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# Labour Market Impacts of Import Penetration from China and Regional Trade Agreement Partners: The Case of Japan

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**Abstract:** *The impacts of imports on the domestic labour market have been hotly debated recently. The purpose of this paper is to empirically examine the effects of not only imports from China but also those under regional trade agreements (RTAs) on employment in Japan. As in previous studies in the literature, we found that the rise in import penetration from China significantly decreases employment in Japan. However, import penetration under RTA regimes is found to have insignificant effects on employment. The finding suggests that the increase in imports under RTA regimes might not be harmful to the domestic labour market. In addition, we did not find significant effects of import penetration via input–output linkages. This insignificant result may be because imports by Japanese manufacturing firms are mostly conducted in the form of intra-firm trade, enabling them to avoid negative impacts on employment.*

**Keywords**: Regional trade agreements, Japan, Employment

**JEL Classification**: F15; F53

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## 1. Introduction

The impacts of imports on the domestic labour market are hotly debated issues in the trade literature. A large and recent impact caused by imports from China is the so-called 'China shock'. Many countries have experienced a dramatic increase in imports from China because of its rapid economic growth and accession to the World Trade Organization (WTO) in 2001. Numerous studies have shown that the surge in imports from China leads to a decrease in jobs (e.g. Autor, Dorn, and Hanson, 2013; Acemoglu, Akcigit, and Kerr, 2015; Acemoglu et al., 2016; Pierce and Schott, 2016; Bloom, Draca, and Van Reenen, 2016; Asquith et al., 2019). In addition to the China shock, various other shocks or drivers increase imports. For example, since the 2000s, the number of regional trade agreements (RTAs) has experienced a dramatic increase. According to the WTO, 291 RTAs were in force as of 4 January 2019. The reduction in tariff rates by RTAs is another key driver of the import surge.

The purpose of this paper is to empirically examine the effects of not only increased imports from China but also from RTA members on employment in Japan. The RTA with Singapore, which was the first RTA for Japan, came into force in November 2002. Following this, Japan concluded RTAs with many other countries. As of July 2019, 17 RTAs were effective in Japan. To investigate the effects of imports under RTAs, we decompose the total import penetration into the import penetrations under the most favoured nation (MFN) and RTA regimes. To this end, we employ Japan's import data by different tariff regimes, which enable us to differentiate imports from RTA partner countries under RTA regimes from those under the MFN regime. RTA regimes enable an importer to import goods with lower tariff rates than the MFN tariff rates. In this sense, the imports under RTA regimes have similar characteristics to those from China because import prices from China tend to be lower than those from other countries. Thus, like the case of imports from China, the increase in imports under RTA regimes is expected to have significant effects on the domestic labour market.

Furthermore, we investigate the effects of import penetration on the labour market not only in the concerned sector, i.e. the sector where imports increased, but also in its downstream and upstream sectors. In other words, we take into account the backward (upstream) and forward (downstream) input–output linkages. Although some studies (e.g. Acemoglu, Akcigit, and Kerr, 2015) have done this in analysing the import penetration from China in the United States (US), we extend this analysis to RTA imports in Japan. The increase in imports of downstream products from China and those under RTA regimes intensifies the competition of those downstream products in the domestic market. If the production of domestic downstream firms shrinks, the employment in a concerned sector may also decrease through the decrease in supply to those downstream firms. On the other hand, the increase in imports of upstream products from China and those under RTA regimes enables a concerned sector to purchase intermediate inputs more cheaply. As a result, a concerned sector may experience an increase in employment. To empirically investigate the validity of these predictions, we examine the effects of import penetration not only in a concerned sector but also on its downstream and upstream sectors.

As existing studies in the literature have shown, estimates by ordinary least squares (OLS) would suffer from various endogeneity biases. For example, unobservable demand shocks may affect both import penetration and employment. In addition, the rise in employment increases domestic production and decreases import penetration. To address this endogeneity issue, we employ the instrumental variable (IV) approach. Specifically, we use two kinds of instruments. Following the strategy adopted in previous studies, one of them is the import penetration from China in other developed countries – representing the change in China's export capacity to the world. The other is inspired by the finding in the literature on the determinants of preferential imports, which is that the utilisation rates of preferential imports become higher when the tariff margin (i.e. MFN tariff rates minus RTA tariff rates) is larger. Based on this finding, we use the MFN tariff rates as another instrument. By using these instruments, we estimate the causal impacts of various types of imports on the labour market.

This paper contributes to the empirical literature on the import–employment nexus. As stated above, many studies have analysed the effect of import penetration from China on the labour market. Some studies have also investigated the effects of import penetration from China on the social (Pierce and Schott, forthcoming; Autor, Dorn, and Hanson, forthcoming) and political environment (Autor et al., 2016). In the Japanese context, Hayakawa, Ito, and Urata (2019) and Taniguchi (2019) examined the effect of import penetration from China on the labour market in Japan. Taniguchi

(2019) found a positive effect of Chinese import penetration on Japan's labour market at the prefecture level. On the other hand, Hayakawa, Ito, and Urata (2019) found a negative impact, as in the studies on the US labour market. Our innovation is to introduce imports under RTA regimes into the context of the effects on the labour market. As mentioned above, such imports are expected to have effects similar to those of imports from China in terms of import prices. In addition, although some strands of literature on RTA utilisation employ import data by tariff regime (e.g. Bureau, Chakir, and Gallezot, 2007; Cadot et al., 2005; Cirera, 2014; Francois, Hoekman, and Manchin, 2006; Hayakawa, Urata, and Yoshimi, 2019; Ozden and Sharma, 2006), to the best of our knowledge, this study is the first one that uses such data to examine the impacts of RTAs on the labour market.

The rest of this paper is organised as follows. The next section explains our empirical framework to investigate the impacts of import penetration 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 first specify our estimation equations. Second, we provide our data sources and discuss estimation issues. Third, an overview of the data is provided.

### 2.1. Specification

In the baseline analysis, we regress employment growth on import penetration at a sector level. Our estimation equation is specified as follows:

$$\boldsymbol{\Delta \ln L_s \equiv \ln L_{st} - \ln L_{s0} = \alpha + \beta \Delta IP_s + \epsilon_s} \tag{1}$$

where

$$\boldsymbol{\Delta IP_s \equiv \frac{Import_{st} - Import_{s0}}{Production_{s0} + Import_{s0} - Export_{s0}} = \frac{Import_{st} - Import_{s0}}{Demand_{s0}}} \tag{2}$$

$L_{st}$ is the number of employees in sector *s* in year *t*. $\Delta IP_s$ indicates the difference in import penetration between years *t* and 0. $Production_{s0}$, $Import_{s0}$, and $Export_{s0}$ are respectively the production value, imports from the world, and exports of sector *s* in Japan in year 0. $\epsilon_s$ is an error term. The coefficient estimate indicates how many percentages the employment increases by one-unit increase of the import penetration (i.e. one-unit increase of imports normalised by the demand size). If fiercer competition from imported products is harmful to employment in Japan, we will expect a negative coefficient estimate for the import penetration variable.

Next, we extend the above model in terms of two dimensions. First, as in the previous studies, total imports are decomposed into those from China (*Imports from China*) and the rest of the world (*Imports from the ROW*). In this paper, ROW denotes all countries in the world except China (and Japan).

$$\boldsymbol{\Delta IP_s = \Delta China\ IP_s + \Delta ROW\ IP_s}, \tag{3}$$

$$\boldsymbol{\Delta China\ IP_s \equiv \frac{Import\ from\ China_{st} - Import\ from\ China_{s0}}{Demand_{s0}}}, \tag{4}$$

$$\boldsymbol{\Delta ROW\ IP_s \equiv \frac{Import\ from\ the\ ROW_{st} - Import\ from\ the\ ROW_{s0}}{Demand_{s0}}}. \tag{5}$$

Then, we estimate the following equation:

$$\boldsymbol{\Delta \ln L_s = \alpha + \beta_1 \Delta China\ IP_s + \beta_2 \Delta ROW\ IP_s + \epsilon_s}. \tag{6}$$

Since Chinese products are relatively cheap, the increase in those products may have greater impacts on the domestic market than that of imports from the ROW.

Second, we decompose the total imports into those under MFN (*Import under MFN*) and RTA regimes (*Import under RTA*). These import penetrations, which are respectively denoted by $\Delta MFN\ IP_s$ and $\Delta RTA\ IP_s$, are summarised as follows:

$$\boldsymbol{\Delta IP_s = \Delta MFN\ IP_s + \Delta RTA\ IP_s}, \tag{7}$$

$$\boldsymbol{\Delta MFN\ IP_s \equiv \frac{Import\ under\ MFN_{st} - Import\ under\ MFN_{s0}}{Demand_{s0}}}, \tag{8}$$

$$\Delta RTA\ IP_s \equiv \frac{Import\ under\ RTA_{st} - Import\ under\ RTA_{s0}}{Demand_{s0}}. \tag{9}$$

Then, we estimate the following equation:

$$\Delta \ln L_s = \alpha + \beta_1 \Delta MFN\ IP_s + \beta_2 \Delta RTA\ IP_s + \epsilon_s. \tag{10}$$

By estimating this equation, we investigate how the import penetration of the MFN and RTA regimes each affects employment. In particular, due to the lower tariff rates in RTA regimes, we may expect larger impacts of import penetration from RTA regimes in terms of elasticity.

These two kinds of extensions are integrated by decomposing the imports under the MFN regime into those from China and those from the ROW under the MFN regime (*Import from the ROW under MFN*).

$$\Delta IP_s = \Delta China\ IP_s + \Delta ROW\ MFN\ IP_s + \Delta RTA\ IP_s, \tag{11}$$

$$\Delta ROW\ MFN\ IP_s \equiv \frac{Import\ from\ the\ ROW\ under\ MFN_{st} - Import\ from\ the\ ROW\ unde}{Demand_{s0}} \tag{12}$$

Then, we estimate the following equation:

$$\Delta \ln L_s = \alpha + \beta_1 \Delta China\ IP_s + \beta_2 \Delta ROW\ MFN\ IP_s + \beta_3 \Delta RTA\ IP_s + \epsilon_s. \tag{13}$$

This is our comprehensive model and enables us to examine which kind of imports has large impacts on the domestic labour market, amongst imports from China, those from the ROW under the MFN regime, and those under RTA regimes.

Last, we take into account the input–output relationship. Specifically, we introduce import penetration variables on the backward ($\Delta IP_s^{Upstream}$) and forward ($\Delta IP_s^{Downstream}$) linkages with sector $s$. Thus, equation (1) is modified as follows:

$$\boldsymbol{\Delta \ln L_s = \alpha + \gamma_1 \Delta IP_s + \gamma_2 \Delta IP_s^{Upstream} + \gamma_3 \Delta IP_s^{Downstream} + \epsilon_s}. \tag{14}$$

$$\boldsymbol{\Delta IP_s^{Upstream} \equiv \sum\nolimits_i (a_{i\to s} \Delta IP_i)}, \qquad \boldsymbol{\Delta IP_s^{Downstream} \equiv \sum\nolimits_i (a_{s\to i} \Delta IP_i)}, \tag{15}$$

where $a_{i\to s}$ is a parameter indicating sales of goods by sector *i* to sector $s$ and $a_{s\to i}$ is interpreted analogously. More explanation of these parameters is given below. We also introduce the counterparts for the decomposed variables specified in equations (4), (5), (8), (9), and (12). When imports in the upstream sector *i* (e.g. cotton) of sector *s* (e.g. textiles) increase, competition effects in sector *i* may reduce the market equilibrium price and/or raise the product quality in sector *i*. Sector *s*, consequently, can procure its intermediate inputs from sector *i* at a lower price or with higher quality. $\Delta IP_s^{Upstream}$ represents this effect. Turning to downstream effects, $\Delta IP_s^{Downstream}$, when imports in the downstream sector *i* (e.g. apparel) of sector *s* (e.g. textiles) increase, domestic production in sector *i* (apparel) shrinks, which leads to reduced demand for intermediate inputs (textiles) from sector *i* (apparel), resulting in lower demand for labour in sector $s$.[1] Thus, we expect asymmetric effects between backward and forward linkages.

As in Acemoglu, Akcigit, and Kerr (2015), we use two kinds of parameters $a$. One is, in $a_{i\to s}$, the share of input values from sector *i* to sector *s* out of output values in sector *s*. When using the input–output coefficients, we do not include sector *s* in the summation in equation (15). The model with the input–output coefficients examines the direct (or the first-order) impacts in the input–output linkages. We introduce another model that includes the Leontief inverse coefficients of the matrix of input–output linkages. This model intends to capture the full impacts – both direct and

[1] The definition of upstream/downstream effects we adopt is different from that of some other articles, e.g. Acemoglu, Akcigit, and Kerr (2015), mainly because of the purpose of the studies. As Acemoglu, Akcigit, and Kerr (2015) studied the propagation effects of a shock on a sector to its upstream and downstream sector, their upstream (downstream) effect is from a sector hit by a shock to its upstream (downstream) sector. On the other hand, our study aims to assess the impacts on a sector's labor market of import penetration in the sector itself and from its upstream and downstream sectors.

indirect impacts – through the chain of input–output linkages. In this case, we include sector *s* in the summation but subtract the value one from the inverse coefficient because the own and direct impacts are captured by a variable of $\Delta IP_S$. These two kinds of matrix coefficients are evaluated at time 0 and are the same for all types (China, ROW, MFN, and RTA) of import penetration variables. Notice that the coefficient estimates we obtain from estimation analyses are not comparable between the two cases, i.e. the case of direct impact only and that of full impact (Leontief inverse matrix) because we do not normalise these input–output coefficients by the common standard. We are more interested in the comparison in each case across import penetration variables (i.e. penetration in the upstream, own, and downstream sectors).

### 2.2. Empirical Issues

We estimate the equations specified in Section 2.1 for Japan. The first RTA for Japan was with Singapore and came into force in November 2002. In our analysis, we need the data on imports by tariff regime, which are available from 2012. The data on employment and demand are obtained from the input–output table, which is available every 5 years. Based on the entry years of the first RTA and the data availability, we set years 0 and *t* to 2000 and 2015, respectively. Although the data on imports by tariff regime are not available for 2000, this unavailability does not matter because no RTAs existed in Japan in that year. As of 2015, the following 14 RTAs (with their respective year of entry into force) were effective for Japan: Singapore (2002), Mexico (2005), Malaysia (2006), Chile (2007), Thailand (2007), Indonesia (2008), Brunei (2008), the Association of Southeast Asian Nations (ASEAN) (2008), the Philippines (2008), Switzerland (2009), Viet Nam (2009), India (2011), Peru (2012), and Australia (2015). Thus, our variables on RTAs include imports from these countries under the respective RTA regimes.

The data sources are as follows. The tariff line data on imports under RTA regimes and on total imports by country are taken from the Trade Statistics of Japan's Ministry of Finance. While all imports in 2000 are taken as those under the MFN regime, those under the MFN regime in 2015 are computed as total imports minus imports under the RTA scheme in 2015. The tariff line is defined at a Harmonized System (HS) nine-digit level in Japan and originally includes about 9,500 codes. The data on employment are obtained from the input–output tables of the Ministry of Internal Affairs and Communications. To investigate the impacts of imports of goods on employment through input–output linkages, we focus on the manufacturing sectors, which include 216 sectors. The data on demand and the input–output coefficients are taken from the input–output table for 2000. We use the converter table provided by the Ministry of Internal Affairs and Communications to match HS codes to the 216 sectors.[2]

There are two empirical issues. First, we take all imports under non-RTA regimes as imports under the MFN regime. However, those may include imports under regimes other than the MFN regime. A typical regime is the Generalised System of Preferences (GSP). Japan's GSP has been effective since 1971.[3] Under its GSP regime, Japan applies reduced tariffs to designated import products originating from developing countries/territories, aiming to help them increase export income, advance industrialisation, and promote economic development. However, we cannot directly control for imports under the GSP because those data are only available from 2013. Accordingly, we do not know the magnitude of those imports in 2000. Nevertheless, we believe that this issue is irrelevant because the number of products eligible for the GSP regime was limited in 2000 (47% of the total number of tariff lines). Furthermore, even in 2013–2015, the share of GSP imports out of total imports in Japan was only 1% or 2% (Customs of Japan).

The second issue is endogeneity. As discussed in the literature on import penetration from China, the unobservable demand shocks may affect both import penetration and employment, yielding a bias in the coefficients obtained by the OLS method. For example, the Great East Japan Earthquake in 2011 may change people's demand for goods. The effects of such negative demand shocks on import penetration are unclear because they decrease not only imports but also domestic production. Nevertheless, negative demand shocks will decrease employment. Thus, the OLS estimates definitely suffer from the omitted variable bias though its direction is unclear. On the other hand, there would also be reverse causality, since the rise in employment increases domestic production and decreases import penetration. Thus, since the error

[2] http://www.soumu.go.jp/main_content/000405471.xlsx
[3] http://www.mofa.go.jp/policy/economy/gsp/explain.html

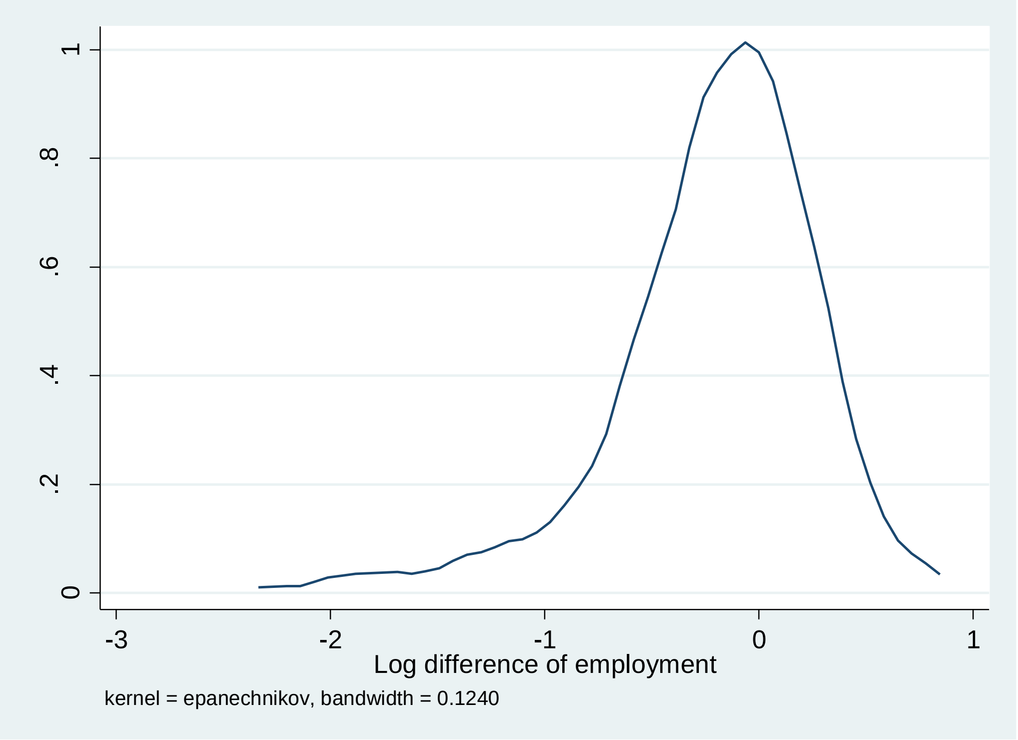
term is negatively correlated with the import penetration variable, the OLS estimates suffer from a downward bias and are overestimated.

To address this endogeneity issue, as in previous studies, we employ the IV approach. We use two kinds of instruments. One is the factor that affects the utilisation of RTA regimes. The literature on the determinants of preferential imports shows that the utilisation rates of preferential imports become higher when the tariff margin (i.e. MFN tariff rates minus RTA tariff rates) is larger (e.g. Hakobyan, 2015). Inspired by this finding, we use the MFN tariff rates in 2015 by assuming that RTA tariff rates are zero for all products. The data on MFN tariff rates are taken from the WTO Tariff Analysis Online. Since 2000, MFN tariff rates have not changed in almost all products. Thus, MFN rates will not have an association with the unobservable demand shocks during 2000–2015. The other instrument is a supply-side variable, which is the import penetration for the G7 countries, excluding Japan (i.e. Canada, France, Germany, Italy, the United Kingdom, and the US). This variable represents the change in the export capacity of foreign countries (e.g. China) to the world, which is not related to the demand shocks in Japan. We explain this issue in more detail in the next section.

### 2.3. Overview of the Data

Before reporting our estimation results, we present a brief overview of employment growth and import changes in Japan. Figure 1 depicts the distribution of the dependent variable, i.e. a log difference of employment for 2000–2015. It is skewed to the negative area, meaning that many manufacturing sectors decreased employment during the 15-year period. Indeed, the total employment of the manufacturing sectors decreased slightly from 10.8 million in 2000 to 9.9 million in 2015. Since the total number of the labour force declined only 2% from 67.6 million in 2000 to 66.4 million in 2015 (World Bank, World Development Indicators online), the decrease in employment in the manufacturing sectors is likely to be attributed to some economic reasons. Amongst the 216 sectors, the mean and median values are −0.21 and −0.13, respectively.

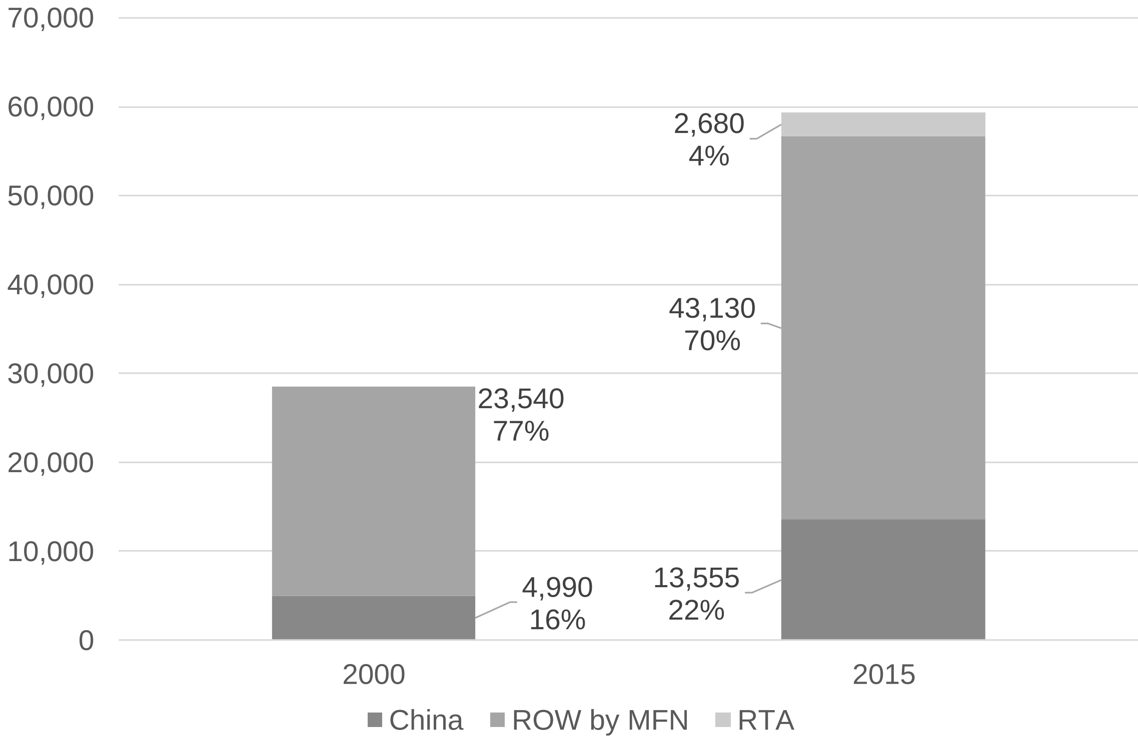
**Figure 1: Distribution of Employment Growth, 2000–2015**




Source: Government of Japan, Ministry of Internal Affairs and Communications, Input-Output Tables.
https://www.meti.go.jp/english/statistics/tyo/entyoio/index.html

Figure 2 shows the composition of Japan's imports. In this figure, we decompose the total imports in the manufacturing sectors into imports from China, those under RTA regimes, and those from the ROW under the MFN regime in 2000 and 2015. First, the figure shows a remarkable increase in manufacturing imports in Japan during this period – doubling in 15 years. Second, the imports from China accounted for 16% in 2000 but rose to 22% in 2015. Thus, like other developed countries shown in previous studies in the literature, Japan has experienced a significant increase in imports from China. Third, although RTA regimes were available in 2015, imports under RTAs accounted for only 4%. This low share is partly because Japan's RTA partner countries did not include the top five import partners (China, the US, Australia, the Republic of Korea, and the United Arab Emirates) and MFN rates are low in Japan. Nevertheless, the low share of RTA imports in total imports does not necessarily mean that RTA imports do not have an impact on employment because some sectors have relatively high shares of RTA imports.

**Figure 2: Japan's Import Decomposition** (¥ billion)




MFN = most favoured nation, ROW = rest of the world except China and Japan, RTA = regional trade agreement.
Source: Japan's Customs.

## 3. Empirical Results

This section reports our estimation results. Although the manufacturing sectors consist of 216 sectors, as mentioned before, some of them include consumption goods only – goods not used for other sectors as inputs (e.g. bread). In such sectors, we cannot define forward-linkage variables. Because of this, for our estimation, we use 164 manufacturing sectors, where forward-linkage variables can be defined.

Table 1 reports the OLS results for the equations without input–output linkage variables. Column (I) shows those for equation (1) and indicates insignificant effects of total import penetration. In column (II), we report the OLS results for equation (6) and find significant effects on the labour market. While the increase in import penetration from China decreases employment, as found in the previous studies, import penetration from the ROW increases it. We found symmetric effects between the import penetrations from China and the ROW. The effects for different import tariff regimes, i.e. the results for equation (10), are shown in column (III). Although the coefficient for import penetration under the MFN regime is insignificant, the import penetration under RTA regimes has a significantly positive coefficient, meaning that import penetration under RTAs increases employment.

**Table 1: Baseline Results by the OLS Method**

| Variables | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| IP | 0.515 | | | |
| | [0.361] | | | |
| China IP | | -0.722** | | -0.732** |
| | | [0.312] | | [0.295] |
| ROW IP | | 1.371*** | | |
| | | [0.258] | | |
| MFN IP | | | 0.44 | |
| | | | [0.362] | |
| RTA IP | | | 1.621* | 1.944** |
| | | | [0.940] | [0.802] |
| ROW MFN IP | | | | 1.309*** |
| | | | | [0.273] |
| Constant | -0.242*** | -0.227*** | -0.253*** | -0.234*** |
| | [0.047] | [0.042] | [0.048] | [0.046] |
| Number of observations | 164 | 164 | 164 | 164 |
| R-squared | 0.0278 | 0.0845 | 0.0333 | 0.0861 |

IP = import penetration, MFN = most favoured nation, OLS = ordinary least squares, ROW = rest of the world except China and Japan, RTA = regional trade agreement.
Notes: The dependent variable is a log difference of employment. ***, **, and * indicate 1%, 5%, and 10% significance, respectively. The square brackets denote robust standard errors.
Source: Authors' estimation.

Column (IV) reports the results of our full decomposition, i.e. equation (13). The coefficients for import penetration from China and under RTA regimes are again estimated to be significantly negative and positive, respectively. The import penetration from the ROW under the MFN regime has a significantly positive coefficient. Thus, amongst imports under the MFN regime, import penetration has different effects between importing from China and the ROW. This symmetric result leads to an insignificant result in the import penetration under the MFN regime in column (III). In sum, only import penetration from China harms the domestic labour market in Japan. The penetration of other types of imports does not have negative effects on employment.

Table 2 reports the results of the same models above by the IV method. Depending on the independent (endogenous) variables, we use different instruments. In equation (1), we use the total import penetration for the G7 countries, excluding Japan, as an instrument. Two instruments in equation (6) include their import penetrations from China and the ROW. In equation (10), we use the total import penetration for the G7 countries, excluding Japan, and Japan's MFN tariff rates in 2015 as instruments. The instruments in equation (11) are the import penetrations from China and the ROW in addition to the MFN rates. When computing these import penetration variables, we normalise the imports by the demand size in Japan. By using these variables as instruments, we estimate our models by the IV method.[4]

[4] The statistics for the under-identification test (Kleibergen-Paap rk LM statistic) show the high values, indicating that the rank condition is satisfied, and the equation is identified. The weak identification test (Kleibergen-Paap rk Wald F statistic) shows the high value in column (I) but not in the other columns, especially in column (IV), where our IV estimates may suffer from bias due to weak instruments.

**Table 2: Baseline Results by the IV Method**

| Variables | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| IP | 0,523 | | | |
| | [0.442] | | | |
| China IP | | -1.223** | | -1.448** |
| | | [0.611] | | [0.592] |
| ROW IP | | 1.638*** | | |
| | | [0.611] | | |
| MFN IP | | | 0,33 | |
| | | | [0.422] | |
| RTA IP | | | 3,054 | 3,72 |
| | | | [2.837] | [3.011] |
| ROW MFN IP | | | | 1.528** |
| | | | | [0.628] |
| Constant | -0.242*** | -0.217*** | -0.267*** | -0.236*** |
| | [0.060] | [0.059] | [0.074] | [0.073] |
| Number of observations | 164 | 164 | 164 | 164 |
| Under-identification test | 24,691 | 15,192 | 20,622 | 21,21 |
| Weak identification test | 26,53 | 8,038 | 5,623 | 3,81 |

G7 = Group of Seven, excluding Japan (Canada, France, Germany, Italy, United Kingdom, United States); IP = import penetration; IV = instrumental variable; LM = Lagrange multiplier; MFN = most favoured nation; OLS = ordinary least squares; ROW = rest of the world except China and Japan; RTA = regional trade agreement.

Notes: The dependent variable is a log difference of employment. ***, **, and * indicate 1%, 5%, and 10% significance, respectively. The square brackets denote robust standard errors. The number of observations is 164 in all specifications. In column (I), we use the total import penetration for the G7 countries, excluding Japan, as an instrument. Two instruments in column (II) include their import penetration from China and that from the ROW. In column (III), we use the total import penetration for the G7 countries, excluding Japan, and Japan's MFN tariff rates in 2015 as instruments. The instruments in column (IV) are the import penetration from China and the ROW in addition to the MFN rates. The under-identification test shows the Kleibergen-Paap rk LM statistic while the weak identification test shows the Kleibergen-Paap rk Wald F statistic.

Source: Authors' estimation.

A notable difference from the results by the OLS is that the coefficient for the import penetration under RTA regimes turns out to be insignificant. The results in the other variables are qualitatively unchanged. The rise in import penetration from China and the ROW under the MFN regime decreases and increases employment in Japan, respectively. This result in the case of Chinese import penetration is consistent with Hayakawa, Ito, and Urata (2019), which also analysed the import penetration of Japan from China. Furthermore, the absolute magnitude of these two coefficients is larger in the IV than in the OLS, indicating that the import penetration from China and the ROW under the MFN regime is negatively and positively associated with the error term, respectively. This symmetric result implies that unobservable elements might affect imports from China and the ROW differently. For example, the increase in foreign direct investment from Japan to China may decrease domestic employment due to the relocation of the labour-intensive production process to China but increase the imports of downstream products produced by Japanese affiliates in China. On the other hand, such an increase in imports from China may decrease those from the ROW.

We turn to our results for the models with input–output linkages (e.g. equation (14)). The results using the input shares in the aggregation are shown in Table 3. The IV results show insignificant coefficients for almost all variables.[5] Only the import penetration from China in the upstream sectors is found to have significant effects with a negative sign. This result is not only inconsistent with our prior expectation but also contrary to the results obtained in Hayakawa, Ito, and Urata (2019), which found its positive effect in the firm/establishment-level analyses. This difference may indicate that our estimates at the product/industry level analyses capture the effects on the entry and exit of firms, which are not included in the firm/establishment-level analyses – namely, the exit of domestic upstream industry firms due to the China shock may decrease employment in their downstream sectors in the long run.

[5] The instruments for input–output linkage variables are also constructed by aggregating a respective instrument across downstream or upstream sectors.

## Table 3: Backward and Forward Linkages – Input Shares

| Variables | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| IP | 0.421 | | | |
| | [0.460] | | | |
| Downstream | 0.288 | | | |
| | [1.054] | | | |
| Upstream | 0.951 | | | |
| | [1.130] | | | |
| China IP | | -0.146 | | -0.532 |
| | | [0.726] | | [1.193] |
| Downstream | | -2.046 | | -2.781 |
| | | [2.556] | | [3.444] |
| Upstream | | -12.409** | | -14.932** |
| | | [5.263] | | [6.522] |
| ROW IP | | 1.000 | | |
| | | [0.703] | | |
| Downstream | | 3.142 | | |
| | | [4.179] | | |
| Upstream | | 0.558 | | |
| | | [1.448] | | |
| MFN IP | | | 0.225 | |
| | | | [1.015] | |
| Downstream | | | 0.491 | |
| | | | [2.173] | |
| Upstream | | | 0.484 | |
| | | | [1.152] | |
| RTA IP | | | 3.268 | 2.441 |
| | | | [10.845] | [11.767] |
| Downstream | | | 2.324 | 2.014 |
| | | | [12.998] | [9.677] |
| Upstream | | | -0.852 | 9.299 |
| | | | [28.084] | [39.628] |
| ROW MFN IP | | | | 0.98 |
| | | | | [2.677] |
| Downstream | | | | 4.102 |
| | | | | [3.457] |
| Upstream | | | | 0.596 |
| | | | | [1.675] |

G7 = Group of Seven, excluding Japan (Canada, France, Germany, Italy, United Kingdom, United States); IP = import penetration; IV = instrumental variable; MFN = most favoured nation; OLS = ordinary least squares; ROW = rest of the world except China and Japan; RTA = regional trade agreement.

Notes: This table reports the estimation results by the IV method. The dependent variable is a log difference of employment. ***, **, and * indicate 1%, 5%, and 10% significance, respectively. The square brackets denote robust standard errors. To save space, we do not report the results of constant terms. The number of observations is 164 in all specifications. In column (I), we use the total import penetration in the other G7 countries as an instrument. Two instruments in column (II) include their import penetration from China and the ROW. In column (III), we use the total import penetration in the other G7 countries and Japan's MFN tariff rates in 2015 as instruments. The instruments in column (IV) are the import penetration from China and the ROW in addition to the MFN rates.

Source: Authors' estimation.

The results using the Leontief inverse coefficients (i.e. the full impacts) are reported in Table 4 and show that only the own and downstream import penetration from the ROW have significant coefficients. Such significance disappears when we decompose the penetration from the ROW according to tariff regime. Thus, when examining the full impacts via input–output linkages, we no longer obtain significant effects of import penetration. In sum, these results in Tables 3 and 4 may indicate that the impacts via input–output linkages are weak in Japan. Indeed, according to the Basic Survey of Japanese Business Structure and Activities, half of the imports in manufacturing firms are sourced from their related companies (e.g. overseas affiliates), so the increase in such intra-firm trade would be less harmful to their employment.

**Table 4: Backward and Forward Linkages – Leontief Inverse Coefficients**

| Variables | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| IP | 0.592 | | | |
| | [0.458] | | | |
| Downstream | 0.226 | | | |
| | [0.446] | | | |
| Upstream | 0.443* | | | |
| | [0.257] | | | |
| China IP | | -0.621 | | -0.598 |
| | | [0.690] | | [0.929] |
| Downstream | | -0.455 | | -0.356 |
| | | [0.848] | | [0.952] |
| Upstream | | -2.163 | | -4.885 |
| | | [3.264] | | [8.212] |
| ROW IP | | 1.418** | | |
| | | [0.626] | | |
| Downstream | | 1.064* | | |
| | | [0.638] | | |
| Upstream | | 0.315 | | |
| | | [0.416] | | |
| MFN IP | | | 0.413 | |
| | | | [0.523] | |
| Downstream | | | 0.28 | |
| | | | [0.575] | |
| Upstream | | | 0.505 | |
| | | | [0.591] | |
| RTA IP | | | 2.906 | 0.197 |
| | | | [4.838] | [8.059] |
| Downstream | | | 2.425 | 0.824 |
| | | | [5.045] | [5.414] |
| Upstream | | | 4.763 | 11.939 |
| | | | [8.967] | [17.670] |
| ROW MFN IP | | | | 1.6 |
| | | | | [1.059] |
| Downstream | | | | 0.928 |
| | | | | [1.327] |
| Upstream | | | | 0.449 |
| | | | | [0.457] |

G7 = Group of Seven, excluding Japan (Canada, France, Germany, Italy, United Kingdom, United States); IP = import penetration; IV = instrumental variable; MFN = most favoured nation; OLS = ordinary least squares; ROW = rest of the world except China and Japan; RTA = regional trade agreement.

Notes: This table reports the estimation results by the IV method. The dependent variable is a log difference of employment. ***, **, and * indicate 1%, 5%, and 10% significance, respectively. The square brackets denote robust standard errors. To save space, we do not report the results of constant terms. The number of observations is 164 in all specifications. In column (I), we use the total import penetration in the other G7 countries as an instrument. Two instruments in column (II) include their import penetration from China and the ROW. In column (III), we use the total import penetration in the other G7 countries and Japan's MFN tariff rates in 2015 as instruments. The instruments in column (IV) are the import penetration from China and the ROW in addition to the MFN rates.

Source: Authors' estimation.

## 4. Concluding Remarks

The impact of imports on the domestic labour market is a hotly debated issue in the trade literature. In this paper, we empirically examined the effects of not only imports from China but also those from RTA partners on employment in Japan. To this end, we decomposed the total import penetration into the import penetrations under the MFN and RTA regimes. Since China is not Japan's RTA partner country, the import penetration under the MFN regime was further decomposed into that of China and the ROW. Moreover, we investigated the effects of import penetration on the labour market not only in the concerned sector, i.e. the sector where imports increased, but also in its downstream and upstream sectors. In other words, we took into account the backward (upstream) and forward (downstream) input–output linkages. To address the endogeneity concern on our import penetration variables, we estimated our models by the IV method.

As in previous studies in the literature, we found that the rise in import penetration from China significantly decreases employment in Japan. However, import penetration from RTA partners is found to have insignificant effects on employment. In this sense, we may claim that the increase in imports from RTA partners is not harmful to the domestic labour market. The absence of negative impacts of imports on employment under RTAs may be because the Government of Japan maintained protection for vulnerable sectors in RTA negotiations. In addition, we did not find significant effects of import penetration via input–output linkages. This insignificant result may be because imports by Japanese manufacturing firms are mostly conducted in the form of intra-firm and intra-group trade, which may enable the firms to avoid negative impacts on employment.

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