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Impacts of Increased Chinese Imports on Japan's Labor Market: Firm and Regional Aspects[1]

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Abstract

Using firm/plant-level data from the Census of Manufacture, this study investigates the impact of Chinese import competition, focusing on different effects based on firm characteristics and regional factors. We find that import competition from China harms Japanese firms' survival ratios, with the negative impacts being especially strong for smaller firms. Subcontractors are also more vulnerable to Chinese import competition. However, subcontractors in metropolitan areas experience lesser negative impact. In terms of the effects on firm employment, import competition from China had a negative impact, but no statistically significant difference exists based on firm size or whether firms are subcontractors. Firms with overseas affiliates in China or multiple domestic plants reduced their employment in Japan. Moreover, plants in Tokyo, Aichi, and Osaka areas have been particularly inflicted an adverse effect.

Keywords: China shock, Japan

JEL classification: F10

[1]This study is conducted as a part of the Project "Globalization and the Japanese Economy: Firm Adjustment and Global Trade Governance" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This study uses data from the questionnaire information based on the "Census of Manufacture" (Ministry of Economy, Trade and Industry) and "Economic Census for Business Activity" (Ministry of Internal Affairs and Communications and Ministry of Economy, Trade and Industry). We also utilize the Census of Manufacture's plant-id converter, which are provided by RIETI. The authors are grateful for helpful comments and suggestions by Kenta Yamanouchi (Kagawa Univ.), Toshiyuki Matsuura (Keio Univ.) and Discussion Paper seminar participants at RIETI. A part of Ito's work for this project is financially supported by Japan Society for Promotion of Science KAKENHI grant number 20H01501.

1. INTRODUCTION

In the aftermath of the Global Financial Crisis in the 2010s, a rapid and massive increase in Chinese imports drew the attention of policymakers and researchers in the United States. An issue that attracted the most attention was their impact on employment. Indeed, one of the most contentious issues during the 2016 U.S. presidential campaign was the negative effects of Chinese imports on employment. The unexpected victory of Donald Trump has been attributed to strong support from workers in the Rust Belt who have allegedly suffered from increased Chinese imports.

Although the U.S. labor market has been a major focus of debates on the effects of Chinese imports on labor markets, imports from China are even more notable in countries other than the U.S., most notably in South Korea and Japan, China's neighboring countries. Figure 1 shows the import penetration ratio from China to the U.S., Japan, the UK, France, Germany, and South Korea. South Korea and Japan have much higher and increasing Chinese import penetration ratios. Given the high import penetration ratio, research on the Japanese labor market is especially important. Simultaneously, as shown in Table 1, the number of employees in Japan's manufacturing sector has decreased substantially. Such a rise in China's import penetration ratio could be linked to a decrease in employment in Japan.

This study investigates how the import competition from China affects Japanese firms differently depending on firm characteristics and regional factors. In terms of firm characteristics, we include in our dataset subcontractor firms that process raw materials and receive processing fees from their outsourcers and have not been studied in previous studies, owing to the difficulty in assembling the necessary data by matching products to processes. Then, we examine how the effects of Chinese import competition differ between subcontractors and non-subcontractors. Similarly, we look into the differences in those effects based on the presence of firms' affiliates in China. In a nutshell, this study empirically investigates the role of firm characteristics that have never been studied before in the literature.

This study's findings are summarized as follows:

1. The import competition from China negatively affected the survival of Japanese firms, with the negative effects being especially severe for smaller firms.
2. Subcontractors are more vulnerable to Chinese import competition. However, the negative effect is attenuated for subcontractors in metropolitan areas.

3. Concerning the effects on employment, import competition from China had a negative impact, but the difference based on firm size or whether firms are subcontractors is not statistically significant.
4. Firms with Chinese affiliates reduced their employment in Japan more than those without.
5. Firms with multiple plants were more likely to dismiss workers.
6. In terms of plant location, plants in Tokyo, Aichi, and Osaka areas are particularly affected.

The remainder of this paper is structured as follows. Section 2 provides an overview of the literature on the effects of Chinese import penetration. Section 3 presents our empirical findings. Finally, Section 4 concludes this study.

2. LITERATURE

The trade literature has empirically investigated the economic effects of a dramatic increase in Chinese imports, known as the "China shock." Autor et al. (2013) pioneered a study in the recent literature that demonstrated that an increase in Chinese imports decreases job opportunities in the U.S. A similar finding has been obtained in other countries, including Mexico (Mendez, 2015), Canada (Murray, 2017; Kim, 2018; Albouy et al., 2019), Denmark (Keller and Utar, 2018), Germany (Dauth et al., 2014), France (Malgouyres, 2017), Brazil (Costa et al., 2016), Spain (Donoso et al., 2015), Belgium (Mion and Zhu, 2013), Norway (Balsvik et al., 2015), Portugal (Branstetter et al., 2019), Italy (Federico, 2014), the UK (Colantone et al., 2019), and South Korea (Choi and Xu, 2020). The economic consequences of the China shock have received much attention in recent trade literature.

This literature has expanded in various directions. The first is to examine the heterogeneous effects across jobs (Lu and Ng, 2013; Autor et al., 2015; del Angel et al., 2019), sectors (Federico, 2014; Acemoglu et al., 2016; Magyari, 2017; Bloom et al., 2019), and firms (Asquith et al., 2019; Aslan and Kumar, 2021). The second direction is to improve the measurement of the impacts in terms of gross trade versus trade in value added (Shen and Silva, 2018; Jakubik and Stolzenburg, 2021) and empirical identification (Adao et al., 2019; Fischer and Saure, 2018). The third step is to investigate the effects on other indicators, such as gender (Keller and Utar, 2018; Benguira and Ederington, 2021; Majlesi, 2016), political stances (Che et al., 2016; Autor et al., 2020; Che and Xiao, 2020; Colantone and Stanig, 2018a, 2018b; Caselli et al., 2020), health (Adda and Fawaz, 2020; Lang et al., 2018; Charles et al., 2018; Pierce and Schott, 2020; Giuntella et al., 2020), and crimes (Che et al., 2018; Dell et al., 2019; Dix-Carneiro et al., 2018).

We empirically investigate the effects of China shocks on the Japanese economy. Several studies on Japan have been included in the preceding literature. For instance, Taniguchi (2019) found the inverse of the preceding result, namely, the positive effect of Chinese import penetration on Japanese jobs. She interpreted this result as reflecting the active imports of intermediate goods from China. Although her analysis is based on cross-regional variation, Hayakawa et al. (2021a) discovered significantly negative effects on jobs using the cross-industry data. Furthermore, Hayakawa et al. (2021b) found that import penetration had a significant negative impact on industries producing competing products to Chinese imports, and a positive impact on industries from which firms purchased their inputs. At the commuting zone level, Kainuma and Saito (2022) found similar results to Hayakawa et al. (2021b) and claimed that the direct negative effect on local labor markets is somewhat mitigated by effects on downstream industries within the same region. Furthermore, for Japanese firms faced with competition from Chinese imports, Matsuura (2022) showed a significant rise in the share of service workers in manufacturing, whereas Yamashita and Yamauchi (2020) found an increase in patenting and a decrease in innovation quality (measured by forward citations received).

3. DATA AND METHODOLOGY

3.1. *Data*

The data on employment are obtained from the Census of Manufacture and the Economic Census compiled by the Ministry of Economy, Trade, and Industry in Japan. The Census of Manufacture was conducted as part of the Economic Census in 2011 and 2015. We used data from 1996 to 2014 because necessary concordances are available. Except for the years 1998, 2000, 2003, 2005, and 2008, the censuses cover all manufacturing plants (establishments)[1] in Japan with four or more employees. The questionnaires must be completed by all establishments. The response rate is approximately 95%. Each year, approximately 200,000–300,000 establishments are recorded. The total number of establishments decreased from around 350,000 in 1996 to approximately 200,000 in 2014. The present study uses data from 1996, which is the initial year for which data are available, up to 2014. We chose 2014 as the end year of our study because of the availability of various concordance tables we needed to use.

The data on production value used to compute the import penetration variable are also derived from censuses. Products are defined at a six-digit level in these censuses.

[1] This study uses the term “plant” and “establishment” for the same meaning.

Approximately 1,200 "products" are available at the six-digit level. The data on Japan's imports from China and the rest of the world are obtained from Japan Customs under the Ministry of Finance. Based on Japan's tariff classification, these data are available at a nine-digit level, with approximately 9,000 products. Our empirical analysis is conducted at the six-digit level in production/employment data by mapping each nine-digit code in trade data to a single six-digit code in production/employment data. In this aggregation of codes in trade data, we use the converter table between nine-digit codes in trade data and six-digit codes in production data developed by Baek et al. (2019) and that of tariff-line-level codes in trade data constructed by Aoyagi and Ito (2019).

The Census datasets provide data on establishments and parent firms separately. We used firm name and paid-up capital to match the two datasets because of the unavailability of firm identification code. We were successful in matching roughly 60% of the data. Because information to construct concordance between firms and establishments is not available for 2011, when the Census of Manufacturers is conducted as part of the Economic Census, 2011 is excluded from our sample.

In this study, we use concordance tables to aggregate plant-level data into firm-level data. To examine the impact of Chinese import competition on firm performance, we define the product with the highest sales value as a firm's representative product.

3.2. *Descriptive analyses*

Figure 2 shows the number of employees in Japan's manufacturing sector as obtained from the Census of Manufacture and the Economic Census. It has substantially decreased over the last 30 years. Figure 3 depicts the total number of employees by industry from 1996 to 2014. A notable decline is observed in industries, such as textiles, electrical machinery, equipment and supplies, and information and communication electronics equipment.

Table 2 shows the change in Chinese import penetration into the Japanese market by industry from 1996 to 2014. Following Acemoglu et al. (2016), we computed the measure on Chinese import penetration. In particular, the change in import penetration from China is computed as the difference between imports from China in years t and 0, over "imports from the rest of the world in year 0 plus production value in year 0." It is multiplied by 100 to show percentage changes and divided by the number of years, i.e., t − 0, to show annual changes. In symbol, as in Acemoglu et al. (2016), it is defined as

$$\Delta IMP_p \equiv \frac{100}{t-0} \times \left(\frac{Import_{pt}^{China} - Import_{p0}^{China}}{Prod_{p0} + Import_{p0}^{World}} \right). \quad (1)$$

Table 2 shows that China's import penetration increased, particularly in industries, such as textiles, furniture and fixtures, business-oriented machinery, electrical machinery, equipment and supplies, and information and communication electronics equipment. Specifically, Japan's import penetration from China increased primarily in the machinery industry. Meanwhile, food, beverages and tobacco, printing, petroleum and coal products, and transportation equipment have seen relatively small increases.

Table 3 shows the change in employment by prefecture. It is computed by aggregating plant-level employment data rather than firm-level data because a firm's headquarter location is often different from the locations of its plants. The greatest drops are observed in metropolitan areas, most notably Tokyo (−56.71%), Kanagawa (−40.20%), and Osaka (−40.20%). Akita and Tottori experienced significant declines in non-metropolitan prefectures. This trend is more visible in Figure 4, which depicts the number of manufacturing employees by region. Minami-Kanto, which includes Tokyo and Kanagawa, and Kinki, which includes Osaka, experienced the greatest drop in employment. This decline is primarily attributed to the structural shift from manufacturing to service industries, which occurred most notably in metropolitan areas. However, besides the structural change, other factors, such as import competition from China, may be driving this drastic decline.

Unlike previous studies on the impacts of Chinese import penetration on the Japanese economy, this study includes processing-fee-receiving subcontractor firms, which are defined as firms whose subcontracting sales exceed non-subcontracting sales. Table 4 shows the total number of subcontractors and others (non-subcontractors). Subcontractors account for approximately 33% of the approximately 300,000 firms. This share underscores the significance of subcontractors in Japanese manufacturing. The lower panel of Table 4 displays the surviving rate, which is defined as the proportion of plants that survived in 2014 out of those that existed in 1996. Meanwhile, subcontractors in metropolitan areas have the lowest surviving rate, whereas non-subcontractors in non-metropolitan areas have the highest. Thus, both plant type and regional characteristics appear to influence plant survival.

3.3. *Estimation analyses*

This section examines the effects of Chinese import penetration on firm survival before moving on to the effects on firm employment. We intend to uncover the heterogeneous effects of firm and regional characteristics. In our regression analyses, we set 2014 and 1996 as years t and 0 in equation (1), respectively.

3.3.1. Survival

We analyze whether Chinese import penetration has affected firm survival and how it varies by firm characteristics. To do so, we use the ordinary least squares (OLS) method to estimate the following linear probability model:

$$\begin{aligned} Survival_f = {} & \beta_0 + \beta_1 Chinese\ Penetration_f + \beta_2 \ln Employment_{f0} \\ & + \beta_3 Chinese\ Penetration_f \times Small_{f0} + \beta_4 Subcontractors_{f0} \\ & + \beta_5 Chinese\ Penetration_f \times Subcontractors_{f0} + u_r + u_i + \epsilon_f. \end{aligned} \quad (2)$$

where $Survival_f$ takes a value of 1 if firm f existed in both 1996 and 2014 and a value of 0 if it existed in 1996 but did not in 2014. $Chinese\ Penetration_f$ represents the change of the import penetration rate of firm f's representative product from 1996 to 2014, as specified in equation (1). We control for firm size in terms of employee number by a log of their number in 1996 ($\ln Employment_{f0}$). To investigate the heterogeneous effects of firm characteristics, we also introduce two interaction terms relating to import penetration. One is an interaction with an indicator variable that takes a value of 1 if firm f's employment in 1996 is less than the median value of employment among all firms ($Small_{f0}$). The other interaction term is with a dummy variable on subcontractors ($Subcontractors_{f0}$), which is defined by the firm status in 1996. On the subcontractor dummy, we also introduce the non-interacted variable. We control for prefecture-fixed effects (u_r) and industry fixed effects (defined at a two-digit level of industry classification, u_i).

Table 5 shows the estimation results. We begin with a specification that does not have interaction terms. In Column (1), we do not control for prefecture-fixed effects and industry fixed effects, which are introduced in Columns (2) and (3), respectively. Both fixed effects are introduced in Column (4). $Chinese\ Penetration$ has statistically significant coefficients with a negative sign in all four columns, as expected. Firms are more likely to exit if they produce products with higher growth in Chinese import penetration. Moreover, the employment coefficients were both positive and significant, indicating that larger firms are more likely to survive. In Column (5), we introduce a cross term of the Chinese penetration variable with a dummy on small-sized firms in terms of employment. Its coefficient is statistically significant and has a negative sign, indicating the more adverse effect of competition with Chinese products on smaller firms.

In Table 6, Column (1), we introduce the subcontractor dummy variable and its cross term with Chinese import penetration. The two coefficients on subcontractor-related variables are negative and statistically significant. The result for the subcontractor dummy indicates that subcontractors are more likely to exit, whereas the result for the interaction term indicates that subcontractors are more adversely affected by Chinese import competition. Furthermore, the location of subcontractors may be important for their survival because they may be able to find other firms for which they subcontract if they are located in metropolitan areas, due to firm agglomeration. [2] To examine this hypothesis, we introduce a metropolitan dummy (Metropolitan) and its interaction term with Chinese import penetration. Although location in the metropolitan area is irrelevant for survival on average, subcontractors located in the metropolitan area can mitigate the negative impact of Chinese import penetration, as shown in Column (2) of Table 6.

3.3.2. Impact on employment

In this subsection, we examine the impact of Chinese import penetration on employment (i.e., the intensive margin in firms' production) rather than survival (i.e., the extensive margin). To do so, we substitute the annualized log-difference of employment from 1996 to 2014 for the dependent variable in equation (2). Note that the sub-sample used in this analysis is that firms that have survived the entire period to focus on the effect on the intensive margin.

Specifically, we use the OLS to estimate the following equation:

$$\begin{aligned}
&Employment\ change_f \\
&\quad = \gamma_0 + \gamma_1 Chinese\ Penetration_f + \gamma_2 \ln Productivity_{f0} \\
&\quad + \gamma_3 Chinese\ Penetration_f \times Low\ productivity_{f0} + \gamma_4 Subcontractors_{f0} \\
&\quad + \gamma_5 Chinese\ Penetration_f \times Subcontractors_{f0} + u_r + u_i + \epsilon_f. \qquad (3)
\end{aligned}$$

where $Employment\ change_f$ is the annualized log change in percentage over the sample period, i.e., $\ln\left(Employment_{f2014}/Employment_{f1996}\right) * 100/18$, as reported by Acemoglu et al. (2016). For this analysis, we altered the independent variables slightly. We control for a log of sales per worker in 1996 ($Productivity_{f0}$). Then, we examine the interaction term of Chinese import penetration with the dummy variable, which takes the value of 1 if a firm's sales per worker in 1996 were less than the industry-level median (Low productivity). As in the equation (2), we also introduce subcontractors-related variables.

Table 7 shows the OLS estimation results. Chinese import penetration has had a negative impact on employment growth. However, its impact does not differ by firm productivity (as measured by sales per worker) or firm type (i.e., whether subcontractors or not). As a result, we find no evidence of heterogeneous effects of Chinese import penetration on the intensive margin across these firm characteristics. Firms that are more productive have significantly higher employment growth. Contrary to our expectations, the subcontractor dummy has a statistically significant positive coefficient. The result of its interaction term may indicate that subcontractors engaged in processes that do not compete with Chinese products increase employment.

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[2] We define Tokyo, Saitama, Kanagawa, Chiba, Aichi, Osaka, Kyoto, and Hyogo.

3.3.3. Number of establishments

When confronted with fierce competition from Chinese imports, firms with more establishments in Japan may shift their employees from one plant to the other, thereby retaining their employees. Meanwhile, firms may find it easier to fire employees by closing one of their plants and claiming that they should close their plants and thus have no choice but to terminate employment. To examine this hypothesis in the context of the intensive margin, we introduce the interaction term of Chinese import penetration as a dummy variable with a value of 1 if firms had more than five establishments in Japan in 1996 (i.e., *Many plants*). We also control for the number of establishments they had in 1996 (i.e., *Number of establishments*).

Table 8 shows the estimation results. This new interaction term has an insignificant coefficient in Column (1), implying that neither of the aforementioned two opposing forces is dominant. The number of establishments coefficient is significantly negative, indicating that firms with more establishments tend to reduce their employees. In Column (2), we also include the number of establishments belonging to a firm within the prefecture where the firm's headquarters are located (*Number of establishments within the same region*), to investigate the possibility of worker relocation between plants. However, its coefficient is estimated insignificantly. Furthermore, the interaction term of Chinese import penetration has a non-significant coefficient.

3.3.4. Foreign direct investment link

When firms have their affiliates in China, the impact of Chinese import penetration on their employment in Japan may be different. Firms with affiliate plants in China may shift production to China to compete with imports from China, thus reducing the number of workers in Japan. To test this hypothesis, we include the interaction term of Chinese import penetration with the dummy variable of the presence of firms' affiliates in China in 1996 (CHN affiliate dummy) in equation (3). We also include the dummy variable's non-interacted version. We eliminate the other Chinese import penetration interaction terms.

The estimation results are shown in Table 9. Firms with overseas affiliates in China tend to reduce employment, as evidenced by the statistically significant coefficient with a negative sign for the China affiliate dummy. In contrast, there is no evidence of additional impact from Chinese import competition, as indicated by its cross term with Chinese import penetration. Thus, firms with overseas affiliates in China tend to reduce their employment in Japan, possibly due to a division of labor between Japan and China, whereas having those affiliates in China has no effect on the effect of Chinese import penetration on Japanese employment growth.

3.3.5. Different impacts by location

This final subsection examines how the effects of Chinese import competition vary by location. Unlike the previous analyses, the analyses in this subsection are conducted at the plant level because the locations of firms' headquarters are typically different from the locations of their plants. The following equation is estimated for prefecture and region.

$$Survival_p = \beta_0 + \beta_1 Chinese\ Penetration_p + \beta_2 \ln Employment_{p0} + u_i + \epsilon_p. \qquad (4)$$

The definition of each term is the same as above. We estimate this equation by the OLS.

Table 10 displays the estimation results broken down by prefecture. The table shows the estimated coefficient for Chinese import penetration. Overall, statistically significant coefficients with negative signs are found in Tokyo and its neighboring prefectures, Aichi and some of its neighboring prefectures, and Osaka and its adjacent prefectures. Table 11 shows the estimation results by region. Minami-Kanto, Kita-Kanto-Koshin, Tokai, and Kinki were particularly negatively affected. These negative effects of Chinese import penetration on employment, particularly in urban areas, can be explained by the interaction of supply and demand. On the supply side, factor prices, particularly those for production premises and labor, are typically higher in urban areas than in rural areas, which works against firms facing fierce competition from China. On the demand side, firms may benefit from increased demand in urban areas, which may assist firms in mitigating the negative shocks of Chinese import penetration. We conjecture that our estimates reflect the net effect of these two forces. Supply-side effects override the demand-side effects.

4. CONCLUDING REMARKS

This study investigates the impact of import competition from China using firm/plant-level data from the Census of Manufacturers, with a particular focus on different effects on firm characteristics and regional aspects. We find that import competition from China negatively affected Japanese firm survival ratios, with the negative impacts being especially strong for smaller firms. Subcontractors are also more vulnerable to Chinese import competition. However, when they are located in metropolitan areas, the negative impact is mitigated. The import competition from China harmed the number of employees, but there is no statistical difference in firm size or whether firms are subcontractors. Moreover, firms with Chinese affiliates reduced their employment in Japan more than those without. Furthermore, firms with multiple plants are more likely to reduce their workforce. In terms of plant location, plants in Tokyo, Aichi, and Osaka areas are adversely affected.

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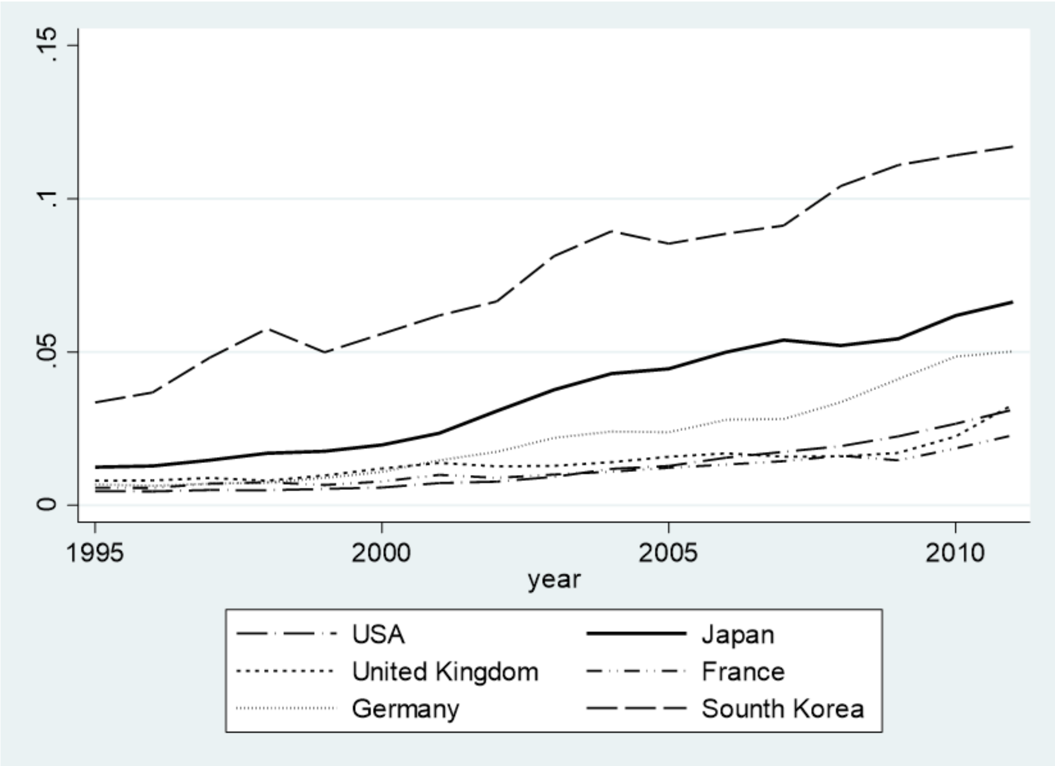
FIGURES AND TABLES

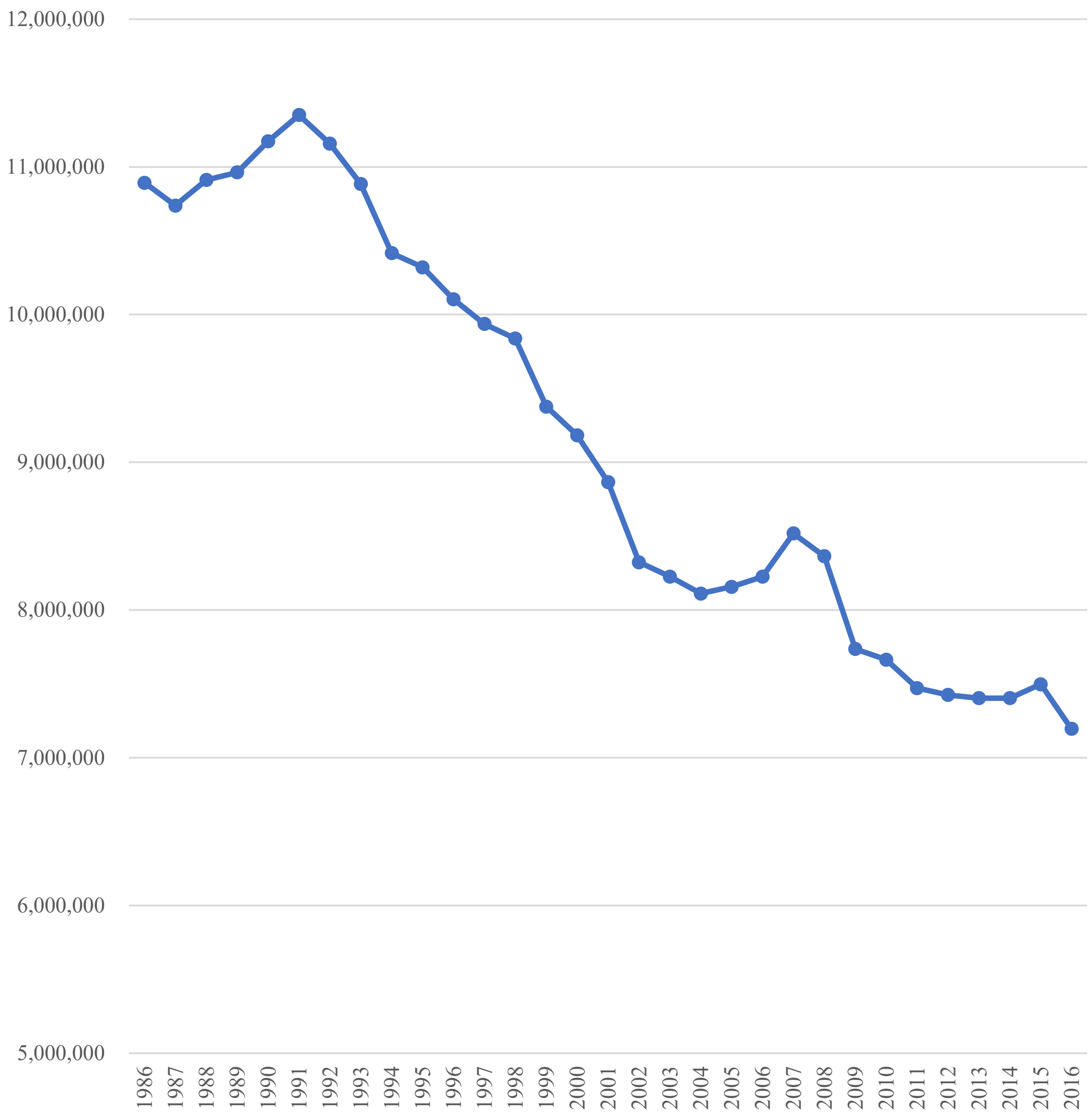
FIGURE 1: IMPORT PENETRATION RATIO FROM CHINA



***NOTE*: CHINA PENETRATION IS COMPUTED AS IMPORT FROM CHINA / DOMESTIC DEMAND, WHERE DOMESTIC DEMAND = DOMESTIC PRODUCTION + IMPORTS FROM THE WORLD–EXPORTS TO THE WORLD**

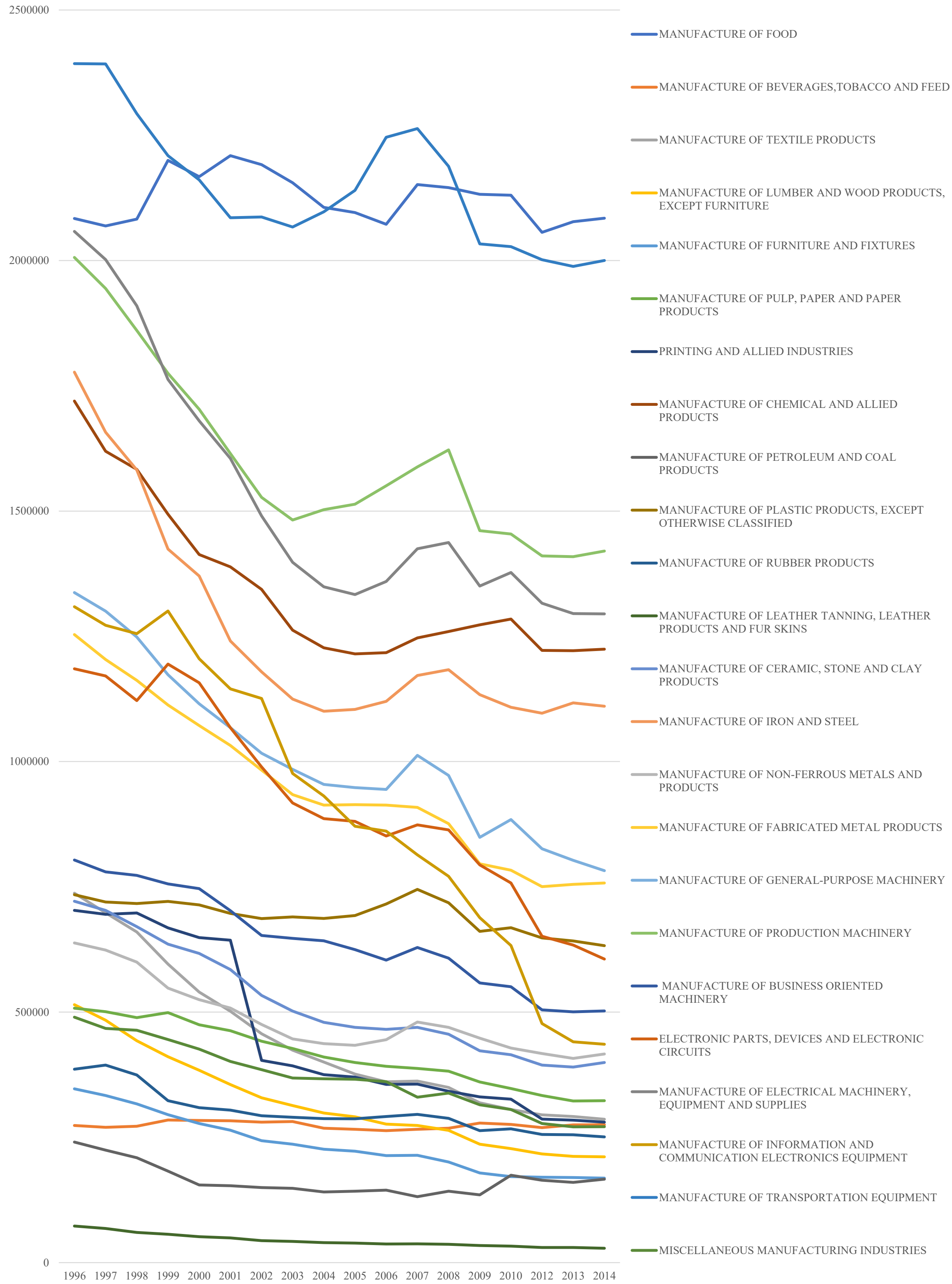
***SOURCE*: FIGURE 1 IN HAYAKAWA ET AL. (2021)**

FIGURE 2: Number of employees in manufacturing sector in Japan



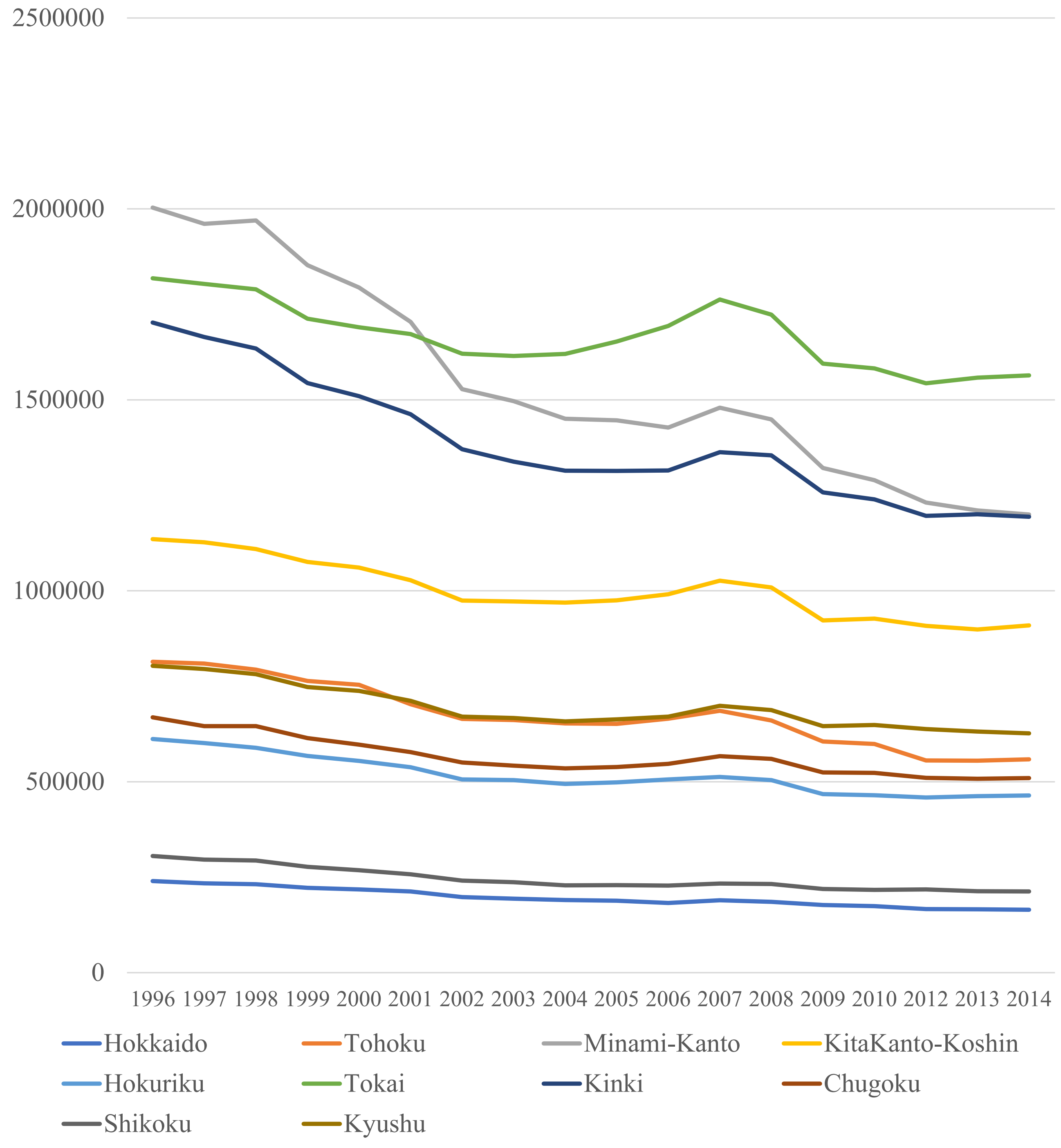
SOURCE**: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS**

FIGURE 3: NUMBER OF EMPLOYEES BY INDUSTRY: 1996-2014



***SOURCE*: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS**

FIGURE 4: NUMBER OF EMPLOYEES IN MANUFACTURING BY REGION: 1996-2014



***SOURCE*: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS**

TABLE 1: NUMBER OF WORKERS IN JAPAN, 2000-2015

	2000	2005	2010	2015
Total	63,032,271	61,530,202	59,607,700	58,890,810
Manufacturing	12,202,064	10,485,635	9,465,070	9,077,510
Manufacturing share (%)	19	17	16	15

***SOURCE*: TABLE 1 IN HAYAKAWA ET AL. (2021)**

TABLE 2: CHINESE IMPORT PENETRATION BY INDUSTRY

Industry code (2-digit)	INDUSTRY_DESCRIPTION	China import penetration (Annual average percent)
09	MANUFACTURE OF FOOD	0.36
10	MANUFACTURE OF BEVERAGES,TOBACCO AND FEED	0.06
11	MANUFACTURE OF TEXTILE PRODUCTS	2.08
12	MANUFACTURE OF LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	0.34
13	MANUFACTURE OF FURNITURE AND FIXTURES	2.46
14	MANUFACTURE OF PULP, PAPER AND PAPER PRODUCTS	0.56
15	PRINTING AND ALLIED INDUSTRIES	0.07
16	MANUFACTURE OF CHEMICAL AND ALLIED PRODUCTS	0.91
17	MANUFACTURE OF PETROLEUM AND COAL PRODUCTS	0.18
18	MANUFACTURE OF PLASTIC PRODUCTS, EXCEPT OTHERWISE CLASSIFIED	1.69
19	MANUFACTURE OF RUBBER PRODUCTS	2.12
20	MANUFACTURE OF LEATHER TANNING, LEATHER PRODUCTS AND FUR SKINS	1.84
21	MANUFACTURE OF CERAMIC, STONE AND CLAY PRODUCTS	0.79
22	MANUFACTURE OF IRON AND STEEL	0.64
23	MANUFACTURE OF NON-FERROUS METALS AND PRODUCTS	1.10
24	MANUFACTURE OF FABRICATED METAL PRODUCTS	1.33
25	MANUFACTURE OF GENERAL-PURPOSE MACHINERY	1.40
26	MANUFACTURE OF PRODUCTION MACHINERY	0.65
27	MANUFACTURE OF BUSINESS ORIENTED MACHINERY	9.94
28	ELECTRONIC PARTS, DEVICES AND ELECTRONIC CIRCUITS	1.67
29	MANUFACTURE OF ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES	2.72
30	MANUFACTURE OF INFORMATION AND COMMUNICATION ELECTRONICS EQUIPMENT	2.37
31	MANUFACTURE OF TRANSPORTATION EQUIPMENT	0.46
32	MISCELLANEOUS MANUFACTURING INDUSTRIES	1.77

***SOURCE*: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS**

TABLE 3: EMPLOYMENT CHANGE BY PREFECTURE: 1996-2014

Prefecture	Growth (1996-2014)	Prefecture	Growth (1996-2014)
Hokkaido	-31.33%	Shiga	-5.37%
Aomori	-31.18%	Kyoto	-31.07%
Iwate	-30.83%	***Osaka***	***-40.20%***
Miyagi	-28.95%	Hyogo	-21.78%
Akita	***-40.40%***	Nara	-29.49%
Yamagata	-29.33%	Wakayama	-25.31%
Fukushima	-30.39%	***Tottori***	***-44.50%***
Ibaraki	-14.35%	Shimane	-34.13%
Tochigi	-19.98%	Okayama	-23.87%
Gunma	-19.40%	Hiroshima	-16.43%
Saitama	-25.56%	Yamaguchi	-24.82%
Chiba	-29.84%	Tokushima	-27.23%
Tokyo	***-56.71%***	Kagawa	-22.45%
Kanagawa	***-40.20%***	Aichi	-35.58%
Niigata	-28.28%	Kochi	-37.51%
Toyama	-18.66%	Shizuoka	-25.16%
Ishikawa	-19.60%	Saga	-17.84%
Fukui	-27.49%	Nagasaki	-29.38%
Yamanasi	-21.27%	Kumamoto	-18.40%
Nagano	-26.34%	Oita	-16.31%
Gifu	-18.06%	Miyazaki	-22.98%
Shizuoka	-20.65%	Kagoshima	-22.79%
Aichi	-9.87%	Okinawa	-4.82%
Mie	-11.39%	Total	-26.72%

***SOURCE*: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS**

TABLE 4: NUMBER OF FIRMS IN 1996 AND THEIR SURVIVAL UP TO 2014: SUBCONTRACTORS AND NON-SUBCONTRACTORS

(I) NUMBER OF ALL FIRMS IN 1996

	Subcontractors		
	Yes	No	Total
Metropolitan area	42,476	96,500	138,976
Non-metropolitan area	52,043	123,348	175,391
Total	94,519	219,848	

(II) SURVIVING RATES

	Subcontractors		
	Yes	No	Total
Metropolitan area	29.4%	38.1%	35.5%
Non-metropolitan area	32.0%	44.0%	40.4%
Total	30.8%	41.4%	

SOURCE: AUTHORS' COMPUTATION FROM THE CENSUS OF MANUFACTURERS

TABLE 5: ESTIMATION RESULTS – SURVIVAL

	(1)	(2)	(3)	(4)	(5)
Chinese penetration	-0.00395***	-0.00232***	-0.00396***	-0.00236***	-0.00102***
	(0.000232)	(0.000248)	(0.000232)	(0.000248)	(0.000303)
Chinese penetration x Small					-0.00353***
					(0.000460)
ln Employment	0.148***	0.146***	0.147***	0.144***	0.143***
	(0.000808)	(0.000819)	(0.000814)	(0.000824)	(0.000851)
Two-digit industry fixed effects		✓		✓	✓
Prefecture fixed effects			✓	✓	✓
Observations	312,288	312,288	312,288	312,288	312,288
R-squared	0.098	0.124	0.102	0.128	0.129

***NOTES*: ROBUST STANDARD ERRORS IN PARENTHESES. *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 6: ESTIMATION RESULTS – Survival – Location

	(1)	(2)
Chinese penetration	-0.00164***	-0.00164***
	(0.000304)	(0.000304)
Chinese penetration x Subcontractors	-0.00187***	-0.00236***
	(0.000474)	(0.000543)
Chinese penetration x Subcontractors x Metropolitan		0.00133+
		(0.000731)
ln Employment	0.142***	0.142***
	(0.000835)	(0.000835)
Subcontractors	-0.0305***	-0.0306***
	(0.00210)	(0.00210)
Metropolitan	-0.000519	-0.000985
	(0.00730)	(0.00730)
Two-digit industry fixed effects	✓	✓
Prefecture fixed effects	✓	✓
Observations	312,288	312,288
R-squared	0.129	0.129

***NOTES*: ROBUST STANDARD ERRORS IN PARENTHESES. *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 7: ESTIMATION RESULTS – EMPLOYMENT GROWTH

	(1)	(2)	(3)	(4)	(5)	(6)
Chinese penetration	-0.0120***	-0.00932**	-0.0124***	-0.00998**	-0.0133**	-0.00854*
	(0.00329)	(0.00354)	(0.00331)	(0.00354)	(0.00458)	(0.00425)
Chinese penetration x Low productivity					0.00686	
					(0.00644)	
Chinese penetration x Subcontractors						-0.00305
						(0.00704)
ln Productivity	0.412***	0.367***	0.411***	0.374***	0.378***	0.486***
	(0.0128)	(0.0134)	(0.0129)	(0.0135)	(0.0141)	(0.0144)
Subcontractors						0.579***
						(0.0266)
Two-digit industry fixed effects		✓		✓	✓	✓
Prefecture fixed effects			✓	✓	✓	✓
Observations	120,125	120,125	120,125	120,125	120,125	120,125
R-squared	0.010	0.037	0.016	0.043	0.043	0.047

***NOTES*: ROBUST STANDARD ERRORS IN PARENTHESES. *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 8: ESTIMATION RESULTS – EMPLOYMENT GROWTH – NUMBER OF PLANTS

	(1)	(2)
Chinese penetration	-0.00704*	-0.00699*
	(0.00353)	(0.00353)
Chinese penetration x Many plants	-0.00923	-0.0106
	(0.0263)	(0.0267)
ln Productivity	0.375***	0.376***
	(0.0133)	(0.0134)
Number of establishments	-0.587***	-0.567***
	(0.0384)	(0.0494)
Number of establilshments within the same region		-0.0586
		(0.0894)
Two-digit industry fixed effects	✓	✓
Prefecture fixed effects	✓	✓
Observations	120,125	120,125
R-squared	0.077	0.077

***NOTES*: ROBUST STANDARD ERRORS IN PARENTHESES. *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 9: ESTIMATION RESULTS – EMPLOYMENT GROWTH – AFFILIATES IN CHINA

	(1)	(2)	(3)	(4)
Chinese penetration	-0.0119***	-0.00923**	-0.0122***	-0.00983**
	(0.00330)	(0.00354)	(0.00331)	(0.00354)
ln Productivity	0.417***	0.372***	0.416***	0.379***
	(0.0129)	(0.0135)	(0.0130)	(0.0136)
CHN affiliate dummy	-1.259***	-1.278***	-1.273***	-1.276***
	(0.250)	(0.242)	(0.250)	(0.242)
Chinese penetration x CHN affiliate dummy	-0.0164	-0.000990	-0.0275	-0.0152
	(0.0502)	(0.0477)	(0.0498)	(0.0473)
Two-digit industry fixed effects		✓		✓
Prefecture fixed effects			✓	✓
Observations	120,125	120,125	120,125	120,125
R-squared	0.010	0.037	0.016	0.043

***NOTES*: ROBUST STANDARD ERRORS IN PARENTHESES. *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 10: SURVIVAL BY PREFECTURE

Prefecture	Coefficient estimate	Degress of freedom	p-value	star
Hokkaido	-0.0085	8,902	0.051	+
Aomori	-0.0063	2,484	0.055	+
Iwate	0.0016	3,429	0.478	
Miyagi	0.0010	4,597	0.663	
Akita	-0.0063	3,357	0.024	*
Yamagata	-0.0022	4,370	0.254	
Fukushima	0.0006	6,610	0.706	
Ibaragi	-0.0035	8,423	0.001	***
Tochigi	-0.0042	7,290	0.004	**
Gunma	0.0001	8,273	0.940	
Saitama	-0.0020	18,821	0.052	+
Chiba	-0.0051	8,516	0.001	**
Tokyo	-0.0024	28,402	0.001	***
Kanagawa	-0.0018	13,659	0.061	+
Niigata	-0.0035	9,456	0.008	**
Toyama	-0.0063	4,255	0.095	+
Ishikawa	0.0004	5,603	0.905	
Fukui	-0.0023	4,234	0.339	
Yamanashi	-0.0024	3,126	0.130	
Nagano	-0.0017	8,641	0.086	+
Gifu	-0.0023	11,115	0.209	
Shizuoka	-0.0035	16,021	0.002	**
Aichi	-0.0032	28,726	0.000	***
Mie	-0.0045	6,349	0.014	*
Shiga	-0.0017	4,038	0.396	
Kyoto	-0.0010	8,148	0.470	
Osaka	-0.0038	33,806	0.000	***
Hyogo	-0.0027	14,762	0.025	*
Nara	-0.0052	3,830	0.019	*
Wakayama	-0.0031	3,237	0.352	
Tottori	0.0010	1,602	0.755	
Shimane	-0.0019	2,172	0.661	
Okayama	-0.0070	5,856	0.039	*
Hiroshima	-0.0034	7,986	0.200	
Yamaguchi	-0.0019	2,923	0.635	
Tokushima	-0.0041	2,502	0.527	
Kagawa	0.0070	3,505	0.169	
Ehime	-0.0028	4,210	0.326	
Kochi	-0.0019	1,756	0.447	
Fukuoka	-0.0052	8,747	0.113	
Saga	-0.0023	2,249	0.624	
Nagasaki	0.0033	2,819	0.682	
Kumamoto	-0.0025	3,200	0.417	
Oita	-0.0004	2,283	0.757	
Miyagi	-0.0042	2,254	0.229	
Kagoshima	-0.0026	3,089	0.190	
Okinawa	-0.0216	1,351	0.153	

***NOTES*: *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

***SOURCE*: AUTHORS' ESTIMATION USING THE CENSUS OF MANUFACTURERS**

TABLE 11: SURVIVAL BY REGION

Region	Coeffiicient estimate	Degrees of freedom	p-value	star
Hokkaido	-0.0085	8,902	0.051	+
Tohoku	-0.0007	24,977	0.411	
Minami-Kanto	-0.0025	69,476	0.000	***
Kita-Kanto-Koshin	-0.0026	35,857	0.000	***
Hokuriku	-0.0033	23,626	0.001	**
Tokai	-0.0035	62,289	0.000	***
Kinki	-0.0031	67,951	0.000	***
Chugoku	-0.0033	20,643	0.024	*
Shikoku	-0.0013	12,049	0.439	
Kyushu	-0.0017	26,172	0.048	*

***NOTES*: *** P<0.001, ** P<0.01, * P<0.05, + P<0.1.**

Source: Authors' estimation using the Census of Manufacturers