PEKING UNIVERSITY
Institute of New Structural Economics
Working Paper Series of New Structural Economics

No. E2019007 **2019-10-7**

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August 15, 2019

Abstract

We evaluate the direct impact of China trade shock on the Korean labor market following the approach of Acemoglu et al. (2016). Using firm- and industry-level data for the period 1993–2013, our direct estimates imply that the net employment effect of the China shock in the manufacturing sector is the creation of 0.52 million jobs. The positive impact is mostly driven by China's rising demand for intermediate inputs and capital goods from Korea to support its export expansion to the global economy. The import-competition channel plays a negligible role in manufacturing employment because it creates temporary jobs that merely compensate for the loss in permanent jobs. By contrast, over the same period, the average wage declined by 2.4 percent, and income inequality, measured as the gap between the high- and low-income quantile, grew substantially in manufacturing. In addition, we find that the direct effect of China shock lowers labor market concentration by shifting workers from big firms to small and medium-sized firms.

Keywords: China Trade Shock; Labor Adjustment; Income Inequality; Temporary Jobs; Labor Market Concentration.

JEL Code: F14, F16, J23, J31, L60.

* We are grateful to Miguel Cardoso, Jason Garred, Tim Halliday, and seminar participants at the University of Hawaii at Manoa and Rocky Mountain Empirical Trade Conference 2019 for fruitful discussions.
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1 Introduction

Studies on the labor market effects of rising Chinese participation in the global market, known as the China Syndrome, have emphasized the import competition effect such that it causes contraction in employment, higher unemployment, and reduced wages, especially in the United States (Autor, Dorn and Hanson, 2013; Acemoglu, Autor, Dorn, Hanson and Price, 2016; Pierce and Schott, 2016).[1] Most analysts would have been likely to agree that rising Chinese import competition has had a negative impact on labor markets until the recent work of Feenstra, Ma and Xu (2017), Wang, Wei, Yu and Zhu (2018) and Feenstra and Sasahara (2018), who re-evaluate the China Syndrome by considering additional mechanisms, such as the rising demand for U.S. products and the interaction between industries through the supply chain linkage. The newer research finds a smaller net employment loss than that found by previous studies.[2]

In this paper, we provide a global value chain (GVC) perspective to rethink the direct impact of the China Syndrome, in case of South Korean manufacturing. Our methodology is based upon recent work by Acemoglu, Autor, Dorn, Hanson and Price (2016) who study the general equilibrium effect of increased import competition from China in the U.S.[3] We specifically focus on the direct impact of the China Syndrome in South Korean manufacturing sector.[4] A departure from Acemoglu, Autor, Dorn, Hanson and Price (2016)'s framework is that the direct impact of the China Syndrome can even have two countervailing forces (the export-creating channel and the import-creating channel) in South Korean manufacturing through the linkage of East Asian value chain. Overlooking either channel will lead to a less accurate interpretation of the China Syndrome even though our focus is based only upon the direct impact of China trade shock.

Our analysis shows that the China Syndrome positively affects the Korean labor market in

[1] Autor, Dorn and Hanson (2013) focused on the U.S. local labor market; Pierce and Schott (2016) adopted national industry approach; Acemoglu, Autor, Dorn, Hanson and Price (2016) combined the local labor market analysis and the national industry approach to estimate national employment impact of the Chinese trade exposure.

[2] Feenstra, Ma and Xu (2017) argue that the job-creating effect of exports has been less explored in evaluating the employment effect of trade liberalization in the U.S. They consider total U.S. exports as compared to imports from China in the empirical analysis.

[3] Admittedly, our analysis is not directly comparable to Acemoglu, Autor, Dorn, Hanson and Price (2016) where they decomposed the national employment impact into four effects: the direct impact on exposed industries, the indirect impact on linked industries, the aggregate reallocation effects, and the aggregate demand effects.

[4] Our direct industry-level estimates are defined as the the direct impacts of both import-competing shock from China and the export-expansion shock to China on labor market outcomes in South Korean manufacturing sector from 1993 to 2013. The main source of variation comes from comparing across 180 manufacturing industries. We adopt the definition from Acemoglu, Autor, Dorn, Hanson and Price (2016).

manufacturing, which is mostly driven by China's rising demand for Korean intermediate inputs and capital goods to supply its export expansion in the global market.[5] Consequently, as more Korean manufacturing firms enter the market, employment rises and employers pay higher wages in manufacturing sector. Our study differs from closely related work by Wang, Wei, Yu and Zhu (2018) who emphasize the role of industry linkages along the GVC in affecting labor demand overall.[6] We emphasize a country linkage along the GVC from a perspective similar to those of Dauth, Findeisen and Suedekum (2014) and Costa, Garred and Pessoa (2016).[7] We provide evidence that the China Syndrome boosts manufacturing employment for upstream countries like Korea. In addition, we show econometrically that separating the export-creating from the import-competition channel is critical in quantifying the direct impact of the China Syndrome on labor market outcomes. In cases where the export-creating channel is substantial and correlated with the import-competition channel, the conventional estimation procedure following Acemoglu, Autor, Dorn, Hanson and Price (2016) may underestimate the negative direct impact of import competition on labor market outcomes due to the omitted variable bias problem (or violation of the exclusion restriction). This issue is especially relevant to countries like Korea that maintain a trade surplus with China[8] although our focus is to estimate the direct impact of the China trade shock.

In our empirical exercise, we first follow the methodology in Acemoglu, Autor, Dorn, Hanson and Price (2016) and in Feenstra, Ma and Xu (2017) to construct an instrument for the import-

[5] As also documented in previous literature (Koopman, Wang and Wei, 2008; Johnson and Noguera, 2012; Koopman, Wang and Wei, 2014), the domestic value added in Chinese exports only accounts for about 50–60 percent. A significant portion of China's gross exports rely on intermediate inputs from Korea, Japan, Taiwan, and ASEAN countries. For instance, Chinese manufacturing companies assemble Apple's iPhones in China and export to global markets, but they source memory chips, microprocessors, LCD panels, and many other components from Korean, Japanese, and Taiwanese companies. If China's exports rely heavily on foreign content, rising Chinese participation in the global economy will boost production activities in the foreign countries that export intermediate inputs to China.

[6] Wang, Wei, Yu and Zhu (2018) find that trade with China boosts local employment because substantial intermediate input imports from China in some industries stimulate employment expansion in downstream U.S. industries. They find that the overall employment effect is positive in the U.S.

[7] Dauth, Findeisen and Suedekum (2014) study the effects of rising trade between Germany and "the East" (China and Eastern Europe) in the period 1988–2008 on German local labor markets. Dauth, Findeisen and Suedekum (2014) also add an export-creating channel in addition to an import-competing channel, as we do, but their study does not explicitly consider the global value chain perspective. In addition, our study focuses only on the impact on Korea from China, not from China and Eastern Europe. Lastly, our unit of analysis is based upon industry, not local labor markets. Costa, Garred and Pessoa (2016) investigate the impact of China in the context of Brazilian labor market. In addition to the traditional import competition channel, Costa, Garred and Pessoa (2016) analyze the impact of growing Chinese demand for commodities. Unlike Costa, Garred and Pessoa (2016), our study focuses on the impact of China Syndrome within manufacturing. In addition, we investigate a case where certain industries simultaneously export to and import from China more compared to other industries, not in the Brazilian case.

[8] The problem is exacerbated when an import-competition shock strongly correlates with an export-expansion shock. The resulting inconsistent estimates could even lead to misleading policy interpretations.

competition channel at the industry level in manufacturing.[9] To avoid simultaneous bias resulting from unobserved domestic shocks in Korea, we use Japan's imports from China at the industry level as an instrument.[10] In addition, we instrument Korean export-expansion to China using Japan's exports to China at the industry level in manufacturing.[11] Our empirical results show that the import-competition and the export-expansion shocks that stem from the China Syndrome affect the South Korean labor market differently.

First, we find a positive causal effect of export expansion on manufacturing employment and a null impact of import competition on manufacturing employment. The null impact of import competition on manufacturing employment is surprising, since previous studies report negative causal impacts from Chinese import competition on manufacturing jobs (Autor, Dorn and Hanson, 2013; Autor, Dorn, Hanson and Song, 2014; Dauth, Findeisen and Suedekum, 2014; Acemoglu, Autor, Dorn, Hanson and Price, 2016; Feenstra, Ma and Xu, 2017).[12] Quantitatively, we compare the direct impact of export-expansion shock and the direct impact of import-competition shock, and uncover the net employment effect over the period 1993–2013 in South Korean manufacturing is the creation of 524,543 manufacturing jobs.[13] To account for the null impact of import competition from China, we further investigate whether import competition has different impacts on the quality of manufacturing jobs. We split total manufacturing employment into permanent and temporary workers,[14] and find that the import competition from China raises the number of temporary jobs but slightly reduces the number of permanent jobs, and the two effects cancel each

[9]There are two reasons why we follow Acemoglu et al. (2016)'s industry-level approach instead of the local labor market approach that is commonly used in the study of labor market effects of the China Syndrome. First, there are not well-defined local labor markets in Korea, especially in our context. The size of Korea (38,691 square miles) is even less than the size of California (163,696 square miles). Due to the small size, workers can easily migrate across regions within Korea, which may violate the assumption of low mobility condition in the local labor market approach. Second, we can avoid potential issues of using Bartik-type IVs in recent studies of shift-share analysis (Borusyak et al., 2018; Adao et al., 2018; Goldsmith-Pinkham et al., 2018). In our paper, the key identifying condition comes from purging our industry shocks from Korean specific factors by measuring China Syndrome outside of the South Korea, not from shift-share-style instruments. Also, Borusyak et al. (2018) note that shift-share IV estimates can be reframed as coefficients from weighted industry-level regressions, which further motivates our choice of the industry-level regression model.

[10]Using Japan's imports from China alleviates the endogeneity concern as they are highly correlated with Korea's imports from China but are not necessarily correlated with unobserved domestic shocks that might affect the labor market outcome variables.

[11]The instrument captures Korean export expansion to China that originates from China's increasing demand from the East Asia value chain, and it does not necessarily correlate with unobserved domestic shocks that might affect the labor market outcome variables.

[12]To the best of our knowledge, Wang, Wei, Yu and Zhu (2018) is the one exception in this research arena.

[13]Note that the net creation of manufacturing jobs only takes the direct impact of the China Syndrome into consideration.

[14]Permanent workers are defined as workers with a contract period of one year or more or the contract period is not regulated; temporary workers are defined as workers with a contract period of less than one year.

other out on average.

Second, we find that export expansion to China increases while import competition from China decreases average wages in manufacturing, with a slightly negative net effect overall. Adopting Chetverikov, Larsen and Palmer (2016)'s quantile regression to study the heterogeneous wage response along its distribution, we find that the negative (positive) wage impact of import competition (export expansion) is stronger for the lower quantile of the wage within industry. We estimate that the direct effect of China trade shock decreases the average wage by 2.4 percent in manufacturing. Since the adverse impacts are more substantial for lower quantiles of the wage distribution, the overall inequality is magnified in manufacturing.

Finally, we use firm-level data to investigate market concentration within industry in response to the China Syndrome. We construct an employment Herfindahl index for the labor share of big firms in each industry. We find that industries exposed to more import competition from China allocate workers toward larger firms, while export expansion to China operates in the opposite direction. Overall, we find that the direct effect of China trade shock reduces labor market concentration by shifting workers from big firms to small and medium-sized firms.

Our paper contributes to several strands of the literature studying the impact of the China Syndrome on the labor market. First, we provide additional empirical evidence for Korea, which expands our understanding of the China Syndrome's impact. South Korea is one of only a few countries in the world that has a huge trade surplus with China. The unique position of South Korea in relation to China along the GVC allows us to investigate the new mechanism, a country linkage through the East Asian value chain. Second, we provide theoretical background on estimations with invalid instruments. If industries with higher exposure to import competition from China are more likely to export to China, an estimation that omits either an import-competition shock or an export-expansion shock will generate an underestimation problem. Third, we show that the China Syndrome affects the composition of the temporary and permanent workforce, and it also affects labor market concentration. Investigations of these outcome variables have been rather limited in the existing literature.

The rest of the paper is organized as follows. Section 2 describes the historical pattern of China-Korea trade. Section 3 discusses our empirical strategy. Data used in our empirical studies are summarized in section 4. Section 5 reports our estimation results, which are shown to be robust

in Section 6. Section 7 concludes.

2 Background

During the Korean War (1950–1953), the participation of China's People's Volunteer Army against South Korea led to an antagonistic relationship between South Korea and China. Until the late 1980s, there was no official relationship between the two countries. China maintained close relations with North Korea, and significant limitations in trade between South Korea and China persisted. However, China and South Korea formally established diplomatic relations in August 1992, ending their long-standing hostile relations. Over the two decades after August 1992, trade between the two countries skyrocketed.

The first three columns of Table 1 present the value of annual total exports, the value of annual total imports, and trade balance for the years 1992, 2000, and 2013 in Korea. During the period between 1992 and 2013, total exports increased from $77 billion to $560 billion (a 630 percent increase), and total imports increased from $82 billion to $516 billion (530 percent).

The remaining three columns of Table 1 show the value of annual Korean exports to China, the value of annual Korean imports from China, and the trade balance for the years 1992, 2000, and 2013. During the period 1992–2013, Korean exports to China increased from $3 billion to $146 billion (5,396 percent), and total imports increased from $4 billion to $83 billion (2,130 percent). The growth rate of both exports to China and imports from China outpaced the growth rate of total exports and total imports.[15] The huge increase in Korean exports to China justifies a careful investigation of the effects of the export expansion shock on the labor market in Korea that arises from rising Chinese participation in the global value chain.

Figure 1 shows that Korea had a trade surplus with China over the period 2000–2010. This pattern is a stark contrast to the trade balance with countries such as Germany and the U.S. German's trade balance with China fluctuated around zero. The U.S. trade balance with China was in deficit during the period. This pattern motivates us to study the impact of the China Syndrome on Korea, different from previous studies such as Dauth, Findeisen and Suedekum (2014) for German and Feenstra, Ma and Xu (2017) for the U.S.

[15] China's share of total Korean exports rose from 3.5 percent to 26.1 percent, and China's share of total Korean imports

Table 1: Value of Trade for Korea, 1992-2013

	Total Trade (in billions US$)			Trade with China (in billions US$)		
	Export	Import	Balance	Export (Share)	Import (Share)	Balance
	(1)	(2)	(3)	(4)	(5)	(6)
1992	76.6	81.8	-5.1	2.7 (3.5%)	3.7 (4.6%)	-1.1
2000	172.3	160.5	11.8	18.5 (10.7%)	12.8 (8.0%)	5.7
2013	559.6	515.6	44.0	145.9 (26.1%)	83.1 (16.1%)	62.8
Growth rate 1992-2013	630%	530%		5,396%	2,130%	

Notes: The trade data are from Korea Customs Service. The numbers in parenthesis denote the share of China in total trade values. The export share is the ratio of Korea exports to China to the total exports in Korea. The import share is the ratio of Korea imports from China to the total imports in Korea.

Figure 2 shows a scatter plot of the change in the import-penetration ratio and the change in the export-to-shipment ratio for 180 Korean industries over the period 1993 to 2013. There is a strong positive correlation between the two, which implies that industries with a higher import-penetration shock from China are more likely to export to China. The correlation coefficient is 0.73 with statistical significance. The positive correlation between the two may reflect the fact that an increasing share of China's role in global manufacturing has been supported by exports from Korea through linkages in the East Asia value chain. Table 2 shows the composition of Korean exports to China during the period 1995–2013. About 90 percent of Korean exports to China consists of intermediate goods and capital goods, while the share of consumption goods to exports to China is less than 5 percent. The massive growth in Chinese exports to the world might have been greatly supported by imports from other source countries, such as Korea, through the East Asian value chain.

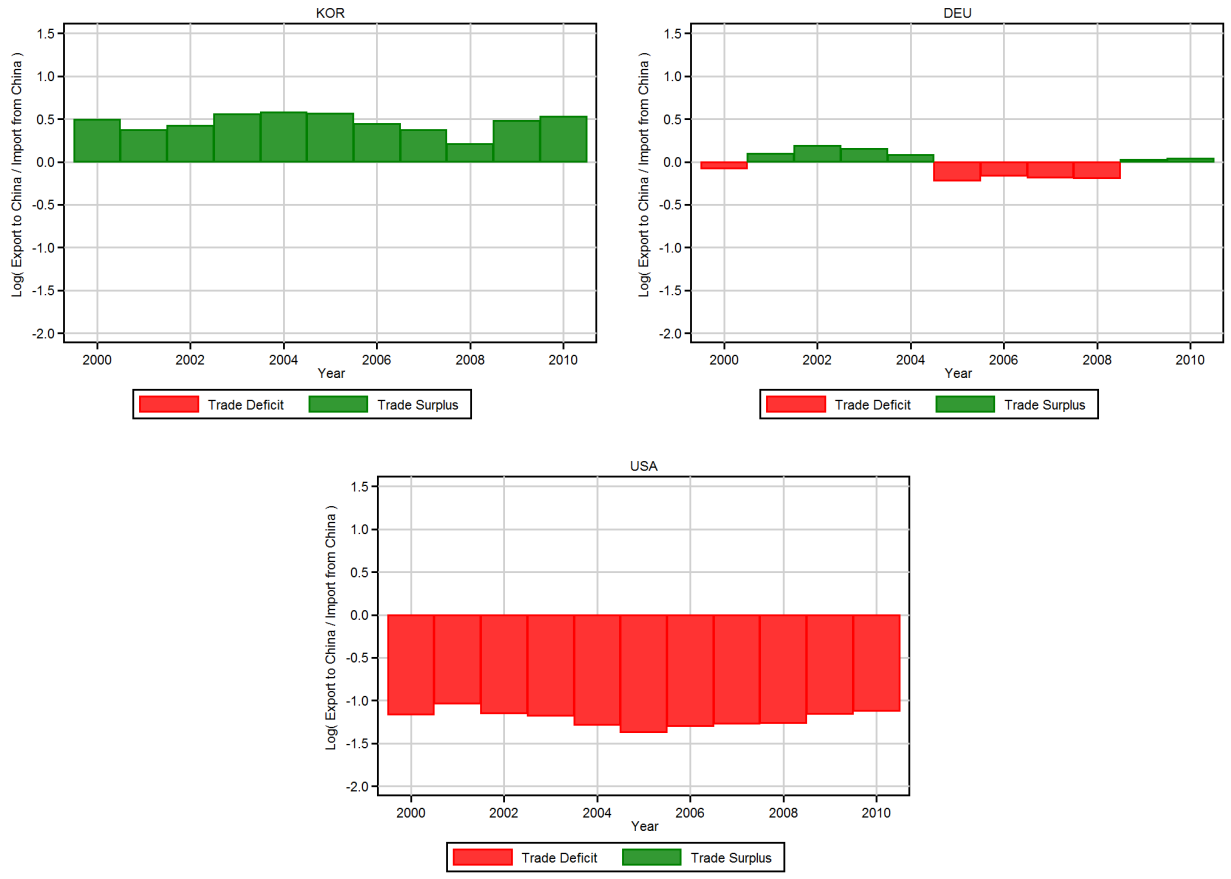
Table 2: Composition of Korea exports to China, 1995-2013

	Year				
	1995	2000	2005	2010	2013
Capital Goods	12.8	9.9	14.0	24.5	22.9
Intermediate Goods	80.7	76.5	77.7	67.4	68.7
Capital + Intermediate Goods	93.5	86.4	91.7	91.9	91.7
Consumption Goods	5.4	4.6	2.4	2.0	2.2

Notes: All numbers are the percentage. The data are from the UN Comtrade Database. The first available data start from the year 1995.

increased from 4.6 percent to 16.1 percent.

Figure 1: Trade Balance with China, 2000-2010



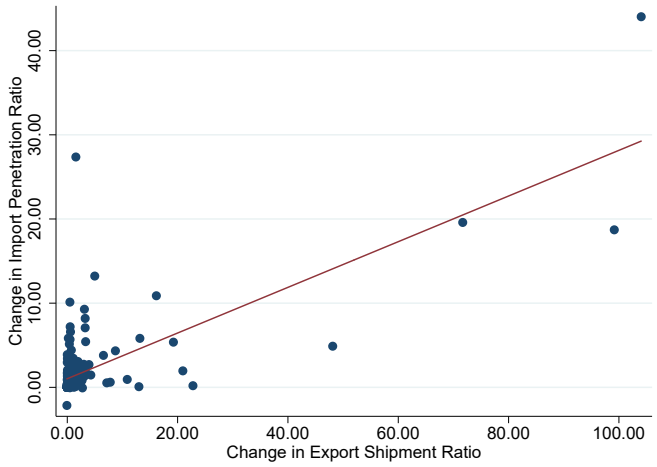
Notes: The Y-axis denotes the log of export to China devided by the log of import from China. Each panel denotes each country: Korea (KOR), Germany (DEU), and the United States (USA).

In this paper, we relate changes in Korean labor market outcomes from 1993 to 2013 to changes in exposure to the Chinese import-competition shock and the Chinese export-creation shock across manufacturing industries. We include both shocks in our analysis of the labor market effects of the China Syndrome.

3 Empirical Specification

We follow Acemoglu, Autor, Dorn, Hanson and Price (2016) to measure the direct Chinese import-competition shock using changes in China's exports to Korea at the industry level in manufacturing. In addition to the import-competition shock, we consider the export-creating channel in the Korean labor market, which stems from China's tremendous rise as a manufacturing exporter in

Figure 2: Scatter Plot of Import-Penetration Ratio and Export-Shipment Ratio in Korea, 1993-2013



Notes: $N = 180$ industries. The Y-axis denotes the change in import-penetration ratio and the X-axis denotes the change in export-shipment ratio during the period 1993 and 2013. The coefficient of correlation is 0.7327 with p-value of 0.0000.

the global economy. We construct a direct export-expansion shock using changes in Korea's exports to China at the industry level in manufacturing. The measure of import competition from China is the change in the import-penetration ratio for a Korean industry over the period 1993 to 2013; the measure of export expansion from Korea to China is the change in the ratio of exports to China for a Korean industry over the period 1993 to 2013:

$$\Delta IP_{j,t} = \frac{\Delta M_{j,t}^{CNtoKR}}{Y_{j,0} + M_{j,0} - E_{j,0}} \quad \text{and} \quad \Delta EX_{j,t} = \frac{\Delta E_{j,t}^{KRtoCN}}{Y_{j,0}}$$

where j denotes Korean industry, t is the year, $\Delta M_{j,t}^{CNtoKR}$ is the change in imports from China to Korea over the period 1993 and 2013 in industry j, $\Delta E_{j,t}^{KRtoCN}$ is the change in exports from Korea to China over the period 1993 and 2013 in industry j, and $Y_{j,0} + M_{j,0} - E_{j,0}$ is the domestic absorption in industry j at year 1990 (measured as industry shipments, $Y_{j,0}$, plus industry imports, $M_{j,0}$, minus industry exports $E_{j,0}$ at year 1990).[16]

One may argue that observed changes in the import-penetration ratio and changes in the export-shipment ratio may not reflect purely supply-driven components that arise from China's emergence in a global market, because unobserved domestic shocks to Korean industries may be

[16]We choose the year 1990 as the initial year because input-output tables are only available at 5-year intervals.

compounded by observed bilateral trade flows. To alleviate this concern, we instrument for the change in the import-penetration ratio and for the change in the export-shipment ratio as follows:

$$\Delta IPO_{j,t} = \frac{\Delta M_{j,t}^{CNtoJP}}{Y_{j,0} + M_{j,0} - E_{j,0}} \quad \text{and} \quad \Delta EXO_{j,t} = \frac{\Delta E_{j,t}^{JPtoCN}}{Y_{j,0}}$$

where $\Delta M_{j,t}^{CNtoJP}$ is the change in imports from China to Japan over the period 1993 and 2013 in industry j; $\Delta E_{j,t}^{JPtoCN}$ is is the change in exports from Japan to China over the period 1993 and 2013 in industry j.

The identification assumption is that the change in imports from China to Japan driven by supply shocks originating in China is highly correlated with the change in imports from China to Korea, but is uncorrelated with unobserved domestic shocks to Korean industries. Likewise, the change in exports from Japan to China driven by demand shocks originating in China is highly correlated with the change in exports from Korea to China, but is uncorrelated with unobserved domestic shocks to Korean industries. Another potential threat to identification is that technological improvement reduces labor demand in Korea and Japan simultaneously for some industries. We address this issue by including a series of initial-year industry-level variables to control for confounding technology shocks.

We specify the following 2SLS specification with multiple endogenous variables:

$$\begin{aligned}
\Delta Y_{j,t} &= \beta_0 + \beta_1 \Delta IP_{j,t} + \beta_2 \Delta EX_{j,t} + \beta_3 IP_{j,0} + \beta_4 EX_{j,0} + X'_{j,0}\beta_5 + u_{j,t}, \\
\Delta IP_{j,t} &= \gamma_0 + \gamma_1 \Delta IPO_{j,t} + \gamma_2 \Delta EXO_{j,t} + \gamma_3 IP_{j,0} + \gamma_4 EX_{j,0} + X'_{j,0}\gamma_5 + v_{j,t}, \\
\Delta EX_{j,t} &= \delta_0 + \delta_1 \Delta IPO_{j,t} + \delta_2 \Delta EXO_{j,t} + \delta_3 IP_{j,0} + \delta_4 EX_{j,0} + X'_{j,0}\delta_5 + \eta_{j,t},
\end{aligned} \tag{1}$$

where $Y_{j,t} \in \{L_{j,t}, EST_{j,t}, W_{j,t}, H_{j,t}\}$ is four main outcome variables over the sample period.[17] $\Delta IP_{j,t}$ is 100 times the annual change in import penetration from China in industry j over the time period, $\Delta EX_{j,t}$ is 100 times the annual change in export-shipment ratio in industry j over the time period, $X_{j,0}$ is a set of initial-year industry-specific control variables, $\Delta IPO_{j,t}$ is an instrument for $\Delta IP_{j,t}$, and $\Delta EXO_{j,t}$ is an instrument for $\Delta EX_{j,t}$.

[17] More specifically, $\Delta L_{j,t}$, $\Delta EST_{j,t}$, $\Delta W_{j,t}$, and $\Delta H_{j,t}$ are 100 times the annual log change in the number of employment, the number of establishment, the wages, and the Herfindahl index, respectively, in industry j over the time period.

In Appendix A, we derive formally econometric properties of omitting either an export shock or an import shock in the above 2SLS specification setting. We found that either case generates an under-estimation problem in the context of Korean labor market. In the subsequent empirical analysis, we confirm the direction of biases and present exact magnitudes of the biases.

4 Data

Having pointed out the potential issues in identification, we take full account of both import and export shocks in the subsequent analysis. Our empirical analysis rests on data that are assembled from different sources.

4.1 Measuring Trade Exposure

We use data on trade flows from the UN Comtrade Database. Specifically, we use Korea-China and Japan-China bilateral trade data at the 6-digit HS products level for the period 1993 to 2013. All units are denominated in current US dollars. To match trade flows in 1993 (HS 1992 version) with trade flows in 2013 (HS 2007 version), we use a conversion table provided by UN Trade Statistics.

Next, we use industry-level shipment, import, and export data from the Bank of Korea's input-output tables for Korea, whose values are denominated in current US dollars. Because the input-output tables are available only at 5-year intervals, we use the year 1990 as the starting year. Because the Korean input-output (IO) tables use different industry classifications,[18] we create a crosswalk to match Korean industry with the 6-digit HS products as follows.

We first link the 1990 IO table industry classifications to the 2010 version. The number of manufacturing industries is collapsed from 257 in 1990 to 211 in 2010.[19] Then, we match the industry classifications used in the 2010 IO table with the 5-digit Korean Standard Industrial Classification (Rev 9) using the conversion table provided by the Bank of Korea. In the last step, we use a crosswalk table provided by Statistics Korea, which links the 6-digit HS products to the 5-digit Korean

[18] There are 257 disaggregated manufacturing industries in the Korean industry classification.

[19] In most cases, each 1990 code maps onto a single 2010 code, although there are few exceptions of many-to-one mapping cases. For instance, naphtha, gasoline, kerosene, diesel, and heavy oil are all different industries in the year 1990, but in 2010 they are aggregated as the crude oil refining industry.

Standard Industrial Classification. In the end, we obtain an industry classification consisting of 211 manufacturing industries to measure the import-penetration and export-shipment ratios.

4.2 Measuring Establishment and Employment

The number of establishments and total employees at the industry level are from Korea's Census on Establishments. It is an annual survey consisting of about 4.4 million establishments that have one or more employees and are doing business in Korea.[20]

Because the industry classifications used in the 1993 and 2013 surveys are different, we use a conversion table provided by Statistics Korea to match the industry codes of 1993 (KSIC Rev 8) with those of 2013 (KSIC Rev 9). Then we link the 5-digit industry codes of KSIC Rev 9 to the industry classifications used in the 2010 IO tables using the conversion table provided by the Bank of Korea.

4.3 Measuring Wage and Market Concentration

Data on wage and market concentration at the industry level is from Statistics Korea's Mining and Manufacturing Survey. This annual survey targets establishments with at least ten employees that are located in Korea and fall into the category of Mining and Manufacturing according to the Korean Standard Industrial Classification (KSIC). The data include information such as the type of legal organization, the number of workers, annual labor costs, annual shipments, import value, operating expenses, annual values of shipments, and inventory by product at the establishment level.

Each establishment reports the number of employees, including the number of permanent employees and the number of temporary employees, and total wages paid to workers. When calculating wages, we restrict our analysis to permanent employees, as the reported annual working hours of temporary employees are heterogeneous across firms, making it difficult for us to compute an average wage precisely. Given the computed wage at the establishment level, we calculate the industry-specific mean and median wage.

[20]The survey does not include agriculture, forestry, and fisheries businesses (with individual owners), national defense, housekeeping services, or international and foreign organizations according to the Korean Standard Industrial Classification (KSIC).

We measure market concentration index using a Herfindahl index based on permanent employees at the firm level, which is defined as follows:

$$H_{j,t} = \sum_{i=1}^{N_{j,t}} (S_{ij,t})^2$$

where $S_{ij,t}$ is the share of workers employed in firm i in industry j at year t and $N_{j,t}$ is the number of firms in industry j at year t. A small index indicates that the size of employment is similar across firms in an industry, while a high index denotes that workers are concentrated in big firms.[21]

4.4 Descriptive Statistics

Table 3 provides basic descriptive statistics by change in trade exposure, main outcome variables, and industry-specific control variables. The first two columns show the mean and standard deviations, and the remaining five columns show the 10th percentile, the 25th percentile, the median, the 75th percentile, and the 90th percentile.

The first row of Panel A of Table 3 reports that Korea's export-shipment ratio to China, $\Delta EX_{j,t}$, increased by 2.43 percentage points annually during the period 1993 through 2013 on average, reflecting a huge acceleration of export growth to China over the time period. The average annual export-shipment growth rate to China is equivalent to 48.6 percentage points over the twenty-year horizon. For the median industry, the annual growth rate is 0.38 percentage points. The gap between the annual mean and median industry growth rates implies that the growth in exports to China is biased toward a few industries. It also documents that a standard deviation of 9.61 percentage points in the annual growth rate reflects substantial industry variation in the export-creating shock. During the time period, an industry at the 75th percentile grew 1.52 (= 1.55 – 0.03) percentage points more annually than an industry at the 25th percentile.

The second row of Panel A in Table 3 shows that Korea's import-penetration ratio from China, $\Delta IP_{j,t}$, increased by 3.61 percentage points annually during the period 1993 through 2013 on average.[22] The average annual import-penetration growth rate from China is equivalent to 72.2

[21] We also define $T^n_{j,t}$ as the top n firm's employment share in industry j and year t and use this measure as an alternative to the market concentration index.

[22] The unweighted change in Korea's export-shipment ratio is 3.18, and the unweighted change in Korea's import-penetration ratio is 1.89. Because industries with a higher number of employees in the year 1993 were associated with a higher import-competition ratio while the opposite was true for exports, the weighted change in Korea's import

percentage points over the twenty-year period. The annual growth rate of import competition from China is 1.18 (= 3.61 – 2.43) percentage points larger than the rate of export creation to China. Similar to the export-shipment ratio measure, the standard deviation of 7.61 percentage points suggests tremendous variation across industries. During the time period, an industry at the 75th percentile grew 2.62 (= 2.74 – 0.12) percentage points more annually than an industry at the 25th percentile.

Table 3: Descriptive Statistics

	Mean	S.D.	p(10)	p(25)	p(50)	p(75)	p(90)
Panel A. Change in Trade Exposure, 1993 - 2013							
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	2.43	9.61	0.00	0.03	0.38	1.55	3.11
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	3.61	7.61	0.00	0.12	0.60	2.74	9.28
Panel B. Main Outcome Variables, 1993 - 2013							
100 × annual log Δ in establishment, $\Delta EST_{j,t}$	0.85	3.53	-3.27	-1.97	0.79	3.45	5.37
100 × annual log Δ in employment, $\Delta L_{j,t}$	-1.66	4.15	-7.13	-4.08	-1.64	1.49	2.88
100 × annual log Δ in mean wage, $\Delta W_{j,t}^{mean}$	6.39	0.87	4.94	6.04	6.45	6.73	7.16
100 × annual log Δ in median wage, $\Delta W_{j,t}^{median}$	6.28	1.04	4.60	6.01	6.33	6.69	7.27
100 × annual log Δ in Herfindahl index, $\Delta H_{j,t}^{emp}$	-0.95	4.77	-6.01	-3.57	-1.45	2.10	4.49
100 × annual log Δ in top 3 firms' share $\Delta T_{j,t}^{3,emp}$	-1.07	3.19	-4.97	-3.37	-1.17	1.11	2.61
100 × annual log Δ in top 5 firms' share $\Delta T_{j,t}^{5,emp}$	-0.96	2.92	-3.98	-3.14	-1.01	0.85	2.51
100 × annual log Δ in top 10 firms' share $\Delta T_{j,t}^{10,emp}$	-0.74	2.59	-3.75	-2.47	-0.54	0.94	2.36
Panel C. Industry-Specific Control Variables, 1993							
Export-shipment ratio$_{1993}$	0.02	0.05	0.00	0.00	0.00	0.01	0.05
Import penetration ratio$_{1993}$	0.03	0.08	0.00	0.00	0.00	0.02	0.09
Log of establishment$_{1993}$	7.27	1.66	5.32	6.17	7.21	8.29	9.52
Log of employment$_{1993}$	10.40	1.02	9.19	9.70	10.32	11.09	11.87
Log of median wage$_{1993}$	2.01	0.19	1.84	1.90	2.00	2.10	2.21
Log of shipment$_{1990}$	20.65	1.14	19.17	19.85	20.73	21.52	22.08
Log of domestic absorption$_{1990}$	20.62	1.09	19.13	19.65	20.75	21.46	21.94
Log of Herfindahl index$_{1993}$	-4.44	1.60	-6.49	-5.79	-4.75	-3.28	-2.16

Notes: $N = 180$ industries. The statistics are weighted by the number of industry employees in the year 1993.

Panel B in Table 3 provides descriptive statistics of the main outcome variables. The first row of Panel B in Table 3 shows that the annual growth rate of the number of establishments, $\Delta EST_{j,t}$, is 0.85 percent on average. The standard deviation of 3.53 percent reveals substantial variations across industries. The second row of Panel B in Table 3 shows that the number of employees in manufacturing sectors, $\Delta L_{j,t}$, drops by 1.66 percent annually, though there is substantial variation across industries. Turning to the annual growth rate of wages, $\Delta W_{j,t}$, the third and fourth columns of Panel B in Table 3 show that the mean wage increases by 6.39 percent and the median wage increases by 6.28 percent annually. The average annual growth rates of four market concentration

penetration ratio is higher than the weighted change in Korea's export-shipment ratio.

measures ($\Delta H_{j,t}$, $\Delta T^3_{j,t}$, $\Delta T^5_{j,t}$, and $\Delta T^{10}_{j,t}$) in Panel B in Table 3 show negative signs, reflecting the fact that employment shares are becoming more equally distributed across establishments. However, positive values for the 75th percentile and 90th percentile indicate that employment in some industries is concentrated in larger firms.

Panel C in Table 3 provides descriptive statistics for industry-specific start-of-the-period control variables. The first two rows of Panel C in Table 3 show that mean values of the export-shipment ratio, $EX_{j,0}$, and the import-penetrating ratio, $IP_{j,0}$ in the year 1993 are 0.02 and 0.03, respectively, and the median values of the export-shipment ratio and the import-penetrating ratio are both zeros. In the year 1993, trade between the two countries was limited, and most industries in Korea had no trade relationship with China.

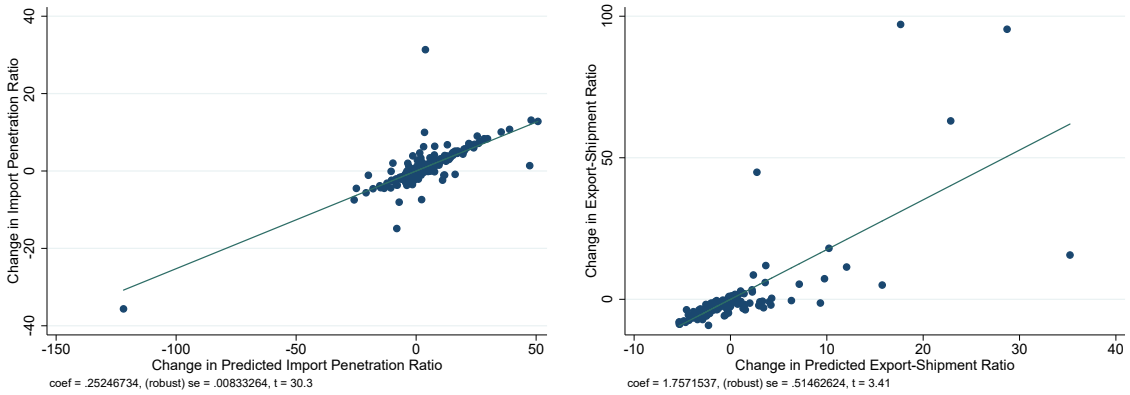
5 Results

5.1 First-Stage and OLS Reduced-Form Regression

The left panel of Figure 3 reports the predictive power of the instrument of the Japan's import penetration ratio with China, $\Delta IPO_{j,t}$, for changes in Korean import-competition exposure to the China Syndrome. The estimation yields a coefficient of 0.25 with a t-value of 30.3. A 10 percentage point increase in import penetration is associated with a 2.5 percentage point increase in import penetration. The right panel of Figure 3 reveals the predictive power of our new instrument of the Japan's export creation to China, $\Delta EXO_{j,t}$, for changes in Korean export-shipment ratio stemming from the China Syndrome. The estimated coefficient is 1.76 with a t-value of 3.4. A 10 percentage point increase in export creation is associated with a 17.6 percentage point increase in export creation. As is visible in the left panel of Figure 3, Japan's import-penetration ratio from China is a strong instrument for Korea's import-penetration ratio from China. In the right panel of Figure 3, Japan's export creation to China is also a good instrument, though not as strong as the import-penetration ratio, for Korea's export creation to China.

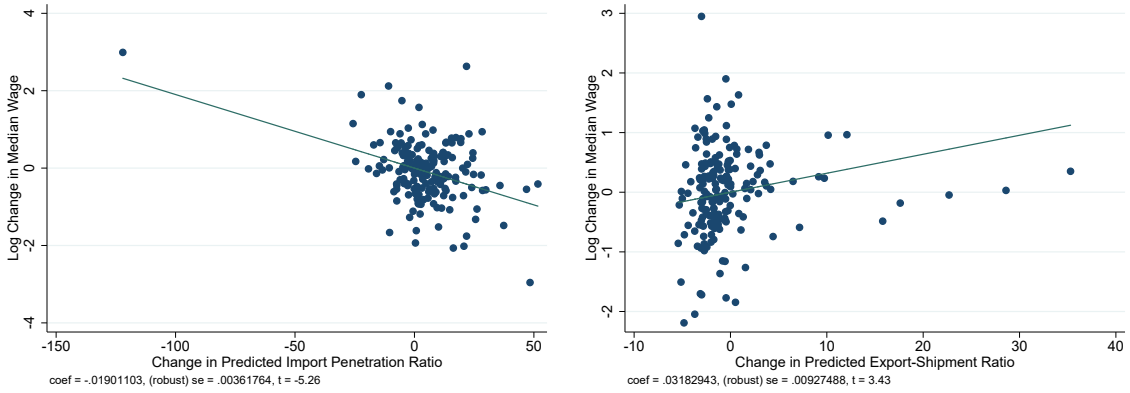
The left panel of Figure 4 displays a reduced form (OLS) regression of the log change in median wage on the instrument of Japan's import penetration ratio from China, $\Delta IPO_{j,t}$. The estimation yields a coefficient of -0.019 with a t-value of -5.26. One percentage point increase in import penetration is associated with a 1.9 percentage point decrease in median wage. The right panel of

Figure 3: Added Variable Plots of First Stage Regression Estimates, 1993-2013



Notes: The number of observations (industries) is 180. The added variable plots control for a set of initial-year industry-specific control variables such as the import-penetration ratio, export-shipment ratio, the number of establishments, the number of employees, and the median wage in industry j for the year 1993. Regression estimates are weighted by 1993 industry employment.

Figure 4: Added Variable Plots of OLS Reduced-Form Regression Estimates, 1993-2013



Notes: The number of observations (industries) is 180. The added variable plots control for a set of initial-year industry-specific control variables such as the import-penetration ratio, export-shipment ratio, the number of establishments, the number of employees, and the median wage in industry j for the year 1993. Regression estimates are weighted by 1993 industry employment.

Figure 4 shows a reduced form (OLS) regression of the log change in median wage on the instrument of Japan's export creation to China, $\Delta EXO_{j,t}$. The estimation yields a coefficient of 0.032 with a t-value of 3.43. One percentage point increase in export creation is associated with a 3.2 percentage point increase in median wage. The figures show two different effects of the China Syndrome on wages.

5.2 Establishment

We move on to the number of manufacturing establishment. Table 4 reports results of the 2SLS estimation of the effects of the China Syndrome on the number of manufacturing establishments. In the bottom two panels of Table 4, both Japan's imports from China and Japan's exports to China are strong instruments for the import-penetration ratio and the export-shipment ratio, as is evident from the F-statistics that range from 10 to 22,469.

The first column of Table 4 shows that there is a positive causal relationship between the number of manufacturing establishments and Korea's export creation to China; there is a negative causal relationship between the number of manufacturing establishments and Korea's import penetration from China. The coefficient of 0.176 in the first row of the first column in Table 4 indicates that a 10 percentage point increase in the export-shipment ratio is predicted to raise the number of manufacturing establishment by 1.76 percentage points. The coefficient of -0.156 in the second row of the first column in Table 4 reveals that a 10 percentage point increase in import-penetration ratio is predicted to decrease the number of manufacturing establishment by 1.56 percentage points.

One may be concerned that industries subject to greater China exposure could also be affected by other economic shocks, such as initial China exposure, that are confounded with China trade. To address this concern, column 2 adds the start-of-period export-shipment ratio and import-penetration ratio. The expected sign and statistical significance remain mostly unchanged in this specification, although we find a slightly smaller effect of import exposure on the number of manufacturing establishments than in the corresponding estimate in column 1.

Columns 3 and 4 add start-of-period control variables such as the number of manufacturing establishments, the number of manufacturing employees, the median wage, shipments, and absorption. These specifications address the concern that China exposure could be confounded with industry-specific trends. While the estimated coefficients of the two key variables are reduced in magnitude, they are still statistically significant across different specifications. The coefficient of 0.137 in the first row of the fourth column in Table 4 indicates that a 10 percentage point increase in export-shipment ratio is predicted to raise the number of manufacturing establishment by 1.37 percentage points. The coefficient of -0.067 in the second row of the fourth column in Table 4 reveals that a 10 percentage point increase in import penetration ratio is predicted to decrease the

number of manufacturing establishment by 0.67 percentage points. The pattern of 2SLS results suggests that the China Syndrome has two distinct effects on Korean firms' entry and exit. A positive China export shock induces more firms to enter, while a negative China import shock forces more firms to exit.

In Column 5, we exclude the import competition variable and estimate the impact of export expansion on the number of manufacturing establishments. Consistent with the previous discussion on the estimation with invalid instruments, the estimated coefficient is 0.120, which is smaller than the coefficient in Column 4, which is 0.137. In Column 6, we run the regression without the export-expansion variable. The estimated coefficient of import competition is -0.029. The coefficient not only underestimates the true coefficient, but is also statistically insignificant. The underestimation problem is consistent with the previous theoretical discussion on the estimation with invalid instruments. It is interesting to note that the omission of either variable can overturn the statistical significance of the impact of the China Syndrome. In Table 5, we report both 2SLS and OLS results. Consistent with our discussion, the underestimation problem also matters in the OLS results. In addition, we find that the estimated values of OLS are smaller than those of 2SLS.

We quantify the economic magnitude of the estimates in our benchmark case in column 4 of Table 4 by constructing counterfactual changes in manufacturing establishments in the absence of the China Syndrome.[23] To do so, we follow Acemoglu, Autor, Dorn, Hanson and Price (2016) to express the difference between the actual and counterfactual establishment in year t as follows:

$$\Delta EST_t^{CF} = \sum_j EST_{j,t} \left[1 - e^{-\left(\hat{\beta}_1 \Delta IP_{j,t}^* + \hat{\beta}_2 \Delta EX_{j,t}^*\right)}\right] \tag{2}$$

where $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimated 2SLS coefficients. $\Delta IP_{j,t}^*$ is the change in import penetration from China and $\Delta EX_{j,t}^*$ is the change in export expansion to China, both of which we ascribe to China's rising share in the world economy in industry j between 1993 and 2013. We estimate $\Delta IP_{j,t}^*$ by multiplying the observed change in import competition from China $\Delta IP_{j,t}$ with the partial R-squared from the first-stage regression.[24] If our instruments are valid, then $\Delta IP_{j,t}^*$ and

[23] Note that the quantification exercise only captures the direct impact of the export-expansion shock and the import-competing shock in South Korean manufacturing, not the full general equilibrium effect of the China Syndrome in South Korea.

[24] Similarly, we estimate $\Delta EX_{j,t}^*$ by multiplying the observed change in export expansion to China $\Delta EX_{j,t}$ with the partial R-squared from the first-stage regression. The partial R-squared of $\Delta IP_{j,t}$ with $\Delta IPO_{j,t}$ has a value of 0.6535

$\Delta EX^*_{j,t}$ are consistent estimates of the contribution of China Syndrome shocks to changes in import penetration and export expansion, respectively.

Using the coefficient estimates in column 4 of Table 4, we calculate the difference between observed end-of-period establishments and counterfactual establishments in manufacturing if the import penetration from China and export expansion to China had remained unchanged during the period from 1993 to 2013. The estimated difference between the actual and counterfactual manufacturing establishments in the year 2013 is –28,706. The observed number of manufacturing establishments in the year 2013 is 362,370, which implies that, had the import penetration from China and export expansion to China remained unchanged between 1993 and 2013, the counterfactual manufacturing establishments would have been 391,076. Since the magnitude of the coefficient of export expansion is greater than the import penetration ($|+0.137| > |-0.067|$), one may think that the negative net direct manufacturing establishment effect is an unexpected result. However, the net establishment effect depends on five components as in equation (2): the number of establishment in industry j and time t, the two estimated 2SLS coefficients, the change in import competition from China, and the change in export expansion to China. We found that the apparel manufacturing industry,[25] which has the second greatest exposure to Chinese import competition, is simultaneously the second largest industry in number of establishments. The Chinese import competition would drive out significant number of firms in the apparel manufacturing industry, which even leads to the negative net establishment effect.[26]

5.3 Employment

Next, Table 6 provides results of the 2SLS estimation of the effects of China Syndrome on the number of manufacturing employees. The first column of Table 6 shows that there is a positive causal relationship between the number of manufacturing employees and Korea's export creation to China; there is a negative causal relationship between the number of manufacturing employees and Korea's import penetration from China. The positive effect of export-shipment ratio on the number of manufacturing employees is highly robust in other specifications with start-of-period

and the partial R-squared of $\Delta EX_{j,t}$ with $\Delta EXO_{j,t}$ has a value of 0.4774.

[25]The apparel manufacturing industry is "57. Apparel Manufacturing" in the 2010 input-output table industry classification.

[26]When we exclude the apparel manufacturing industry, we obtain a positive net employment effect.

control variables (columns 2 to 4). The coefficient of 0.183 in the first row of column 4 in Table 6 indicates that a 10 percentage point increase in export-shipment ratio is predicted to raise the number of manufacturing employees by 1.83 percentage points.

Turning to the impact of import penetration on the number of manufacturing employees, we find no statistical significance by adding more start-of-period control variables (columns 2 to 4). The null impact of import penetration is quite surprising because previous studies report substantial negative manufacturing employment impact stemming from rising imports from China (Autor, Dorn and Hanson, 2013; Autor, Dorn, Hanson and Song, 2014; Acemoglu, Autor, Dorn, Hanson and Price, 2016).

We re-run the 2SLS regression excluding either the export-expansion variable or the import-competition variable. Since the estimated coefficient of import competition in column 4 is 0.004 with no statistical significance, the bias of estimating the regression without the import-competition variable can overestimate the actual magnitude of export-expansion shock on the number of employees. Similarly, the bias of estimating the regression without the export-expansion variable can overestimate the actual magnitude of the import-competition shock on the number of employees. In columns 5 and 6, we confirm the direction of biases such that the coefficient of the export expansion shock is 0.184, which is 0.001 higher than the one in column 4; and the coefficient of the import-competition shock is 0.055, which is 0.051 higher than the one in column 4.[27]

Using the coefficient estimates in column 4 of Table 6, we calculate the difference between observed end-of-period employment and counterfactual employment in manufacturing if the import penetration from China and export expansion to China had remained unchanged during the period from 1993 to 2013.[28] The estimated difference between the actual and counterfactual manufacturing employment in year 2013 is +524,543. The observed number of employed in the year 2013 is 3,544,675, which implies that, had the import penetration from China and export expansion to China remained unchanged between 1993 and 2013, the counterfactual manufacturing establishments would have been 3,020,132.[29]

[27] The coefficient of the impact of the import competition on the outcome variable, π_1, turns out to be positive. Hence, omitting either the import-competition shock or the export-expansion shock generates the overestimation problem. In Table 7, we report both 2SLS and OLS estimation results.

[28] Note again that the quantification exercise only captures the direct impact of the export-expansion shock and the import-competing shock in South Korean manufacturing, not the full general equilibrium effect of the China Syndrome in South Korea.

[29] Similar to the establishment case, we express the difference between the actual and counterfactual employment in

The finding of a positive net direct manufacturing employment effect of the China Syndrome is quite new in the literature.[30] Acemoglu, Autor, Dorn, Hanson and Price (2016) note that rising Chinese import competition over the period 1999 - 2011 in the U.S. generated job losses in the range of 2.0 - 2.4 million. Feenstra, Ma and Xu (2017) find a net loss of around 0.2 - 0.3 million jobs over the period 1991-2011 in the U.S when they incorporate both Chinese import competition and global export expansion from the U.S. Dauth, Findeisen and Suedekum (2014) estimate that trade integration (with Eastern Europe and China) has caused some 442,000 additional jobs in Germany. While our finding of a positive net direct manufacturing employment effect is similar to that of Dauth, Findeisen and Suedekum (2014), those authors observe that the positive net effect is driven almost exclusively by the rise of Eastern Europe, not by China.

5.3.1 Permanent and Temporary Workers

To account for the null impact of rising Chinese import competition, we conjecture that the results might differ for different types of workers. Thus we explore the heterogeneous effects of the China Syndrome by separating total manufacturing employment into two groups: permanent workers and temporary workers.

Table 8 provides the results of the impact of the China Syndrome on employment for different worker types. Column (1) of Table 8 replicates the baseline result, and column (2) of Table 8 re-runs the regression without the Electric and Electronic sector. When we include two additional variables, the number of temporary workers and the number of permanent workers, three industries are missing. In columns (3) and (4) of Table 8, the regression specification mirrors that in the main specifications in columns (1) and (2) of Table 8, respectively, but the log of the number of permanent workers and the log of the number of temporary workers are included as control variables. Reassuringly, the results are similar to those found in columns (1) and (2).

Columns (5) and (6) of Table 8 report the effect of the China Syndrome on the number of permanent workers. The coefficients of export-creating shock have almost the same magnitude. However, the magnitudes of coefficients of import-penetrating shock increase as much as 1.94

year t as follows:

$$\Delta L_t^{CF} = \sum_j L_{j,t} \left[1 - e^{-\left(\hat{\beta}_1 \Delta IP^*_{j,t} + \hat{\beta}_2 \Delta EX^*_{j,t}\right)}\right].$$

[30] Wang, Wei, Yu and Zhu (2018) is the only exception, to our knowledge.

to 2.47 times. In column (6), the estimate of the import-competing shock becomes statistically significant at the 10 percent level. In columns (7) and (8) of Table 8, we focus on the effect of the China Syndrome on the number of temporary workers. We find that the export-creating shock has no impact on temporary workers, while the import-penetrating shock increases the number of temporary workers. This result explains to some extent why import penetration has no impact on the number of manufacturing employees in Korea. Korean manufacturing firms that had been more exposed to Chinese import competition responded by increasing the number of temporary workers and reducing the number of permanent workers to a lesser degree.

In Appendix B, following the approach of Acemoglu et al. (2016), we further study the effects of the China Syndrome on establishment and employment incorporating intersector linkages: the upstream effect and the downstream effect.

5.4 Wage

Table 9 presents the impact of the China Syndrome on the mean wage in manufacturing.[31] The first two rows of Table 9 show that the impact of the export-shipment ratio is positively associated with the mean wage, while the impact of the import-penetration ratio is negatively associated with the mean wage in manufacturing.[32] Quantitatively, the coefficient of 0.028 in column 4 of Table 9 shows that a 10 percentage point increase in the export-shipment ratio is predicted to raise the mean wage by 0.29 percentage points in manufacturing, while the coefficient of -0.055 in column 6 of Table 9 shows that a 10 percentage point increase in import-penetration ratio is predicted to decrease the mean wage by 0.55 percentage points in manufacturing. In Columns 5 and 6, we confirm that excluding one of the shocks underestimates the actual impact of the China Syndrome. In Table 10, we report both 2SLS and OLS results. Consistent with our discussion, the underestimation problem also matters in the OLS results. In addition, we find that the estimated values of OLS are smaller than those of 2SLS.

One may be concerned that extreme values of the within-industry wage distribution could influence the industry-level mean wage in manufacturing. To address this issue, we re-run the 2SLS regressions using the median wage as an outcome variable. Reassuringly, the results prove

[31] As mentioned in Section 4, wage is defined as total labor costs divided by the number of permanent workers at the firm level. Mean wage refers to the average wage within an industry.

[32] All coefficients of interest are statistically significant at the one percent level.

very robust to the alternative outcome variable. The first two rows of Table 11 show that all coefficients are statistically significant at the one percent level. Quantitatively, the coefficient of 0.033 in column 6 of Table 11 shows that a 10 percentage point increase in the export-shipment ratio is predicted to raise the median wage by 0.33 percentage points in manufacturing, while the coefficient of -0.079 in column 6 of Table 11 shows that a 10 percentage point increase in the import-penetration ratio is predicted to decrease the median wage by 0.79 percentage points in manufacturing.[33] The finding of negative mean (median) wage impact in manufacturing is consistent with Malgouyres (2017) who finds that Chinese import competition negatively affects the manufacturing sector in France; while Balsvik, Jensen and Salvanes (2015) finds no wage impact of Chinese import competition in Norway where centralized wage bargaining plays a role in limited wage flexibility.

Using the coefficient estimates in column 4 of Table 9, we calculate the difference between end-of-period average wage and counterfactual average wage in manufacturing if the import penetration from China and export expansion to China had remained unchanged during the period from 1993 to 2013.[34] The estimated difference between the actual and counterfactual average wage in year 2013 is –735,000 Korean won.[35] The average wage in the year 2013 is 30,452 thousand Korean won, which implies that, had the import penetration from China and export expansion to China remained unchanged between 1993 and 2013, the counterfactual average wage in manufacturing would have been 31,187 thousand Korean won. The net average wage impact is a 2.4 percent decrease in manufacturing. Although export creation bids up the average wage, import creation reduces the average wage, and the impact of import competition on the wage appears to be larger than that of export expansion.

[33] In Columns 5 and 6, we confirm that excluding one of the shocks underestimates the actual impact of the China Syndrome.

[34] We express the difference between the actual and counterfactual average wage in year t as follows:

$$\Delta W_t^{mean,CF} = \left(\sum_j W_{j,t}^{mean} \left[1 - e^{-\left(\hat{\beta}_1 \Delta IP_{j,t}^* + \hat{\beta}_2 \Delta EX_{j,t}^* \right)} \right] \right) / N$$

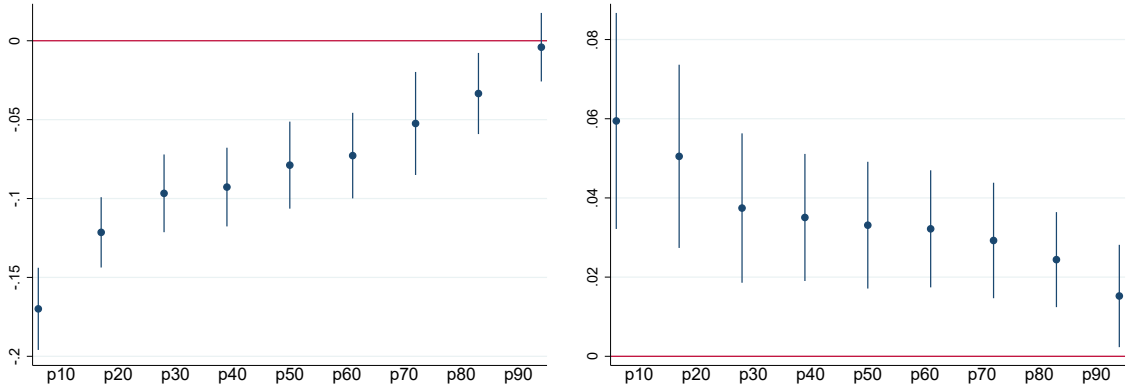
where N is the number of industry.

[35] Note again that the quantification exercise only captures the direct impact of the export-expansion shock and the import-competing shock in South Korean manufacturing, not the full general equilibrium effect of the China Syndrome in South Korea.

5.4.1 Conditional Wage Distribution

Chetverikov, Larsen and Palmer (2016) extend the analysis of Autor, Dorn and Hanson (2013) to a quantile regression setting and find that low-wage earners in the United States were significantly more affected by increased Chinese import competition than were high-wage earners. We build on the Chetverikov, Larsen and Palmer (2016)'s quantile regression framework to analyze whether low-paying firms are more adversely affected than high-paying firms by the Chinese import-competition shock and export-creation shock in South Korean manufacturing. For outcome variables, we compute the changes in the u-th quantile of log wages in the industry from 1993 and 2013.

Figure 5: The impact of the China Syndrome on conditional wage distribution, 1993-2013



Notes: The left (right) panel shows the impact of import competition (export expansion) on conditional wage distribution. The figure plots 2SLS quantile regression estimates along with 95% confidence intervals. The 95% confidence intervals are constructed from robust standard errors clustered by broad industry, and regression estimates are weighted by 1993 industry employment.

The left panel of Figure 5 displays the result of the 2SLS quantile regression estimator for the impact of import competition on the u-th quantile of log wages.[36] Each figure shows u-th quantile estimates for $u \in \{0.1, 0.2, ..., 0.8, 0.9\}$, along with 95% confidence intervals for each estimate. We find the same result as for the U.S., where Chinese import competition affected the wages of low-paying firms more than high-paying firms, as in Chetverikov, Larsen and Palmer (2016), implying that increases in Chinese import competition can exacerbate income inequality in Korea.[37]

[36] Table 12 reports full regression results, including coefficients and clustered standard errors of other control variables.

[37] The difference between the findings of Chetverikov, Larsen and Palmer (2016) and ours is the measurement of the wage distribution. We compute the quantiles using micro-level observations of firms from Statistics Korea's Mining and

In the left panel of Figure 5, quantitatively, we find a coefficient of -0.170 for the 0.1-th quantile, where the effect is 2.2 times as large as the median effect. The magnitudes of negative effects are monotonically decreasing. For the 0.9-th quantile, we find a coefficient of -.004 and a standard error of .0111, where the impact is statistically insignificant. To sum up, the exposure to Chinese import competition lowered wages on average, and the negative impacts are substantially higher for low quantile log wages; some firms, especially high-paying firms, are not affected by Chinese import competition. This finding is comparable to Malgouyres (2017), unlike ours, who finds that wages are rather uniformly negatively affected in the manufacturing sector in France.[38]

We then investigate whether low-paying firms are differentially affected by the Chinese export-creation shock in the case of import competition. The right panel of Figure 5 shows the result of the 2SLS quantile regression estimator along with a 95% confidence interval for the impact of export creation on the u-th quantile of log wages.[39] For all the quantiles of log wages, the effects of the export-creation shock are positive and statistically significant at the 5 percent level. Unlike the case of import competition, the export-creation shock reduces inequality in Korea because positive benefits are more significant for low-paying firms than for high-paying firms.

Quantitatively, the coefficient of 0.059 for the 0.1-th quantile, 0.033 for the median, and 0.015 for the 0.9-th quantile, are all statistically significant at the 5 percent level. The magnitude for the 0.1-th quantile of log wages is 1.8 times as large as the median effect, and 3.9 times as large as the 0.9-th quantile of log wages. The exposure to export creation to China bids up wages on average, and the positive impacts are substantially higher for low-paying firms than for high-paying firms, mitigating inequality in South Korean manufacturing.

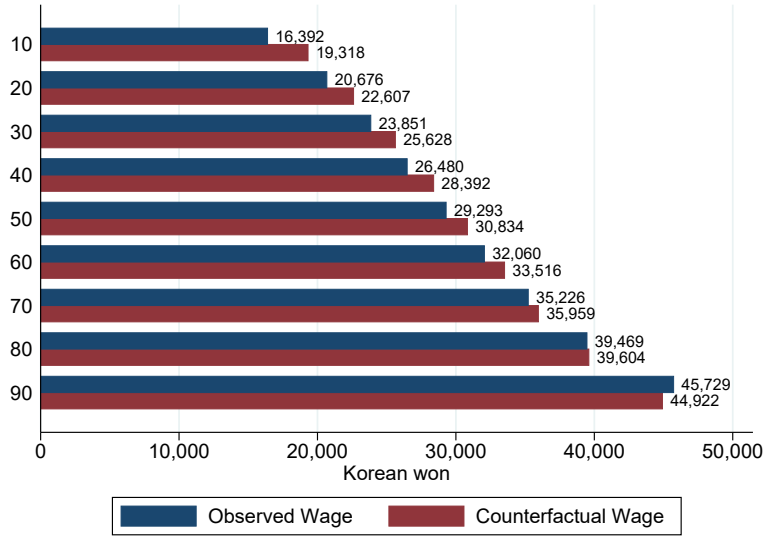
Using coefficient estimates in Table 12, we calculate the difference between end-of-period counterfactual wage quantiles if the import penetration from China and export expansion to China

Manufacturing Survey for 1993 and 2013, while they calculate the quantiles using micro-level observations of workers from the Census Integrated Public Use Micro Samples for 1990 and 2000 and the American Community Survey for 2006–2008.

[38] Admittedly, Malgouyres (2017) further investigates the impact of Chinese import competition on wage distribution outside of manufacturing sector. The author shows a decrease in lower-tail inequality in nontradable sector, which reflects the strongly binding minimum wage legislation in France.

[39] Table 12 reports full regression results, including coefficients and clustered standard errors of other control variables.

Figure 6: Observed and counterfactual wage quantiles, 2013



Notes: The figure plots actual wage quantiles and counterfactual wage quantiles in the year 2013.

had remained unchanged during the period from 1993 to 2013.[40] Figure 6 shows that the net wage impacts are negative across different quantiles of the wage distribution, reflecting the fact that the import-competition channel outweighs the export-expansion channel. Interestingly, the adverse impacts are more substantial for lower quantiles of the wage distribution, while the effect on the top 10th of the wage quantile of the wage distribution is positive, exacerbating inequality in South Korean manufacturing. Quantitatively, the bottom 10th of the wage quantile in the year 2013 was 16,392 thousand Korean won, whereas the counterfactual bottom 10th of the wage quantile would have been 19,318 thousand Korean won. The net impact is a 17.9 percent decrease. The top 10th of the wage quantile in the year 2013 was 45,729 thousand Korean won, while the counterfactual top 10th of the wage quantile would have been 44,922 thousand Korean won. The net impact is a 1.8 percent increase.

[40] We express the difference between the actual and counterfactual x-th wage quantiles in year t as follows:

$$\Delta W_t^{q(x),CF} = \left(\sum_j W_{j,t}^{q(x)} \left[1 - e^{-\left(\hat{\beta}_1 \Delta IP_{j,t}^* + \hat{\beta}_2 \Delta EX_{j,t}^*\right)} \right] \right) / N$$

where N is the number of industry.

5.5 Labor Reallocation

So far, we have focused on analyzing the impacts of the China Syndrome on the manufacturing employment channel. In line with McCaig and Pavcnik (2018)[41], it would also be interesting to investigate another adjustment channel through which the impacts of an export-creation shock and import-penetration shock can reallocate workers between firms in South Korean manufacturing. We use the Herfindahl index and top n firms' employment share in industry j to investigate the reallocation channel.

Table 13 shows the impact of the China Syndrome on the market concentration using the Herfindahl index. The first two rows of Table 13 show that the impact of the export-creating shock alleviates market concentration while the impact the import-penetration shock reallocates workers toward bigger firms. Quantitatively, the coefficient of -0.158 in column 4 of Table 13 shows that a 10 percentage point increase in export-shipment ratio is predicted to decrease the Herfindahl index by 1.58 percentage points. From our previous analysis, we found that the export-expansion shock increases both employment and the number of establishments. Hence, the potential mechanism of the negative impact of export expansion to China on market concentration (based on employment) would be such that export opportunity to China induces more firms to enter the market and hire more workers.

The coefficient of 0.162 in column 4 of Table 13 shows that a 10 percentage point increase in import penetration ratio is predicted to raise the Herfindahl index by 1.62 percentage points. In Columns 5 and 6, we confirm that excluding one of the shocks underestimates the actual impact of the China Syndrome on the market concentration. In Table 14, we compare the 2SLS and OLS results and find similar patterns of the biases as in previous cases. From our previous analysis, import competition from China reduces the number of manufacturing establishments and has a null impact on manufacturing employment. Because some firms, most likely those that are smaller and less productive, exit the market, the remaining workers are more likely to be reallocated to firms that are larger and more productive, which in turn increases market concentration.[42]

[41] They find evidence of a reallocation channel in international trade in which the share of manufacturing workers in Vietnam in the formal sector increased by 5 percentage points in response to a positive export shock. This empirical finding supports the idea that international trade can reallocate workers from microenterprises to more productive establishments (Melitz, 2003).

[42] We use alternative measures of market concentration. We use $T^{\phi}_{j,t}$, the top ϕ firm's employment share in industry j and year t, as an outcome variable instead of the Herfindahl index. Specifically, we use $T^{3}_{j,t}$, $T^{5}_{j,t}$, and $T^{10}_{j,t}$. Reassuringly,

Using the coefficient estimates in column 4 of Table 13, we calculate the difference between the end-of-period average Herfindahl index and the counterfactual average Herfindahl index if the import penetration from China and export expansion to China had remained unchanged during the period from 1993 to 2013.[43] The observed average Herfindahl index in the year 2013 is 0.042, and the counterfactual average Herfindahl index is 0.069.[44] The net impact of the China Syndrome on the Herfindahl index is negative, which implies that it reduces the market concentration of manufacturing employment. Workers are more likely to be reallocated toward mid-sized and small firms in industries with higher exposure to the China Syndrome. It is interesting to note that the observed average Herfindahl index in the year 1993 was 0.060. Had it not been for the China Syndrome, the average Herfindahl index would have risen during the period. The China Syndrome actually reversed the process of market concentration in manufacturing.

6 Robustness

6.1 Without the Electric and Electronic Sector

We exclude the Electric and Electronics sector (16 industries) from the analysis. Because technological advancement is most prevalent in those industries, their inclusion might confound the pure China Syndrome effect. In columns (1), (3), (5), and (7) of Table 16, we report our benchmark coefficients of the impact of the China Syndrome on the number of manufacturing establishments, the number of manufacturing employees, the median wage, and the Herfindahl index. In columns (2), (4), (5) and (8) of Table 16, we provide corresponding coefficients without the Electric and Electronics sector. Reassuringly, the core results are not sensitive to the exclusion of the Electric and Electronics sector.

the first two rows of Table 15 show that the signs, significance, and magnitude of the two key parameters are still robust to the different measures of market concentration.

[43] We express the difference between the actual and counterfactual average Herfindahl index in year t as follows:

$$\Delta H_t^{emp,CF} = \left(\sum_j H_{j,t}^{emp} \left[1 - e^{-\left(\hat{\beta}_1 \Delta IP_{j,t}^{*} + \hat{\beta}_2 \Delta EX_{j,t}^{*}\right)} \right] \right) / N$$

where N is the number of industry.

[44] Note again that the quantification exercise only captures the direct impact of the export-expansion shock and the import-competing shock in South Korean manufacturing, not the full general equilibrium effect of the China Syndrome in South Korea.

6.2 Alternative Measures of Market Concentration

In Table 17, we use different measures of the market concentration index as an outcome variable. Instead of using the number of permanent employees at the firm level, we calculate the market concentration index using total sales and value added at the firm level in manufacturing:

$$H_{j,t}^{sales} = \sum_{i=1}^{N_{j,t}} \left(S_{ij,t}^{sales} \right)^2 \quad \text{and} \quad H_{j,t}^{va} = \sum_{i=1}^{N_{j,t}} \left(S_{ij,t}^{va} \right)^2$$

where $S_{ij,t}^{sales}$ is the share of value of total sales in firm i in the industry j at year t, $S_{ij,t}^{va}$ is the share of value-added amount in firm i in the industry j at year t and $N_{j,t}$ is the number of firms in industry j at year t.[45] We also define $T_{j,t}^{n,sales}$ and $T_{j,t}^{n,va}$ as the top n firm's share of total sales and value-added, respectively, in industry j and year t.

Column (1) of Table 17 shows our benchmark result from column (6) of Table 13. Columns (2) through (4) in Table 17 reveal the impacts of the China Syndrome on market concentration index using total sales. Positive and statistically significant coefficients of the export-creation shock in the first row and negative and statistically significant coefficients of the import-penetration shock in the second row reconfirm our finding, even when we measure the market concentration index using total sales. Quantitatively, the coefficient of -0.091 in column 2 of Table 17 shows that a 10 percentage point increase in the export-shipment ratio is predicted to decrease the Herfindahl index (based on total sales) by 0.91 percentage point, while the coefficient of 0.103 in column 2 of Table 17 shows that a 10 percentage point increase in import-penetration ratio is predicted to raise the Herfindahl index (based on total sales) by 1.03 percentage point. Columns (5) through (7) in Table 17 show the impacts of the China Syndrome on the market concentration index using the value-added amount, and the new concentration measures do not change the signs and significance of coefficients of the China Syndrome. Overall, the export-creation shock alleviates market concentration by reallocating workers from big firms to small firms and increasing the share of total sales and the share of value added of relatively small firms. In contrast, the import-penetration shock reallocates more employees to larger firms and induces more prominent establishments to

[45] As in the case of employment market concentration, a small index indicates that total sales (or value-added) are similar across firms in an industry while a high index denotes that total sales (or value-added) are concentrated in big firms.

produce more.

6.3 Discussion on the presence of confounding trends

Because the formal relationship between China and South Korea was established in 1992, it is less likely that reverse causality is the main threat to identification in our study. Nonetheless, it is still possible that the presence of confounding trends might undermine identification as industries that experienced largest trade changes with China were experiencing more rapid increase (or decrease) in labor market activities in the absence of the China Syndrome. In other words, our results might be picking up a secular trend of labor market activities. One way to address this issue is to conduct a falsification test by regression past changes of manufacturing employment (or establishment) on future changes in trade exposure.[46] Unfortunately, Korea's Census on Establishments dataset is available only after the year 1993 because it started the survey in the year 1993. Hence, we cannot conduct the falsification test (or the placebo regression) to rule out the possibility of the presence of confounding trends.

Despite data limitation, we follow McCaig (2011) to address the pre-trend issue by controlling for the industry-level economic activity in the initial year in our regressions. For instance, the export-shipment ratio and the import penetration ratio in the initial year can control for underlying trends in labor market activities because different initial trade exposures to China reflect different labor market conditions and also are more likely to associate with the future trajectory of trade changes with China. Likewise, other initial-year control variables to some extent control for initial labor market environments that might reflect both the underlying trends and changes in trade exposure.

While the initial-year control variables do not completely eliminate the concern for the pre-trend issue, we believe that this is the best available strategy that attempts to control for the presence of underlying trends that are associated with changes in trade exposure to China. Future research could take further steps by developing econometric tools to address the pre-trend issue when researchers cannot conduct a falsification test.

[46] See Autor, Dorn and Hanson (2013) and Malgouyres (2017) for more details.

7 Conclusion

Although a plethora of studies has investigated the labor market impacts of China's increasing participation in the global economy, known as the China Syndrome, few provide empirical evidence for countries outside the United States or Europe. This lack of evidence may be originated from a limited data set on labor market outcomes over the long horizon and limited concordance tables that link trade variables to domestic industry-level variables in a consistent manner. Thus the question of how the China Syndrome affects the labor market in other countries remains largely unanswered. This paper overcomes the data limitation to provide empirical evidence of the direct labor market effects of the China Syndrome in South Korean manufacturing at the industry-level.

Trade between South Korea and China during the period from 1993 through 2013 provides an excellent historical setting for examining the labor market impacts of the China Syndrome because there was no official relationship between the two countries until August 1992, after which exports and imports began to skyrocket. Unlike most previous studies that report adverse direct labor market impacts of the China Syndrome, we provide new evidence that the rising importance of China in the global market increased manufacturing employment in South Korea. The positive manufacturing employment impact stems from the fact that China's gross exports rely heavily on the East Asian value chain. In another perspective, if it had not been for the input-output linkages in the East Asian value chain, the rapid increase in China's share of the global market would not have been as substantial, and the impact of the China Syndrome on other countries would have been weaker. In addition to wage and employment, we find that the China trade shock reduces market concentration and increases inequality in South Korean manufacturing.

Table 4: The impacts of China Syndrome on establishment, 1993-2013

Dependent variable:	100 × annual log change in establishment, $\Delta EST_{j,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS					
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	0.176***	0.176***	0.151***	0.137***	0.120***	
	(0.046)	(0.050)	(0.052)	(0.043)	(0.040)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	-0.156***	-0.111***	-0.054**	-0.067***		-0.029
	(0.014)	(0.017)	(0.022)	(0.025)		(0.038)
(Export-shipment ratio)$_{1993}$		-9.440***	-9.186***	-9.606***	-8.889**	-8.416**
		(3.485)	(2.699)	(3.339)	(3.708)	(4.142)
(Import penetration ratio)$_{1993}$		-5.692**	-5.969**	-5.644**	-8.029***	-7.354**
		(2.237)	(2.486)	(2.497)	(3.105)	(3.218)
(Log of establishment)$_{1993}$			0.164	-0.620*	-0.645**	-0.720**
			(0.234)	(0.328)	(0.327)	(0.335)
(Log of employment)$_{1993}$			-0.895***	-0.514	-0.673*	-0.630*
			(0.341)	(0.324)	(0.386)	(0.345)
(Log of median wage)$_{1993}$			0.270	0.052	0.116	0.010
			(1.317)	(1.165)	(1.166)	(1.043)
(Log of shipment)$_{1990}$				-1.564***	-1.543***	-1.762***
				(0.470)	(0.451)	(0.430)
(Log of domestic absorption)$_{1990}$				1.354***	1.467***	1.474***
				(0.389)	(0.404)	(0.330)
(Log of Herfindahl index)$_{1993}$				-0.785**	-0.794**	-0.808**
				(0.310)	(0.322)	(0.330)
Observations	180	180	180	180	180	180
R-squared	0.087	0.111	0.163	0.256	0.252	0.265
	First-stage regression I					
Dependent variable:	100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$					
100 × annual log Δ in Japan's export expansion to China, $\Delta EXO_{j,t}$	1.694***	1.746***	1.753***	1.761***	1.773***	
	(0.479)	(0.508)	(0.513)	(0.520)	(0.518)	
100 × annual log Δ in Japan's import exposure from China, $\Delta IPO_{j,t}$	0.030***	0.022*	0.023	0.027*		
	(0.006)	(0.012)	(0.017)	(0.013)		
F-statistic	11.76	10.09	12.43	19.33	11.22	
	First-stage regression II					
Dependent variable:	100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$					
100 × annual log Δ in Japan's export expansion to China, $\Delta EXO_{j,t}$	0.337*	0.346*	0.349*	0.336		
	(0.186)	(0.193)	(0.195)	(0.194)		
100 × annual log Δ in Japan's import exposure from China, $\Delta IPO_{j,t}$	0.270***	0.263***	0.261***	0.252***		0.261***
	(0.004)	(0.009)	(0.010)	(0.008)		(0.015)
F-statistic	7659	5710	6982	5803		22469

Notes: Both of the first stage regressions include the same set of control variables as in the corresponding second stage regression. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The impacts of China Syndrome on establishment, 1993-2013:
2SLS vs. OLS Estimates

Dependent variable:	100 × annual log change in establishment, $\Delta EST_{j,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS			OLS		
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	0.137***	0.120***		0.063**	0.051**	
	(0.043)	(0.040)		(0.024)	(0.018)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	-0.067***		-0.029	-0.046		0.013
	(0.025)		(0.038)	(0.054)		(0.068)
(Export-shipment ratio)$_{1993}$	-9.606***	-8.889**	-8.416**	-8.964**	-8.463*	-8.031*
	(3.339)	(3.708)	(4.142)	(4.071)	(4.270)	(4.504)
(Import penetration ratio)$_{1993}$	-5.644**	-8.029***	-7.354**	-6.571**	-8.224**	-8.826*
	(2.497)	(3.105)	(3.218)	(2.718)	(3.173)	(4.275)
(Log of establishment)$_{1993}$	-0.620*	-0.645**	-0.720**	-0.674*	-0.692*	-0.728*
	(0.328)	(0.327)	(0.335)	(0.349)	(0.350)	(0.354)
(Log of employment)$_{1993}$	-0.514	-0.673*	-0.630*	-0.577	-0.686	-0.727
	(0.324)	(0.386)	(0.345)	(0.405)	(0.411)	(0.432)
(Log of median wage)$_{1993}$	0.052	0.116	0.010	0.029	0.073	0.056
	(1.165)	(1.166)	(1.043)	(1.162)	(1.147)	(1.094)
(Log of shipment)$_{1990}$	-1.564***	-1.543***	-1.762***	-1.670***	-1.657***	-1.731***
	(0.470)	(0.451)	(0.430)	(0.460)	(0.441)	(0.447)
(Log of domestic absorption)$_{1990}$	1.354***	1.467***	1.474***	1.419***	1.498***	1.541***
	(0.389)	(0.404)	(0.330)	(0.397)	(0.396)	(0.384)
(Log of Herfindahl index)$_{1993}$	-0.785**	-0.794**	-0.808**	-0.797**	-0.804**	-0.812**
	(0.310)	(0.322)	(0.330)	(0.342)	(0.352)	(0.358)
Observations	180	180	180	180	180	180
R-squared	0.256	0.252	0.265	0.290	0.286	0.268

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The impacts of China Syndrome on employment, 1993-2013

Dependent variable:	100 × annual log change in employment, $\Delta L_{j,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS					
100 × annual log Δ in Korea's export	0.211***	0.199***	0.191***	0.183***	0.184***	
expansion to China, $\Delta EX_{j,t}$	(0.066)	(0.070)	(0.062)	(0.059)	(0.060)	
100 × annual log Δ in Korea's import	-0.091***	-0.010	0.005	0.004		0.055
exposure from China, $\Delta IP_{j,t}$	(0.032)	(0.021)	(0.052)	(0.061)		(0.053)
$(\text{Export-shipment ratio})_{1993}$		-8.549*	-5.288	-5.062	-5.101	-3.472
		(4.450)	(5.332)	(6.288)	(6.087)	(6.882)
$(\text{Import penetration ratio})_{1993}$		-10.033***	-10.688***	-10.324**	-10.193*	-12.609**
		(3.574)	(3.808)	(4.210)	(6.049)	(5.018)
$(\text{Log of establishment})_{1993}$			0.740	0.398	0.399	0.265
			(0.464)	(0.596)	(0.615)	(0.609)
$(\text{Log of employment})_{1993}$			-1.062	-0.859	-0.850	-1.013
			(1.166)	(1.188)	(1.054)	(1.212)
$(\text{Log of median wage})_{1993}$			2.940	2.885	2.881	2.828
			(2.620)	(2.544)	(2.513)	(2.375)
$(\text{Log of shipment})_{1990}$				-1.144	-1.145	-1.408
				(0.995)	(1.010)	(0.994)
$(\text{Log of domestic absorption})_{1990}$				1.107	1.100	1.268
				(1.112)	(1.027)	(1.097)
$(\text{Log of Herfindahl index})_{1993}$				-0.339	-0.339	-0.369
				(0.325)	(0.327)	(0.314)
Observations	180	180	180	180	180	180
R-squared	0.033	0.059	0.112	0.141	0.141	0.162

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 7: The impacts of China Syndrome on employment, 1993-2013:
2SLS vs. OLS Estimates

Dependent variable:	100 × annual log change in employment, $\Delta L_{j,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS			OLS		
100 × annual log Δ in Korea's export	0.183***	0.184***		0.089***	0.085***	
expansion to China, $\Delta EX_{j,t}$	(0.059)	(0.060)		(0.023)	(0.019)	
100 × annual log Δ in Korea's import	0.004		0.055	-0.016		0.068
exposure from China, $\Delta IP_{j,t}$	(0.061)		(0.053)	(0.084)		(0.076)
(Export-shipment ratio)$_{1993}$	-5.062	-5.101	-3.472	-4.666	-4.491	-3.351
	(6.288)	(6.087)	(6.882)	(6.855)	(6.757)	(7.350)
(Import penetration ratio)$_{1993}$	-10.324**	-10.193*	-12.609**	-9.893**	-10.472	-13.074*
	(4.210)	(6.049)	(5.018)	(3.485)	(6.250)	(6.013)
(Log of establishment)$_{1993}$	0.398	0.399	0.265	0.339	0.333	0.263
	(0.596)	(0.615)	(0.609)	(0.647)	(0.664)	(0.649)
(Log of employment)$_{1993}$	-0.859	-0.850	-1.013	-0.832	-0.870	-1.044
	(1.188)	(1.054)	(1.212)	(1.279)	(1.123)	(1.297)
(Log of median wage)$_{1993}$	2.885	2.881	2.828	2.805	2.820	2.843
	(2.544)	(2.513)	(2.375)	(2.582)	(2.544)	(2.539)
(Log of shipment)$_{1990}$	-1.144	-1.145	-1.408	-1.312	-1.308	-1.398
	(0.995)	(1.010)	(0.994)	(1.082)	(1.088)	(1.066)
(Log of domestic absorption)$_{1990}$	1.107	1.100	1.268	1.117	1.144	1.289
	(1.112)	(1.027)	(1.097)	(1.193)	(1.088)	(1.165)
(Log of Herfindahl index)$_{1993}$	-0.339	-0.339	-0.369	-0.350	-0.352	-0.371
	(0.325)	(0.327)	(0.314)	(0.341)	(0.342)	(0.337)
Observations	180	180	180	180	180	180
R-squared	0.141	0.141	0.162	0.193	0.192	0.162

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 8: The impacts of China Syndrome on employment across permanent and temporary workers, 1993-2013

Dependent variable:	$\Delta L_{j,t}$				$\Delta L_{j,t}^{permanent}$		$\Delta L_{j,t}^{temporary}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industries:	All	w/o	All	w/o	All	w/o	All	w/o
Method:	2SLS							
100 × annual log Δ in Korea's export	0.183***	0.215**	0.178***	0.213**	0.177***	0.215***	0.037	0.062
expansion to China, $\Delta EX_{j,t}$	(0.059)	(0.096)	(0.053)	(0.085)	(0.047)	(0.074)	(0.032)	(0.040)
100 × annual log Δ in Korea's import	0.004	-0.015	-0.017	-0.036	-0.042	-0.070*	0.163***	0.146***
exposure from China, $\Delta IP_{j,t}$	(0.061)	(0.057)	(0.046)	(0.036)	(0.058)	(0.039)	(0.038)	(0.038)
(Export-shipment ratio)$_{1993}$	-5.062	-5.601	-6.646	-7.481	-5.563	-7.967	-10.226**	-11.943***
	(6.288)	(6.259)	(5.615)	(5.506)	(6.459)	(6.238)	(4.095)	(4.303)
(Import penetration ratio)$_{1993}$	-10.324**	-10.354**	-10.157**	-10.044**	-8.337***	-8.359***	-6.881***	-7.012***
	(4.210)	(4.205)	(4.174)	(4.344)	(2.642)	(2.847)	(1.391)	(1.441)
(Log of establishment)$_{1993}$	0.398	0.554	0.670	0.722	0.218	0.295	2.161***	2.190***
	(0.596)	(0.553)	(0.552)	(0.532)	(0.509)	(0.493)	(0.355)	(0.357)
(Log of employment)$_{1993}$	-0.859	-0.713	-2.424**	-2.768*	1.180	0.319	-0.050	-0.547
	(1.188)	(1.181)	(1.091)	(1.441)	(1.096)	(1.351)	(0.963)	(1.362)
(Log of median wage)$_{1993}$	2.885	2.659	2.622	2.803	2.135	2.443	-7.175***	-7.105***
	(2.544)	(2.747)	(2.623)	(2.932)	(2.561)	(2.823)	(1.777)	(1.982)
(Log of shipment)$_{1990}$	-1.144	-1.398	-1.205	-1.446	-1.418	-1.721*	-0.242	-0.407
	(0.995)	(0.981)	(0.940)	(0.904)	(0.956)	(0.915)	(0.568)	(0.635)
(Log of domestic absorption)$_{1990}$	1.107	1.242	1.126	1.171	1.498	1.488*	0.588	0.589
	(1.112)	(1.072)	(0.948)	(0.849)	(0.917)	(0.828)	(0.663)	(0.833)
(Log of Herfindahl index)$_{1993}$	-0.339	-0.125	0.016	0.112	0.059	0.194	-0.228	-0.171
	(0.325)	(0.272)	(0.417)	(0.418)	(0.366)	(0.363)	(0.196)	(0.174)
(Log of permanent employment)$_{1993}$			1.500***	1.905**	-1.659**	-0.744	1.572*	2.132*
			(0.465)	(0.780)	(0.725)	(0.797)	(0.874)	(1.125)
(Log of temporary employment)$_{1993}$			0.166	0.249	-0.069	0.025	-4.183***	-4.135***
			(0.319)	(0.351)	(0.320)	(0.362)	(0.347)	(0.401)
Observations	180	164	177	162	177	162	177	162
R-squared	0.141	0.130	0.210	0.201	0.242	0.221	0.610	0.589

Notes: $\Delta L_{j,t}$ is 100 times the annual log change in employment in industry j over the time period, $\Delta L_{j,t}^{permanent}$ is 100 times the annual log change in permanent employment in industry j over the time period, and $\Delta L_{j,t}^{temporary}$ is 100 times the annual log change in temporary employment in industry j over the time period. We run the regressions exluding the Electric and Electronic sector in columns (2), (4), (6), and (8), denoted by "w/o". Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 9: The impacts of China Syndrome on mean wage, 1993-2013

Dependent variable:	100 × annual log change in mean wage, $\Delta W_{j,t}^{mean}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS					
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	0.043***	0.033***	0.028***	0.029***	0.015**	
	(0.014)	(0.008)	(0.007)	(0.007)	(0.006)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	-0.062***	-0.053***	-0.046***	-0.055***		-0.047***
	(0.008)	(0.007)	(0.014)	(0.011)		(0.009)
(Export-shipment ratio)$_{1993}$		4.798	3.226*	3.001*	3.581*	3.253*
		(3.265)	(1.832)	(1.767)	(1.994)	(1.771)
(Import penetration ratio)$_{1993}$		-0.840	-0.531	-0.613	-2.557**	-0.981*
		(0.779)	(0.377)	(0.381)	(1.060)	(0.521)
(Log of establishment)$_{1993}$			-0.249**	-0.169**	-0.188***	-0.193**
			(0.111)	(0.077)	(0.071)	(0.083)
(Log of employment)$_{1993}$			0.278	0.315**	0.186	0.293*
			(0.203)	(0.155)	(0.195)	(0.157)
(Log of mean wage)$_{1993}$			-0.067	-0.157	-0.103	-0.201
			(0.549)	(0.535)	(0.530)	(0.569)
(Log of shipment)$_{1990}$				0.005	0.021	-0.037
				(0.160)	(0.146)	(0.161)
(Log of domestic absorption)$_{1990}$				-0.116	-0.023	-0.091
				(0.105)	(0.114)	(0.107)
(Log of Herfindahl index)$_{1993}$				0.123***	0.116***	0.118**
				(0.047)	(0.042)	(0.046)
Observations	180	180	180	180	180	180
R-squared	0.158	0.265	0.397	0.421	0.377	0.415

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 10: The impacts of China Syndrome on mean wage, 1993-2013:
2SLS vs. OLS Estimates

Dependent variable:	100 × annual log change in mean wage, $\Delta W_{j,t}^{mean}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:		2SLS			OLS	
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	0.029***	0.015**		0.014***	0.002	
	(0.007)	(0.006)		(0.003)	(0.002)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	-0.055***		-0.047***	-0.043***		-0.030**
	(0.011)		(0.009)	(0.008)		(0.012)
(Export-shipment ratio)$_{1993}$	3.001*	3.581*	3.253*	3.167	3.625	3.369*
	(1.767)	(1.994)	(1.771)	(1.860)	(2.068)	(1.887)
(Import penetration ratio)$_{1993}$	-0.613	-2.557**	-0.981*	-1.100*	-2.613**	-1.589
	(0.381)	(1.060)	(0.521)	(0.610)	(1.104)	(0.920)
(Log of establishment)$_{1993}$	-0.169**	-0.188***	-0.193**	-0.196**	-0.212**	-0.207**
	(0.077)	(0.071)	(0.083)	(0.079)	(0.080)	(0.081)
(Log of employment)$_{1993}$	0.315**	0.186	0.293*	0.291	0.191	0.258
	(0.155)	(0.195)	(0.157)	(0.175)	(0.206)	(0.179)
(Log of mean wage)$_{1993}$	-0.157	-0.103	-0.201			
	(0.535)	(0.530)	(0.569)			
(Log of shipment)$_{1990}$	0.005	0.021	-0.037	-0.015	-0.003	-0.028
	(0.160)	(0.146)	(0.161)	(0.169)	(0.156)	(0.169)
(Log of domestic absorption)$_{1990}$	-0.116	-0.023	-0.091	-0.092	-0.020	-0.066
	(0.105)	(0.114)	(0.107)	(0.109)	(0.121)	(0.113)
(Log of Herfindahl index)$_{1993}$	0.123***	0.116***	0.118**	0.120**	0.115**	0.117**
	(0.047)	(0.042)	(0.046)	(0.046)	(0.043)	(0.045)
(Log of median wage)$_{1993}$				-0.348	-0.309	-0.342
				(0.438)	(0.428)	(0.442)
Observations	180	180	180	180	180	180
R-squared	0.421	0.377	0.415	0.445	0.400	0.429

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 11: The impacts of China Syndrome on median wage, 1993-2013

Dependent variable:	100 × annual log change in median wage, $\Delta W_{j,t}^{median}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS					
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	0.050***	0.038***	0.032***	0.033***	0.013*	
	(0.016)	(0.010)	(0.008)	(0.008)	(0.007)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	-0.093***	-0.079***	-0.069***	-0.079***		-0.070***
	(0.008)	(0.007)	(0.018)	(0.014)		(0.011)
(Export-shipment ratio)$_{1993}$		5.574	3.803**	3.514**	4.356**	3.802**
		(3.567)	(1.826)	(1.760)	(2.090)	(1.733)
(Import penetration ratio)$_{1993}$		-1.386*	-1.071***	-1.160***	-3.961***	-1.574***
		(0.837)	(0.400)	(0.419)	(1.412)	(0.559)
(Log of establishment)$_{1993}$			-0.319***	-0.270***	-0.299***	-0.294***
			(0.124)	(0.094)	(0.091)	(0.097)
(Log of employment)$_{1993}$			0.299	0.344**	0.158	0.316**
			(0.198)	(0.149)	(0.212)	(0.152)
(Log of median wage)$_{1993}$			-0.790	-0.891	-0.816	-0.901
			(0.553)	(0.569)	(0.587)	(0.580)
(Log of shipment)$_{1990}$				0.004	0.028	-0.044
				(0.216)	(0.191)	(0.217)
(Log of domestic absorption)$_{1990}$				-0.124	0.009	-0.095
				(0.156)	(0.178)	(0.158)
(Log of Herfindahl index)$_{1993}$				0.089*	0.079*	0.084
				(0.054)	(0.042)	(0.052)
Observations	180	180	180	180	180	180
R-squared	0.282	0.385	0.505	0.517	0.460	0.509

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 12: The impacts of China Syndrome on quantiles of log wages, 1993-2013

Dependent variable:	q(10)	q(20)	q(30)	q(40)	q(50)	q(60)	q(70)	q(80)	q(90)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Method:					2SLS				
100 × annual log Δ in Korea's export	0.059***	0.051***	0.037***	0.035***	0.033***	0.032***	0.029***	0.024***	0.015**
expansion to China, $\Delta EX_{j,t}$	(0.014)	(0.012)	(0.010)	(0.008)	(0.008)	(0.008)	(0.007)	(0.006)	(0.007)
100 × annual log Δ in Korea's import	-0.170***	-0.121***	-0.097***	-0.093***	-0.079***	-0.073***	-0.052***	-0.033**	-0.004
exposure from China, $\Delta IP_{j,t}$	(0.013)	(0.011)	(0.013)	(0.013)	(0.014)	(0.014)	(0.017)	(0.013)	(0.011)
$(\text{Export-shipment ratio})_{1993}$	1.433	2.780	2.963	2.916*	3.514**	3.930*	4.397*	3.313**	2.104*
	(2.445)	(1.975)	(1.831)	(1.675)	(1.760)	(2.025)	(2.552)	(1.585)	(1.179)
$(\text{Import penetration ratio})_{1993}$	0.975	0.323	-0.615	-0.643	-1.160***	-1.318***	-1.589***	-0.757*	-0.632**
	(0.774)	(0.548)	(0.403)	(0.391)	(0.419)	(0.468)	(0.565)	(0.398)	(0.316)
$(\text{Log of establishment})_{1993}$	-0.069	-0.274***	-0.302***	-0.274***	-0.270***	-0.255**	-0.262**	-0.146*	-0.040
	(0.116)	(0.095)	(0.093)	(0.088)	(0.094)	(0.107)	(0.133)	(0.079)	(0.067)
$(\text{Log of employment})_{1993}$	0.098	0.336***	0.351**	0.363***	0.344**	0.379**	0.436**	0.307*	0.249
	(0.134)	(0.112)	(0.154)	(0.138)	(0.149)	(0.156)	(0.211)	(0.179)	(0.167)
$(\text{Log of median wage})_{1993}$	0.415	-0.040	-0.647	-0.753	-0.891	-0.913*	-0.707	-0.311	0.042
	(0.636)	(0.701)	(0.632)	(0.623)	(0.569)	(0.510)	(0.473)	(0.363)	(0.332)
$(\text{Log of shipment})_{1990}$	-0.431	-0.108	-0.036	-0.059	0.004	0.040	0.090	0.097	0.065
	(0.271)	(0.234)	(0.262)	(0.235)	(0.216)	(0.185)	(0.204)	(0.154)	(0.131)
$(\text{Log of domestic absorption})_{1990}$	0.318	-0.046	-0.131	-0.101	-0.124	-0.177	-0.217	-0.189*	-0.145
	(0.231)	(0.146)	(0.182)	(0.161)	(0.156)	(0.122)	(0.164)	(0.111)	(0.107)
$(\text{Log of Herfindahl index})_{1993}$	0.145	0.105	0.098*	0.098*	0.089*	0.094**	0.128**	0.140**	0.165**
	(0.090)	(0.067)	(0.056)	(0.053)	(0.054)	(0.046)	(0.062)	(0.067)	(0.065)
Observations	180	180	180	180	180	180	180	180	180
R-squared	0.541	0.515	0.503	0.511	0.517	0.483	0.435	0.329	0.199

Notes: q(u) is 100 times the annual log change in u-th quantile wage in industry j over the time period. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 13: The impacts of China Syndrome on market concentration, 1993-2013

Dependent variable:	100 × annual log change in market concentration, $\Delta H_{j,t}^{emp}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS					
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	-0.148***	-0.151***	-0.146***	-0.158***	-0.117**	
	(0.046)	(0.055)	(0.047)	(0.047)	(0.046)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	0.231***	0.179***	0.187***	0.162***		0.118***
	(0.025)	(0.031)	(0.042)	(0.046)		(0.043)
(Export-shipment ratio)$_{1993}$		12.614*	15.558**	12.049*	10.320	10.676
		(7.463)	(7.645)	(6.627)	(7.311)	(7.364)
(Import penetration ratio)$_{1993}$		6.690*	5.899*	4.745	10.499**	6.718*
		(3.740)	(3.510)	(2.890)	(4.807)	(3.627)
(Log of establishment)$_{1993}$			0.343	-1.279*	-1.219*	-1.164*
			(0.317)	(0.663)	(0.629)	(0.629)
(Log of employment)$_{1993}$			-0.802*	-0.633	-0.251	-0.499
			(0.474)	(0.476)	(0.591)	(0.497)
(Log of median wage)$_{1993}$			-2.594*	-2.974**	-3.128**	-2.925**
			(1.539)	(1.440)	(1.515)	(1.401)
(Log of shipment)$_{1990}$				1.499**	1.449**	1.727**
				(0.680)	(0.654)	(0.730)
(Log of domestic absorption)$_{1990}$				-1.927***	-2.200***	-2.066***
				(0.720)	(0.795)	(0.732)
(Log of Herfindahl index)$_{1993}$				-1.807***	-1.785***	-1.781***
				(0.574)	(0.575)	(0.607)
Observations	180	180	180	180	180	180
R-squared	0.118	0.142	0.177	0.323	0.308	0.312

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 14: The impacts of China Syndrome on market concentration, 1993-2013: 2SLS vs. OLS Estimates

Dependent variable:	100 × annual log change in market concentration, $\Delta H_{j,t}^{emp}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2SLS			OLS		
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	-0.158***	-0.117**		-0.087**	-0.052**	
	(0.047)	(0.046)		(0.030)	(0.019)	
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	0.162***		0.118***	0.131**		0.049
	(0.046)		(0.043)	(0.057)		(0.073)
(Export-shipment ratio)$_{1993}$	12.049*	10.320	10.676	11.328	9.917	10.046
	(6.627)	(7.311)	(7.364)	(7.310)	(7.990)	(7.925)
(Import penetration ratio)$_{1993}$	4.745	10.499**	6.718*	6.026*	10.684*	9.126
	(2.890)	(4.807)	(3.627)	(3.317)	(5.038)	(5.625)
(Log of establishment)$_{1993}$	-1.279*	-1.219*	-1.164*	-1.225*	-1.175	-1.151
	(0.663)	(0.629)	(0.629)	(0.685)	(0.664)	(0.653)
(Log of employment)$_{1993}$	-0.633	-0.251	-0.499	-0.547	-0.237	-0.340
	(0.476)	(0.591)	(0.497)	(0.559)	(0.634)	(0.575)
(Log of median wage)$_{1993}$	-2.974**	-3.128**	-2.925**	-2.965*	-3.087*	-3.002*
	(1.440)	(1.515)	(1.401)	(1.501)	(1.546)	(1.480)
(Log of shipment)$_{1990}$	1.499**	1.449**	1.727**	1.593*	1.557**	1.677**
	(0.680)	(0.654)	(0.730)	(0.733)	(0.706)	(0.749)
(Log of domestic absorption)$_{1990}$	-1.927***	-2.200***	-2.066***	-2.007**	-2.229**	-2.175**
	(0.720)	(0.795)	(0.732)	(0.786)	(0.848)	(0.830)
(Log of Herfindahl index)$_{1993}$	-1.807***	-1.785***	-1.781***	-1.794**	-1.776**	-1.774**
	(0.574)	(0.575)	(0.607)	(0.627)	(0.632)	(0.640)
Observations	180	180	180	180	180	180
R-squared	0.323	0.308	0.312	0.339	0.325	0.317

Notes: Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 15: The impacts of China Syndrome on market concentration, top 3 share, top 5 share, and top 10 share, 1993-2013

Dependent variable:	$\Delta H_{j,t}^{emp}$	$\Delta T_{j,t}^{3,emp}$	$\Delta T_{j,t}^{5,emp}$	$\Delta T_{j,t}^{10,emp}$
	(1)	(2)	(3)	(4)
Method:	2SLS			
100 × annual log Δ in Korea's export expansion to China, $\Delta EX_{j,t}$	-0.158***	-0.101***	-0.102***	-0.093***
	(0.047)	(0.027)	(0.027)	(0.027)
100 × annual log Δ in Korea's import exposure from China, $\Delta IP_{j,t}$	0.162***	0.151***	0.149***	0.131***
	(0.046)	(0.036)	(0.032)	(0.029)
(Export-shipment ratio)$_{1993}$	12.049*	7.376	6.845	5.686*
	(6.627)	(5.204)	(4.266)	(3.175)
(Import penetration ratio)$_{1993}$	4.745	2.712*	2.438*	2.496*
	(2.890)	(1.604)	(1.398)	(1.384)
(Log of establishment)$_{1993}$	-1.279*	-0.842	-0.757*	-0.603*
	(0.663)	(0.522)	(0.411)	(0.323)
(Log of employment)$_{1993}$	-0.633	-0.480*	-0.493*	-0.468**
	(0.476)	(0.289)	(0.256)	(0.227)
(Log of median wage)$_{1993}$	-2.974**	-2.375**	-1.978**	-1.535*
	(1.440)	(0.962)	(0.856)	(0.796)
(Log of shipment)$_{1990}$	1.499**	1.283***	1.137***	0.958***
	(0.680)	(0.437)	(0.388)	(0.335)
(Log of domestic absorption)$_{1990}$	-1.927***	-1.475***	-1.334***	-1.181***
	(0.720)	(0.463)	(0.398)	(0.376)
(Log of Herfindahl index)$_{1993}$	-1.807***	-0.840**	-0.762**	-0.625*
	(0.574)	(0.405)	(0.378)	(0.330)
Observations	180	180	180	180
R-squared	0.323	0.260	0.267	0.262

Notes: $\Delta H_{j,t}^{emp}$ is 100 times the annual log change in the Herfindahl index (based on employment) in industry j over the time period and $\Delta T_{j,t}^{\phi,emp}$ is 100 times the annual log change in Top ϕ share in industry j over the time period. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 16: Robustness Check: The impacts of China Syndrome on establishment, employment, wage, and market concentration with and without electric and electronic machinary sectors, 1993-2013

Dependent variable:	$\Delta EST_{j,t}$		$\Delta L_{j,t}$		$\Delta W_{j,t}^{median}$		$\Delta H_{j,t}^{emp}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industries:	All	w/o	All	w/o	All	w/o	All	w/o
Method:	2SLS							
100 × annual log Δ in Korea's export	0.137***	0.130**	0.183***	0.215**	0.033***	0.029***	-0.158***	-0.169**
expansion to China, $\Delta EX_{j,t}$	(0.043)	(0.060)	(0.059)	(0.096)	(0.008)	(0.010)	(0.047)	(0.078)
100 × annual log Δ in Korea's import	-0.067***	-0.078***	0.004	-0.015	-0.079***	-0.082***	0.162***	0.154***
exposure from China, $\Delta IP_{j,t}$	(0.025)	(0.024)	(0.061)	(0.057)	(0.014)	(0.014)	(0.046)	(0.046)
(Export-shipment ratio)$_{1993}$	-9.606***	-9.323***	-5.062	-5.601	3.514**	3.556**	12.049*	12.798*
	(3.339)	(3.473)	(6.288)	(6.259)	(1.760)	(1.716)	(6.627)	(6.737)
(Import penetration ratio)$_{1993}$	-5.644**	-5.410**	-10.324**	-10.354**	-1.160***	-1.139***	4.745	4.429
	(2.497)	(2.345)	(4.210)	(4.205)	(0.419)	(0.440)	(2.890)	(3.056)
(Log of establishment)$_{1993}$	-0.620*	-0.606*	0.398	0.554	-0.270***	-0.251***	-1.279*	-0.884
	(0.328)	(0.351)	(0.596)	(0.553)	(0.094)	(0.095)	(0.663)	(0.554)
(Log of employment)$_{1993}$	-0.514	-0.477	-0.859	-0.713	0.344**	0.347**	-0.633	-0.527
	(0.324)	(0.343)	(1.188)	(1.181)	(0.149)	(0.153)	(0.476)	(0.478)
(Log of median wage)$_{1993}$	0.052	0.359	2.885	2.659	-0.891	-0.796	-2.974**	-3.330**
	(1.165)	(1.300)	(2.544)	(2.747)	(0.569)	(0.660)	(1.440)	(1.479)
(Log of shipment)$_{1990}$	-1.564***	-1.697***	-1.144	-1.398	0.004	-0.005	1.499**	1.319*
	(0.470)	(0.461)	(0.995)	(0.981)	(0.216)	(0.211)	(0.680)	(0.679)
(Log of domestic absorption)$_{1990}$	1.354***	1.378***	1.107	1.242	-0.124	-0.136	-1.927***	-1.678**
	(0.389)	(0.393)	(1.112)	(1.072)	(0.156)	(0.145)	(0.720)	(0.747)
(Log of Herfindahl index)$_{1993}$	-0.785**	-0.817**	-0.339	-0.125	0.089*	0.101*	-1.807***	-1.304***
	(0.310)	(0.330)	(0.325)	(0.272)	(0.054)	(0.060)	(0.574)	(0.373)
Observations	180	164	180	164	180	164	180	164
R-squared	0.256	0.269	0.141	0.130	0.517	0.532	0.323	0.272

Notes: $\Delta EST_{j,t}$ is 100 times the annual log change in establishment in industry j over the time period, $\Delta L_{j,t}$ is 100 times the annual log change in employeement in industry j over the time period, $\Delta W_{j,t}^{median}$ is 100 times the annual log change in median wage in industry j over the time period, $\Delta H_{j,t}^{emp}$ is 100 times the annual log change in the Herfindahl index (based on employment) in industry j over the time period. We run the regressions exluding the Electric and Electronic sector in columns (2), (4), (6), and (8), denoted by "w/o". Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table 17: Robustness Check: The impacts of China Syndrome on market concentration with alternative measures, 1993-2013

Dependent variable:	$\Delta H_{j,t}^{emp}$	$\Delta H_{j,t}^{sales}$	$\Delta T_{j,t}^{5,sales}$	$\Delta T_{j,t}^{10,sales}$	$\Delta H_{j,t}^{va}$	$\Delta T_{j,t}^{5,va}$	$\Delta T_{j,t}^{10,va}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Method:				2SLS			
100 × annual log Δ in Korea's export	-0.158***	-0.091**	-0.043**	-0.043**	-0.070**	-0.044***	-0.042**
expansion to China, $\Delta EX_{j,t}$	(0.047)	(0.040)	(0.020)	(0.019)	(0.032)	(0.017)	(0.017)
100 × annual log Δ in Korea's import	0.162***	0.103**	0.067**	0.080***	0.092*	0.065***	0.068***
exposure from China, $\Delta IP_{j,t}$	(0.046)	(0.050)	(0.029)	(0.027)	(0.048)	(0.025)	(0.021)
(Export-shipment ratio)$_{1993}$	12.049*	8.778***	4.068**	3.084*	9.370***	3.386	2.839
	(6.627)	(2.495)	(1.740)	(1.809)	(2.275)	(2.131)	(2.003)
(Import penetration ratio)$_{1993}$	4.745	13.155***	5.193**	4.109**	9.347**	4.045	3.672
	(2.890)	(4.493)	(2.255)	(2.013)	(4.649)	(2.708)	(2.253)
(Log of establishment)$_{1993}$	-1.279*	-1.054	-0.565*	-0.426*	-1.161*	-0.647**	-0.421*
	(0.663)	(0.660)	(0.316)	(0.254)	(0.662)	(0.322)	(0.244)
(Log of employment)$_{1993}$	-0.633	-0.385	-0.058	-0.152	-0.280	-0.066	-0.107
	(0.476)	(0.318)	(0.202)	(0.161)	(0.352)	(0.154)	(0.122)
(Log of median wage)$_{1993}$	-2.974**	-2.324*	-1.897**	-1.756**	-4.325***	-3.077***	-2.322***
	(1.440)	(1.215)	(0.797)	(0.726)	(1.481)	(0.952)	(0.769)
(Log of shipment)$_{1990}$	1.499**	1.573**	1.034***	0.929***	1.395	0.933*	0.895**
	(0.680)	(0.708)	(0.348)	(0.265)	(1.075)	(0.517)	(0.403)
(Log of domestic absorption)$_{1990}$	-1.927***	-1.787**	-1.168**	-0.981***	-1.503	-0.975*	-0.905**
	(0.720)	(0.811)	(0.463)	(0.340)	(1.079)	(0.554)	(0.432)
(Log of Herfindahl index)$_{1993}$	-1.807***	-1.560***	-0.640**	-0.467**	-1.586**	-0.648**	-0.449*
	(0.574)	(0.548)	(0.263)	(0.213)	(0.631)	(0.291)	(0.233)
Observations	180	180	180	180	180	180	180
R-squared	0.323	0.342	0.317	0.329	0.270	0.261	0.283

Notes: $\Delta H_{j,t}^{emp}$ is 100 times the annual log change in the Herfindahl index (based on employment) in industry j over the time period, $\Delta H_{j,t}^{sales}$ is 100 times the annual log change in the Herfindahl index (based on sales) in industry j over the time period, $\Delta H_{j,t}^{va}$ is 100 times the annual log change in the Herfindahl index (based on value added) in industry j over the time period, and $\Delta T_{j,t}^{\phi}$ is 100 times the annual log change in Top ϕ share in industry j over the time period. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

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Appendix

A Econometric Issues of Invalid Instruments

A.1 Estimation with Invalid Instruments

Standard methods of evaluating the labor market impacts of the China Syndrome may cause some problems, particularly if the analysis rests only on import or export shocks. Suppose, for example, that one runs the following reduced-form and first-stage regression equations omitting the export-expansion shock, as in Acemoglu, Autor, Dorn, Hanson and Price (2016):

$$\Delta Y_{j,t} = \pi_0 + \pi_1 \Delta IPO_{j,t} + \pi_3 IP_{j,0} + \pi_4 EX_{j,0} + X'_{j,0}\pi_5 + \varepsilon_{j,t}$$
$$\Delta IP_{j,t} = \gamma_0 + \gamma_1 \Delta IPO_{j,t} + \gamma_3 IP_{j,0} + \gamma_4 EX_{j,0} + X'_{j,0}\gamma_5 + \epsilon_{j,t}.$$

If $Cov(\Delta IPO_{j,t}, \epsilon_{j,t}) = 0$ and $Cov(\Delta IPO_{j,t}, \varepsilon_{j,t}) = 0$, then,

$$\beta_1 = \frac{\pi_1}{\gamma_1} = \frac{Cov(\Delta Y_{j,t}, \widetilde{\Delta IPO_{j,t}})}{Cov(\Delta IP_{j,t}, \widetilde{\Delta IPO_{j,t}})}$$

where $\widetilde{\Delta IPO_{j,t}}$ is the residual from a regression of $\Delta IPO_{j,t}$ on $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$. Using a sample analogue of β_1, we can consistently estimate the impact of import competition from China on labor market outcomes if the instrument satisfies the exclusion restriction.

However, suppose that industries with more import competition from China simultaneously export more to China. Then the above estimation strategy will yield a biased estimate of the import competition from China. Algebraically, this is equivalent to $Cov(\Delta IPO_{j,t}, \Delta EXO_{j,t}) > 0$. In the U.S. case, the trade deficit with China is high, and sectors that import more from China do not necessarily export more to China. Hence, even without an export-expansion shock such as U.S. exports to China, one may still consistently estimate the impact of Chinese import competition on employment, the number of establishments, wages, and the Herfindahl index, respectively, in industry j over the time period.

On the contrary, even though Korea's imports and import share from China increased significantly during the period 1992–2013, Korea's exports and export share *to* China far outweighed

imports and the import share *from* China (see Table 1). Moreover, the composition of Korea's exports to China is mainly capital and intermediate goods (see Table 2). Hence, industries that experience more import competition from China are more likely to be ones that export more to China through the East Asian value chain (see Figure 2). Therefore, omitting the export-expansion shock biases the coefficient of import competition on labor market outcomes. More importantly, a quantitative analysis based only on import competition might not show the total impact of the China Syndrome because the export-expansion shock is omitted, which could be substantial in the case of South Korea.

To be concrete, suppose that $Cov(\Delta IPO_{j,t}, \epsilon_{j,t}) \neq 0$ and $Cov(\Delta IPO_{j,t}, \varepsilon_{j,t}) \neq 0$ where $\epsilon_{j,t} = \gamma_2 \Delta EXO_{j,t} + v_{j,t}$ and $\varepsilon_{j,t} = \pi_2 \Delta EXO_{j,t} + \zeta_{j,t}$. Then, the biases of π_1 and γ_1 can be expressed as follows:

$$\widehat{\pi_1} - \pi_1 = \pi_2 \frac{Cov(\Delta EXO_{j,t}, \widetilde{\Delta IPO_{j,t}})}{Cov(\Delta IPO_{j,t}, \widetilde{\Delta IPO_{j,t}})} = \pi_2 \frac{Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}})}{Var(\widetilde{\Delta IPO_{j,t}})}$$

$$\widehat{\gamma_1} - \gamma_1 = \gamma_2 \frac{Cov(\Delta EXO_{j,t}, \widetilde{\Delta IPO_{j,t}})}{Cov(\Delta IPO_{j,t}, \widetilde{\Delta IPO_{j,t}})} = \gamma_2 \frac{Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}})}{Var(\widetilde{\Delta IPO_{j,t}})}.$$

where $\widetilde{\Delta EXO_{j,t}}$ is the residual from a regression of $\Delta EXO_{j,t}$ on $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$. The bias $(\widehat{\beta_1} - \beta_1)$ comes from two sources: the first-stage equation and the reduced-form regression.

It is instructive to note that we can predict the direction of the bias of an estimator. Suppose that we do not add the export expansion shock and the $Cov(\Delta IPO_{j,t}, \epsilon_{j,t}) \neq 0$ and $Cov(\Delta IPO_{j,t}, \varepsilon_{j,t}) \neq 0$ where $\epsilon_{j,t} = \gamma_2 \Delta EXO_{j,t} + v_{j,t}$ and $\varepsilon_{j,t} = \pi_2 \Delta EXO_{j,t} + \zeta_{j,t}$. Then, the coefficient of import competition from China under-estimates the true parameter if $\pi_1 < 0$, $\gamma_1 > 0$, $\pi_2 > 0$, $\gamma_2 > 0$, and $Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}}) > 0$.[47] These restrictions suggest that the export shock has a positive impact on an outcome variable, the import shock has a negative impact on an outcome variable, the export instrument is positively correlated with the export shock, the import instrument is positively correlated with the import shock, and the correlation between the export instrument and the import instrument is positive, all of which is consistent with the context of our study. Under the above assumption, the coefficient of Chinese import competition underestimates the true

[47] π_1 is the coefficient of the impact of import competition shock on the outcome variable in the reduced-form regression. γ_1 is the coefficient of the impact of import competition shock on the observed change in import competition in the first-stage regression. π_2 is the coefficient of the impact of export expansion on the outcome variable in the reduced-form regression. γ_2 is the coefficient of the impact of export expansion shock on the observed change in import competition in the first-stage regression.

magnitude.[48]

A.2 Estimation with Omitted Variables

We delve deeper into the sources of the underestimation problem. Suppose that the model in equation (1) satisfies $Cov(\Delta IP_{j,t}, u_{j,t}) = 0$ and $Cov(\Delta EX_{j,t}, u_{j,t}) = 0$. This assumption implies that we can obtain consistent estimates using the OLS method. If we omit either $\Delta EX_{j,t}$ or $\Delta IP_{j,t}$ and run the OLS estimation, then the biases of β_1 and β_2 can be expressed as follows:

$$\widehat{\beta_1} - \beta_1 = \beta_2 \frac{Cov(\widetilde{\Delta EX_{j,t}}, \widetilde{\Delta IP_{j,t}})}{Var(\widetilde{\Delta IP_{j,t}})} \quad \text{and} \quad \widehat{\beta_2} - \beta_2 = \beta_1 \frac{Cov(\widetilde{\Delta EX_{j,t}}, \widetilde{\Delta IP_{j,t}})}{Var(\widetilde{\Delta EX_{j,t}})}$$

where $\widetilde{\Delta IP_{j,t}}$ is the residual from a regression of $\Delta IP_{j,t}$ on $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$ and $\widetilde{\Delta EX_{j,t}}$ is the residual from a regression of $\Delta EX_{j,t}$ on $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$. As in the previous case, OLS coefficients under-estimate the magnitude of true parameters if $\beta_1 < 0$, $\beta_2 > 0$, and $Cov(\widetilde{\Delta EX_{j,t}}, \widetilde{\Delta IP_{j,t}}) > 0$. The restrictions suggest that the import shock has a negative impact on an outcome variable, the export shock has a positive impact on an outcome variable, and the correlation between the export shock and import shock is positive, all of which is consistent with the context of our study.[49]

[48] In the following empirical result section, we confirm the direction of biases and also uncover exact magnitudes of biases in Tables 5, 7, 10, and 14. We also show that the case of omission of the import competition shock generates under-estimation problem. Suppose that the import competition shock is included but the export expansion shock is not included:

$$\Delta Y_{j,t} = \pi_0 + \pi_2 \Delta EXO_{j,t} + \pi_3 IP_{j,0} + \pi_4 EX_{j,0} + X'_{j,0}\pi_5 + \varepsilon_{j,t}$$
$$\Delta EX_{j,t} = \gamma_0 + \gamma_2 \Delta EXO_{j,t} + \gamma_3 IP_{j,0} + \gamma_4 EX_{j,0} + X'_{j,0}\gamma_5 + \epsilon_{j,t}.$$

If $Cov(\Delta EXO_{j,t}, \epsilon_{j,t}) = 0$ and $Cov(\Delta EXO_{j,t}, \varepsilon_{j,t}) = 0$, then,

$$\beta_2 = \frac{\pi_2}{\gamma_2} = \frac{Cov(\Delta Y_{j,t}, \widetilde{\Delta EXO_{j,t}})}{Cov(\Delta EX_{j,t}, \widetilde{\Delta EXO_{j,t}})}$$

where $\widetilde{\Delta EXO_{j,t}}$ is the residual from a regression of $\Delta EXO_{j,t}$ on $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$. Assume that $Cov(\Delta EXO_{j,t}, \epsilon_{j,t}) \neq 0$ and $Cov(\Delta EXO_{j,t}, \varepsilon_{j,t}) \neq 0$ where $\epsilon_{j,t} = \gamma_1 \Delta IPO_{j,t} + v_{j,t}$ and $\varepsilon_{j,t} = \pi_1 \Delta IPO_{j,t} + \zeta_{j,t}$. Then, the biases of π_2 and γ_2 can be expressed as follows:

$$\widehat{\pi_2} - \pi_2 = \pi_1 \frac{Cov(\Delta IPO_{j,t}, \widetilde{\Delta EXO_{j,t}})}{Cov(\Delta EXO_{j,t}, \widetilde{\Delta EXO_{j,t}})} = \pi_1 \frac{Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}})}{Var(\widetilde{\Delta EXO_{j,t}})}$$

$$\widehat{\gamma_2} - \gamma_2 = \gamma_1 \frac{Cov(\Delta IPO_{j,t}, \widetilde{\Delta EXO_{j,t}})}{Cov(\Delta EXO_{j,t}, \widetilde{\Delta EXO_{j,t}})} = \gamma_1 \frac{Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}})}{Var(\widetilde{\Delta EXO_{j,t}})}.$$

Suppose that $\pi_1 < 0$, $\gamma_1 > 0$, $\pi_2 > 0$, $\gamma_2 > 0$, and $Cov(\widetilde{\Delta EXO_{j,t}}, \widetilde{\Delta IPO_{j,t}}) > 0$. Again, the absolute value of numerator of β_2 is underestimated while the absolute value of denominator of β_2 is overestimated, which lead to the underestimation of magnitude of the export expansion shock.

[49] We also confirm the direction of biases and show the exact magnitudes of the biases in Tables 5, 7, 10, and 14.

Hence, the problem of underestimation does not appear to originate from the estimation method because both the OLS and 2SLS yield the same problem. The underestimation problem arises from the omitted variable problem (or the invalid instrument problem).

A.3 Estimation Methods: 2SLS vs. OLS

Last, we study the case in which both the export-expansion shock and the import-competition shock enter the equation and compare the 2SLS and the OLS methods. To this end, suppose that we estimate the equation (1) using OLS instead of 2SLS. Then biases of β_1 and β_2 can be expressed as:

$$\widehat{\beta}_1 - \beta_1 = \frac{Cov(\widetilde{\Delta IP_{j,t}}, u_{j,t})}{Var(\widetilde{\Delta IP_{j,t}})} \quad \text{and} \quad \widehat{\beta}_2 - \beta_2 = \frac{Cov(\widetilde{\Delta EX_{j,t}}, u_{j,t})}{Var(\widetilde{\Delta EX_{j,t}})}$$

where $\widetilde{\Delta IP_{j,t}}$ is the residual from a regression of $\Delta IP_{j,t}$ on $\Delta EX_{j,t}$, $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$ and $\widetilde{\Delta EX_{j,t}}$ is the residual from a regression of $\Delta EX_{j,t}$ on $\Delta IP_{j,t}$, $IP_{j,0}$, $EX_{j,0}$, and $X_{j,0}$. In this case, the biases depend on signs of $Cov(\widetilde{\Delta IP_{j,t}}, u_{j,t})$ and $Cov(\widetilde{\Delta EX_{j,t}}, u_{j,t})$. Because an unexplained error term is not observed until we run a regression, the direction of biases cannot be predicted ex ante.

B Intersector Linkages

We investigate the effects of the import-competition shock and the export-expansion shock on labor market outcomes by incorporating IO linkages. We use the 1990 IO table to measure upstream and downstream effects. Since China and South Korea had no official international trade before 1992, it is unlikely that the IO linkages in the year 1990 are endogenous to the impact of the China Syndrome shock. To measure IO linkages, we follow the methodology of Acemoglu, Autor, Dorn, Hanson and Price (2016),[50] and define the upstream effect of import competition for each industry j and its instrument as follows:

$$\Delta IP^U_{j,t} = \sum_g \omega^U_{gj} \Delta IP_{g,t} \quad \text{and} \quad \Delta IPO^U_{j,t} = \sum_g \omega^U_{gj} \Delta IPO_{g,t}$$

with weights ω^U_{gj} defined as

$$\omega^U_{gj} = \frac{\mu^U_{gj}}{\sum_{g'} \mu^U_{g'j}} \tag{3}$$

where μ^U_{gj} is the value of industry j's output purchased by industry g. ω^U_{gj} is the share of industry j's output that are used as inputs by industry g. Hence, $\Delta IP^U_{j,t}$ is the weighted average of the import competition by the purchasers of j's output. If purchasers of industry j's output face import competition, then they reduce demand for output j.[51]

We turn to construct downstream effect of import competition for each industry j and its instrument as follows:

$$\Delta IP^D_{j,t} = \sum_g \omega^D_{jg} \Delta IP_{g,t} \quad \text{and} \quad \Delta IPO^D_{j,t} = \sum_g \omega^D_{jg} \Delta IPO_{g,t}$$

[50] Note that the U.S. Bureau of Economic Analysis provides "supply" tables that capture the domestic supply of commodities by industry and "use" tables that capture the use of commodities by industry. In Korea, the 1990 IO tables provide a commodity-by-commodity matrix. We convert 1990 IO table commodity classifications to 2010 input-output table industry classifications.

[51] Similarly, we define the upstream effect of export expansion for each industry j and its instrument as follows:

$$\Delta EX^U_{j,t} = \sum_g \omega^U_{gj} \Delta EX_{g,t} \quad \text{and} \quad \Delta EXO^U_{j,t} = \sum_g \omega^U_{gj} \Delta EXO_{g,t}$$

where we use the same weights as in equation (3). If purchasers of industry j's output face export expansion, then they increase demand for output j.

with weights ω_{jg}^{D} defined as

$$\omega_{jg}^{D} = \frac{\mu_{jg}^{D}}{\sum_{g'} \mu_{jg'}^{D}} \tag{4}$$

where μ_{jg}^{D} is the value of industry g's output purchased by industry j. ω_{jg}^{D} is the share of industry g's output that are used as inputs by industry j. Hence, $\Delta IP_{j,t}^{D}$ is the weighted average of the import competition by the suppliers of j's input. If suppliers of industry j's input face import competition, then they reduce supply of input for industry j.[52]

Table B.1 provides pairwise correlations between direct, upstream, and downstream shocks. Correlations among export shock measures (import shock measures, respectively), which ranges from 0.49 to 0.61 (from 0.13 to 0.37, respectively), are all positive and statistically significant at the 10 percent level. Although the correlations between the different measures are all positive, the degrees of correlations do not appear to be substantial enough to worry about the issue of multicollinearity.

Table B.1: Pairwise correlations between direct, upstream, and downstream measures, 1993-2013

	$\Delta EXO_{j,t}$	$\Delta EXO_{j,t}^{U}$	$\Delta EXO_{j,t}^{D}$	$\Delta IPO_{j,t}$	$\Delta IPO_{j,t}^{U}$	$\Delta IPO_{j,t}^{D}$
$\Delta EXO_{j,t}$	1.00					
$\Delta EXO_{j,t}^{U}$	0.49	1.00				
	(0.00)					
$\Delta EXO_{j,t}^{D}$	0.61	0.57	1.00			
	(0.00)	(0.00)				
$\Delta IPO_{j,t}$	0.22	0.02	0.08	1.00		
	(0.00)	(0.77)	(0.27)			
$\Delta IPO_{j,t}^{U}$	0.14	0.26	0.14	0.23	1.00	
	(0.05)	(0.00)	(0.07)	(0.00)		
$\Delta IPO_{j,t}^{D}$	0.23	0.17	0.27	0.37	0.13	1.00
	(0.00)	(0.02)	(0.00)	(0.00)	(0.08)	

Notes: N=180. The table displays the pairwise correlation coefficients between direct, upstream, and downstream measures. The significance levels of correlation coefficients are in parenthesis.

Column 1 of Table B.2 reports estimates of the impact of the China Syndrome on the number of manufacturing establishments. Then, we analyze the upstream, downstream, and both effects

[52]Similarly, we define the downstream effect of export expansion for each industry j and its instrument as follows:

$$\Delta EX_{j,t}^{D} = \sum_{g} \omega_{jg}^{D} \Delta EX_{g,t} \quad \text{and} \quad \Delta EXO_{j,t}^{D} = \sum_{g} \omega_{jg}^{D} \Delta EXO_{g,t}$$

where we use the same weights as in equation (4). If suppliers of industry j's input face export expansion, then they increase supply of input for output j.

of the China Syndrome in columns 2,3, and 4, respectively. Although the signs of the coefficients are the same as in the direct measures, the downstream effects and upstream effects are not statistically significant.

Using upstream and downstream linkages, we identify the impact of the China Syndrome on the number of manufacturing employees. In Column 8 of Table B.2, we show that the direct impact of export expansion on manufacturing employment becomes statistically insignificant, while the upstream impact of export expansion on manufacturing employment is positive with statistical significance. Interestingly, the direct impact of import competition becomes positive, while the upstream and downstream effects are negative with statistical significance, which may suggest that the null impact of import competition on employment is confounded with direct (positive), upstream (negative), and downstream (negative) impacts.

Table B.3 provides more detailed results. We first separate total manufacturing employment into permanent and temporary workers. Then, we analyze whether the upstream and downstream effects of the China Syndrome on the number of permanent (and the number of temporary) employees are affected by the input-output linkages. From Columns 1 through 4 in Table B.3, the dependent variable is the number of permanent employees. In our benchmark case in Table 4, the export-creation shock has not only direct positive effects but also indirect, upstream and downstream, positive effects on the number of permanent employees. The direct effects of import competition on the number of permanent employees is positive, while the upstream and downstream effects are negative. From Columns 5 through 8 in Table B.3, we focus on the effects of intersector linkages created by the China Syndrome on the number of temporary employees. In our benchmark case in Table 8, the result indicates a direct positive impact of import competition, while other effects are not statistically significant.

Table B.2: The impacts of China Syndrome incorporating upstream and downstream linkages, 1993-2013

Dependent variable:	$\Delta EST_{j,t}$				$\Delta L_{j,t}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Method:	2SLS							
100 × annual log Δ in Korea's direct export expansion to China, $\Delta EX_{j,t}$	0.137***	0.113**	0.120**	0.105*	0.183***	0.092*	0.174**	0.106
	(0.043)	(0.056)	(0.054)	(0.056)	(0.059)	(0.049)	(0.078)	(0.071)
100 × annual log Δ in Korea's direct import exposure from China, $\Delta IP_{j,t}$	-0.067***	-0.064**	-0.068*	-0.064*	0.004	0.013	0.113***	0.128**
	(0.025)	(0.025)	(0.038)	(0.035)	(0.061)	(0.068)	(0.033)	(0.055)
100 × annual log Δ in Korea's upstream export expansion to China, $\Delta EX^U_{j,t}$		0.401		0.388		1.416*		1.555*
		(0.546)		(0.567)		(0.821)		(0.870)
100 × annual log Δ in Korea's upstream import exposure from China, $\Delta IP^U_{j,t}$		-0.547		-0.539		-1.490		-1.833*
		(0.641)		(0.647)		(1.073)		(1.055)
100 × annual log Δ in Korea's downstream export expansion to China, $\Delta EX^D_{j,t}$			0.119	0.070			0.439***	0.250
			(0.172)	(0.245)			(0.168)	(0.191)
100 × annual log Δ in Korea's downstream import exposure from China, $\Delta IP^D_{j,t}$			-0.024	-0.033			-2.226***	-2.269***
			(0.425)	(0.394)			(0.708)	(0.609)
(Export-shipment ratio)$_{1993}$	-9.606***	-9.930***	-9.882***	-10.097***	-5.062	-6.142	-7.566	-8.395
	(3.339)	(3.307)	(3.262)	(3.275)	(6.288)	(6.832)	(5.845)	(6.942)
(Import penetration ratio)$_{1993}$	-5.644**	-4.696	-5.525**	-4.652*	-10.324**	-7.466**	-10.607**	-7.470*
	(2.497)	(2.865)	(2.467)	(2.763)	(4.210)	(3.654)	(5.050)	(4.127)
(Log of establishment)$_{1993}$	-0.620*	-0.673*	-0.626*	-0.674*	0.398	0.211	0.409	0.214
	(0.328)	(0.366)	(0.325)	(0.366)	(0.596)	(0.631)	(0.631)	(0.674)
(Log of employment)$_{1993}$	-0.514	-0.458	-0.495	-0.448	-0.859	-0.689	-0.731	-0.561
	(0.324)	(0.300)	(0.338)	(0.314)	(1.188)	(1.162)	(1.189)	(1.156)
(Log of median wage)$_{1993}$	0.052	-0.305	-0.054	-0.349	2.885	1.430	2.739	1.409
	(1.165)	(1.084)	(1.267)	(1.191)	(2.544)	(2.039)	(2.425)	(2.128)
(Log of shipment)$_{1990}$	-1.564***	-1.633***	-1.547***	-1.624***	-1.144	-1.208	-0.962	-1.137
	(0.470)	(0.497)	(0.480)	(0.500)	(0.995)	(0.957)	(0.865)	(0.791)
(Log of domestic absorption)$_{1990}$	1.354***	1.385***	1.320***	1.367***	1.107	1.059	0.948	1.018
	(0.389)	(0.445)	(0.391)	(0.452)	(1.112)	(1.198)	(1.046)	(1.140)
(Log of Herfindahl index)$_{1993}$	-0.785**	-0.833**	-0.783**	-0.830**	-0.339	-0.496	-0.265	-0.444
	(0.310)	(0.357)	(0.309)	(0.360)	(0.325)	(0.309)	(0.340)	(0.319)
Observations	180	180	180	180	180	180	180	180
R-squared	0.256	0.259	0.268	0.265	0.141	0.162	0.116	0.124

Notes: $\Delta EST_{j,t}$ ($\Delta L_{j,t}$) is 100 times the annual log change in establishment (employment) in industry j over the time period. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.

Table B.3: The impacts of China Syndrome incorporating upstream and downstream linkages, 1993-2013

Dependent variable:	$\Delta L_{j,t}^{permanent}$					$\Delta L_{j,t}^{temporary}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Method:					2SLS			
100 × annual log Δ in Korea's direct	0.177***	0.110**	0.154***	0.109*	0.037	-0.000	-0.023	-0.042
export expansion to China, $\Delta EX_{j,t}$	(0.047)	(0.051)	(0.058)	(0.063)	(0.032)	(0.061)	(0.045)	(0.052)
100 × annual log Δ in Korea's direct	-0.042	-0.034	0.108**	0.128**	0.163***	0.169***	0.129**	0.139**
import exposure from China, $\Delta IP_{j,t}$	(0.058)	(0.066)	(0.049)	(0.065)	(0.038)	(0.049)	(0.051)	(0.055)
100 × annual log Δ in Korea's upstream		1.124		1.276*		0.742		0.648
export expansion to China, $\Delta EX_{j,t}^{U}$		(0.752)		(0.742)		(0.809)		(0.838)
100 × annual log Δ in Korea's upstream		-1.678		-2.282**		-1.519		-1.363
import exposure from China, $\Delta IP_{j,t}^{U}$		(1.083)		(0.975)		(1.313)		(1.325)
100 × annual log Δ in Korea's downstream			0.659***	0.515***			0.314**	0.240
export expansion to China, $\Delta EX_{j,t}^{D}$			(0.253)	(0.160)			(0.149)	(0.220)
100 × annual log Δ in Korea's downstream			-3.101***	-3.257***			0.590	0.506
import exposure from China, $\Delta IP_{j,t}^{D}$			(0.562)	(0.459)			(0.702)	(0.559)
(Export-shipment ratio)$_{1993}$	-5.563	-6.702	-9.451	-10.646	-10.226**	-11.062***	-10.408**	-11.057**
	(6.459)	(6.878)	(6.042)	(6.876)	(4.095)	(4.226)	(4.526)	(4.605)
(Import penetration ratio)$_{1993}$	-8.337***	-5.771**	-8.920**	-5.845*	-6.881***	-4.782***	-6.326***	-4.566***
	(2.642)	(2.272)	(3.793)	(3.117)	(1.391)	(1.287)	(1.520)	(1.217)
(Log of establishment)$_{1993}$	0.218	0.140	0.317	0.253	2.161***	2.121***	2.119***	2.093***
	(0.509)	(0.519)	(0.569)	(0.608)	(0.355)	(0.330)	(0.349)	(0.327)
(Log of employment)$_{1993}$	1.180	1.106	1.035	0.894	-0.050	-0.108	0.079	0.002
	(1.096)	(1.118)	(1.156)	(1.209)	(0.963)	(0.917)	(0.944)	(0.910)
(Log of median wage)$_{1993}$	2.135	0.697	1.392	-0.019	-7.175***	-8.030***	-7.460***	-8.130***
	(2.561)	(1.777)	(2.111)	(1.596)	(1.777)	(1.074)	(1.935)	(1.271)
(Log of shipment)$_{1990}$	-1.418	-1.661*	-1.152	-1.592**	-0.242	-0.569	-0.231	-0.537
	(0.956)	(0.978)	(0.749)	(0.743)	(0.568)	(0.561)	(0.575)	(0.588)
(Log of domestic absorption)$_{1990}$	1.498	1.603	1.231	1.518*	0.588	0.799	0.514	0.729
	(0.917)	(1.002)	(0.749)	(0.846)	(0.663)	(0.611)	(0.637)	(0.624)
(Log of Herfindahl index)$_{1993}$	0.059	-0.042	0.223	0.110	-0.228	-0.302*	-0.262	-0.323
	(0.366)	(0.283)	(0.416)	(0.340)	(0.196)	(0.178)	(0.211)	(0.208)
(Log of permanent employment)$_{1993}$	-1.659**	-1.305*	-1.222	-0.737	1.572*	1.862**	1.467	1.742**
	(0.725)	(0.709)	(0.802)	(0.867)	(0.874)	(0.733)	(0.921)	(0.766)
(Log of temporary employment)$_{1993}$	-0.069	-0.232	-0.214	-0.429*	-4.183***	-4.321***	-4.171***	-4.295***
	(0.320)	(0.272)	(0.248)	(0.222)	(0.347)	(0.264)	(0.380)	(0.299)
Observations	177	177	177	177	177	177	177	177
R-squared	0.242	0.267	0.211	0.224	0.610	0.607	0.607	0.606

Notes: $\Delta L_{j,t}^{permanent}$ ($\Delta L_{j,t}^{temporary}$) is 100 times the annual log change in permanent (temporary) employment in industry j over the time period. Regression estimates are weighted by the number of industry employees in the year 1993. Standard errors in parentheses are clustered on broad industries (13 industries). *** p<0.01, ** p<0.05, * p<0.1.