Impacts of Increased Chinese Imports on Japan's Labor Market

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Abstract:

Using the Japanese firm/establishment level census data, we investigate on the impact of the Chinese import penetration for employment in Japan. We have found little or slightly negative impact in total employment level, but found that employment through exit has been reinforced by the Chinese import penetration and the impact on exit was stronger for the small and medium enterprises. Log level of employment and sales value for Japanese firms on average has little to do with the Chinese penetration ratio, but it is negatively associated for the SMEs.

Keywords: China, Japan, Import penetration

JEL Classification: F15; F53

1. Introduction

There is a hot debate over how the surge of imports from China affects the domestic economy. After China's joining the World Trade Organization (WTO) in 2001, many countries in the world have experienced a dramatic increase in imports from China. This "China shock" resulted in yielding the concern on the negative impacts on various kinds of dimensions. Against this backdrop, the existing studies have investigated the impacts of import penetration from China on not only domestic economic performance (e.g., Autor et

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al., 2013; Acemoglu et al., 2016; Pierce and Schott, 2016; Bloom et al., 2016; Asquith et al., 2019) but also social (Pierce and Schott, forthcoming; Autor et al., forthcoming) and political environment (Autor et al., 2016). The typical result particularly in the analysis on the domestic economy is negative. For example, it is shown that the surge in imports from China leads to the decrease of jobs.

The purpose of this paper is to empirically examine the effects of imports from China on employment in Japan. Since Japan is one of the countries geographically closest to China, there would be significant impacts of imports from China on the Japanese economy. Indeed, as Figure 1 shows, imports from China have substantially increased in Japan, and even more than the U.S. Simultaneously, the share of manufacturing jobs has been steadily decreasing as shown in Table 1. However, the impacts in Japan might be different from those in other countries, especially Western countries. Due to the geographical proximity, Japan had engaged in actively trading with China since long years ago, i.e., since the year before China's accession to the WTO. Due to this long experience, firms in Japan may be able to immediately adjust their production against the change of imports from China, for example, by upgrading their product quality. Also, due to the input-output relationship, the increase in imports from China may not necessarily be harmful to Japanese manufactures.

We begin with the estimation of the standard equation in the literature. Namely, we investigate how the change of the import penetration from China in a product affects the growth of employment in that product in Japan between 1996 and 2007. We examine this question by employing manufacturing census in Japan, which covers all manufacturing establishments, including micro enterprises (i.e., those with less than five employees). The estimation is carried out at the product level comparable to a six-digit-level of the harmonized system in trade statistics. The existing studies for developed countries in this literature have addressed the endogeneity concern on the import penetration from China by using the import penetration from China in other OECD countries as an instrument. This paper follows this strategy but also uses that in Korea because as mentioned above, Japan might be different from other OECD countries (e.g., European countries and the U.S.) in terms of trade relationship with China. In this sense, Korea might have a more similar tie with China.

Then, to investigate the impacts of import penetration from China at a more detailed level, we decompose the above "net" employment change according to establishment status. Specifically, inspired by Davis et al. (1996), we classify establishments into three types. The first is the "New" establishments defined as those who did not exist in 1997 but did in 2007 while the second is the "Exit" establishments, which is the establishments which existed in 1997 but did not in 2007. The last group is "Survivor," which is defined as establishments which existed in both 1997 and 2007. The net impacts of import penetration from China are the sum of those in these three types of establishments. In particular, as mentioned above, surviving establishments may not decrease their employment against the surge of imports from China by adjusting their production. To further investigate this assertion, we also

examine the impacts of import penetration from China on employment at not only a product-level but also an establishment-level.

Among the studies in this growing literature, Asquith et al. (2019) are the one closest to ours. They examine the impacts of import penetration from China on U.S. employment. In particular, similar to ours, those are differentiated according to the establishment status. As a result, they found the negative net effects on employment and that those negative effects are mainly driven by the exit of establishments. As is consistent with their latter result, we found the significantly negative contribution of their exit in Japan. However, the net impacts are almost zero, i.e., insignificant.[1] This insignificant result is because survivors increase their employment significantly and offset the negative impacts in exiting enterprises. We further found that this increase occurs especially in small- and medium-sized enterprises (SMEs). Thus, this paper presents a new and somehow different result in the literature.

The rest of this paper is organized as follows. The next section explains our empirical framework to investigate the impacts of import penetration from China on employment in Japan. Section 3 reports our estimation results. We conclude this paper in Section 4.

2. Empirical Framework

In this section, we explain our empirical framework. We fist specify our estimation equations. Second, we provide our data sources and some estimation issues. Last, we take overview of data.

2.1. Specification

We regress employment growth on import penetration from China at a product-level. Our equation is specified as follows.

$$\frac{L_{pt} - L_{p0}}{L_{p0}} = \alpha + \beta \Delta IMP_p + \epsilon_p \tag{1}$$

L_{pt} is the number of employees in product p in year t. ΔIMP_p indicates the difference of import penetration from China between years t and 0. The import penetration from China is computed as the difference of imports from China between years t and 0 over "imports from the world in year 0 plus production value in year 0". It is multiplied by 100 to show percentage changes and is also divided by the length of years, i.e., $t - 0$, to indicate annual changes. In symbol, it is defined as $\frac{\left(\frac{IMP_{pt}^{China} - IMP_{p0}^{China}}{Prod_0 + IMP_{p0}^{World}}\right) * 100}{t-0}$, as in Acemoglu et al. (2016). As a

[1] Taniguchi (2019) found the positive impacts of import penetration from China in Japan by employing a different approach. She examines this issue by exploiting variation across regions rather products.

result, this equation indicates that a 1% increase of the import penetration from China changes employment by β%. ϵ_i is an error term.

After examining this "net" employment growth, we decompose the dependent variable. Let L_{pt}^i be the number of employees in plant i producing (mainly) product p in year t. Namely, $L_{pt} \equiv \sum_{i\in\Omega_{pt}} L_{pt}^i$, where Ω_{pt} is a set of plants that produce product p in year t. This set is decomposed into a set of those plants that did not exist in year 0 but did in year t (Ω_{pt}^{New}), that of those plants that existed in year 0 but did not in year t (Ω_{pt}^{Exit}), and that of those plants that existed in both years 0 and t ($\Omega_{pt}^{Survivor}$). These types of plants are respectively called new plants, exit plants, and survivors.

As in Davis et al. (1996), we decompose the dependent variable in equation (1) into three components.

$$\frac{L_{pt}-L_{p0}}{L_{p0}} \equiv \frac{\sum_{i\in\Omega_{pt}} L_{pt}^i - \sum_{i\in\Omega_{p0}} L_{p0}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}$$

$$= \left(\frac{\sum_{i\in\Omega_{pt}^{New}} L_{pt}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right) + \left(\frac{-\sum_{i\in\Omega_{p0}^{Exit}} L_{p0}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right) + \left(\frac{\sum_{i\in\Omega_{pt}^{Survivor}} L_{pt}^i - \sum_{i\in\Omega_{p0}^{Survivor}} L_{p0}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right)$$

Then, we estimate the following three equations separately.

$$New: \quad \left(\frac{\sum_{i\in\Omega_{pt}^{New}} L_{pt}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right) = \alpha^{New} + \beta^{New}\Delta IMP_p + \epsilon_p^{New}$$

$$Exit: \quad \left(\frac{-\sum_{i\in\Omega_{p0}^{Exit}} L_{p0}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right) = \alpha^{Exit} + \beta^{Exit}\Delta IMP_p + \epsilon_p^{Exit}$$

$$Survivor: \quad \left(\frac{\sum_{i\in\Omega_{pt}^{Survivor}} L_{pt}^i - \sum_{i\in\Omega_{p0}^{Survivor}} L_{p0}^i}{\sum_{i\in\Omega_{p0}} L_{p0}^i}\right) = \alpha^{Survivor} + \beta^{Survivor}\Delta IMP_p + \epsilon_p^{Survivor}$$

Naturally, the following holds.

$$\alpha = \alpha^{New} + \alpha^{Exit} + \alpha^{Survivor},$$
$$\beta = \beta^{New} + \beta^{Exit} + \beta^{Survivor}.$$

By this decomposition analysis, we examine what types of establishments change their employment more against the change of import penetration from China.

2.2. Empirical Issues

Our data sources are as follow. The data on employment is obtained from the Census of Manufacture complied by Ministry of Economy, Trade and Industry in Japan. This survey is conducted to clarify the actual conditions of the nation's manufacturing industry and obtain basic data for industrial policies. We use the data on employment at an establishment-level in 1996 and 2007 to include the year of China's WTO accession in the middle of data period. The census covers all manufacturing establishments in Japan. It is mandatory for

establishments to answer to the questionnaires. The response rate is approximately 95 percent. The data on production value in the import penetration variable are also drawn from this survey. In this survey, the product is defined at six-digit level. There are approximately 1200 products at the six-digit level. The data on Japan's imports from China and the world are obtained from the Customs in Japan. These data are available at a Japan's tariff-line level, which is a nine-digit level. There are approximately 9000 products at the nine-digit level.

There are four empirical issues. First, by mapping each nine-digit code in trade data into a single six-digit code in production/employment data, our empirical analysis is conducted at a six-digit level in production/employment data. In this aggregation of codes in trade data, we use the converter table of tariff-line level codes over time, which was constructed in Ito and Aoyagi (2019). Second, we cluster standard errors by a four-digit product code to take into account the within-industry correlation in error terms. Third, we define each establishment's product by identifying its product with the largest sales in 1996. In the estimation, we may drop establishments in which the product with the largest sales does not account for greater than 50% out of total sales.

The last issue is endogeneity. As is discussed in the literature, the unobservable demand shocks may affect both the import penetration and the employment, yielding the bias in the coefficients obtained by the ordinary least square (OLS) method. To address this endogeneity issue, the previous studies in this literature employ the instrumental variable (IV) approach. The typical instrument is ΔIMP_p of which the numerator is replaced with the time-difference of imports from China in other countries (e.g., the U.S., European Union, or OECD countries). Although we follow this approach, we also try the instrument using the time-difference of imports from China in one of the developed countries in Asia, i.e., Korea. This use is because as is well known, international production networks have developed among Asian countries, and thus the supply shocks in China that affect import from China in Western countries might be different from those that affect the import in Japan. On the other hand, industry import demand shocks might be correlated across countries within a same production network. Since such correlation violates the identifying assumption, we try both the two instruments.

2.3. Data Overview

We use the Census of Manufacture, conducted annually by the Japanese government for establishments with four or more employees in the manufacturing sector. Importantly, the data are at establishment level and covers even very small firms, which is not the case for other data available for Japanese manufacturing firms, such as Basic Survey of Japanese Business Structure and Activities. We draw information on the products sold, their sales values, paid-up capital of the parent firm, the number of employees from the Census of Manufacture. To compute import penetration of China, we use trade data at HS 9-digit of

Japanese customs. HS 9-digit import data over 1996-2007 are concorded using the concordance table from Aoyagi and Ito (2019). The concorded HS 9-digit import data are, then, concorded to the product code of the Census of Manufacture at 6-digit. There are approximately 1200 product code at HS 6-digit of the Census of Manufacture. The data are available annually for 1996-2014. We focus on the period of 1996-2007, which covers the China's WTO accession in 2001 and is comparable with the previous studies done for the U.S. Two million to three million establishments are recorded in each year. The total number of establishments are in decreasing trend from around 350 thousand establishments in 1996 to around 200 thousand in 2014. The Census of Manufacture dataset include the data for establishment information and the data for parent firm information separately. As there is no consistent firm id number to match the two data, we matched them using phone numbers of parent firms, which enables us to match approximately 60% of the dataset.

3. Empirical Results

To estimate the equation (1), we take a subsample of establishments which exist in the initial year of 1996 and the end year of 2007, to make the result comparable with the previous literature for the U.S. There are approximately 2.3 million establishments in these two years, out of which approximately 20 % are new establishments, which did not exist in 1996 but existed in 2007, approximately 40% are exit establishments, which existed in 1996 but disappeared in 2007, the rest of 40% are survivor establishments. We match a representative product of establishment to the import penetration ratio. For the representative product, we take the product whose sales values is more than 50 percent of the total sales value of the establishment. As robustness checks, we take the products whose sales value is the largest within the establishment. When we take the product of more than 50 percent of sales value as the representative product of establishments, 74% of establishments in 1996 keep producing the same product as their representative products in 2007. For the purpose of decomposition in the equation (1), we need to implicitly assume that establishments in 1996 keep producing the same product in 2007. Otherwise, we cannot define the entry (new), exit, and survivor, at product level. Table 2 shows estimation results for the equation (1) for the period of 1996-2007. First, the cases of taking the product whose sales values is more than 50 percent of the total sales value of the establishment ("More than 50% sales value product"), the coefficient estimate for total change is statistically insignificant. The decomposition to Entry, Exit, Survivor show a negative highly significant coefficient estimate for Exit, and insignificant coefficient estimates for the other two, i.e., Entry and Survivor. This result indicates that the Chinese penetration has little to do with the total employment change, but it is negatively correlated with Exit. Namely, a decrease of employment through exit is correlated with an increasing Chinese penetration ratio. The second table shows the case of the products whose sales value is the largest within the establishment ("Max sales value product"). The coefficient estimate for total employment

change is highly statistically significant with negative sign whereas Entry shows a statistically significant coefficient at five percent significance level with positive sign and Exit shows highly significant negative coefficient. We also carried out the same estimation for the full period of 1996-2014. The results shown in Table 3. are very similar to those in Table 2.

Having found that there seems to be little or a slight negative impact on total employment whereas there is an indication of negative impact on exit firms, we further investigate whether there is a difference in the propensity of exit between large and small firms. Table 4. Shows the discrete model estimation for exit establishments. The second column shows the estimation results with linear probability model and the third column shows the estimation results with probit model. In both estimations, the chinese penetration is positively correlated with exit probability and SME dummy shows highly statistically significant positive coefficient with relatively large magnitude. The cross dummy between the Chinese import penetration and SME dummy shows positive coefficients with 5 to 10 percent significance level. These results indicate that exit firms are mainly SME and the Chinese penetration's impact on exit is stronger for SME.

Our firm/establishment level dataset allow us to investigate the impact of the Chinese penetration ratio on employment and sales at firm level. Here we estimate the following equation for 1996-2007. Here we take log of levels of the number of employment and Chinese import penetration. By doing this, the data covers all the firms which existed in any year of the period and we do not have to implicitly assume that firms keep producing the same representative product throughout the year. For some firms, it may change over years.

$$\log(L_{ft}) = \alpha + \beta \log(IMP_{fpt}) + \epsilon_{fp} + \epsilon_t \qquad (2)$$

where the subscript f represents firm, p products, t years.
For the left-hand side variable L, we use numbers of employees for firm and sales values for firm. As in the data management process for the estimation equation (1), we take "More than 50% sales value product" or "Max sales value product" as the representative product of establishment. We compute the Chinese import penetration at firm level using the sales values of each establishment's product as weight. We focus on firm level impact rather than establishment level because employment is usually decision at firm level, not establishment level. Table 5 shows the estimation for the period of 1996-2007. Log of Chinese penetration ratio shows insignificant coefficient estimates both for Log of number of employees and Log of sales value, but the cross variable with SME dummy shows highly statistically significant negative coefficients with larger magnitude than those for Log of Chinese import penetration ratio. The very similar results for the case of "Max sales value product" are in the second table. Table 6 is the same estimation for the full period of 1996-2014. The results are very similar to those in Table 5.

4. Concluding Remarks and future research agenda

Using the Japanese firm/establishment level census data, we investigate on the impact of the Chinese import penetration for employment in Japan. We have found little or slightly negative impact in total employment level, but found that employment through exit has been reinforced by the Chinese import penetration and the impact on exit was stronger for the small and medium enterprises. Log level of employment and sales value for Japanese firms on average has little to do with the Chinese penetration ratio, but it is negatively associated for the SMEs.

We will investigate more on the difference of the impact of the Chinese penetration ratio by firm characteristics.

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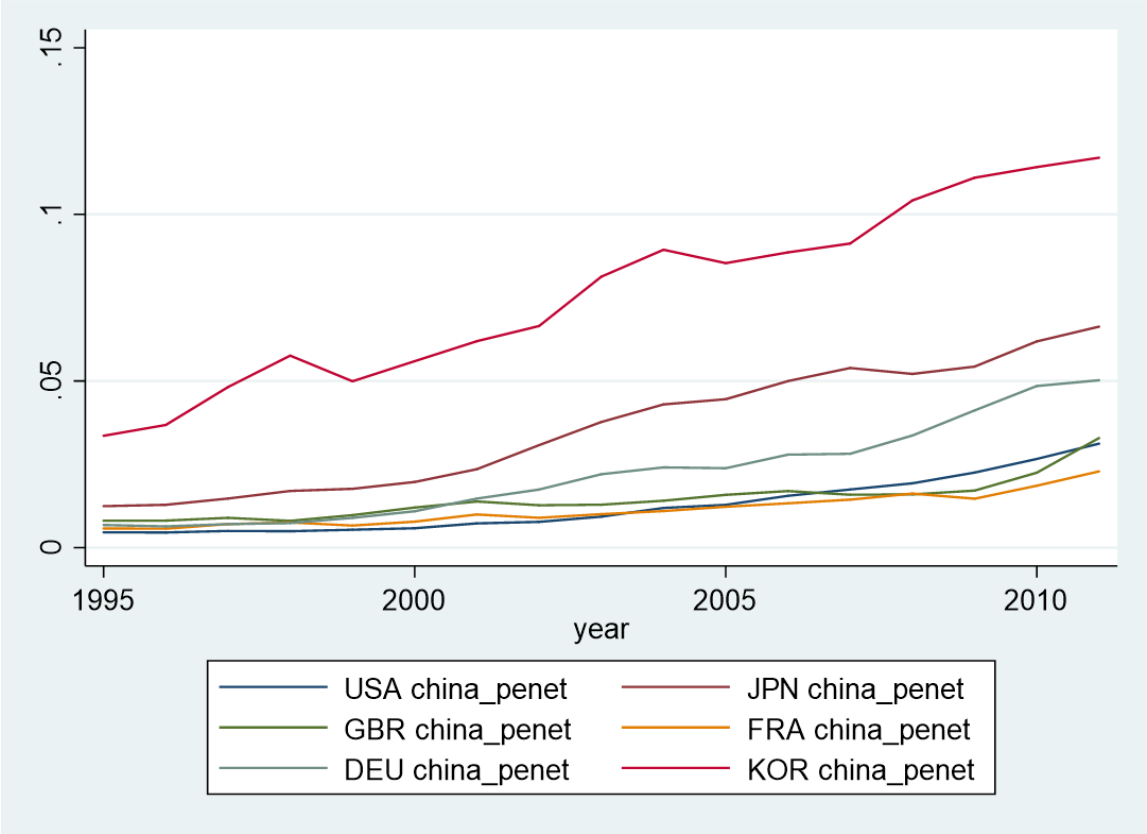
Figure 1. Chinese penetration ratio (Import from China/Domestic production + Import from the world



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：Authors' computation using World Input-Output Database

Table 1. Number of workers in Japan, 2000-2015

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	19.4%	17.0%	15.9%	15.4%

Source: Census of population

Table 2. Estimation results of Employment change (Total, Entry, Exit, Survivor) 1996-2007

More than 50 % sales value product

	Total	Entry	Exit	Survivor
Chinese import penetration	-0.0043	0.0015	-0.0089***	0.0031
	(-0.33)	(0.13)	(-3.96)	(-1.02)
Number of observations	1052	1052	1052	1052

* Clustering with common code 4 digit

* t-values in paretheses

Max sales value product

	Total	Entry	Exit	Survivor
Chinese import penetration	-0.0076***	0.0025*	-0.0105***	0.0004
	(-3.79)	(2.08)	(-4.33)	(0.27)
Number of observations	962	962	962	962

* Clustering with common code 4 digit

* t-values in paretheses

Table 3. Estimation results of Employment change (Total, Entry, Exit, Survivor) 1996-2014

More than 50 % sales value product

	Total	Entry	Exit	Survivor
Chinese import penetration	0.0008	-0.0162	-0.0056**	0.0008
	(0.97)	(-0.84)	(-2.89)	(0.70)
Number of observations	1053	1053	1053	1053

* Clustering with common code 4 digit

* t-values in paretheses

Max sales value product

	Total	Entry	Exit	Survivor
Chinese import penetration	-0.0107	-0.0070	-0.0042**	0.0006
	(-0.94)	(-0.63)	(-2.63)	(0.86)
Number of observations	1065	1065	1065	1065

* Clustering with common code 4 digit

* t-values in paretheses

Table 4. Discrete model estimation for exit

Dependent variable: Exit = 1 , otherwise 0

	Linear probability model	Probit model
Chinese import penetration	0.0091***	0.0234***
	(10.74)	(10.82)
Chinese import penetration ratio*SME	0.0019*	0.0046+
	(1.95)	(1.87)
SME	0.0954***	0.2443***
	(25.92)	(25.88)
Number of observations	159043	159043

(Note 1) t-values in paretheses

(Note 2) + 10%, * 5%, ** 1%, *** 0.1% significance level

Table 5. Estimation at firm level, 1996-2007

	More than 50 % sales value product	
Dependent variable	Log of number of employees	Log of sales value
Log of Chinese import penetration ratio	0.2059	0.1896
	(1.12)	(1.21)
Log of Chinese import penetration ratio*SME	-0.5402***	-0.5387***
	(-3.16)	(-5.13)
Adjusted R-squared	0.8829	0.9515
Number of observations	1032790	1032790
Year fixed effects	Yes	Yes
Firm*Product fixed effects	Yes	Yes

(Note 1) t-values in paretheses
(Note 2) * 5%, ** 1%, *** 0.1% significance level

	Max sales value product	
Dependent variable	Log of number of employees	Log of sales value
Log of Chinese import penetration ratio	0.2182	0.1938
	1.16	(1.24)
Log of Chinese import penetration ratio*SME	-0.5609***	-0.5379***
	(-3.21)	(-5.22)
Adjusted R-squared	0.8839	0.9531
Number of observations	1038752	1038752
Year fixed effects	Yes	Yes
Firm*Product fixed effects	Yes	Yes

(Note 1) t-values in paretheses
(Note 2) * 5%, ** 1%, *** 0.1% significance level

Table 6. Estimation at firm level, 1996-2014

	More than 50 % sales value product	
Dependent variable	Log of number of employees	Log of sales value
Log of Chinese import penetration ratio	0.1271	0.1959
	(0.87)	(1.26)
Log of Chinese import penetration ratio*SME	-0.4420***	-0.6401***
	(-3.19)	(-6.10)
Adjusted R-squared	0.8912	0.9456
Number of observations	1262055	1262055
Year fixed effects	Yes	Yes
Firm*Product fixed effects	Yes	Yes

(Note 1) t-values in paretheses
(Note 2) * 5%, ** 1%, *** 0.1% significance level

	Max sales value product	
Dependent variable	Log of number of employees	Log of sales value
Log of Chinese import penetration ratio	0.1393	0.1928
	(0.90)	(1.24)
Log of Chinese import penetration ratio*SME	-0.4562***	-0.6255***
	(-3.15)	(-6.06)
Adjusted R-squared	0.8921	0.9473
Number of observations	1268117	1268117
Year fixed effects	Yes	Yes
Firm*Product fixed effects	Yes	Yes

(Note 1) t-values in paretheses
(Note 2) * 5%, ** 1%, *** 0.1% significance level