. (2009) found that the relationship between sales and wage volatility was stronger in services firms than in manufacturing firms. This is because in the service sector, it can be difficult to monitor or assess performance, which makes it difficult to relate the

worker's individual performance and incentives to firm goals. As a result, when firms set wages, they need to relate wages to observable firm-level performance (i.e., sales). The distinction between these types of firms is important for a deeper understanding of international trade.

Third, we consider the difference between intrafirm and interfirm trade. The effects of intrafirm trade on employment volatility are also ambiguous. On one hand, because intrafirm trade is, by definition, a transaction within a firm, we expect intrafirm trade uncertainty to be smaller than that of interfirm trade. As a result, firms with a greater intensity of intrafirm trade could experience less employment volatility, all else being equal.<sup>2</sup> On the other hand, if intrafirm trade depends on the supply chain of certain specific products, the firm could lack flexibility when unexpected shocks affect foreign demand or the supply chain itself. For example, when severe flooding affected the Thai economy in 2011, Honda needed to halve its production in its Japanese and North American plants. This was not because the floods directly influenced these plants, but because the affected plants in Thailand disrupted its global supply of parts and components (*Toyokeizai*, Japanese version, November 14, 2011). Distinguishing between intrafirm and interfirm trade then allows us to examine which precise channel transmits foreign shocks to domestic employment.

In addition to these contributions, this paper is the first to address the relationship between foreign exposure and the employment volatility of firms in Japan.<sup>3</sup> Thus, our study contributes to the literature by adding another national perspective to the available evidence. Furthermore, our analysis covers the period 1994–2012, making it the most current firm-level study concerning foreign exposure and employment volatility.

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<sup>2</sup>Kiyota et al. (2008) found that the intrafirm trade of Japanese multinational enterprises (MNEs) increased as exchange rate uncertainty increased. This suggests that intrafirm trade helps make adjustments within the firm so it is able to absorb exchange rate shocks.

<sup>3</sup>Using the firm-level data for Japan from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA), Tanaka (2013) examined the effects of trade on sales volatility, but not on employment volatility. Similarly, Yokoyama et al. (2015) utilized BSJBSA firm-level data to examine the effects of the exchange rate on employment. However, they did not explicitly focus on employment volatility.

The remainder of the paper is organized as follows. Section 2 explains the analytical framework and the data used. Section 3 presents the baseline regression results along with a discussion of the robustness of our results and some extensions. Section 4 provides some concluding remarks.

## 2 Analytical Framework

### 2.1 Methodology

For the measurement of employment volatility, following Kurz and Senses (2016), we employ a “residual” approach. Let  $i$ ,  $j$ , and  $t$  denote the firm, industry, and year, respectively. Let  $\gamma_{ijt}$  denote the growth of employment  $E_{it}$ . We define  $\gamma_{ijt}$  as the conditional (residual) growth rate of employment estimated from the following specification:

$$\gamma_{ijt} = \ln(E_{it}) - \ln(E_{it-1}) = \phi_i + \mu_{jt} + v_{ijt}, \quad (1)$$

where  $\phi_i$  are the firm fixed effects, which capture the unobserved firm-specific characteristics, including the employment system used,  $\mu_{jt}$  are the industry and year fixed effects, which capture industry-year-specific shocks, and  $v_{ijt}$  is the deviation of employment from the firm and industry averages in year  $t$ . The volatility  $\sigma$  is the standard deviation of the residual growth rates for a window of length  $w$ :

$$\sigma_{ij}^w = \sqrt{\frac{1}{w-1} \sum v_{ijt}^2}. \quad (2)$$

To test formally the linkage between the firm’s foreign exposure and its employment

volatility, we begin by estimating the following specification:

$$\begin{aligned}
\ln \sigma_{ij}^w &= \beta_0 + \beta_1 \text{Both}_i^w + \beta_2 X_i^w + \beta_3 M_i^w + \beta_4 x_i^w + \beta_5 m_i^w \\
&\quad + \beta_6 \text{Both}_i^{\text{int},w} + \beta_7 X_i^{\text{int},w} + \beta_8 M_i^{\text{int},w} + \beta_9 x_i^{\text{int},w} + \beta_{10} m_i^{\text{int},w} \\
&\quad + \beta_{11} \text{MNE}_i^w + \alpha Z_i^w + \theta Y_j^w + \varepsilon_{ij}^w,
\end{aligned} \tag{3}$$

where  $\text{Both}_i^w$  is an importer and exporter dummy,  $X_i^w$  is an exporter (but not importer) dummy,  $M_i^w$  is an importer (but not exporter) dummy,  $x_i^w$  is the share of exports relative to sales,  $m_i^w$  is the share of imports relative to purchases,  $\text{Both}_i^{\text{int},w}$  is an intrafirm importer and exporter dummy;  $X_i^{\text{int},w}$  is an intrafirm exporter (but not intrafirm importer) dummy,  $M_i^{\text{int},w}$  is an intrafirm importer (but not intrafirm exporter) dummy,  $x_i^{\text{int},w}$  is the share of intrafirm exports to sales,  $m_i^{\text{int},w}$  is the share of intrafirm imports to purchases,  $\text{MNE}_i^w$  is a dummy for firms that either engage in FDI or are foreign-owned firms,  $Z_i^w$  and  $Y_j^w$  are the firm and industry control variables, respectively, and  $\varepsilon_{ij}^w$  is the error term. The firm and industry control variables are calculated as the average over  $w$ , the window of interest.

## 2.2 Data

### 2.2.1 Source and industry classification

Our data are from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA) compiled by the Ministry of Economy, Trade, and Industry (METI), Japan. The purpose of this survey is to capture an overall picture of Japanese corporate activities, including globalization and diversification, along with basic corporate characteristics, including sales, costs, profits, employment, assets, and debt. The strengths of this survey are the coverage and reliability. In evidence, the survey is compulsory for firms in both manufacturing and non-manufacturing industries with more than 50 employees and with capital exceeding 30 million

yen, although some nonmanufacturing industries, such as construction, medical services, and transportation services, are not included. In this analysis, we focus on manufacturing and the wholesale trade industry because data for these industries are available throughout our sample period.

In the BSJBSA, there is an industry classification code assigned to each firm based on their main activities. For example, suppose that a firm engages in both manufacturing and wholesale trade. If its greatest revenue is from wholesale trade, the BSJBSA classifies it as a wholesale trade firm. This implies that firms in the wholesale trade industry do not always specialize in wholesale trade activities. Moreover, some firms switch from one industry to another during our sample period. Although the switching behavior of firms is an important issue in itself, we assign each firm the industry classification to which it belongs most frequently during our sample period.<sup>4</sup>

### **2.2.2 Sample selection**

We use the BSJBSA covering the period 1994–2012. Following Kurz and Senses (2016), we first delete outlier observations from the top and bottom first percentiles of the employment level and growth rate. We then restrict the sample to firms that report employment for at least five consecutive years to obtain sufficient observations to calculate the firm-level volatility. In the BSJBSA as a whole, there are 36,074 manufacturing and wholesale trade firms. We exclude 12,518 firms that report employment for less than five years. As a result, our final sample consists of 23,556 firms (15,978 manufacturing and 7,578 wholesale trade firms). As the data for 1994 are used to calculate the employment growth rate for 1995, the volatility measure is available from 1995 to 2012, an 18-year window.

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<sup>4</sup>For the product-switching behavior of firms, see Bernard et al. (2010b), Kawakami and Miyagawa (2010), and Bernard and Okubo (2013).



### 2.2.3 Employment

The number of permanent workers measures employment. In the BSJBSA, permanent workers are workers with a contract period that extends for one month or longer, or an employee who worked for 18 days or more in each of the last two months in the previous fiscal year. Accordingly, permanent workers comprise regular workers (i.e., *Seishain* or *Seikishokuin* in Japanese) and part-time workers (i.e., *Parto* or *Arubaito* in Japanese), but not daily (i.e., *Hiyatoi* in Japanese) and dispatched workers (i.e., *Haken* in Japanese).<sup>5</sup>

Other than regular and part-time workers, there are two additional worker classifications, namely daily and dispatched workers. As noted, daily workers are not included as permanent workers because their contract period is shorter than one month. We also exclude dispatched workers because they have no direct employment contract with the firm, but with temporary worker agencies. We refer to daily and dispatched workers as temporary workers.<sup>6</sup> Importantly, while we can disaggregate the number of workers by sector for a firm, such as the research and development and manufacturing sectors, wage bills are only available at the firm level.

### 2.2.4 Trade and multinational enterprise (MNE) status

From the BSJBSA, we obtain variables for trade status, MNE status, and export and import intensity. Trade status includes four categories: firms that do not engage in trade (*Nontrader*), firms that engage only in exports (*Exports only*), firms that engage only in imports (*Imports only*), and firms that engage in both exports and imports (*Both*). We define *Imports only* (*Exports only*) firms as those that engage in importing (exporting) in at least one year during our sample period, but do not engage in exporting (importing). *Both*

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<sup>5</sup>The use of permanent and regular workers in this paper follows Yokoyama et al. (2015). In Section 3.3, we extend the analysis by focusing on regular workers only.

<sup>6</sup>As a robustness check, we include daily and dispatched workers in the total number of employees. The number of dispatched workers is available after 2000.

firms are defined as those that engage in exporting and importing in at least one year in the 18-year window.<sup>7</sup> The remaining firms are *Nontraders*. Export and import intensities are defined as the ratio of exports to total sales and the ratio of imports to total procurement, respectively.<sup>8</sup>

One could ask what wholesale trade firms engage in exports and/or imports. A typical example in wholesale trade is trading companies. Note also that firms could engage in both manufacturing and wholesale trade activities. We classify firms that engage in both manufacturing and wholesale trade activities as wholesale trade firms if their primary sales are from wholesale trade activity.

In the BSJBSA, MNEs comprise two types of firms: foreign-owned firms and Japanese firms that engage in FDI, which we refer to as Japanese FDI firms. A foreign-owned firm is a firm with a foreign capital share greater than 50 percent and with headquarters located outside of Japan. A Japanese FDI firm that engages in FDI is a firm that has at least one foreign affiliate.<sup>9</sup> The share of foreign-owned firms is rather small in our sample, just 1.3 percent of the firms in manufacturing and 3.0 percent in wholesale trade. Given this, and to ensure consistency with the existing literature, we combine these two types of firms. We classify the remaining firms as non-MNEs.<sup>10</sup> We define MNE status similarly as trade status. Japanese FDI firms are then firms with foreign subsidiaries for at least one year in the 18-year window. Similarly, foreign-owned firms are firms with foreign parent firms at

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<sup>7</sup> *Both* then includes firms that export in one year and import in another year.

<sup>8</sup>For 1995 and 1996, the value of exports and imports is not available. Instead, we obtain sales to and purchases from foreign countries. These variables include transactions between foreign branches and foreign sales or purchases through trading companies along with conventional exports and imports. As both export and foreign sales (imports and purchases from foreign countries) are available for 1997, we adjust the value of foreign sales (purchases from foreign countries) in 1995 and 1996 using the ratio of exports to foreign sales (imports to purchases from foreign countries) at the industry level. We modify intrafirm export and import intensity in the same manner.

<sup>9</sup>If the foreign-owned firms also have foreign affiliates outside Japan, they are classified not as Japanese FDI firms, but as foreign-owned firms. In the BSJBSA, a Japanese foreign affiliate is an affiliate with a capital share of more than 20 percent.

<sup>10</sup>For example, Bernard et al. (2009) defined firms that have a related-party transaction during a particular year as multinationals.

least once during the 18 years. The remaining firms are *non-MNEs*.

The other feature of this survey is the availability of the data for intrafirm trade. The BSJBSA reports between exports and imports to/from the firms' majority-owned foreign affiliates. To distinguish between intrafirm and interfirm trade, we construct intrafirm export and import intensity variables (*Intrafirm export intensity* and *Intrafirm import intensity*, respectively) and intrafirm trade status variables (*Intrafirm both*, *Intrafirm exports only*, and *Intrafirm imports only*). Intrafirm export and import intensities are the ratios of intrafirm exports to total sales and intrafirm imports to total procurement, respectively. Firms that engage in intrafirm trade are a subset of MNEs and trading firms (either exporters or importers).

### 2.2.5 Control variables

To control for firm characteristics (i.e.,  $Z_i^w$  in Equation (3)), we use the log of the number of employees (*Employment*), the log of the number of establishments (*Number of establishments*), the R&D–sales ratio (*R&D–sales ratio*), firm age (*Age*), and the share of nonproduction workers (*Share of nonproduction workers*). We define the share of nonproduction workers as the ratio of nonproduction workers to total employees at the firm level.<sup>11</sup>

The industry control variables (i.e.,  $Y_j^w$  in Equation (3)) include the industry-level share of nonproduction workers (*Industry nonproduction worker share*), the size of the industry (*Industry size*), the import penetration ratio (*Import penetration*), and the capital–labor ratio (*Industry capital–labor ratio*). We calculate the industry skill share by aggregating the firm-level share of nonproduction workers. The size of the industry is the log of the aggregate number of employees by industry. The import penetration ratio and the capital–labor ratio

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<sup>11</sup>To calculate the share of nonproduction workers, we first obtain the number of employees who work in the manufacturing plant or engage in manufacturing activities in the firm headquarters. We then subtract this from the total number of employees, which implies the number of nonproduction workers. The share of nonproduction workers is the ratio of this figure to the total number of employees.

are from the Japan Industry Productivity (JIP) database.<sup>12</sup> The import penetration ratio is the ratio of imports to total domestic demand. As the import data in the JIP database come from trade statistics, exports and imports for the wholesale trade industry are not available. The capital–labor ratio is the ratio of the net capital stock to person-hour labor inputs. We calculate these control variables as an average over the 18-year window.

### 2.3 Descriptive statistics

Table 1 provides basic descriptive statistics for the 18-year window from 1994 to 2012 for the full sample of firms and by trade and MNE status for all industries.<sup>13</sup> Column (1) provides the number of firms. Column (2) shows the shares of firms, in terms of the number of firms, by trade and MNE status. Column (3) indicates the average employment size. Columns (5) and (6) detail the mean and standard deviation of employment volatility, respectively, as measured by Equation (2). Our sample consists of 23,556 firms, of which 52.3 percent (12,324 firms) engage in international trade and 28.9 percent (6,814 firms) are MNEs.

=== Table 1 ===

Four findings stand out from Table 1. First, there is a systematic relationship between firm size and trade status. Firms that engage in either exports or imports are larger than those that do not. Moreover, firms that engage in both exports and imports are even larger than those that engage in either exports or imports. Second, there is a systematic relationship between firm size and MNE status. On average, MNEs are approximately two-and-a-half times larger than other firms. This indicates that the firms that engage in international trade and MNEs are generally larger.

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<sup>12</sup>The database is downloadable from <http://www.rieti.go.jp/en/database/JIP2014/index.html>. For more details about the JIP database, see Fukao et al. (2007).

<sup>13</sup>Table A1 presents the number of firms, by sector and year, whereas Table A2 presents the summary statistics of variables used in the regression analysis. We take each two-digit industry category as representing a “sector”, whereas each three-digit industry category is an “industry”. All the industry characteristics are at the industry (three-digit) level.

Third, the employment volatility of firms that import only is larger than that of firms that do not trade. In contrast, the employment volatility of firms that engage in exports only is smaller than that of those firms that do not trade. These results suggest that exports and imports have different effects on employment volatility. Finally, the employment volatility of foreign-owned firms is larger than that of non-MNEs and FDI firms. This implies that employment volatility could also vary by MNE status.

We note that even though the trading firms and MNEs represent less than 53 and 74 percent of all firms, respectively, their shares of employment are much larger. Figure 1 presents employment share, by trade and MNE status. In 2012, for example, the employment share of trading firms was 73.4 percent. Similarly, the employment share of MNEs was 58.6 percent. This implies that the employment volatility of trading firms and MNEs could have substantial effects on the Japanese labor market.

=== Figure 1 ===

Table 2 decomposes these statistics by manufacturing and wholesale trade. Our sample consists of 15,978 manufacturing and 7,578 wholesale trade firms. Interestingly, while 54.1 percent (8,646 firms) of firms engage in international trade in manufacturing, 48.5 percent (3,678 firms) of firms do so in wholesale trade. Similarly, the share of MNEs is 30.9 percent (4,939 firms) in manufacturing, whereas it is 24.7 percent (1,875 firms) in wholesale trade. These figures indicate that the share of firms that engage in international trade or as MNEs are comparable for manufacturing and wholesale trade, although wholesale trade firms are more likely than manufacturing firms to focus their sales only on the domestic market.

=== Table 2 ===

We highlight three main findings. First, in manufacturing, we observe a similar relationship between firm size and trade status to the relationship for all industries. On average,

firms that engage in both exports and imports are largest, followed by those that engage in either exports or imports only. Firms that do not engage in international trade tend to be smaller in terms of employment. We confirm a similar relationship in wholesale trade. These results indicate that a relationship between trade status and firm size is common in both manufacturing and wholesale trade.

Second, in both manufacturing and wholesale trade, the employment volatility of firms that import only is higher than that of firms that do not trade, and the employment volatility of firms that engage in exports only is smaller than that of firms that do not trade. Third, employment volatility is almost identical for MNEs and non-MNEs in manufacturing. In contrast, the employment volatility of MNEs is higher than that of non-MNEs in wholesale trade. Moreover, employment volatility is generally higher in wholesale trade than in manufacturing. Together, these results suggest that the relationship between trade, MNEs, and employment volatility differs between manufacturing and wholesale trade.

We could question whether the composition of workers differs between manufacturing and wholesale trade because this could also account for the difference in employment volatility. Although our data cannot distinguish between differences in skill types among workers, it is possible to distinguish between production and nonproduction workers. We compute the share of nonproduction workers and examine how this varies with trade and MNE status as well as industry types.

Table 3 presents the share of nonproduction workers, by trade and MNE status and industry. There are three notable findings. First, the share of nonproduction workers is higher in wholesale trade than in manufacturing. The average share of nonproduction workers is 34 percent in manufacturing and 92 percent in wholesale trade. This may not be surprising. However, note that the six percent of workers who engage in production activities, even in wholesale trade, implies that some of the wholesale trade firms also engage in production activities, despite the fact that production is not their major activity (and why we classify

them as wholesale trade firms).

=== Table 3 ===

Second, in manufacturing, the share of nonproduction workers tends to be high for firms that engage in international trade. In contrast, in wholesale trade, we confirm the opposite relationship: the share of nonproduction workers tends to be high for firms that do not engage in international trade. Finally, the share of production workers varies with MNE status in manufacturing. The share of nonproduction workers is higher for MNEs than for non-MNEs. In contrast, the share of nonproduction workers is almost the same between MNEs and non-MNEs in wholesale trade. Because the share of nonproduction workers varies across trade and MNE status as well as across industries, it is important to control for the differences in the share of nonproduction workers when examining the determinants of employment volatility.

Note that export or import status does not necessarily infer a high degree of foreign exposure because export or import intensities in some cases may be very small. Thus, it may be useful to examine the export and import intensities of the firms.<sup>14</sup> The upper part of Table 4 presents the export and import intensities. Table 4 shows that the average export and import intensities are small, amounting to about three percent for exports and five percent for imports in all industries. We also report the shares of intrafirm exports and imports to total sales. These are also small, amounting to about one percent for intrafirm exports and two percent for intrafirm imports in all industries.

=== Table 4 ===

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<sup>14</sup>For the definition of export and import intensity, see Section 2.2. In this sense, we could argue that not only the intensity of trade, but also the share of foreign production to total production may affect employment volatility. While this may be true, it is difficult to obtain such information for foreign-owned firms. Even if we were to focus only on Japanese multinationals, the sample size would decline substantially owing to the limited data availability. For this reason, we do not pursue this further.

One could argue that the existence of zero trade affects these results in that the figures in Table 1 confirmed that more than half of firms do not trade, so the average share of exports and imports is zero. Therefore, we compute the export and import intensities, conditional on positive exports and imports, respectively. The results are shown in the lower part of Table 4. If we exclude zero-trade firms, the average share of exports and imports is slightly higher, about eight percent for exports and 11 percent for imports in all industries. Similar results are confirmed when we focus on manufacturing and wholesale trade. Thus, it is not clear how exports and imports affect employment volatility. To better test the linkage between firm foreign exposure and its employment volatility, we now turn to the regression analysis.

### 3 Globalization and Employment Volatility in Japan

#### 3.1 Baseline results

Tables 5 and 6 present the estimation results of Equation (3) for manufacturing and wholesale trade, respectively, estimated using ordinary least squares.<sup>15</sup> Table 5 provides the results for manufacturing, while Table 6 provides the results for wholesale trade. For the categorical variables, the coefficients of trade status (i.e., *Both*, *Exports only*, *Imports only*, *Intrafirm both*, *Intrafirm exports only*, and *Intrafirm imports only*) are relative to *Nontrader*. The coefficient of MNE status is relative to that of *Non-MNEs*. We first examine the results for manufacturing and then discuss the results for wholesale trade.

=== Tables 5 & 6 ===

Column (1) in Tables 5 and 6 provides the baseline results. As pointed out by Guadalupe and Wulf (2010), this is a standard differences-in-differences specification that exploits the

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<sup>15</sup>Tables 5 and 6 report the coefficients of interest only. For the coefficients for the firm and industry characteristics, see Table A3.



effects of exports and imports in which exports and imports (the “treatment”) are continuous. In the baseline results, we estimate employment volatility using the residual approach over the 18-year window, as in Equation (2)).<sup>16</sup>

Four findings are evident from the baseline results in Table 5. First, the estimated coefficient for *Exports only* is significantly negative. This implies that the employment of firms that engage in exports only is less volatile than that of firms that do not engage in international trade. This result is consistent with the finding of Kurz and Senses (2016), where the number of products and destination countries for exports display negative relationships with employment volatility. This suggests that the diversification of products and/or destinations occurs in Japan, even though the firm-level data cannot identify the number of products or the destination countries. Second, the coefficient for *Intrafirm export intensity* is significantly positive. These results together suggest that the effect of exports is more or less volatile, depending on the share of intrafirm exports to total sales.

Third, the coefficients for both *Imports only* and *Import intensity* are significantly positive. This implies that employment volatility becomes higher as import intensity increases. Note that the coefficient of *Intrafirm import intensity* is insignificant. Accordingly, unlike the effects of exports, the effects of imports arise through interfirm trade. Finally, the coefficient for *MNEs* is significantly positive, suggesting that the employment of MNEs is more volatile than that of non-MNEs.

For wholesale trade in Table 6, the baseline results are shown in column (6). We highlight four main findings. First, none of the coefficients for *Both*, *Exports only*, *Export intensity*, *Intrafirm exports only*, or *Intrafirm export intensity* are statistically significant. This implies that, unlike manufacturing, exports do not have significant effects on employment volatility

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<sup>16</sup>Tables 5 and 6 report the coefficients of interest only. For the coefficients of firm and industry characteristics, see Table A3. Note that while the industry characteristic variables are at the industry (i.e., three-digit) level, the sector-window fixed effect is at the sector (i.e., two-digit) level because of the perfect collinearity between them. Note also that we control for the industry–year-specific shocks in computing the employment volatility.

in general. Second, the coefficients of *Imports only*, *Import intensity*, *Intrafirm both*, and *Intrafirm imports only* are significantly positive. However, it should be noted that the coefficient of *Intrafirm import intensity* is significantly negative. Consequently, employment volatility increases alongside import intensity, but somewhat offsets as intrafirm import intensity increases.

Third, the coefficient for *MNEs* is insignificant. This indicates that there is no significant difference in employment volatility between MNEs and non-MNEs. Note that, in Table 2, we confirmed the higher employment volatility of MNEs in wholesale trade. Once we control for various firm and industry characteristics, the employment volatility of MNEs is almost the same as that of non-MNEs in wholesale trade. Finally, the coefficient for *Intrafirm import intensity* is significantly negative. This indicates that employment volatility decreases as intrafirm import intensity increases.

### 3.2 Robustness check

There could be some concern that our results are sensitive to the measurement of employment volatility, sample period, etc. To confirm the robustness of our results, we address three issues. The first is the measurement of employment volatility. Following Kurz and Senses (2016), we accordingly employ two alternative measures of employment volatility. One utilizes shorter windows, as we split the original 18-year sample period into three six-year subperiods. We then calculate the employment volatility for each subperiod, which implies that the analysis focuses on shorter-run effects relative to the baseline model. The other measure of employment volatility utilizes the actual rather than the residual growth rate (i.e., Equation (2)). Here, we measure employment volatility as the standard deviation of actual employment growth, where the employment growth rate is the log difference in

employment between years  $t$  and  $t - 1$ :

$$\sigma_{ij}^w = \left[ \frac{1}{w-1} \sum_{\tau=0}^w (\gamma_{ij,t+\tau} - \bar{\gamma}_{ijt})^2 \right]^{1/2}, \quad (4)$$

where  $w$  is the length of the window (18 years) and  $\bar{\gamma}_{it}$  is the average growth rate over the window  $w$ .

The second issue is the sample period. There is the possibility shocks caused by the global financial crisis in 2009, the 2011 Great East Japan earthquake, and the 2011 Thailand floods affect our results. Employment volatility may then increase purely or in part because of these unexpected domestic and foreign shocks. Thus, our results may be sensitive to the choice of the sample period. To address this concern, we rerun the regression for the period 1994–2008, prior to these events.

The third issue is the effects of productivity shocks. Productivity shocks may also affect employment. Although we include industry–year fixed effects to measure the employment volatility (as in Equation (2)), such productivity shocks could be heterogeneous across firms. To address this, we include the volatility of total factor productivity (TFP) as an additional control variable. The volatility of TFP is calculated by the same methodology as the employment volatility (i.e., Equation (2)). To estimate TFP, we employ the Wooldridge–Levinsohn–Petrin method (Wooldridge, 2009).

Columns (2)–(5) in Tables 5 and 6 present the results of the robustness check. Column (2) presents the results for the six-year windows. Column (3) shows the results for actual employment growth. Column (4) details the results for the period 1994–2008. Column (5) indicates the results in which the volatility of productivity is included as an additional control variable.

Table 5 presents the results for manufacturing. There are three notable findings. First, the coefficient for *Exports only* is significantly negative in almost all specifications, whereas

the coefficient for *Intrafirm export intensity* is significantly positive, again in all specifications. Second, although the coefficient for *Imports only* is sensitive to the measurement of volatility or the inclusion of TFP shocks, the coefficient for *Import intensity* is significantly positive in almost all specifications. These results together suggest that the effects of exports and imports on employment are generally robust.

Third, the coefficient for *MNEs* is significantly positive in all specifications. This implies that employment volatility is higher for MNEs than for non-MNEs. Note that firms that engage in intrafirm trade are a subset of MNEs; therefore, not only whether firms engage in multinational activities, but also how much they engage in intrafirm exports (relative to their total exports), is important when discussing the employment volatility of MNEs.

Table 6 presents the results for wholesale trade. We highlight three main results. First, regarding the baseline results, none of the coefficients for *Both*, *Exports only*, *Export intensity*, *Intrafirm exports only*, or *Intrafirm export intensity* are significant. Second, the coefficients for both *Imports only* and *Import intensity* are significantly positive. While the coefficient of *Intrafirm imports only* is insignificant in most specifications, the coefficient of *Intrafirm import intensity* continues to be significantly negative in all specifications. These results together suggest that the effects of exports and imports on employment are mostly robust. Third, the coefficient for *MNEs* is insignificant in three of the four specifications. This suggests that multinational activities have insignificant effects on employment volatility and implies that MNEs do not necessarily exhibit higher employment volatility.

The main findings are as follows. First, in manufacturing, the effect of exports on employment volatility varies depending on the share of intrafirm exports to total sales. This suggests that the transmission of the effects of foreign demand shocks on domestic employment is through intrafirm exports. In wholesale trade, the effect of exports is generally insignificant. Unlike manufacturing, there is no significant effect of foreign demand shocks

on domestic employment.

Second, in both manufacturing and wholesale trade, employment volatility tends to increase alongside the share of imports to total purchases. This suggests that the effects of foreign supply shocks on domestic employment are from interfirm imports. However, in wholesale trade, intrafirm imports tend to offset these shocks.

Finally, MNEs exhibit higher employment volatility when manufacturing. Therefore, multinational activities could account for higher employment volatility. In contrast, in wholesale trade, MNEs do not necessarily exhibit higher employment volatility. Note that firms that engage in intrafirm trade are a subset of MNEs. In wholesale trade, MNEs may successfully mitigate the effects of foreign supply shocks through intrafirm trade.

### 3.3 Extensions

#### 3.3.1 An alternative definition of trade and MNE status

Trade and MNE status take values of one if firms engage in trade and multinational activities in at least one year during our sample period. This implies that some exporters or MNEs may engage in trade or multinational activities only once during the 18 years. We follow Kurz and Senses (2016) in using this definition. However, our results might change with an alternative indicator of trade and MNE status.

To address this, we measure trade and MNE status based on the mode of the status. For example, if a firm is an MNE in only one year during the sample period, it is now a domestic firm. In contrast, if a firm is an MNE during most of the sample period, it remains an MNE. We apply this measure to all trade and MNE status firms and re-estimate Equation (3).

Table 7 presents the regression results. Columns (1) and (6) provide the baseline results, copied from Table 5. Columns (2) and (7) are the results that employ the alternative definition of trade and MNE status. The results indicate that while some of the coefficients

exhibit different signs and/or significance levels from the baseline results, our main findings remain unchanged. In manufacturing, the coefficient of *Exports only* is significantly negative, whereas the coefficient of *Intrafirm export intensity* is significantly positive. The coefficient of *Import intensity* is significantly positive. These are qualitatively identical to the baseline results.

=== Table 7 ===

In wholesale trade, the coefficient of *Import intensity* continues to be significantly positive. Similarly, the coefficient of *Intrafirm import intensity* continues to be significantly negative. The coefficient of *MNEs* continues to be insignificant. These results are consistent with the baseline results. However, the coefficient of *Imports only* turns negative. The coefficient of *Exports only* is now significantly negative. The coefficients of *Export intensity* and *Intrafirm exports only* turn both positive and significant. Some of the results may be sensitive to the definition of the trade and MNE status. These results together imply that it is important to check how the results change when the analysis employs an alternative measure of trade and MNE status.

### **3.3.2 An alternative definition of employment**

We measure employment as the number of permanent workers. Because the definition of permanent workers does not include temporary workers, but does include part-time workers, it may be a concern that employment volatility could vary if we include temporary workers or exclude part-time workers (i.e., if we focus on regular workers only). Indeed, regular and nonregular workers have different degrees of employment protection (OECD, 2014, Chapter 4). As a result, employment could be less volatile in response to foreign exposure for regular than for nonregular workers.

It is interesting to examine the employment volatility of regular workers (= permanent

workers – part-time workers), that of part-time workers, and that of temporary workers separately. However, some firms employ neither part-time nor temporary workers. Moreover, the information on temporary workers is available only after 2000. As a compromise, we utilize two alternative measures of employment: the number of permanent and temporary workers, and the number of regular workers, which excludes part-time workers from the permanent worker category. We then compute the employment volatility and run the same regression as the baseline model.

Columns (3) and (8) in Table 7 provide the results that include temporary workers for manufacturing and wholesale trade, respectively. Columns (4) and (9) in Table 7 provide the results that exclude part-time workers for manufacturing and wholesale trade, respectively. The results are similar but slightly different to those presented in Table 5.

In manufacturing, we continue to find a significantly positive coefficient for *Exports only* in both specifications. Similarly, the coefficient of *Intrafirm export intensity* is also significantly positive in both specifications. We also continue to find a significantly positive coefficient for *Imports only*. Although the coefficient for *Import intensity* becomes insignificant when the employment includes temporary workers, the coefficient for *Intrafirm import intensity* becomes significantly positive. In wholesale trade, the results are qualitatively similar to those presented in Table 5. The effects of exports on employment volatility are insignificant in both specifications. Employment volatility is higher for importers and increases as import intensity increases and decreases as intrafirm import intensity increases. These results together suggest that our main findings remain unchanged even when we utilize an alternative definition of employment. This in turn implies that employment adjustments by trading firms occur mainly among regular workers.

### 3.3.3 “Pure” wholesale trade firms

As noted, we classify firms that engage in both manufacturing and wholesale trade activities as wholesale trade firms if their primary sales are from wholesale trade. One may question how the results would change if we focus on wholesale trade firms that do *not* engage in manufacturing activities, which we refer to as “pure” wholesale trade firms. We now focus on these “pure” wholesale trade firms.

Column (10) in Table 7 presents the results. Even when we focus on wholesale trade firms that do not employ manufacturing workers, we continue to find qualitatively the same results as the baseline model. The effects of exports on employment volatility are insignificant. Employment volatility is higher for importers and increases as import intensity increases and lower when intrafirm import intensity increases. These results suggest that employment adjustments by trading firms in wholesale trade firms occur mainly among nonproduction regular workers.

### 3.3.4 Volatility of wages

One could also be interested in wage volatility along with employment volatility. When foreign shocks hit firms, firms could adjust through employment and/or wages. Thus, firms with lower employment volatility may have higher wage volatility. To address this issue, we use wages rather than employment to compute the volatility and estimate the same regression equation as the baseline model. We define wages as the total wage bill divided by the number of permanent workers.

Columns (5) and (11) in Table 7 present the results for manufacturing and wholesale trade, respectively. We highlight two main results. First, in manufacturing, the coefficient for *Exports only* is significantly positive. Noting that *Exports only* shows consistently negative and significant coefficients in Tables 5 and 6, this implies that firms that engage in exports only absorb foreign shocks through wage adjustments rather than through em-



ployment adjustments. Second, for wholesale trade, the signs and significance levels of the coefficients are generally the same as those in the baseline model. One notable difference is that the coefficient for *MNEs* is now significantly positive. Combined with the insignificant effect of *MNEs* on the employment volatility of regular workers, this suggests that MNEs in wholesale trade absorb foreign shocks through changes in the wages of regular workers rather than through changes in employment.

## 4 Concluding Remarks

In light of the increasing concerns over the relationship between globalization and labor market outcomes, this paper examines the effects of international trade and FDI on employment volatility using large-scale, firm-level data from Japan. The major contributions of this paper are threefold. First, we distinguish between multinational firms, exporters, importers, and domestic firms. This enables us to examine the heterogeneous effects of foreign exposure on employment volatility. Second, we expand the industry coverage of the analysis, covering not only manufacturing, but also wholesale trade firms. Third, we consider the difference between intrafirm trade and interfirm trade. This allows us to examine the mechanism through which foreign shocks transmit to domestic employment.

Our major findings are as follows. First, in manufacturing, the effect of exports on employment volatility varies depending on the share of intrafirm exports to total sales. This suggests that the effects of foreign demand shocks on domestic employment are via intrafirm exports. In wholesale trade, the effect of exports is generally insignificant. Unlike manufacturing, there is no significant effect of foreign demand shocks on domestic employment.

Second, in both manufacturing and wholesale trade, employment volatility tends to become higher as the share of imports to total purchases increases. This suggests that the effects of foreign supply shocks on domestic employment are via interfirm imports. In whole-

sale trade, however, intrafirm imports tend to offset such shocks.

Finally, MNEs exhibit higher employment volatility in manufacturing. Therefore, multinational activities could invoke higher employment volatility. In wholesale trade, however, MNEs do not necessarily exhibit higher employment volatility. Note that firms that engage in intrafirm trade are a subset of MNEs. In wholesale trade, MNEs may successfully offset the effects of foreign supply shocks through intrafirm trade.

For manufacturing, our results are similar to those of Kurz and Senses (2016), who found that, on average, firms that exported were less volatile. However, as discussed, the account becomes slightly different if we consider the effects of intrafirm trade and if we extend the analysis to wholesale trade. These results together suggest that the transmission of foreign supply and demand shocks could be through not only manufacturing, but also wholesale trade firms. Further, a higher share of intrafirm trade could magnify the foreign demand shocks in manufacturing, while it could mitigate the foreign supply shocks in wholesale trade. In identifying the potential risks from foreign demand and supply shocks, it is important for policy makers to be aware of the heterogeneity in manufacturing and wholesale trade and the possible effects through intrafirm trade.

In conclusion, there are several possible research topics for the future worth mentioning. First, further investigation of FDI is an important extension. For example, employment volatility could vary between firms with production plants abroad and firms without such plants if the substitution of domestic and foreign workers causes higher employment volatility for MNEs. Second, it is important to examine the effects on nonregular workers. Even in our data, some firms do not employ any nonregular workers. We could not define the employment growth rate when firms do not employ any nonregular workers, so nonregular worker employment volatility is beyond the scope of this analysis. In this sense, it is important to consider the effect of firm exit on employment volatility.

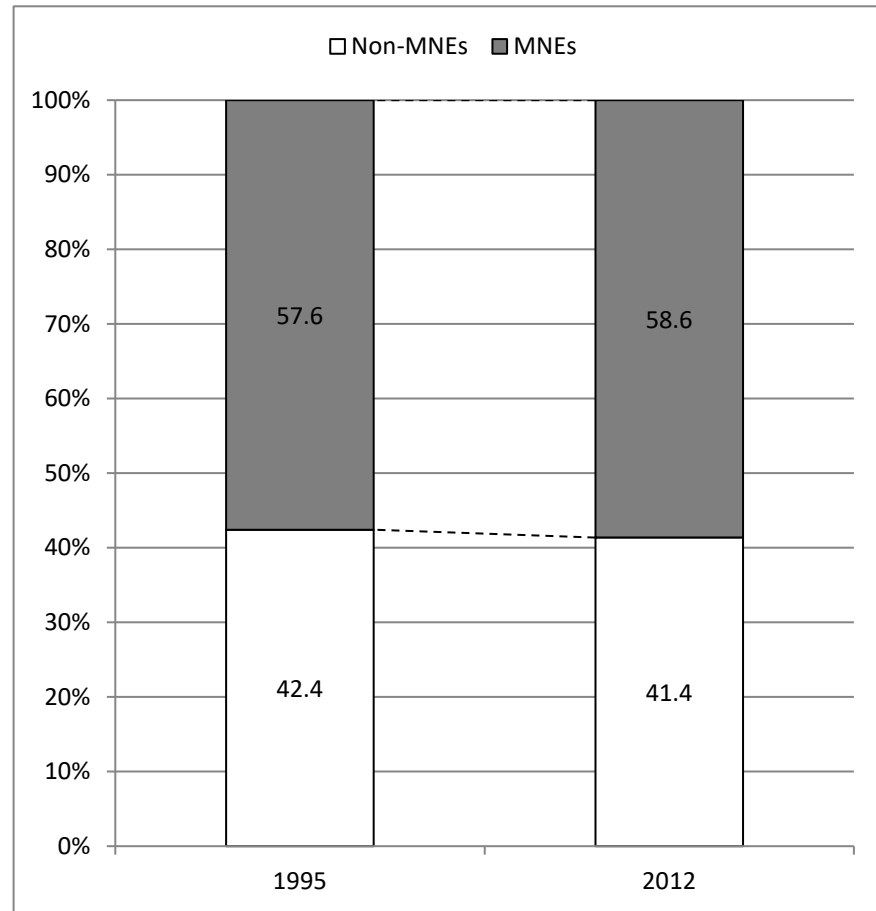
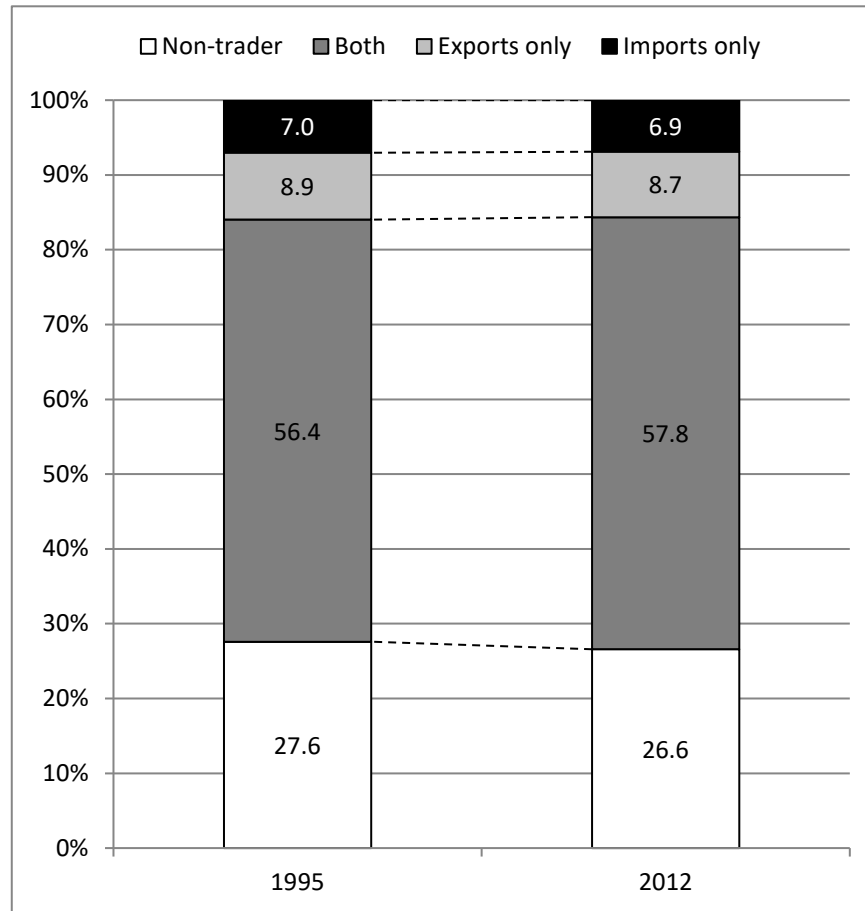
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**Figure 1. Employment Share, by Trade and MNE Status: All Industries**



Source: Authors' calculation based on the BSJBSA.

**Table 1. Basic Statistics, by Trade and MNE Status: All Industries**

	# of firms	Share (%)	Average employment size	Employment volatility	
				Mean	S.D.
All industries					
Total	23,556	100.0	265	0.083	0.044
Non-trader	11,232	47.7	185	0.083	0.045
Both	7,898	33.5	397	0.084	0.044
Exports only	2,016	8.6	251	0.078	0.042
Imports only	2,410	10.2	218	0.089	0.045
Non-MNEs	16,742	71.1	182	0.083	0.044
MNEs	6,814	28.9	470	0.085	0.044

Source: Authors' calculation based on the BSJBSA.

**Table 2. Basic Statistics, by Trade and MNE Status and by Industry**

	# of firms	Share (%)	Average employment size	Employment volatility	
				Mean	S.D.
Manufacturing					
Total	15,978	100.0	289	0.081	0.041
Non-trader	7,332	45.9	186	0.082	0.042
Both	5,552	34.7	450	0.081	0.040
Exports only	1,629	10.2	257	0.077	0.040
Imports only	1,465	9.2	231	0.085	0.042
Non-MNEs	11,039	69.1	187	0.081	0.041
MNEs	4,939	30.9	517	0.082	0.041
Wholesale trade					
Total	7,578	100.0	215	0.088	0.050
Non-trader	3,900	51.5	184	0.084	0.050
Both	2,346	31.0	272	0.091	0.050
Exports only	387	5.1	226	0.081	0.048
Imports only	945	12.5	198	0.095	0.049
Non-MNEs	5,703	75.3	173	0.086	0.050
MNEs	1,875	24.7	345	0.093	0.051

Source: Authors' calculation based on the BSJBSA.

**Table 3. Share of Non-production Workers, by Trade and MNE Status and by Industry**

	All industries	Manufacturing	Wholesale trade
Total	0.53	0.34	0.92
Non-trader	0.52	0.30	0.93
Both	0.55	0.40	0.91
Exports only	0.45	0.34	0.90
Imports only	0.57	0.35	0.91
Non-MNEs	0.53	0.32	0.92
MNEs	0.53	0.39	0.91

Note: Intensities are average over the firms.

Source: Authors' calculation based on the BSJBSA.



**Table 4. Export and Import Intensity, by Trade and MNE Status and by Industry**

	All industries		Manufacturing		Wholesale trade	
	# of firms	Intensity	# of firms	Intensity	# of firms	Intensity
Unconditional intensity						
Exports	23,556	0.03	15,978	0.04	7,578	0.02
Imports	23,556	0.05	15,978	0.04	7,578	0.07
Intrafirm exports	23,556	0.01	15,978	0.01	7,578	0.00
Intrafirm imports	23,556	0.02	15,978	0.02	7,578	0.02
	All industries		Manufacturing		Wholesale trade	
Conditional intensity	# of firms	Intensity	# of firms	Intensity	# of firms	Intensity
Exports	9,914	0.08	7,181	0.08	2,733	0.06
Imports	10,308	0.11	7,017	0.10	3,291	0.15
Intrafirm exports	9,914	0.02	7,181	0.02	2,733	0.01
	(5,619)		(4,187)		(1,432)	
Intrafirm imports	10,308	0.04	7,017	0.04	3,291	0.05
	(5,423)		(3,836)		(1,587)	

Notes: Intensities are average over the firms. Conditional intensity shows the averages for firms with non-zero exports or imports. Figures in parentheses indicate the number of firms with non-zero intra-firm exports (or imports).

Source: Authors' calculation based on the BSJBSA.

**Table 5. Regression Results: Manufacturing**

	(1)	(2)	(3)	(4)	(5)
	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks
<i>Both</i>	-0.014 (0.014)	-0.007 (0.015)	-0.002 (0.001)	-0.008 (0.015)	-0.023 (0.014)
<i>Exports only</i>	-0.047*** (0.015)	-0.024 (0.015)	-0.003*** (0.001)	-0.042*** (0.016)	-0.050*** (0.015)
<i>Imports only</i>	0.027* (0.015)	0.041** (0.016)	0.001 (0.001)	0.043** (0.017)	0.019 (0.016)
<i>Export intensity</i>	-0.045 (0.059)	-0.018 (0.057)	-0.002 (0.005)	-0.098 (0.069)	-0.130** (0.060)
<i>Import intensity</i>	0.136** (0.057)	0.016 (0.052)	0.014*** (0.005)	0.219*** (0.064)	0.112* (0.060)
<i>MNEs</i>	0.038*** (0.013)	0.047*** (0.012)	0.003*** (0.001)	0.050*** (0.014)	0.024* (0.013)
<i>Intrafirm both</i>	0.001 (0.018)	0.024 (0.019)	-0.000 (0.001)	-0.018 (0.020)	0.004 (0.018)
<i>Intrafirm exports only</i>	0.010 (0.018)	0.004 (0.019)	-0.000 (0.001)	-0.002 (0.021)	0.017 (0.019)
<i>Intrafirm imports only</i>	0.004 (0.021)	-0.024 (0.024)	-0.001 (0.002)	-0.031 (0.025)	0.002 (0.022)
<i>Intrafirm export intensity</i>	0.486*** (0.134)	0.299*** (0.114)	0.045*** (0.013)	0.595*** (0.149)	0.541*** (0.144)
<i>Intrafirm import intensity</i>	0.026 (0.094)	0.197** (0.086)	-0.006 (0.008)	-0.029 (0.107)	0.042 (0.099)
Number of observations	15,978	31,174	15,978	14,493	14,213
R-squared	0.043	0.048	0.045	0.041	0.073
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes
Sector (2 digit)-window-Fixed effect	No	Yes	No	No	No

Notes: Standard errors clustered by firm are in parentheses. \*\*\*, \*\*, and \* indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A3.

Source: Authors' calculation based on the BSJBSA and the JIP database.

**Table 6. Regression Results: Wholesale Trade**

	(1)	(2)	(3)	(4)	(5)
	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks
<i>Both</i>	0.013 (0.021)	-0.025 (0.023)	0.001 (0.002)	0.034 (0.023)	-0.002 (0.022)
<i>Exports only</i>	-0.026 (0.030)	-0.045 (0.030)	-0.002 (0.003)	-0.048 (0.033)	-0.035 (0.031)
<i>Imports only</i>	0.093*** (0.021)	0.119*** (0.022)	0.006*** (0.002)	0.116*** (0.023)	0.089*** (0.022)
<i>Export intensity</i>	0.062 (0.121)	-0.096 (0.120)	0.009 (0.012)	-0.004 (0.135)	0.030 (0.126)
<i>Import intensity</i>	0.332*** (0.056)	0.253*** (0.062)	0.032*** (0.006)	0.344*** (0.067)	0.379*** (0.061)
<i>MNEs</i>	0.021 (0.022)	0.051** (0.022)	0.001 (0.002)	0.011 (0.025)	0.003 (0.023)
<i>Intrafirm both</i>	0.054* (0.028)	0.080*** (0.031)	0.003 (0.003)	0.030 (0.032)	0.038 (0.031)
<i>Intrafirm exports only</i>	0.056 (0.035)	0.082** (0.038)	0.003 (0.003)	0.039 (0.040)	0.047 (0.036)
<i>Intrafirm imports only</i>	0.050* (0.030)	0.024 (0.036)	0.003 (0.003)	0.018 (0.034)	0.088*** (0.032)
<i>Intrafirm export intensity</i>	0.267 (0.285)	0.203 (0.296)	0.026 (0.029)	0.510 (0.314)	0.314 (0.328)
<i>Intrafirm import intensity</i>	-0.379*** (0.089)	-0.265*** (0.095)	-0.035*** (0.009)	-0.389*** (0.106)	-0.439*** (0.094)
Number of observations	7,578	13,856	7,578	6,877	6,454
R-squared	0.053	0.043	0.059	0.047	0.088
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes
Sector (2 digit)-window-Fixed effect	No	Yes	No	No	No

Notes: Standard errors clustered by firm are in parentheses. \*\*\*, \*\*, and \* indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A3.

Source: Authors' calculation based on the BSJBSA and the JIP database.

**Table 7. Regression Results: Extensions**

	Manufacturing					Wholesale trade					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	Volatility of wages	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	No MFG workers	Volatility of wages
<i>Both</i>	-0.014 (0.014)	-0.124*** (0.016)	-0.014 (0.017)	-0.049*** (0.015)	0.054*** (0.016)	0.013 (0.021)	-0.095*** (0.024)	-0.004 (0.025)	0.019 (0.023)	0.029 (0.029)	0.005 (0.021)
<i>Exports only</i>	-0.047*** (0.015)	-0.095*** (0.016)	-0.050*** (0.018)	-0.083*** (0.016)	0.030* (0.017)	-0.026 (0.030)	-0.113*** (0.037)	0.034 (0.035)	-0.004 (0.033)	-0.021 (0.039)	0.019 (0.029)
<i>Imports only</i>	0.027* (0.015)	-0.056*** (0.020)	0.033* (0.019)	0.042** (0.018)	0.045** (0.019)	0.093*** (0.021)	0.023 (0.023)	0.060** (0.026)	0.098*** (0.022)	0.111*** (0.028)	0.015 (0.021)
<i>Export intensity</i>	-0.045 (0.059)	0.112* (0.061)	-0.090 (0.060)	-0.178*** (0.063)	0.231*** (0.063)	0.062 (0.121)	0.249** (0.123)	0.019 (0.123)	-0.079 (0.134)	0.180 (0.167)	0.038 (0.114)
<i>Import intensity</i>	0.136** (0.057)	0.294*** (0.060)	-0.028 (0.061)	0.225*** (0.062)	0.153** (0.067)	0.332*** (0.056)	0.400*** (0.059)	0.284*** (0.065)	0.276*** (0.061)	0.355*** (0.071)	0.261*** (0.055)
<i>MNEs</i>	0.038*** (0.013)	-0.008 (0.014)	0.036** (0.015)	0.019 (0.014)	0.028* (0.014)	0.021 (0.022)	0.002 (0.025)	0.041 (0.026)	0.012 (0.024)	0.051* (0.029)	0.046** (0.022)
<i>Intrafirm both</i>	0.001 (0.018)	0.096*** (0.018)	0.034 (0.022)	-0.005 (0.019)	-0.000 (0.020)	0.054* (0.028)	0.096*** (0.031)	0.046 (0.035)	0.034 (0.031)	0.018 (0.037)	-0.007 (0.028)
<i>Intrafirm exports only</i>	0.010 (0.018)	0.042*** (0.015)	0.019 (0.023)	-0.000 (0.020)	-0.013 (0.021)	0.056 (0.035)	0.091*** (0.030)	0.089** (0.042)	0.044 (0.037)	0.028 (0.046)	0.045 (0.037)
<i>Intrafirm imports only</i>	0.004 (0.021)	0.058*** (0.018)	-0.002 (0.026)	0.027 (0.024)	0.002 (0.024)	0.050* (0.030)	0.125*** (0.027)	0.007 (0.040)	0.048 (0.033)	0.043 (0.042)	0.024 (0.030)
<i>Intrafirm export intensity</i>	0.486*** (0.134)	0.367*** (0.135)	0.496*** (0.116)	0.508*** (0.152)	0.075 (0.133)	0.267 (0.285)	0.241 (0.286)	0.031 (0.296)	0.345 (0.308)	-0.236 (0.559)	0.383 (0.296)
<i>Intrafirm import intensity</i>	0.026 (0.094)	-0.111 (0.097)	0.203** (0.093)	-0.066 (0.106)	-0.126 (0.110)	-0.379*** (0.089)	-0.460*** (0.089)	-0.282*** (0.099)	-0.296*** (0.091)	-0.486*** (0.114)	-0.474*** (0.091)
Number of observations	15,978	15,978	13,137	15,974	14,936	7,578	7,578	5,812	7,621	4,773	6,966
R-squared	0.043	0.046	0.081	0.060	0.027	0.053	0.054	0.048	0.049	0.055	0.037
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors clustered by firm are in parentheses. \*\*\*, \*\*, and \* indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A5.

Source: Authors' calculation based on the BSJBSA and the JIP database.

**Table A1. Number of Firms, by Industry and Year**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Manufacturing</b>	<b>11,301</b>	<b>11,602</b>	<b>11,921</b>	<b>12,336</b>	<b>12,203</b>	<b>11,803</b>	<b>11,939</b>	<b>11,729</b>	<b>11,346</b>	<b>11,794</b>	<b>11,634</b>	<b>11,516</b>	<b>11,698</b>	<b>11,788</b>	<b>11,549</b>	<b>10,967</b>	<b>10,865</b>	<b>10,575</b>
Food products and beverages	1,326	1,343	1,392	1,440	1,464	1,408	1,440	1,433	1,388	1,451	1,424	1,429	1,454	1,469	1,472	1,382	1,387	1,356
Textiles	281	301	316	327	322	300	293	285	262	268	262	244	243	242	229	211	207	207
Pulp ,paper and paper products	371	382	383	403	387	382	376	371	370	373	355	354	356	355	351	345	339	326
Chemicals	834	826	840	846	850	833	832	821	804	838	818	797	806	814	798	778	763	767
Petroleum and coal products	661	675	700	717	710	683	686	673	658	698	688	693	700	708	694	664	653	634
Non-metallic mineral products	512	522	537	552	530	507	488	463	439	448	441	429	428	413	416	383	376	371
Basic metal	639	647	656	685	668	666	660	655	635	663	676	669	687	696	698	666	665	641
Fabricated metal products	824	839	873	908	894	862	897	869	843	870	863	859	870	900	872	832	813	790
Machinery	1,360	1,415	1,434	1,487	1,466	1,413	1,450	1,441	1,400	1,469	1,474	1,459	1,497	1,512	1,491	1,436	1,410	1,389
Electrical machinery	1,598	1,656	1,695	1,764	1,747	1,723	1,725	1,704	1,654	1,712	1,679	1,671	1,686	1,656	1,614	1,518	1,496	1,426
Transport equipment	995	1,026	1,053	1,078	1,080	1,040	1,058	1,038	1,021	1,074	1,040	1,045	1,076	1,097	1,065	1,025	1,027	1,010
Precision instruments	132	140	143	152	149	150	151	152	156	159	154	154	158	159	158	141	148	143
Other manufacturing	1,768	1,830	1,899	1,977	1,936	1,836	1,883	1,824	1,716	1,771	1,760	1,713	1,737	1,767	1,691	1,586	1,581	1,515
<b>Wholesale trade</b>	<b>5,389</b>	<b>5,605</b>	<b>5,698</b>	<b>5,860</b>	<b>5,746</b>	<b>5,428</b>	<b>5,459</b>	<b>5,305</b>	<b>5,148</b>	<b>5,240</b>	<b>5,189</b>	<b>5,042</b>	<b>5,151</b>	<b>5,171</b>	<b>5,001</b>	<b>4,812</b>	<b>4,788</b>	<b>4,652</b>
<b>Total</b>	<b>16,690</b>	<b>17,207</b>	<b>17,619</b>	<b>18,196</b>	<b>17,949</b>	<b>17,231</b>	<b>17,398</b>	<b>17,034</b>	<b>16,494</b>	<b>17,034</b>	<b>16,823</b>	<b>16,558</b>	<b>16,849</b>	<b>16,959</b>	<b>16,550</b>	<b>15,779</b>	<b>15,653</b>	<b>15,227</b>

Note: Industry classification is based on sector (2-digit) level.

Source: Authors' calculation based on the BSJBSA.

**Table A2. Summary Statistics**

	All industries					Manufacturing					Wholesale trade				
	# of firms	Mean	S.D.	p25	p75	# of firms	Mean	S.D.	p25	p75	N	Mean	S.D.	p25	p75
Employment volatility	23,556	-2.618	0.523	-2.970	-2.252	15,978	-2.632	0.505	-2.968	-2.276	7,578	-2.588	0.558	-2.974	-2.191
Both	23,556	0.335	0.472	0.000	1.000	15,978	0.347	0.476	0.000	1.000	7,578	0.310	0.462	0.000	1.000
Exports only	23,556	0.086	0.280	0.000	0.000	15,978	0.102	0.303	0.000	0.000	7,578	0.051	0.220	0.000	0.000
Imports only	23,556	0.102	0.303	0.000	0.000	15,978	0.092	0.289	0.000	0.000	7,578	0.125	0.330	0.000	0.000
Export intensity	23,556	0.032	0.093	0.000	0.012	15,978	0.038	0.100	0.000	0.018	7,578	0.021	0.076	0.000	0.003
Import intensity	23,556	0.050	0.134	0.000	0.023	15,978	0.042	0.108	0.000	0.025	7,578	0.066	0.175	0.000	0.021
Intrafirm both	23,556	0.180	0.384	0.000	0.000	15,978	0.195	0.396	0.000	0.000	7,578	0.150	0.357	0.000	0.000
Intrafirm exports only	23,556	0.058	0.234	0.000	0.000	15,978	0.067	0.251	0.000	0.000	7,578	0.039	0.194	0.000	0.000
Intrafirm imports only	23,556	0.050	0.218	0.000	0.000	15,978	0.045	0.208	0.000	0.000	7,578	0.060	0.237	0.000	0.000
Intrafirm export intensity	23,556	0.009	0.040	0.000	0.000	15,978	0.011	0.045	0.000	0.000	7,578	0.005	0.029	0.000	0.000
Intrafirm import intensity	23,556	0.018	0.080	0.000	0.000	15,978	0.016	0.063	0.000	0.000	7,578	0.022	0.108	0.000	0.000
MNEs	23,556	0.289	0.453	0.000	1.000	15,978	0.309	0.462	0.000	1.000	7,578	0.247	0.432	0.000	0.000
Employment	23,556	5.075	0.851	4.419	5.519	15,978	5.136	0.876	4.457	5.596	7,578	4.949	0.780	4.354	5.342
Employment^2	23,556	26.480	9.553	19.530	30.460	15,978	27.140	9.932	19.860	31.310	7,578	25.100	8.537	18.960	28.530
Number of establishments	23,556	1.354	0.987	0.619	2.015	15,978	1.128	0.938	0.363	1.719	7,578	1.831	0.915	1.275	2.398
Age	23,556	41.740	17.690	30.000	53.350	15,978	41.870	17.670	30.500	53.500	7,578	41.490	17.740	29.500	53.110
Shre of non-production workers	23,556	0.528	0.338	0.231	0.952	15,978	0.342	0.217	0.178	0.462	7,578	0.920	0.170	0.952	1.000
R&D-sales ratio	23,556	0.007	0.023	0.000	0.005	15,978	0.010	0.024	0.000	0.009	7,578	0.002	0.018	0.000	0.000
Import penetration	23,556	0.081	0.096	0.014	0.105	15,978	0.113	0.101	0.050	0.136	7,578	0.014	0.002	0.012	0.015
Industry non-producton worker share	23,556	0.703	0.214	0.550	0.936	15,978	0.589	0.165	0.511	0.666	7,578	0.943	0.022	0.926	0.950
Industry employment size	23,556	12.300	1.333	11.250	13.980	15,978	11.510	0.806	10.960	11.920	7,578	13.980	0.012	13.980	13.980
Industry capital-labor ratio	23,556	1.913	0.648	1.458	2.149	15,978	2.133	0.684	1.591	2.587	7,578	1.449	0.056	1.430	1.474

Notes: For the definition of variables, see the main text.

Source: Authors' calculation based on the BSJBSA and the JIP database.

Table A3. Regression Results: All Coefficients

	Manufacturing					Wholesale trade				
	(1) Baseline	(2) 6-year window	(3) Actual growth	(4) Before 2009	(5) Includes TFP shocks	(1) Baseline	(2) 6-year window	(3) Actual growth	(4) Before 2009	(5) Includes TFP shocks
<i>Both</i>	-0.014 (0.014)	-0.007 (0.015)	-0.002 (0.001)	-0.008 (0.015)	-0.023 (0.014)	0.013 (0.021)	-0.025 (0.023)	0.001 (0.002)	0.034 (0.023)	-0.002 (0.022)
<i>Exports only</i>	-0.047*** (0.015)	-0.024 (0.015)	-0.003*** (0.001)	-0.042*** (0.016)	-0.050*** (0.015)	-0.026 (0.030)	-0.045 (0.030)	-0.002 (0.003)	-0.048 (0.033)	-0.035 (0.031)
<i>Imports only</i>	0.027* (0.015)	0.041** (0.016)	0.001 (0.001)	0.043** (0.017)	0.019 (0.016)	0.093*** (0.021)	0.119*** (0.022)	0.006*** (0.002)	0.116*** (0.023)	0.089*** (0.022)
<i>Export intensity</i>	-0.045 (0.059)	-0.018 (0.057)	-0.002 (0.005)	-0.098 (0.069)	-0.130** (0.060)	0.062 (0.121)	-0.096 (0.120)	0.009 (0.012)	-0.004 (0.135)	0.030 (0.126)
<i>Import intensity</i>	0.136** (0.057)	0.016 (0.052)	0.014*** (0.005)	0.219*** (0.064)	0.112* (0.060)	0.332*** (0.056)	0.253*** (0.062)	0.032*** (0.006)	0.344*** (0.067)	0.379*** (0.061)
<i>MNEs</i>	0.038*** (0.013)	0.047*** (0.012)	0.003*** (0.001)	0.050*** (0.014)	0.024* (0.013)	0.021 (0.022)	0.051** (0.022)	0.001 (0.002)	0.011 (0.025)	0.003 (0.023)
<i>Intrafirm both</i>	0.001 (0.018)	0.024 (0.019)	-0.000 (0.001)	-0.018 (0.020)	0.004 (0.018)	0.054* (0.028)	0.080*** (0.031)	0.003 (0.003)	0.030 (0.032)	0.038 (0.031)
<i>Intrafirm exports only</i>	0.010 (0.018)	0.004 (0.019)	-0.000 (0.001)	-0.002 (0.021)	0.017 (0.019)	0.056 (0.035)	0.082** (0.038)	0.003 (0.003)	0.039 (0.040)	0.047 (0.036)
<i>Intrafirm imports only</i>	0.004 (0.021)	-0.024 (0.024)	-0.001 (0.002)	-0.031 (0.025)	0.002 (0.022)	0.050* (0.030)	0.024 (0.036)	0.003 (0.003)	0.018 (0.034)	0.088*** (0.032)
<i>Intrafirm export intensity</i>	0.486*** (0.134)	0.299*** (0.114)	0.045*** (0.013)	0.595*** (0.149)	0.541*** (0.144)	0.267 (0.285)	0.203 (0.296)	0.026 (0.029)	0.510 (0.314)	0.314 (0.328)
<i>Intrafirm import intensity</i>	0.026 (0.094)	0.197** (0.086)	-0.006 (0.008)	-0.029 (0.107)	0.042 (0.099)	-0.379*** (0.089)	-0.265*** (0.095)	-0.035*** (0.009)	-0.389*** (0.106)	-0.439*** (0.094)
Firm characteristics										
<i>Employment</i>	0.213*** (0.046)	-0.061 (0.047)	0.020*** (0.004)	0.163*** (0.050)	0.172*** (0.047)	0.615*** (0.086)	0.254*** (0.087)	0.059*** (0.007)	0.662*** (0.101)	0.557*** (0.091)
<i>Employment^2</i>	-0.021*** (0.004)	-0.001 (0.004)	-0.002*** (0.000)	-0.017*** (0.004)	-0.016*** (0.004)	-0.050*** (0.008)	-0.023*** (0.008)	-0.005*** (0.001)	-0.055*** (0.009)	-0.045*** (0.008)
<i>Number of establishments</i>	0.004 (0.006)	0.002 (0.006)	0.000 (0.001)	0.008 (0.007)	0.011* (0.006)	-0.024*** (0.009)	-0.026*** (0.009)	-0.001* (0.001)	-0.024** (0.010)	-0.018* (0.010)
<i>Age</i>	-0.003*** (0.000)	-0.003*** (0.000)	-0.000*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.004*** (0.000)	-0.005*** (0.000)	-0.000*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)
<i>Share of non-production workers</i>	-0.117*** (0.023)	-0.078*** (0.022)	-0.010*** (0.002)	-0.100*** (0.025)	-0.139*** (0.023)	-0.093** (0.036)	-0.161*** (0.038)	-0.006* (0.003)	-0.093** (0.040)	-0.070* (0.038)
<i>R&amp;D-sales ratio</i>	-0.640 (0.424)	-1.126*** (0.260)	-0.036 (0.036)	-1.207*** (0.289)	-1.665*** (0.255)	-0.179 (0.263)	-0.080 (0.407)	-0.011 (0.030)	-0.159 (0.276)	-2.664* (1.389)
<i>Volatility of productivity</i>					0.502*** (0.025)					0.817*** (0.056)
Industry characteristics										
<i>Import penetration</i>	0.308*** (0.042)	0.173*** (0.055)	0.024*** (0.003)	0.356*** (0.048)	0.319*** (0.043)	-3.626*** (0.803)	-15.755*** (5.803)	-0.317*** (0.076)	-3.090 (2.012)	-4.862*** (0.798)
<i>Industry skill share</i>	-0.142*** (0.029)	-0.251*** (0.074)	-0.012*** (0.002)	-0.204*** (0.044)	-0.100*** (0.029)	2.306 (1.914)	21.227*** (4.152)	0.391** (0.184)	1.845 (1.908)	2.239 (1.846)
<i>Industry size</i>	0.038*** (0.005)	0.012 (0.008)	0.003*** (0.000)	0.032*** (0.006)	0.042*** (0.005)	1.204** (0.572)	-1.954 (1.481)	0.111** (0.055)	1.171** (0.585)	1.285** (0.558)
<i>Industry capital-labor ratio</i>	-0.034*** (0.006)	-0.039*** (0.011)	-0.003*** (0.000)	-0.034*** (0.006)	-0.042*** (0.006)	-34.682 (27.073)	-281.550*** (60.058)	-5.385** (2.604)	-28.778 (28.884)	-32.786 (26.108)
<i>Constant</i>	-3.310*** (0.139)	-2.223*** (0.182)	0.019* (0.011)	-3.108*** (0.153)	-3.419*** (0.144)					
Number of observations	15,978	31,174	15,978	14,493	14,213	7,578	13,856	7,578	6,877	6,454
R-squared	0.043	0.048	0.045	0.041	0.073	0.053	0.043	0.059	0.047	0.088

For notes and sources, see Table 5.

**Table A4. Extensions: All Coefficients**

	(1)	(2)	(3)	(4)	(5)
	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	Volatility of wages
<i>Both</i>	-0.014 (0.014)	-0.124*** (0.016)	-0.014 (0.017)	-0.049*** (0.015)	0.054*** (0.016)
<i>Exports only</i>	-0.047*** (0.015)	-0.095*** (0.016)	-0.050*** (0.018)	-0.083*** (0.016)	0.030* (0.017)
<i>Imports only</i>	0.027* (0.015)	-0.056*** (0.020)	0.033* (0.019)	0.042** (0.018)	0.045** (0.019)
<i>Export intensity</i>	-0.045 (0.059)	0.112* (0.061)	-0.090 (0.060)	-0.178*** (0.063)	0.231*** (0.063)
<i>Import intensity</i>	0.136** (0.057)	0.294*** (0.060)	-0.028 (0.061)	0.225*** (0.062)	0.153** (0.067)
<i>MNEs</i>	0.038*** (0.013)	-0.008 (0.014)	0.036** (0.015)	0.019 (0.014)	0.028* (0.014)
<i>Intrafirm both</i>	0.001 (0.018)	0.096*** (0.018)	0.034 (0.022)	-0.005 (0.019)	-0.000 (0.020)
<i>Intrafirm exports only</i>	0.010 (0.018)	0.042*** (0.015)	0.019 (0.023)	-0.000 (0.020)	-0.013 (0.021)
<i>Intrafirm imports only</i>	0.004 (0.021)	0.058*** (0.018)	-0.002 (0.026)	0.027 (0.024)	0.002 (0.024)
<i>Intrafirm export intensity</i>	0.486*** (0.134)	0.367*** (0.135)	0.496*** (0.116)	0.508*** (0.152)	0.075 (0.133)
<i>Intrafirm import intensity</i>	0.026 (0.094)	-0.111 (0.097)	0.203** (0.093)	-0.066 (0.106)	-0.126 (0.110)
<b>Firm characteristics</b>					
<i>Employment</i>	0.213*** (0.046)	0.221*** (0.046)	0.468*** (0.052)	0.284*** (0.049)	0.167*** (0.050)
<i>Employment^2</i>	-0.021*** (0.004)	-0.021*** (0.004)	-0.034*** (0.005)	-0.028*** (0.004)	-0.020*** (0.004)
<i>Number of establishments</i>	0.004 (0.006)	0.011* (0.006)	-0.085*** (0.007)	0.020*** (0.007)	0.043*** (0.007)
<i>Age</i>	-0.003*** (0.000)	-0.003*** (0.000)	-0.005*** (0.000)	-0.003*** (0.000)	-0.001*** (0.000)
<i>Share of non-production workers</i>	-0.117*** (0.023)	-0.110*** (0.023)	0.099*** (0.026)	-0.182*** (0.024)	0.106*** (0.025)
<i>R&amp;D-sales ratio</i>	-0.640 (0.424)	-0.511 (0.388)	-0.893** (0.396)	-0.778** (0.346)	0.654*** (0.189)
<b>Industry characteristics</b>					
<i>Import penetration</i>	0.308*** (0.042)	0.322*** (0.042)	0.239*** (0.044)	0.537*** (0.045)	0.025 (0.047)
<i>Industry skill share</i>	-0.142*** (0.029)	-0.139*** (0.029)	-0.287*** (0.046)	-0.019 (0.031)	0.141*** (0.032)
<i>Industry size</i>	0.038*** (0.005)	0.040*** (0.005)	0.070*** (0.006)	0.069*** (0.006)	0.007 (0.006)
<i>Industry capital-labor ratio</i>	-0.034*** (0.006)	-0.032*** (0.006)	-0.000 (0.007)	-0.070*** (0.006)	-0.035*** (0.007)
<i>Constant</i>	-3.310*** (0.139)	-3.367*** (0.138)	-4.372*** (0.160)	-3.716*** (0.151)	-2.500*** (0.156)
<b>Number of observations</b>	15,978	15,978	13,137	15,974	14,936
<b>R-squared</b>	0.043	0.046	0.081	0.060	0.027

For notes and sources, see Table 7.



Table A5. Extensions: Wholesale Trade, All Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	No MFG workers	Volatility of wages
<i>Both</i>	0.013 (0.021)	-0.095*** (0.024)	-0.004 (0.025)	0.019 (0.023)	0.029 (0.029)	0.005 (0.021)
<i>Exports only</i>	-0.026 (0.030)	-0.113*** (0.037)	0.034 (0.035)	-0.004 (0.033)	-0.021 (0.039)	0.019 (0.029)
<i>Imports only</i>	0.093*** (0.021)	0.023 (0.023)	0.060** (0.026)	0.098*** (0.022)	0.111*** (0.028)	0.015 (0.021)
<i>Export intensity</i>	0.062 (0.121)	0.249** (0.123)	0.019 (0.123)	-0.079 (0.134)	0.180 (0.167)	0.038 (0.114)
<i>Import intensity</i>	0.332*** (0.056)	0.400*** (0.059)	0.284*** (0.065)	0.276*** (0.061)	0.355*** (0.071)	0.261*** (0.055)
<i>MNEs</i>	0.021 (0.022)	0.002 (0.025)	0.041 (0.026)	0.012 (0.024)	0.051* (0.029)	0.046** (0.022)
<i>Intrafirm both</i>	0.054* (0.028)	0.096*** (0.031)	0.046 (0.035)	0.034 (0.031)	0.018 (0.037)	-0.007 (0.028)
<i>Intrafirm exports only</i>	0.056 (0.035)	0.091*** (0.030)	0.089** (0.042)	0.044 (0.037)	0.028 (0.046)	0.045 (0.037)
<i>Intrafirm imports only</i>	0.050* (0.030)	0.125*** (0.027)	0.007 (0.040)	0.048 (0.033)	0.043 (0.042)	0.024 (0.030)
<i>Intrafirm export intensity</i>	0.267 (0.285)	0.241 (0.286)	0.031 (0.296)	0.345 (0.308)	-0.236 (0.559)	0.383 (0.296)
<i>Intrafirm import intensity</i>	-0.379*** (0.089)	-0.460*** (0.089)	-0.282*** (0.099)	-0.296*** (0.091)	-0.486*** (0.114)	-0.474*** (0.091)
Firm characteristics						
<i>Employment</i>	0.615*** (0.086)	0.616*** (0.086)	0.449*** (0.096)	0.786*** (0.104)	0.622*** (0.115)	0.287*** (0.098)
<i>Employment^2</i>	-0.050*** (0.008)	-0.050*** (0.008)	-0.034*** (0.009)	-0.065*** (0.010)	-0.051*** (0.011)	-0.025*** (0.009)
<i>Number of establishments</i>	-0.024*** (0.009)	-0.022** (0.009)	-0.031*** (0.011)	-0.047*** (0.010)	-0.026** (0.011)	0.032*** (0.009)
<i>Age</i>	-0.004*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)	-0.004*** (0.000)	-0.002*** (0.000)
<i>Share of non-production workers</i>	-0.093** (0.036)	-0.101*** (0.036)	-0.143*** (0.044)	-0.202*** (0.040)		-0.312*** (0.038)
<i>R&amp;D-sales ratio</i>	-0.179 (0.263)	-0.110 (0.279)	-0.166 (0.543)	-0.279 (0.228)	0.579** (0.248)	0.969*** (0.167)
Industry characteristics						
<i>Import penetration</i>	-3.626*** (0.803)	-3.680*** (0.804)	-6.148*** (1.801)	-3.342*** (0.719)	-4.214*** (0.999)	-0.332 (0.862)
<i>Industry skill share</i>	2.306 (1.914)	2.295 (1.912)	7.037*** (1.855)	1.306 (2.025)	4.279* (2.354)	-1.140 (2.166)
<i>Industry size</i>	1.204** (0.572)	1.249** (0.573)	-4.195 (3.729)	1.515** (0.709)	1.839*** (0.708)	0.426 (0.697)
<i>Industry capital-labor ratio</i>	-34.682 (27.073)	-34.533 (27.036)	-89.410*** (26.294)	-21.579 (29.153)	-62.758* (33.276)	12.841 (30.417)
<i>Constant</i>						
Number of observations	7,578	7,578	5,812	7,621	4,773	6,966
R-squared	0.053	0.054	0.048	0.049	0.055	0.037

For notes and sources, see Table 7.