The Geography of Trade and Agglomeration in Japan

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April 2014

ABSTRACT

This paper finds that imported inputs decrease the domestic labor demand, but the agglomeration economy in manufacturing mitigates this decreasing. Previous papers show that low skill labors are replaced by overseas employment, but this paper indicates that the impact of overseas production on the domestic labor demand differs according to location. Solitary plants are replaced by overseas productions easier than plants in the region where intermediate inputs suppliers agglomerate. Further, this paper also examines whether R&D mitigates decreasing the labor demand by trade exposure, but does not find the clear effects.

Keywords: Geography of trade, Agglomeration economy, Labor demand, Offshoring

JEL codes: J23, J24, J31

※The author appreciates the financial support provided by the Ministry of Education, Culture, Sports, Science and Technology in Japan and Chukyo University. The author is also grateful to the Ministry of Health, Labor and Welfare, the Ministry of Economy, Trade and Industry and the Ministry of International Affairs and Communications Statistics Bureau of providing me with the Basic Survey on Wage Structure, the Basic Survey of Japanese Business Structure and Activities and the Establishment and Enterprise Census. I constructed the data set myself using these data.

1. Introduction

Many developed countries, including Japan, have experienced increasing overseas production or imported intermediate inputs and a collapse of domestic labor market over the past several decades. Begin with the standard theory of international trade (Heckscher-Ohlin-Samuelson model) which yields strong results on the international trade between countries with different endowments of human skills leads to a decline in the relative wages of unskilled workers in the more developed countries, now the discussions center on the empirical results and analytical framework. Most previous studies have analyzed the effect of increasing overseas productions on an entire country. These studies determined that the imports of intermediate goods from low-income countries affect the labor composition and shift labor requirements to highly skilled workers (Feenstra and Hanson, 1999; Ekholm and Hakkala, 2005; Ahn et al., 2008). Furthermore, offshoring increases the ratio of non-regular workers to whole-country workers (Machikita and Sato, 2011; Tomiura, Ito and Wakasugi, 2011), and middle-skill tasks are offshored to minimize the cost of the final goods/services using a task approach (Acemoglu and Autor, 2011; Autor, Levy Murnane, 2003; Black and Spitz-Oener, 2010).

However, little is known regarding the effect of trade on local labor markets. The labor market does not usually integrate into a whole in many countries, and the labor market is significantly segmented at the local level. In Japan, labor mobility is lower than the United States and approximately twice that of the European cross-region mobility within countries. Even the United States, labor mobility is not high as in a perfectly integrated labor market. Autor et al. (2013a) conducted a rare study that reveals important differences in the exposure of local labor markets with respect to the impact of technology and trade. Some previous studies (Celi and Segnana, 2000; Topalova, 2010; McLaren, 2010; Kovak, 2011) examine the impact of trade on labor markets by introducing a regional differentiation. These studies identify the regional skill intensity or uneven distribution of industries as regional differences. Those do not look at the external environment of firms and workers, rather control it as regional characteristics, i.e. fixed effects. However, Moretti(2012) points out the economies differ between communities, in other words, by regions where what kind of firms agglomerate. Therefore, this paper focuses on the external environment, i.e. the agglomeration economy, as the regional difference.

The aim of this paper is to examine the impact of agglomeration economy on local labor market under increasing of imported intermediate inputs. This paper

analyzes whether the effect of imported inputs on domestic workers differ according to location even if the workers have the same skill levels. Firms and intermediate inputs' suppliers agglomerate and develop their intermediate inputs in cooperation in some areas. A business relationship between a firm and many sorts of suppliers makes it more difficult to a part of intermediate inputs replace overseas producing. On the other side, local government attract a plant of a large firm and local firms benefit from this attraction, but huge damage hit local economy when this attracted plant is closed because of replacement by overseas production in some areas. This paper measures the level of agglomeration with the concentration of manufacturing as well as the variety of manufacturing. Firms agglomerate for knowledge spillover, intermediate inputs producers and labor market (Ashenfelter and Card, 2010). Then, this paper compares the concentration of specific manufacturing in which the firms have strong business relationships among them to integrate the intermediate inputs and the concentration of all manufacturing in which includes less of integrated firms. This will obtain the agglomeration that has strong business relationships from the agglomeration of varied reasons. Further, this paper examines whether R&D under the agglomeration economy increases much more labor demand rather than the agglomeration of only production plants. I analyzed these issues at the commuting zones (CZs) level by using the Basic Survey on Wage Structure and the Basic Survey of Japanese Business Structure and Activities, with information from 1997 to 2011.

Important and related previous studies on this subject have been presented in Autor et al. (2013a) and Autor et al. (2012 and 2013b). Autor et al. (2013a) find an absence of overlap in the geography of trade and technology shocks. The former is present where labor-intensive manufacturing spatially agglomerates, and the latter is present throughout the United States. Autor et al. (2013a) measures technology change by specialization in routine tasks and compares the routine employment share by CZs and growth in import exposure per worker by CZs to illustrate the map of the United States. Specifically, Autor et al. (2012 and 2013b) analyzes the trade effect from China and argues that the share of manufacturing employees in the working age population of a CZ at the 75th percentile of import exposure declines by -0.65 percentage points more than in a CZ at the 25th percentile between 2000 and 2007 in the United States. These papers indicate a strong geography trade effect via their main arguments.

Go further back in time, Celi and Segnana (2000) argue that trade-induced displacement effect on demand for unskilled labor differs among regions using Italian data. They empirically evaluate the impact of trade on labor markets by introducing regional differentiation as well as vertical differentiation. They regard white/blue-collar

ratio, the change in skilled workers share between/within industries and factor contents trade by manufacturing and service sectors. They find that the trade-induced displacement effects on unskilled labor demand operate principally in Northern Italy; skill upgrading in North has involved the concentration of skills in those sectors which were already skill intensive. The southern imports from less advanced countries indicate the progressive convergence of Southern Italy's international specialization on the specialization of less advanced countries' exports. They argue that the North is always relatively more sensitive to changes in technology, and the South relatively more sensitive to changes in labor demand. They point out the initial skill intensive as a regional difference.

Other related literatures treat trade liberalization. Topalova (2010) shows the heterogeneous effects with different areas from trade liberalization in 1991 in India. He finds that rural areas in which employment is concentrated in sectors exposed to larger reductions in tariff protection experiences substantially less poverty reduction, and slower consumption growth, than relatively unexposed rural areas. He examines the geographical different effects from trade by using flexibility of labor law in his paper.

McLaren (2010) looks for effects of NAFTA on US wages by industry and by geography using US Census data for 1990-2000 because they recognize the political debate that workers in some vulnerable locations have been harmed, relative to workers in other places. He defines the average local tariff weighted by local employment in each industry and evaluates the wage including terms in which treat locations and industries. He finds that dramatically lowering wage growth for blue-collar workers in the most affected industries and localities. He argues that both costs of moving geographically and costs of switching industries are important. In his paper, the regional difference is the number of workers who involved in the exposed industries.

Kovak (2011) measures the effects of Brazil's 1987-1995 trade liberalization on local labor market wages considering internal migration patterns. He separately estimates the log of wages controlling demographic and educational levels, industries fixed effects and micro region fixed effects. He finds that regions whose output faced a 10% larger liberalization-induced price decline experienced a 9.4% larger wage decline. In addition, liberalization resulted in a shift in migration patterns.

Above previous literatures consider the skill intensity (Celi and Segnana, 2000) and uneven distribution of industries (McLaren, 2010 and Autor et al., 2012, 2013a and 2013b) as regional differences. However, this paper looks for the difference in regions in the external environment of firms and workers; in the issue that does not involved switching industries and geographical mobility. Then, this paper differs from previous

studies in the consideration of geographic trade effect as well as in the point of view of the external environment of firms and workers.

As the results, this study found that rising inputs from abroad decreases the demand for male workers in more highly and lower educational levels. This trade exposure affects more strongly lower educated workers than more highly educated workers. However, the agglomeration economy, i.e. the start-of-period values of the concentration of manufacturing, mitigates this trade exposure. The impact of increases in imported inputs on the labor demand differs according to location. Agglomeration economy makes it more difficult to that domestic labors are replaced by overseas productions. Previous studies especially focus on workers' skill and tasks, but it is also important the strong business relationships among firms.

The remainder of the paper is organized as follows. The next section describes the conceptual framework and empirical approach and explains the data set. Section 3 presents the empirical results, and Section 4 presents the conclusions and discussion.

2. Conceptual framework, empirical strategy and data

2.1 Conceptual framework and Empirical strategy

Firms agglomerate for knowledge spillover, the quality and quantity of intermediate inputs producers and labor market (Ashenfelter and Card, 2010). This paper assumes business relationships between a firm and many sorts of suppliers in order to integrate intermediate inputs make it more difficult to a part of intermediate inputs replace overseas producing. This relationship results in the different impact of increasing imported intermediate inputs on local labor market. Further, this is the reason why this paper focuses on the geographical impact, not only skills or tasks of workers as previous studies. I do not treat this geographical difference as regional characteristics because Moretti (2012) points out the differences of communities' economies by what sorts of central jobs exist. As the same time, this paper examines whether the R&D affect the replacement of domestic labor by oversea production to verify that the agglomeration of production plants are replaced by oversea production easier than the agglomeration where plants involve R&D deeply. This paper fits models following form:

$$\Delta L_{rt} = \gamma_t + \beta_1 \Delta IPW_{rt} + X'_{rt}\beta_2 + e_{rt} \quad (1)$$

where ΔL_{rt} is the decadal change in the manufacturing employment share of the working age population in CZ r or the unemployment share of the working age population in CZ r. ΔIPW_{rt} is the change in imported intermediate inputs by manufacturing firms per worker in a CZ, where imported inputs are apportioned to the CZ according to the location of the firm's establishments. The data of the imported intermediate inputs is collected by location headquarters. I then divided the volume of imported inputs by the number of establishments owned by each headquarter. I aggregated the volume of imported inputs per establishment by each CZ.

The vector X_{rt} contains changes in the tangible fixed asset, volume of business and the start-of-period values of explanatory variables, such as the unemployment rate, ratio of employment in manufacturing to whole employment, the ratio of female workers to the population in the CZ, the ratio of college graduates to the population in the CZ, the ratio of elderly people at least 65 years old to the population in the CZ, the ratio of R&D to the volume of business in manufacturing in CZ. Moreover, the vector X_{rt} contains the start-of-period values of the concentration of manufacturing[1] as calculated below, the change in the concentration of manufacturing during the period, the cross-term of the start-of-period values of the concentration of manufacturing and the change in the volume of imported intermediate inputs and the cross-term between the change in the concentration of manufacturing and the change in the volume of imported intermediate inputs.

The concentration of manufacturing index is calculated by the equations (2). The equation (2) is followed Ellison and Glaeser (1997) but adjusted for regional base because Ellison and Glaeser (1997) calculate their index by industrial base. Lu and Tao (2005) propose a measurement of regional specialization in terms of the Ellison and Glaeser (1997) index as follows:

$$EG_r \equiv \frac{G_r - \left(1 - \sum_{i=1}^{N} S_i^2\right) H_r^*}{\left(1 - \sum_{i=1}^{N} S_i^2\right)\left(1 - H_r^*\right)} \tag{2}$$

where $\mathrm{H_r^*} = \sum_{\mathrm{k=1}}^{\mathrm{K}} \left(\mathrm{E_{rk}} / \sum_{\mathrm{k=1}}^{\mathrm{K}} \mathrm{E_{rk}}\right)^2$ is the Herfindahl index of commuting zone r, and E_{rk} is

[1] This index represents the concentration of the specific industry in manufacturing, not the intensity of manufacturing. The ratio of manufacturing employment represents intensity of manufacturing.

employment of establishment k in commuting zone r, and K is total number of establishments in commuting zone r. G_r is $G_r = \sum_i (S_{ri} - S_i)^2$, and S_{ri} is the employment share of industry i in commuting zone r in manufacturing of the commuting zone r, i.e., $S_{ri} = E_{ri} / TRE$, where E_{ri} and TRE are the employment in industry i of manufacturing in commuting zone r and total employment in manufacturing in commuting zone r ($\mathrm{TRE} = \sum_i E_{ri}$), respectively. Si is the employment share of industry i in aggregate employment in manufacturing, i.e., $Si=NEi/TNE$, where NE_i and TNE are the employment in industry i of manufacturing throughout the country and total employment in manufacturing throughout the country ($\mathrm{TNE} = \sum_i \sum_r E_{ri}$), respectively.

A higher index indicates a higher concentration of manufacturing industry in the given commuting zone. This paper makes two types the concentration of manufacturing using (2). First, manufacturing is limited the specific industries, i.e. general machinery, manufacture of electrical machinery, equipment and supplies, manufacture of transportation equipment and precision equipment manufacturing industry. Second concentration of manufacturing is calculated using all manufacturing data, in other words, manufacturing include manufacture of furniture, manufacture of beverages and among others. This paper compares the concentration of specific manufacturing in which the firms have strong business relationships among them in order to integrate the intermediate inputs and the concentration of all manufacturing in which includes less of integrated firms. When I use the concentration of specific manufacturing, the change in imported intermediate inputs by manufacturing firms and the ratio of R&D to the volume of business in manufacturing are also limited by specific manufacturing. I estimate the model (1) by the male worker's educational level and employment status (short-time worker and unemployment).

To identify the causal effect of rising imported intermediate inputs from abroad on Japanese domestic labor and other local labor market outcomes, this paper employs an instrumental variables strategy that accounts for the potential endogeneity of Japanese trade exposure. To identify the component of intermediate inputs from abroad driven by the rising competitiveness of manufacturers abroad, lower wages or easy access to consumers' needs in abroad, I instrument for growth in imported intermediate inputs using growth of imports in manufacturing goods, machinery and transport

equipment in eight other developed countries[2]. The instrumental variable is determined as follows:

$$\Delta IM_{ort} = \frac{L_{rt}^{m}}{L_{t}^{m}} \times \Delta IM_{ot} \quad (3)$$

where ΔIM_{ot} is the growth of import in manufacturing goods, machinery and transport equipment in eight other developed countries. I distribute this manufacturing import to each region by weighted ratio of regional manufacturing employment in whole country's manufacturing employment.

2.2 Data

I use the Basic Survey on Wage Structure and the Basic Survey of Japanese Business Structure and Activities in 1997, 2006 and 2011[3]. I examined the decadal changes of two periods; the first period contained the change from 1997 to 2006, and the second period contained change from 2006 to 2011. To ensure that the two periods are comparable on a decadal scale, the difference in the second period was multiplied by a factor of 10/6. The Ministry of Health, Labor and Welfare conducts the Basic Survey on Wage Structure on establishments with 10 or more regular employees and private establishments with 5 to 9 regular employees. This survey also includes workers selected by a uniform sampling method from among the establishments that were selected for the Basic Survey on Wage Structure to obtain a clear picture of the wage structure throughout Japan. The Basic Survey on Wage Structure provides rich information about workers, including their educational level, age, gender and income. This paper uses this survey to calculate the changes in manufacturing employment, the ratio of employment in manufacturing to whole employment, the ratio of female

[2] This instrumental variable is followed Autor et al. (2013b) who instrument for growth in Chinese imports to the United States using growth of Chinese imports in eight other developed countries. The eight other high-income countries are Australia, Denmark, Finland, Germany, USA, New Zealand, Spain, Switzerland and USA following Autor et al.(2013b). This growth of imports is evaluated by the commodities although the change in imported intermediate inputs is imported by manufacturing firms.

[3] 1997 is the oldest data collected using the same definition with the latest data. Before 1997, the data on imported intermediated inputs included imported inputs of establishment abroad and offshore trading, but recent data exclude these volumes. 2011 is the latest data, and it reflects increases in Japanese trade after the financial shock of 2009.

workers to the population[4] in the commuting zone, the concentration of manufacturing index and the variety of manufacturing. This paper estimates the above model by the worker's educational level, gender and employment status (short-time worker and unemployment).

The Minister of Economy, Trade and Industry conducts the Basic Survey of Japanese Business Structure and Activities. This paper uses this data to calculate the changes in the tangible fixed asset, volume of business and the volume of imported intermediate inputs and the R&D ratio. This survey covers enterprises with 50 or more employees that have excess capital or investment funds valued at over 30 million yen. The covered industries include the mining, manufacturing, wholesale and retail trade, as well as the food and drink industry. I added the information detailing where enterprises have their establishments to the Basic Survey of Japanese Business Structure and Activities using the Establishment and Enterprise Census. The Establishment and Enterprise Census is conducted on all establishments in Japan to compile a complete directory as the master sampling framework for various statistical surveys, including the Basic Survey on Wage Structure by the Statistics Bureau.[5]

I calculated the data both from a worker and enterprise point of view via commuting zones using the above two data sets. I then connected these data using commuting zone code[6]. This paper uses commuting zones proposed by the Center for Spatial Information Science[7]. The 2005 code outlines 251 commuting zones and these commuting zones cover an area where population of the central city exceeds 10000, and approximately 90% of total employment[8] is concentrated at these commuting zones. This paper uses 244 commuting zones for estimations[9]. Additionally, I used the population census to determine the unemployment ratio and the college graduation rates. The population census is conducted every five years, and I used the 1995, 2005

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[4] I uses the population recorded the Basic Resident Registration explained below.

[5]The author is grateful to the Ministry of Health, Labor and Welfare, the Minister of Economy, Trade and Industry, the Ministry of Internal Affairs and Communications Statistics Bureau for providing us with the Basic Survey on Wage Structure, the Basic Survey of Japanese Business Structure and Activities, the Establishment and Enterprise Census.

[6] The Basic Survey on Wage Structure and the Establishment and Enterprise Census contain information about an administrative area. I aggregated the administrative area into CZs. I responded to changes in the administrative area using information proposed by the Ministry of Internal Affairs and Communications Statistics Bureau.

[7] Kanamoto, a researcher at the Center for Spatial Information Science, proposed the data.

[8] Excluding agriculture, forestry, fisheries and public service.

[9] Excluding Tokyo and Osaka because these cities lose touch with other regions and this paper focus on the rural regions.

and 2010 data to generate the above dataset for 1997, 2006 and 2011. I also calculated the ratio of elderly people (>65 years old) from the data based on the records of the Basic Resident Registration that the mayor of each municipality is responsible for preparing. As for instrumental variable, I use UN Comtrade Database to obtain the eight developed countries' imports data of manufacturing goods, machinery and transport equipment at standard international trade classification revision 3 level.

Table 1 provides detailed descriptive statistics. The change in the manufacturing employment share of the working age population decreases in both lower and more highly educational levels. In contrast, the change in the male and female short-time workers increases. This is consistence of increasing trend in the short-time workers in the recent decade in Japan. Table 1 shows the correlation of the cross-term between the R&D and imported inputs and the cross-term among the concentration of specific manufacturing, R&D and imported inputs with the other variables, respectively. Table 1 shows that the correlation of the volume of imported intermediate inputs with the cross-term of R&D and imported inputs is large; 0.967. The expected estimation coefficient of imported inputs is negative and that of the cross-term between R&D and imported inputs is positive. Then, the results are not interpreted. Therefore, this paper does not use the cross-term between R&D and imported inputs. Further, the cross-term among the concentration of manufacturing, R&D and imported inputs has high correlation with the cross-term between the concentration of manufacturing and imported inputs; this cross-term is required using the cross-term between R&D and imported inputs mentioned earlier. Then, this paper does not use this cross-term among the concentration of manufacturing, R&D and imported inputs.

3. Results

Table 2 shows the estimation results of model (1) when employing instrumental variables calculated using (3). Table 2 indicates that increasing in imported intermediate inputs decreases the demand for male workers in more highly and lower educational levels. The effect on lower educated workers is stronger than the effect on more highly educated workers. It indicates that less skilled workers are replaced by overseas productions easier than skilled workers as previous studies show. The coefficient of unemployment is insignificant.

However, the agglomeration economy mitigates this decreasing in domestic lower educated labor demand by trade exposure. The cross-terms between imported inputs and the start-of-period values of the concentration of specific manufacturing, i.e. general machinery, manufacture of electrical machinery, equipment and supplies, manufacture of transportation equipment and precision equipment manufacturing industry, in Table2 are positive. It means that decreases in labor demand by trade exposure depend on the initial level of the concentration of specific manufacturing and that the impact of imported inputs on labor demand differs in according to location. Increasing imported intermediate inputs indicates that the domestic workers are replaced by overseas production, but, suppliers of intermediate inputs located near demanders are less replaced by overseas production than isolate suppliers. Previous studies especially focus on workers' skill and tasks, but it is also important the strong business relationships among firms. Further, the attraction of a large company's plant and the closure of that plant often becomes a political issue for the local government in Japan. However, the strengthening of relationship between the regional firms and the attracted firms and the support to do this are important, not only the attracting of firms.

The initial level of the concentration of manufacturing and the change in the concentration of manufacturing also affect the labor demand positively. The number of workers augments in the region where manufacturing concentrates and vice versa. Appendix 2 shows the causes of the increases in the change of concentration of manufacturing. Firms in the manufacturing agglomerate in the region growing the imported inputs. Table 2 indicates that the cross-terms between imported inputs and the start-of-period values of the concentration of specific manufacturing is positive even though controlling the change in the concentration of manufacturing.

The lower part of Table 2 shows the results of endogeneity test. All endogeneity tests, except the test for unemployment, reject null hypothesis that imported intermediate inputs are exgoneity. Appendix 1 shows the first-stage results. The instrumental variable, i.e. the growth of manufacturing import in eight other developed countries, has significantly positive correlation with the instrumented variable.

Table 3 indicates the results that I estimate model (1) using the concentration of all manufacturing, in other words, the specific manufacturing plus other manufacturing such as beverage manufacturing, textile industry, wood manufacturing and among others. Table 3 represents the decreasing the demand for lower educated workers, but the cross-term between the imported inputs and the initial level of the concentration of all manufacturing is insignificant. The concentration of specific

manufacturing represents agglomeration of intermediate suppliers while concentration of all manufacturing includes the industries that might be unnecessary to construct strong business relationships between intermediate suppliers. Therefore, comparing two tables results in that the strong business relationship in the agglomeration economy makes it difficult to be replaced by overseas productions.

Table 4 shows the estimation results of model (1) including the cross-term between the initial level of the concentration of specific manufacturing and R&D. This paper examines whether R&D under the agglomeration economy increases much more labor demand rather than the agglomeration of only production plants. This paper does not find clear effect of R&D. The cross-term between the concentration of specific manufacturing and R&D is not significant for lower educated workers and even though for more highly educated workers. However, this paper divides the R&D investment of whole a firm by each establishment, but this method might not capture well to which plants involved both with production and development.

4. Conclusions and Discussions

This paper explores the effect of imported intermediate inputs on local Japanese labor markets, the impact of an agglomeration economy on this trade effect and the role of R&D in the agglomeration economy. Little is known about the effect of trade on local labor markets, although the labor market does not usually integrate into a whole in many countries. The previous studies estimate impact of offshoring, overseas production or FDI by educational skills or workers' tasks. Little literatures considering local labor market identify the skill intensity or uneven distribution of industries as regional differences. These are important studies. However, if business relationships between a firm and many sorts of suppliers in order to integrate intermediate inputs are strong, this business relationship makes it more difficult to a part of intermediate inputs replace overseas producing. Even if the workers have the same skills, the impacts of oversea productions differ among regions. Therefore, it is need to geographical study, not only the study at firm or national level.

I analyzed these issues at the commuting zones (CZs) level using the Basic Survey on Wage Structure and the Basic Survey of Japanese Business Structure and Activities with information from 1997 to 2011. First, this paper finds that rising inputs from abroad decrease the demand for more highly and less educated workers. This

effect affects stronger lower educated workers than more highly educated workers. However, the agglomeration of manufacturing mitigates this trade exposure. The decreases in labor demand by trade exposure depend on the concentration of specific manufacturing, which means that the impact of imported inputs on labor demand differs in according to location. The suppliers of intermediate inputs agglomerated near the demander are less replaced by overseas production than isolate suppliers. This is confirmed by comparing the estimation results using the concentration of all manufacturing included the industries that do not associate intermediate inputs' suppliers. Second, I estimated whether the R&D mitigates the decreasing the demand of domestic labor caused by trade exposure. I did not find clear its effect. However, this paper divides the R&D investment of whole a firm by each establishment and this method might not capture well to which plants involved both with production and development.

The collapse of domestic labor market replaced by overseas production has been politically and economically concerning topics for a long time. The damage by trade exposure is huge especially in the rural areas when the large plant attracted by local government is closed. However, the damage by increasing imported inputs is not unique across the regions. In the case of attraction of firms to the regions, the strengthening of relationship between the regional firms and the attracted firm and the support to do this are important, not only the attracting of firms.

Again, the decreases in labor demand by increasing imported inputs depend on the concentration of manufacturing. The impact of imported inputs on labor demand differs in according to location. Focusing on the external environment of firms and workers of this paper enables to find above results.

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Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
d_lower educated male worker	488	-0.093	0.197	-0.906	0.948
d_more highly educated male worker	488	-0.007	0.063	-0.240	0.465
d_unempl: unemployment	488	0.928	1.249	-2.331	6.308
d_short-time worker	488	0.265	0.372	-0.250	1.655
d_imported inputs in manufacturing	488	5.530	25.431	-69.634	384.598
d_tangible fixed asset	488	13.937	314.894	-2316.056	3033.195
d_volume of business	488	34.610	918.293	-7266.887	10706.590
unemployment rate	488	4.792	1.826	1.840	13.995
ratio of employment in manufacturing	488	34.560	15.920	0.000	79.863
the concentration of specific manufacturing (EG)	488	1.126	0.662	-1.113	6.241
the concentration of all manufacturing	488	1.169	7.748	-76.185	95.936
d_EG (specific manufacturing)	488	-0.039	0.542	-4.543	3.617
d_EG (all manufacturing)	488	0.484	12.780	-131.986	118.284
R&D rate in specific manufacturing	488	290.965	215.646	0.000	1054.191
R&D rate in all manufacturing	488	225.173	148.341	0.000	745.029
EG x imported inputs (specific manufacturing)	488	7.876	39.772	-428.075	325.851
EG x imported inputs (all manufacturing)	488	-14.924	309.507	-4052.932	2978.864
d_EG x imported inputs (specific manufacturing)	488	0.918	64.609	-176.810	1391.051
d_EG x imported inputs (all manufacturing)	488	43.359	500.319	-2887.051	6891.796
EG x R&D (specific manufacturing)	488	371.709	387.914	-482.664	2699.639
EG x R&D (all manufacturing)	488	163.580	1997.257	-28753.090	15493.770
ratio of female workers	488	377.000	172.039	40.502	1191.061
college graduation rate	488	89.248	27.922	38.359	170.452
ratio of elderly people	488	206.067	45.992	86.640	356.090
period dummy	488	0.500	0.501	0.000	1.000

R&D rate=ratio of research and development (R&D) to the volume of business in manufacturing

d_~: the decadal change in volume.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

Table 1 Correlation

	Specific manufacturing	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	d_imported inputs	1.000																
2	d_tangible fixed asset	0.540	1.000															
3	d_volume of business	0.602	0.928	1.000														
4	unemployment rate	-0.137	-0.233	-0.167	1.000													
5	ratio of employment in manufacturing	0.066	0.216	0.169	-0.386	1.000												
6	the concentration of manufacturing (EG)	0.098	0.050	0.030	-0.038	0.108	1.000											
7	d_EG	0.083	-0.103	-0.056	0.044	-0.064	-0.506	1.000										
8	R&D rate	0.129	0.061	0.063	-0.027	-0.043	0.310	-0.077	1.000									
9	EG x imported inputs	0.241	0.090	0.040	-0.090	0.017	0.493	-0.458	0.126	1.000								
10	d_EG x imported inputs	0.590	0.350	0.438	-0.015	0.010	-0.262	0.423	0.008	-0.623	1.000							
11	EG x R&D	0.134	0.097	0.078	-0.026	-0.043	0.796	-0.414	0.729	0.437	-0.194	1.000						
12	ratio of female workers	0.040	0.039	0.026	-0.137	0.010	0.348	-0.006	0.132	0.060	-0.012	0.264	1.000					
13	college graduation rate	0.284	0.005	0.043	-0.070	-0.067	0.414	0.008	0.429	0.230	0.061	0.487	0.219	1.000				
14	ratio of elderly people	-0.264	-0.236	-0.224	0.199	-0.196	-0.231	0.138	-0.345	-0.212	-0.035	-0.368	-0.031	-0.494	1.000			
15	period dummy	-0.246	-0.453	-0.370	0.543	-0.424	-0.103	0.180	-0.042	-0.199	-0.012	-0.126	-0.125	0.000	0.565	1.000		
16	R&D rate x imported inputs	**0.967**	0.571	0.632	-0.115	0.048	0.110	0.083	0.170	0.195	0.617	0.176	0.034	0.304	-0.279	-0.236	1.000	
17	EG x R&D x imported inputs	0.186	0.113	0.058	-0.072	-0.003	0.517	-0.471	0.161	**0.973**	-0.629	0.490	0.061	0.241	-0.222	-0.190	0.196	1.000
	All manufacturing																	
1	d_imported inputs	1.000																
2	d_tangible fixed asset	0.482	1.000															
3	d_volume of business	0.523	0.928	1.000														
4	unemployment rate	-0.045	-0.233	-0.167	1.000													
5	ratio of employment in manufacturing	0.030	0.216	0.169	-0.386	1.000												
6	the concentration of manufacturing (EG)	-0.034	-0.068	-0.058	0.036	0.062	1.000											
7	d_EG	0.024	0.122	0.070	-0.029	-0.022	-0.616	1.000										
8	R&D rate	0.067	0.034	0.038	-0.077	-0.036	-0.087	0.066	1.000									
9	EG x imported inputs	0.170	0.090	0.064	-0.042	0.110	0.426	-0.259	-0.054	1.000								
10	d_EG x imported inputs	0.563	0.257	0.288	-0.049	-0.040	-0.279	0.273	0.056	-0.399	1.000							
11	EG x R&D	-0.034	-0.084	-0.072	0.040	0.054	0.822	-0.511	0.002	0.496	-0.324	1.000						
12	ratio of female workers	0.016	0.039	0.026	-0.137	0.010	-0.022	0.123	0.181	-0.032	0.034	-0.041	1.000					
13	college graduation rate	0.144	0.005	0.043	-0.070	-0.067	-0.063	0.006	0.526	-0.081	0.128	-0.005	0.219	1.000				
14	ratio of elderly people	-0.153	-0.236	-0.224	0.199	-0.196	0.111	-0.051	-0.353	0.024	-0.064	0.075	-0.031	-0.494	1.000			
15	period dummy	-0.158	-0.453	-0.370	0.543	-0.424	0.092	-0.073	-0.001	-0.037	-0.066	0.113	-0.125	0.000	0.565	1.000		
16	R&D rate x imported inputs	**0.994**	0.479	0.522	-0.033	0.019	-0.039	0.025	0.090	0.110	0.572	-0.038	0.016	0.167	-0.168	-0.155	1.000	
17	EG x R&D x imported inputs	0.124	0.058	0.035	-0.031	0.104	0.475	-0.290	-0.061	**0.970**	-0.405	0.582	-0.038	-0.096	0.054	-0.003	0.068	1.000

Table2 Estimation results (Depend variables: 10 x annual change in the manufacturing employment share of the working age population)

	Less educated male workers						Highly educated male workers					
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.002181 ***	0.000671	-0.002160 ***	0.000669	-0.002111 ***	0.000658	-0.000696 ***	0.000244	-0.000687 ***	0.000244	-0.000660 ***	0.000239
d_tangible fixed asset	0.000006	0.000066	0.000011	0.000066	0.000015	0.000066	-0.000010	0.000024	-0.000008	0.000024	-0.000006	0.000024
d_volume of business	0.000037	0.000025	0.000036	0.000025	0.000034	0.000025	0.000013	0.000009	0.000012	0.000009	0.000011	0.000009
unemployment rate	-0.003557	0.005052	-0.003805	0.005047	-0.003689	0.005039	-0.002252	0.001839	-0.002359	0.001837	-0.002296	0.001832
ratio of employment in manufacturing	-0.005596 ***	0.000527	-0.005641 ***	0.000528	-0.005807 ***	0.000560	-0.000928 ***	0.000192	-0.000947 ***	0.000192	-0.001037 ***	0.000204
the concentration of manufacturing (EG)	0.032640 **	0.016384	0.035755 **	0.016560	0.055788 **	0.027682	0.010633 *	0.005966	0.011974 **	0.006026	0.022789 **	0.010062
d_EG	0.088371 ***	0.018865	0.088488 ***	0.018832	0.086367 ***	0.018741	0.026865 ***	0.006869	0.026916 ***	0.006853	0.025771 ***	0.006812
R&D rate			-0.000046	0.000039	0.000007	0.000070			-0.000020	0.000014	0.000009	0.000026
EG x imported inputs	0.000484 *	0.000256	0.000466 *	0.000256	0.000480 *	0.000257	0.000126	0.000093	0.000118	0.000093	0.000126	0.000094
EG x R&D					-0.000056	0.000063					-0.000030	0.000023
ratio of female workers	-0.000149 ***	0.000048	-0.000148 ***	0.000048	-0.000150 ***	0.000048	-0.000005	0.000018	-0.000005	0.000017	-0.000006	0.000017
college graduation rate	-0.000087	0.000402	-0.000020	0.000406	-0.000039	0.000405	-0.000099	0.000147	-0.000070	0.000148	-0.000081	0.000147
ratio of elderly people	0.000589 **	0.000253	0.000527 **	0.000258	0.000512 **	0.000258	0.000148	0.000092	0.000121	0.000094	0.000113	0.000094
period dummy	0.057616 *	0.025688	0.060797 **	0.025773	0.058432 **	0.025891	0.018120 *	0.009354	0.019490 **	0.009379	0.018213 *	0.009411
_cons	0.005050	0.081536	0.022510	0.082655	0.017039	0.082808	-0.001221	0.029689	0.006293	0.030079	0.003339	0.030100
Number of obs	488		488		488		488		488		488	
R-squared	0.3483		0.351		0.3531		0.1518		0.156		0.1609	
Durbin (score) chi2(1)	9.02617 (0.0027)		8.794(0.003)		8.44669 (0.0037)		5.63929 (0.0176)		5.417 (0.020)		4.72866 (0.0297)	
Wu-Hausman F(1, .)	8.93244(0.0029)		8.680 (0.003)		8.31365 (0.0041)		5.54155 (0.0190)		5.309(0.022)		4.61837 (0.0321)	

	Unemployment		Short-time workers	
	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.005665	0.004952	-0.001439	0.000915
d_tangible fixed asset	0.000929 *	0.000489	0.000058	0.000090
d_volume of business	-0.000218	0.000187	-0.000001	0.000035
unemployment rate	-0.075537 **	0.037347	0.004094	0.006901
ratio of employment in manufacturing	0.001665	0.003905	-0.001271 *	0.000722
the concentration of manufacturing (EG)	-0.394171 ***	0.122542	-0.010903	0.022644
d_EG	-0.254150 *	0.139355	0.036970	0.025750
R&D rate	-0.000646 **	0.000285	-0.000099 *	0.000053
EG x imported inputs	0.001123	0.001893	0.000269	0.000350
EG x R&D				
ratio of female workers	-0.000500	0.000355	0.000564 ***	0.000066
college graduation rate	0.001387	0.003006	0.000740	0.000555
ratio of elderly people	0.002880	0.001912	-0.000027	0.000353
period dummy	-0.129529	0.190721	0.561241 ***	0.035242
_cons	1.407479 **	0.611655	-0.216709 *	0.113023
Number of obs	488		488	
R-squared	0.113		0.658	
Durbin (score) chi2(1)	1.623 (0.203)		2.696 (0.101)	
Wu-Hausman F(1, .)	1.578 (0.210)		2.628 (0.106)	

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

Table3 Estimation results-ALL manufacturing (Depend variables: 10 x annual change in the manufacturing employment share of the working age population)

	Less educated male workers						Highly educated male workers					
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.001063 *	0.000647	-0.001046 +	0.000644	-0.001033 +	0.000643	-0.000319	0.000226	-0.000311	0.000225	-0.000309	0.000225
d_tangible fixed asset	0.000018	0.000074	0.000023	0.000074	0.000024	0.000074	-0.000010	0.000026	-0.000008	0.000026	-0.000008	0.000026
d_volume of business	0.000040	0.000035	0.000039	0.000035	0.000038	0.000035	0.000014	0.000012	0.000013	0.000012	0.000013	0.000012
unemployment rate	0.001949	0.006308	0.001316	0.006312	0.001267	0.006296	-0.000625	0.002206	-0.000924	0.002205	-0.000932	0.002203
ratio of employment in manufacturing	-0.005558 ***	0.000589	-0.005563 ***	0.000587	-0.005569 ***	0.000585	-0.000916 ***	0.000206	-0.000918 ***	0.000205	-0.000919 ***	0.000205
the concentration of manufacturing (EG)	0.000364	0.001638	0.000344	0.001631	-0.000448	0.002138	0.000680	0.000573	0.000671	0.000570	0.000552	0.000748
d_EG	-0.000562	0.001096	-0.000523	0.001092	-0.000517	0.001089	0.000134	0.000383	0.000152	0.000381	0.000153	0.000381
R&D rate			-0.000063	0.000066	-0.000067	0.000066			-0.000030	0.000023	-0.000031	0.000023
EG x imported inputs	0.000174	0.000111	0.000171	0.000110	0.000164	0.000111	0.000050	0.000039	0.000049	0.000039	0.000048	0.000039
EG x R&D					0.000004	0.000007					0.000001	0.000003
d_EG x imported inputs	0.000172 *	0.000102	0.000169 *	0.000102	0.000168 *	0.000102	0.000053	0.000036	0.000052	0.000036	0.000052	0.000036
ratio of female workers	-0.000106 **	0.000050	-0.000101 **	0.000050	-0.000099 **	0.000050	0.000006	0.000018	0.000009	0.000018	0.000009	0.000018
college graduation rate	0.000231	0.000441	0.000346	0.000456	0.000332	0.000456	-0.000010	0.000154	0.000045	0.000159	0.000043	0.000159
ratio of elderly people	0.000578 **	0.000285	0.000522 *	0.000289	0.000522 *	0.000289	0.000141	0.000100	0.000115	0.000101	0.000115	0.000101
period dummy	0.060846 **	0.028388	0.065780 **	0.028719	0.065173 **	0.028661	0.018908 *	0.009927	0.021239 **	0.010032	0.021147 **	0.010029
_cons	-0.031577	0.090824	-0.017495	0.091580	-0.015352	0.091425	-0.010515	0.031761	-0.003862	0.031988	-0.003540	0.031992
Number of obs	488		488		488		488		488		488	
R-squared	0.1906		0.1975		0.2018		0.0283		0.0388		0.0405	
Durbin (score) chi2(1)	3.30437 (0.0691)		3.20252 (0.0735)		3.12303 (0.0772)		2.08341 (0.1489)		1.97892 (0.1595)		1.94994 (0.1626)	
Wu-Hausman F(1, ・)	3.22464 (0.0732)		3.11798 (0.0781)		3.03365 (0.0822)		2.02803 (0.1551)		1.92183 (0.1663)		1.88957 (0.1699)	

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

Table4 Estimation results-R&D (Depend variables: 10 x annual change in the manufacturing employment share of the working age population)

	Less educated male workers						Highly educated male workers					
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.001345 *	0.000692	-0.002323 ***	0.000727	-0.002111 ***	0.000658	-0.000421 *	0.000251	-0.000716 ***	0.000263	-0.000660 ***	0.000239
d_tangible fixed asset	0.000014	0.000066	0.000024	0.000066	0.000015	0.000066	-0.000006	0.000024	-0.000003	0.000024	-0.000006	0.000024
d_volume of business	0.000021	0.000025	0.000034	0.000025	0.000034	0.000025	0.000008	0.000009	0.000011	0.000009	0.000011	0.000009
unemployment rate	-0.003145	0.005089	-0.003868	0.005088	-0.003689	0.005039	-0.002125	0.001844	-0.002343	0.001841	-0.002296	0.001832
ratio of employment in manufacturing	-0.005667 ***	0.000565	-0.005918 ***	0.000567	-0.005807 ***	0.000560	-0.000990 ***	0.000205	-0.001066 ***	0.000205	-0.001037 ***	0.000204
the concentration of manufacturing (EG)	0.029319	0.027104	0.062132 **	0.028079	0.055788 **	0.027682	0.014554	0.009823	0.024448 **	0.010160	0.022789 **	0.010062
d_EG			0.079558 ***	0.017887	0.086367 ***	0.018741			0.023990 ***	0.006472	0.025771 ***	0.006812
R&D rate	0.000023	0.000070	-0.000010	0.000070	0.000007	0.000070	0.000014	0.000025	0.000004	0.000025	0.000009	0.000026
EG x imported inputs					0.000480 *	0.000257					0.000126	0.000094
EG x R&D	-0.000070	0.000062	-0.000043	0.000062	-0.000056	0.000063	-0.000035	0.000023	-0.000027	0.000023	-0.000030	0.000023
ratio of female workers	-0.000116 **	0.000047	-0.000165 ***	0.000049	-0.000150 ***	0.000048	0.000005	0.000017	-0.000010	0.000018	-0.000006	0.000017
college graduation rate	0.000290	0.000418	0.000116	0.000420	-0.000039	0.000405	0.000012	0.000152	-0.000040	0.000152	-0.000081	0.000147
ratio of elderly people	0.000603 **	0.000261	0.000538 **	0.000261	0.000512 **	0.000258	0.000140	0.000094	0.000120	0.000094	0.000113	0.000094
period dummy	0.061030 **	0.026086	0.050679 *	0.026176	0.058432 **	0.025891	0.019306 **	0.009454	0.016185 *	0.009472	0.018213 *	0.009411
_cons	-0.025579	0.083434	0.009402	0.083741	0.017039	0.082808	-0.009207	0.030237	0.001342	0.030302	0.003339	0.030100
Number of obs	488		488		488		488		488		488	
R-squared	0.3396		0.3405		0.3531		0.1486		0.1523		0.1609	
Durbin (score) chi2(1)	3.58129 (0.0584)		9.04248 (0.0026)		8.44669 (0.0037)		1.70545 (0.1916)		4.94983 (0.0261)		4.72866 (0.0297)	
Wu-Hausman F(1, ・)	3.50427 (0.0618)		8.93 (0.0030)		8.31365 (0.0041)		1.66233 (0.1979)		4.84685 (0.0282)		4.61837 (0.0321)	

	Unemployment		Short-time workers	
	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.005537	0.004879	-0.001477	0.000902
d_tangible fixed asset	0.000939 *	0.000490	0.000055	0.000091
d_volume of business	-0.000223	0.000186	0.000000	0.000034
unemployment rate	-0.075238 **	0.037345	0.004006	0.006903
ratio of employment in manufacturing	0.001238	0.004149	-0.001145	0.000767
the concentration of manufacturing (EG)	-0.342581 *	0.205168	-0.026103	0.037923
d_EG	-0.259610 *	0.138900	0.038579	0.025674
R&D rate	-0.000509	0.000520	-0.000140	0.000096
EG x imported inputs	0.001157	0.001907	0.000259	0.000352
EG x R&D	-0.000145	0.000463	0.000043	0.000086
ratio of female workers	-0.000507	0.000355	0.000566 ***	0.000066
college graduation rate	0.001337	0.002999	0.000754	0.000554
ratio of elderly people	0.002843	0.001915	-0.000016	0.000354
period dummy	-0.135620	0.191895	0.563035 ***	0.035469
_cons	1.393388 **	0.613742	-0.212558 *	0.113442
Number of obs	488		488	
R-squared	0.1133		0.6583	
Durbin (score) chi2(1)	1.59162 (0.2071)		3.17867 (0.0746)	
Wu-Hausman F(1, ・)	1.54447 (0.2146)		3.09461 (0.0792)	

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

Appendix1a First-stage estimation results of Table2 (Depend variables: 10 x annual change in imported intermediate inputs)

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
d_tangible fixed asset	-0.016963	***	0.005989	-0.016771	***	0.006001	-0.015535	***	0.005933
d_volume of business	0.012018	***	0.002024	0.011972	***	0.002027	0.011562	***	0.002004
unemployment rate	-0.580690		0.459328	-0.593070		0.460053	-0.561427		0.454180
ratio of employment in manufacturing	0.040459		0.048058	0.038344		0.048209	-0.021542		0.050297
the concentration of manufacturing (EG)	-11.174710	***	1.630554	-11.037710	***	1.646345	-3.924149		2.527033
d_EG	4.278625	***	1.626120	4.288488	***	1.627244	3.591909	**	1.617325
R&D rate				-0.002183		0.003502	0.017119	***	0.006286
EG x imported inputs	0.227937	***	0.020570	0.227302	***	0.020609	0.236307	***	0.020489
EG x R&D							-0.020568	***	0.005595
ratio of female workers	-0.003268		0.004347	-0.003208		0.004351	-0.004199		0.004303
college graduation rate	-0.011958		0.036764	-0.008766		0.037143	-0.015995		0.036715
ratio of elderly people	0.012735		0.023014	0.009754		0.023521	0.004677		0.023257
period dummy	5.085650	**	2.370781	5.242187	**	2.385566	4.473372	*	2.363962
growth of imports in 8 developped countries	0.000000	***	0.000000	0.000000	***	0.000000	0.000000	***	0.000000
_cons	3.342843		7.420263	4.177231		7.544759	2.255351		7.465445
Number of obs	488			488			488		
Adj R-squared	0.6771			0.6767			0.685		

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Appendix1b First-stage estimation results of Table3 (Depend variables: 10 x annual change in imported intermediate inputs)

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
d_tangible fixed asset	0.000674		0.031778	0.000755		0.031871	0.000675		0.031922
d_volume of business	0.030623	***	0.010729	0.030602	***	0.010752	0.030625	***	0.010768
unemployment rate	3.767120		2.399460	3.756634		2.415195	3.756726		2.417738
ratio of employment in manufacturing	-0.178049		0.247030	-0.178196		0.247315	-0.177731		0.247650
the concentration of manufacturing (EG)	-1.190853	*	0.609576	-1.191613	*	0.610492	-1.144412		0.868596
d_EG	-1.056634	***	0.354927	-1.056266	***	0.355412	-1.055847	***	0.355828
R&D rate				-0.001170		0.028149	-0.000943		0.028334
EG x imported inputs	0.170438	***	0.013458	0.170437	***	0.013472	0.170703	***	0.013928
EG x R&D							-0.000247		0.003225
d_EG x imported inputs	0.159695	***	0.008261	0.159686	***	0.008273	0.159633	***	0.008310
ratio of female workers	-0.008009		0.021689	-0.007906		0.021852	-0.007992		0.021903
college graduation rate	0.004785		0.188105	0.006919		0.195171	0.007722		0.195658
ratio of elderly people	-0.056826		0.120717	-0.057894		0.123546	-0.057885		0.123676
period dummy	2.515196		12.222500	2.607328		12.434450	2.640889		12.455280
growth of imports in 8 developped countries	0.000000	***	0.000000	0.000000	***	0.000000	0.000000	***	0.000000
_cons	-0.320258		38.823530	-0.059731		39.366420	-0.184979		39.441880
Number of obs	488			488			488		
Adj R-squared	0.6098			0.609			0.6082		

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Appendix1c First-stage estimation results of Table4 (Depend variables: 10 x annual change in imported intermediate inputs)

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
d_tangible fixed asset	-0.010077		0.006664	-0.010023		0.006686	-0.015535	***	0.005933
d_volume of business	0.010378	***	0.002260	0.010385	***	0.002263	0.011562	***	0.002004
unemployment rate	-0.587542		0.512999	-0.587942		0.513543	-0.561427		0.454180
ratio of employment in manufacturing	-0.068548		0.056469	-0.069045		0.056680	-0.021542		0.050297
the concentration of manufacturing (EG)	-0.813927		2.733721	-0.723231		2.840077	-3.924149		2.527033
d_EG				0.214693		1.798516	3.591909	**	1.617325
R&D rate	0.008030		0.006984	0.007921		0.007051	0.017119	***	0.006286
EG x imported inputs							0.236307	***	0.020489
EG x R&D	-0.012958	**	0.006211	-0.012851	**	0.006281	-0.020568	***	0.005595
ratio of female workers	-0.010169	**	0.004743	-0.010274	**	0.004829	-0.004199		0.004303
college graduation rate	0.055346		0.040565	0.054732		0.040931	-0.015995		0.036715
ratio of elderly people	0.016113		0.026184	0.015896		0.026275	0.004677		0.023257
period dummy	0.621518		2.631391	0.591944		2.645750	4.473372	*	2.363962
growth of imports in 8 developped countries	0.000000	***	0.000000	0.000000	***	0.000000	0.000000	***	0.000000
_cons	-1.462281		8.384874	-1.364022		8.433852	2.255351		7.465445
Number of obs	488			488			488		
Adj R-squared	0.5981			0.5973			0.685		

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Appendix2a The effect on the concentration of SPECIFIC manufacturing, 2sls model

	(Depend variables: the change in the concentration of manufacturing)						EG in the first year	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	0.009856 ***	0.001546	0.009430 ***	0.001594	0.012199 ***	0.001954	0.014809 ***	0.002850
d_tangible fixed asset	0.000018	0.000166	-0.000049	0.000170	-0.000155	0.000186	0.000464 *	0.000259
d_volume of business	-0.000174 ***	0.000062	-0.000147 **	0.000064	-0.000152 **	0.000071	-0.000404 ***	0.000100
unemployment rate	0.005903	0.012695	0.006488	0.012983	0.008534	0.014325	0.052045 ***	0.019814
ratio of employment in manufacturing	0.005222 ***	0.001502	0.002517 *	0.001352	0.004235 ***	0.001481	0.007239 ***	0.002041
the concentration of manufacturing (EG)	-0.416849 ***	0.037781	-0.399629 ***	0.038582	-0.541753 ***	0.036690		
R&D rate	0.000034	0.000097	0.000041	0.000099	0.000093	0.000109	0.000506 ***	0.000150
EG x imported inputs	-0.004438 ***	0.000590	-0.004548 ***	0.000608				
ratio of female workers	0.000428 ***	0.000133	0.000451 ***	0.000121	0.000640 ***	0.000132	0.001083 ***	0.000178
college graduation rate	0.003605 ***	0.001017	0.003578 ***	0.001041	0.002300 *	0.001180	0.004384 ***	0.001599
ratio of elderly people	0.000790	0.000648	0.001063	0.000663	0.000908	0.000732	0.000583	0.001020
period dummy	0.012001	0.080282	0.058280	0.066245	0.147724 **	0.072724	-0.073894	0.101185
d_lower educated male worker	0.508590 ***	0.168572						
d_more highly educated male worker	0.354459	0.408694						
d_lower educated female worker	-0.306718	0.274132						
d_more highly educated female worker	1.991013	1.409849						
d_unemployment	-0.055729 ***	0.016123						
d_short-time worker	0.003110	0.086511						
_cons	-0.366473 *	0.208133	-0.467395 **	0.211848	-0.411169 *	0.234166	-0.478101	0.324623
Number of obs	488		488		488		488	
R-squared	0.464		0.430		0.307		0.096	
Durbin (score) chi2(1)	12.336 (0.0004)		8.991(0.003)		28.624 (0.000)		50.681 (0.000)	
Wu-Hausman	12.137 (0.0005)		8.897(0.003)		29.598 (0.000)		55.164(0.000)	
strength test	Instruments are weak		Instruments are weak		Instruments are weak		Instruments are weak	

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

Appendix2b The effect on the concentration of ALL manufacturing-fixed panel model

	(Depend variables: the change in the concentration of manufacturing)						EG in the first year *	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
d_imported inputs	-0.005581	0.004078	-0.005899	0.004042	-0.003012	0.003911	0.000815	0.002123
d_tangible fixed asset	0.000104	0.001943	0.000002	0.001928	0.000607	0.001933	-0.000121	0.001485
d_volume of business	0.000674	0.000989	0.000758	0.000980	0.000205	0.000964	-0.000049	0.000669
unemployment rate	-0.235768	1.167400	-0.319458	1.090397	-0.073816	1.097548	0.049262	0.238704
ratio of employment in manufacturing	-0.012337	0.085246	-0.039239	0.065721	-0.034142	0.066397	0.062873 **	0.025167
the concentration of manufacturing (EG)	-1.670810 ***	0.088006	-1.665405 ***	0.086981	-1.562079 ***	0.077067		
R&D rate	0.003245	0.008682	0.003284	0.008577	0.003365	0.008669	-0.002884	0.002764
the variety of manufacturing	0.773370 *	0.416007	0.865768 **	0.403913	0.833413 **	0.408051	-0.098318	0.099309
EG x imported inputs	0.005974 **	0.002495	0.006102 **	0.002472				
ratio of female workers	0.006714	0.006302	0.004372	0.005388	0.004783	0.005443	0.001284	0.002353
ratio of elderly people	-0.054807	0.067447	-0.043817	0.065457	-0.045872	0.066157	0.005960	0.010696
period dummy	3.955320	4.751172	4.184678	4.200958	3.510492	4.237247	1.787462	1.098502
d_lower educated male worker	-3.377320	4.971526						
d_more highly educated male worker	11.731220	11.704990						
d_lower educated female worker	8.293324	7.728427						
d_more highly educated female worker	-21.713500	39.145040						
d_unemployment	0.432699	0.602911						
d_short-time worker	1.219074	2.756569						
_cons	3.620119	13.031880	3.263509	12.815450	2.475086	12.949540	-2.444914	2.960009
Number of obs	492		492		492		492	
R-sq: within	0.6631		0.660		0.650		0.027	
between	0.1193		0.116		0.126		0.036	
overall	0.3449		0.339		0.341		0.031	
chi2(P-value)	136.88(0.000)		151.600(0.000)		134.220(0.000)		4.670(0.862)	

***, ** and * denote 1%, 5% and 10% significance levels, respectively.

the concentration of manufacturing (EG) is the start-of-period value.

d_EG is the change in the concentration of manufacturing

*The result of random effect model