The FORMATION OF INDUSTRIALCLUSTERS IN ASIA AND REGIONAL INTEGRATION
Kuchiki A. & M. Tsuji (ed.), IDE-JETRO, 2008
Midterm Report

Chapter 7

The relocation form industrial clusters: Guangdong and Hanoi

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1. Introduction

Pearl River Delta, which is in Guangdong, has industrial agglomerations as examined by Tuan and Ng (2007). Foreign direct investments contribute to form industrial agglomeration. Many Japanese multinational firms also locate in the area. As a result, GDP in Guangzhou city of Guangdong is slightly larger than that in Vietnam.

Some multinational firms already locating in industrial agglomeration of Pearl River Delta may need to relocate or fragment their production activity. To develop Pearl River Delta more in 2020, the following recommendations was done: “The region, through phasing out a number of backward enterprises, relocating a batch of labor-intensive ones,… will facilitate the adjustment of its composition of enterprises” (NDRC 2008). It was said before financial crisis that wage rates in Guangzhou were larger than in Malaysia. After China became a member of WTO, favorable trade policy for multinational firms locating in China such as VAT rebates changed or removed gradually (WTO 2008). Candidate for the relocation of plants might be Vietnam or Nanning in Guangxi, which has international ports, under the corporation with local governments. We examines when firms relocate from the industrial agglomeration.

Section 2 overview the input and output structure by Japanese multinational firms in Southeast Asia and China. Section 3 introduces the access between Guangzhou, Guangdong and Hanoi, Vietnam. Section 4 examines the effects of transport costs on the emergence of firms in the low-wage country. Finally, some policy recommendations derived from interview to Japanese multinational firms are mentioned as the conclusion.

2. Japanese MNEs input and output structure in East Asia

The input and output structures by Japanese multinational firms differ in East Asia and Southeast Asia. The rows in Table 1 show whether the majority of Japanese MNEs in total samples in a location rely on local procurement or not, whereas the columns in Table 1 show whether the sales by the majority of Japanese MNEs in total samples depends on export or local sales in a location. Thus, the four groups in the table explain characteristics in each location. The firms at the location of the upper right group in the table imported most inputs and exported most products. These firms may be in the

foreign production networks due to the inexpensive labor costs and/or good transport location. The firms at the location of the lower left group used local inputs and sold their product locally. This might be due to large local markets and the large number of supporting firms. In the case, forward and backward linkages in a region might bring industrial agglomerations as the explanations of New Economic Geography. The firms at the location of the upper left group imported most inputs and sold most their products locally. This might be due to large local market. The firms at the location of the lower right group purchased most inputs locally and exported most their products. From Table 1, Guangdong, Hong Kong and Vietnam is in the case where firms rely on trade for purchases and sales. This might be because most Japanese firms are export processing enterprise, which is duty-free firms, in Vietnam, and also many Japanese firms engage processing with imported materials or processing with customer's materials in Guangdong.

The relationships on export or on procurement in locations in Table 1 differ among ASEAN countries and China. Many Japanese MNEs in ASEAN preferred to export to Japan or other ASEAN countries from Figure 1, whereas those in Chinese cities except Hong Kong preferred to export only to Japan from Figure 2. Most Japanese MNEs in ASEAN countries imports from Japan, and about half of Japanese MNEs in ASEAN countries in the sample imports from ASEAN countries, whereas most Japanese MNEs in Chinese cities imports from Japan but they do not imports so much from ASEAN countries and China. Thus Japanese firms in ASEAN countries compose inputs and outputs relationships in ASEAN countries, but those in Chinese cities does not constructs such relationships as those in ASEAN countries.

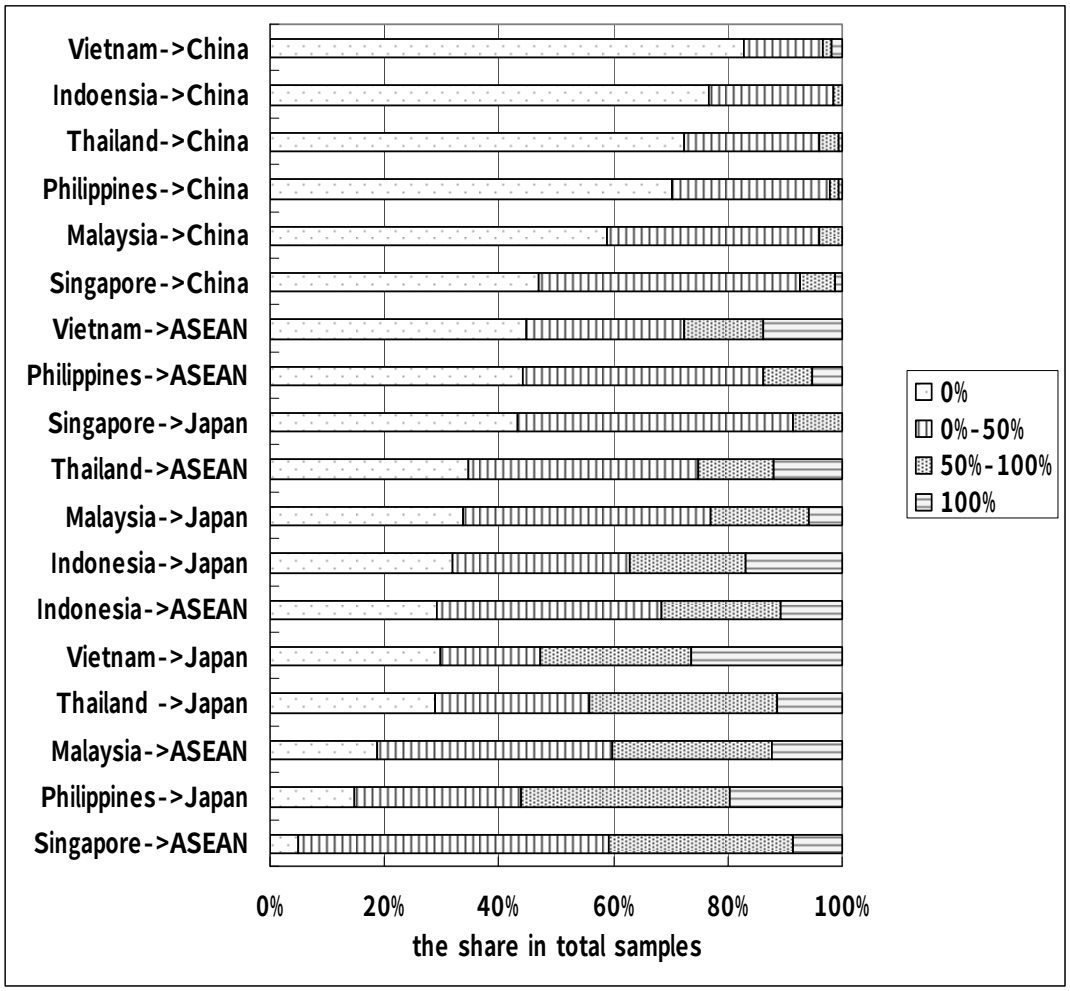
Table 1: The characteristics of countries and cities
on input-output structure by the majority of Japanese MNEs

		Export / Sales	
		0%-50%	50%-100%
Local purchase / Total purchase	0%-50%	Indonesia, Korea, Taiwan	Dalian, Guangdong, Hong Kong, Malaysia, the Philippines, Singapore, Vietnam
	50%-100%	Beijing, Shanghai, Thailand	Qingdao

(Source) Compiled by author utilizing results in Japanese-affiliated manufacturers in Asia: ASEAN and India (survey 2005) and Japanese-affiliated manufacturers in Asia: China, Hong Kong, Taiwan, Korea (survey 2005) Overseas Research Dept., Japan External Trade Organization (JETRO)

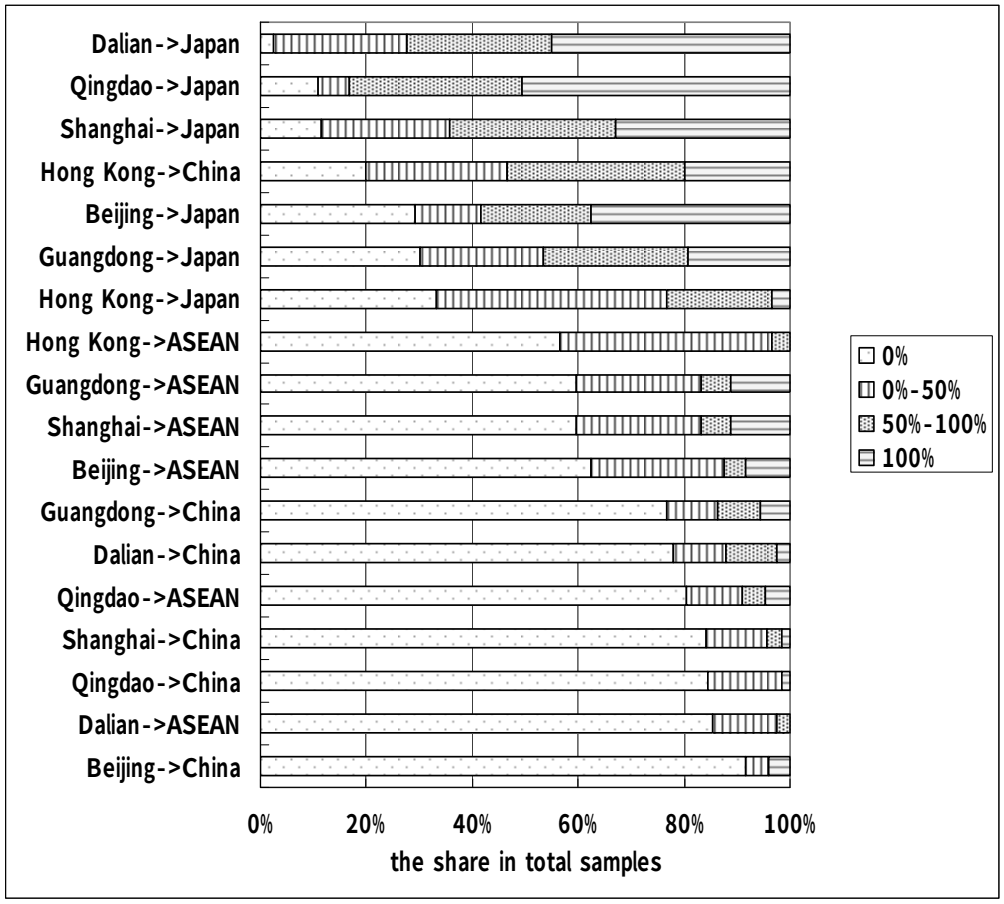
The linkages between ASEAN countries and Chinese cities by Japanese MNEs are not so strong as those in ASEAN countries and with Japan. The export of them in Singapore to China excels that in other ASEAN countries. Hong Kong also has strong ties with ASEAN countries. When we limit our focus on exports in total sales, those in Guangdong also has the strong relations with those in ASEAN countries. From figures, most Japanese firms in Vietnam had no relations with China. Although Vietnam shares the same boarder with China, the share of Japanese MNEs in Vietnam which earned all of their sales by exporting to China in total samples is larger than that in Singapore. From the statistical yearbook of Guangdong, main trade partner is Singapore, Thailand, Malaysia and Indonesia in ASEAN countries.

Figure 1: The share of Japanese MNEs' export from ASEAN countries in sales



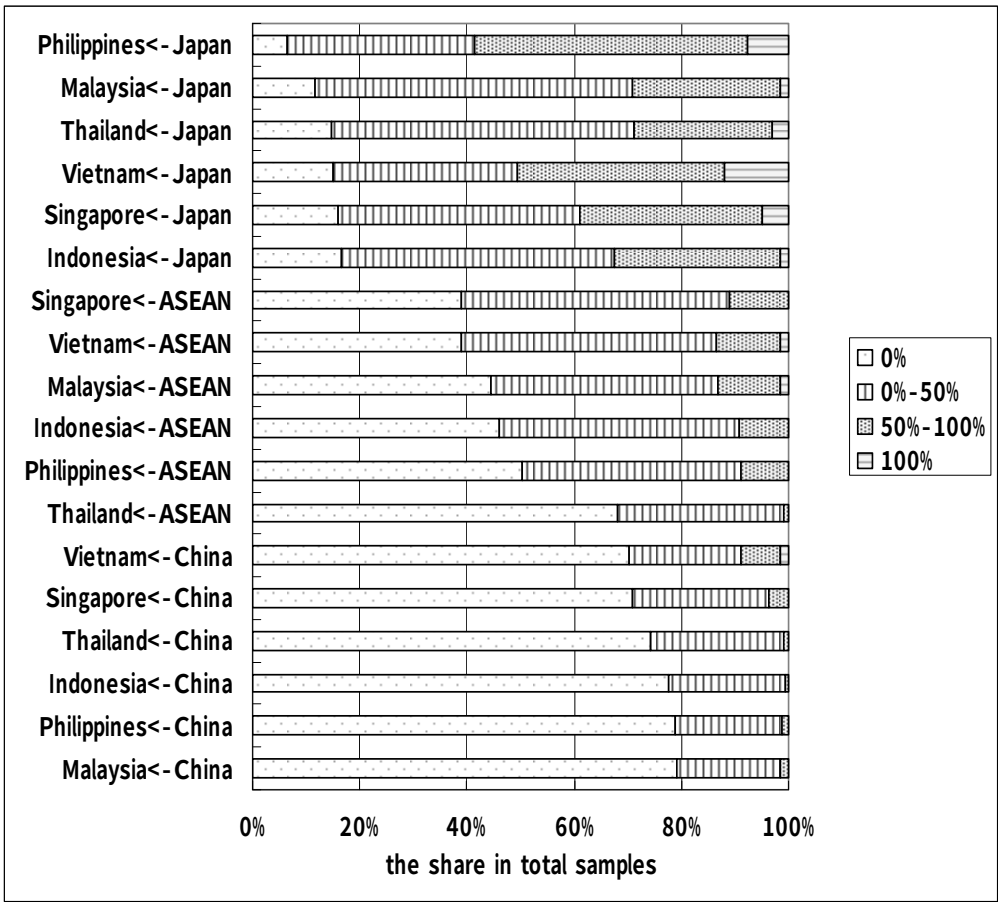
(Source) Compiled by author from the results in Japanese-affiliated manufacturers in Asia: ASEAN and India (survey 2005) Overseas Research Dept., Japan External Trade Organization (JETRO)

Figure 2: The share of Japanese MNEs' export from China in sales



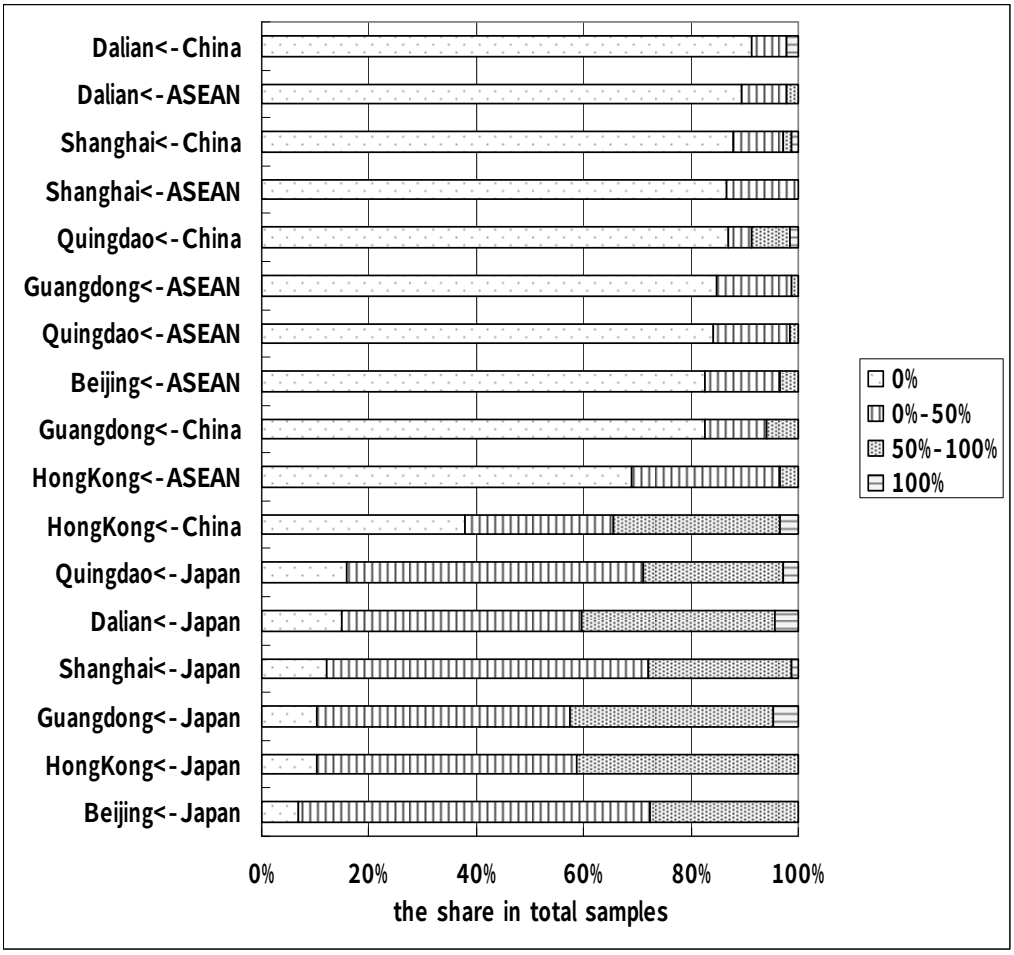
(Source) Compiled by author from the results in Japanese-affiliated manufacturers in Asia: China, Hong Kong, Taiwan, Korea (survey 2005) Overseas Research Dept., Japan External Trade Organization (JETRO)

Figure 3: The share of Japanese MNEs' procurement in ASEAN countries



(Source) Compiled by author from the results in Japanese-affiliated manufacturers in Asia: ASEAN and India (survey 2005) Overseas Research Dept., Japan External Trade Organization(JETRO)

Figure 4: The share of Japanese MNEs procurement in China



(Source) Compiled by author from the results in Japanese-affiliated manufacturers in Asia: China, Hong Kong, Taiwan, Korea (survey 2005) Overseas Research Dept., Japan External Trade Organization (JETRO)

3. The transportation between Guangzhou and Vietnam

The shipping distance from Ho Chi Minh port to Haiphong port, which is the closest port to Hanoi, is 819 miles; that from Haiphong port to Guangzhou port via Qiongzhou straight is 563 miles; that from Ho Chi Minh port to Guangzhou port is 1001 miles.[1] Furthermore road distance from Guangzhou of Guangdong to the border between China and Vietnam is 907 km; that from the border to Hanoi is 174 km; that from Hanoi to Ho Chi Minh is 1732 km.[2] Nanning of Guangxi is on the way to the border between China

[1] Source: Japanese shipowner's association
[2] Source: Nell's map

and Vietnam. The distance between Guangdong and Nanning is 664km and the distance between Nanning and the boarder is 243km.

There exist three transport modes between Guagnzhou and Hanoi: air freight, ocean freight, and land freight. The charges become more expensive when the cargoes are arrived earlier at the destination. That is, air freight is the most expansive and ocean freight is the cheapest in the three transportation modes. It takes three days by trucks and five days by ships to transport goods from Guangzhou to Hanoi. Ocean freight is most popular and air freight almost covers remaining demand. Land transport has started recently.

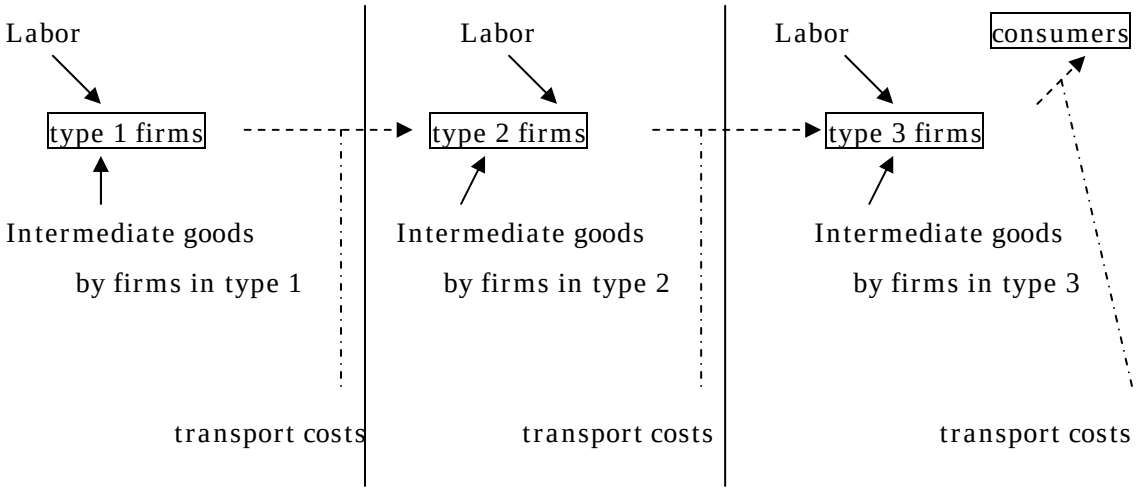
4. Examination with a general equilibrium model

In this section, using New Economic Geography model, the effects of decreasing transport costs are examined. Trade costs embrace broad meaning, covering the costs caused by the firm's transaction between countries such as tariffs and custom clearance. The model is the expansion from that in the Chapter 7 of Combes, Mayer and Thisse (2008) to express more fragmented production processes in manufacturing sector. In the model, the economic space consists of two regions, region A and region B. The economy is endowed with given populations. The workers are immobile between regions but mobile between sectors and manufacturing firms. Consumption goods are a good produced in the other sector and one variety of manufactured goods. Preferences are identical across all workers and expressed by a Cobb Douglass utility with a composite differentiated manufactured good expressed by a CES-type index. The expenditure share on the other sector is sufficiently large for the good produced in the other sector to be always produced in both regions.

The economy has two production sectors, the other sector and manufacturing sector. The other sector produces a homogeneous good under constant returns, using labor as the only input. One unit of output requires one units of labor in region A and more than one unit of labor in region B. That is, the workers in the other sector supposed to be more productive in region A than in region B. This productivity difference of labor between the two regions is assumed to arise from some exogenous factors. The output of the other sector costlessly traded between regions and is chosen as the numeraire, so that the equilibrium wages for the workers in the other sector is one in region A and the inverse of labor requirements in region B. That is, the wage rates in region B is less than those in region A. The wage difference increases with the labor requirements for one unit of output in region B. In other to retain the symmetric

regional income between two regions, the spatial distribution of unskilled workers is supposed to be the same in terms of effective units. As a result, the present general equilibrium model has a partial equilibrium flavor.

Figure 5: The input and output structure in manufacturing sector



(Source) Author[3]

Manufacturing sector produces three continuums of varieties of horizontally differentiated products under increasing returns, but the degree of differentiation, the elasticity of substitution, is supposed to be the same in the three continuums. Each variety of manufactured good is produced by a separate firm. Monopolistic manufacturing firms produce under increasing returns to scale technology with constant fixed inputs requirements and constant marginal inputs requirements. Inputs include firm's own production. The composition of inputs, which is expressed by Cobb-Douglass with CES function, differs in the type of continuums. Figure 5 shows input-output linkages in the present model. The three continuums of varieties of differentiated products correspond to three sequential production processes: the most upstream processes, middle processes, and the most downstream processes. The most upstream firms, which we called as type 1 firms, use the goods produced by the most upstream firms and labor as inputs; the firms in middle processes, which we call as type 2 firms, use the goods produced by the most upstream firms and the firms in middle processes and labor as inputs; the most downstream firms, which we called as type 3

[3] I would like to thank for the suggestion from Dr. Kuroiwa (IDE-JETRO), which was very helpful.

firms, use the goods produced by the most downstream firms, the goods produced by the firms in middle processes and labor as inputs. The goods produced by type 3 firms are consumption goods for households. The fixed costs are supposed to be the same among three types of firms. Manufacturing firms pay to workers the same nominal wage rate as workers in the other sector because the perfectly competitive other sector exists in both regions. Thus the nominal wage rate is unaffected by the spread of firms. To send manufactured products to the other region, transport costs are required. Within each region, the transportation of manufactured goods is costless. Applying the free-entry condition implies that the firms' profits are zero. Thus, manufacturing firms do not emerge in a region where their profits become negative.

From the above setting, we can summarize parameters. The input shares of labor and intermediate goods are expressed as μ where $0 < \mu < 1$: the first numbers in subscripts show the type of firms and the last numbers in subscripts show the type of inputs. The fixed costs, which are required even if the products are zero, are expressed as f whose subscript shows the location of firms. The marginal input requirements, which increase with firm's production, are expressed as c whose subscripts show the location of firms and the type of firms. The elasticity of substitutions are expressed as σ, which is larger than one. The products are more differentiated when the elasticity of substitutions are closer to one. The transport costs are expressed as t whose subscript shows the type of firms. The wage rates in region A is one, and that in region B is expressed as w, which is smaller than one.

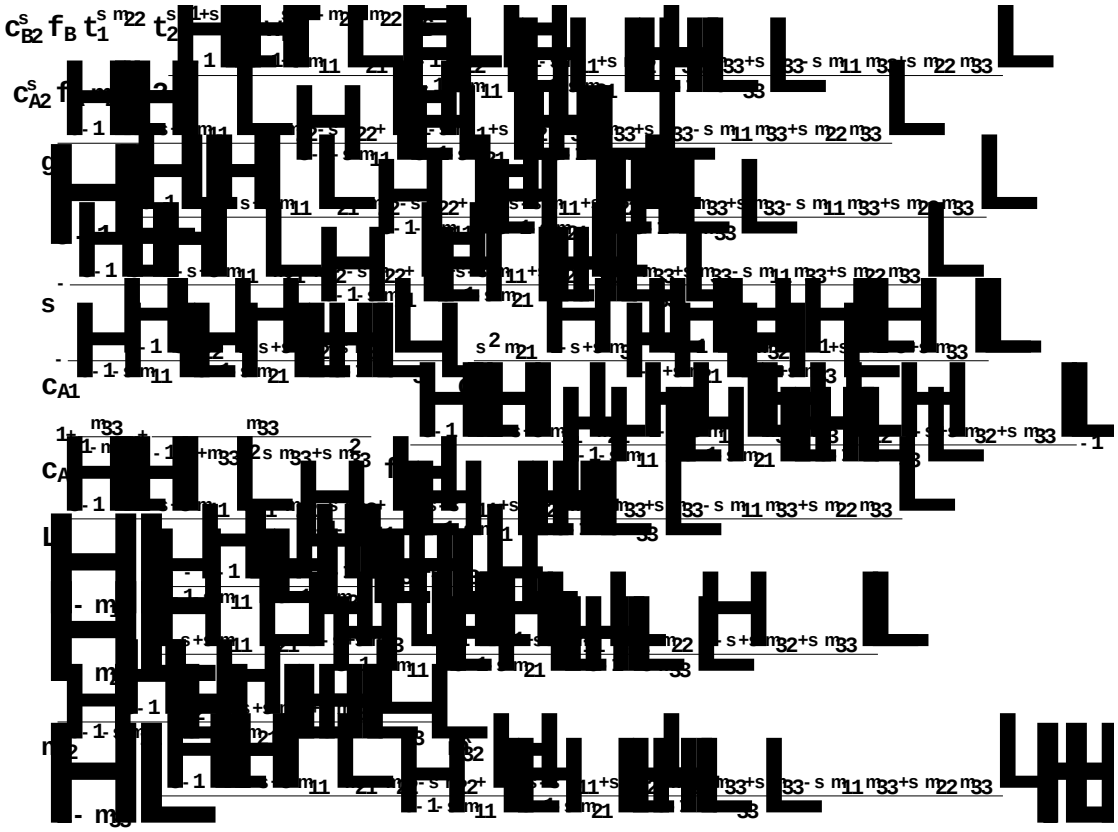
Solving the present model, we focus on equilibria in which all firms locate in region A. Thus, we must derive the condition when three types of firms in region B emerge in the low-wage country, given the full agglomeration of firms in region A.

The condition where type 1 firms emerge in region B is as follows:

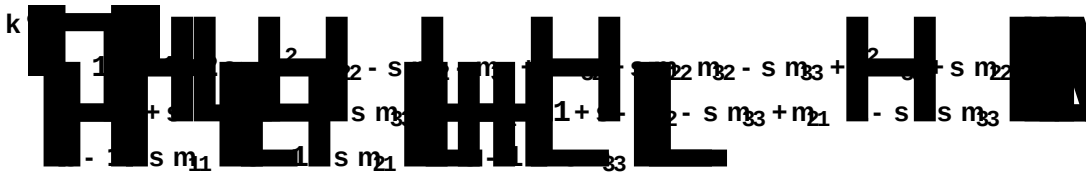
$$\frac{f_B c_{B1}^s w_B^s}{f_A c_{A1}^s} \leq t_1^{-1} \quad . \qquad (1)$$

From (1), type 1 firms emerge in the low-wage country when the fixed costs and the labor requirements are lower in the country, when the transport costs for the goods produced by type 1 firms is lower, and when type 1 firms are labor intensive.

The condition where type 2 firms emerge in region B is as follows:

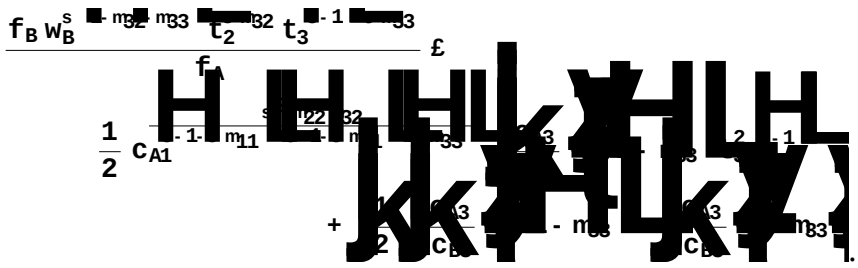


where



From (2), type 2 firms emerge in the low-wage country when the fixed costs and the labor requirements of type 2 firms are lower in the country, when the transport costs for the goods produced by type 1 firms and type 2 firms is lower. The importance between two transport costs depends on which goods are intensively used.

The condition where type 3 firms emerge in region B is as follows:

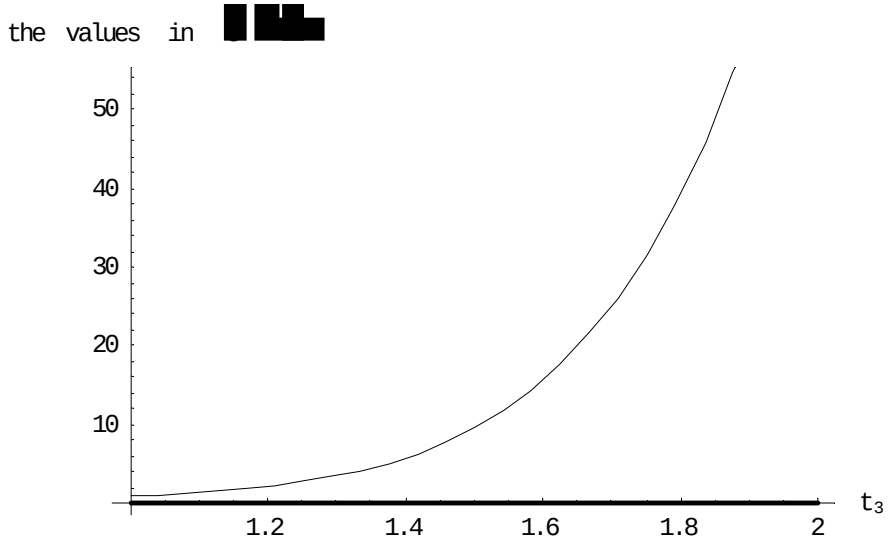


(3)

The implication from (3) depends on the relations between parameters as in Figure 6 to

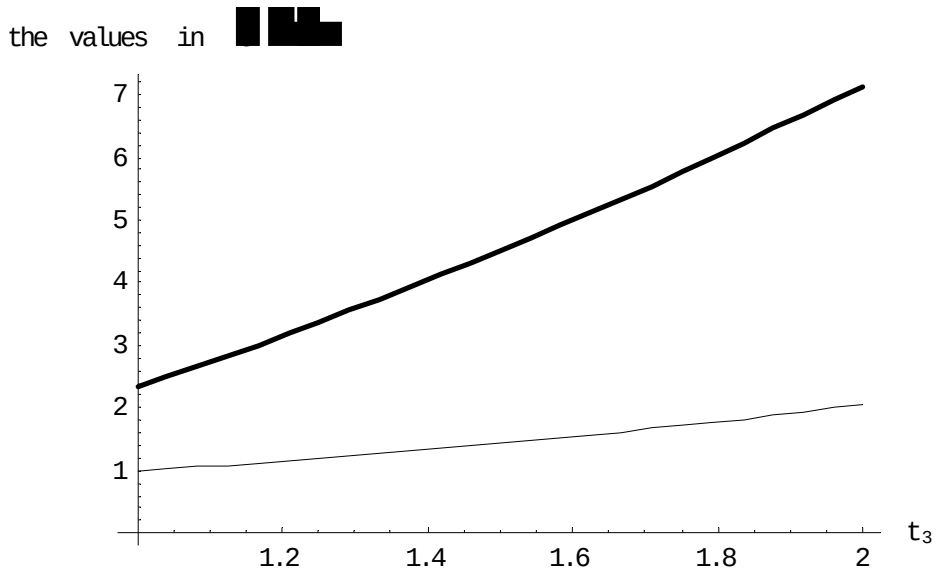
Figure 9. In Figures below, thin lines shows the value in the right-hand side of equation (3), whereas thick line shows the value in the left-hand side of equation (3). Thus, type 3 firms emerges at the transport costs of goods produced by type 3 firms when thin lines are above thick lines in the figures. From Figure 6, type 3 firms always emerge in the low-wage region in the case where the input share of goods produced by type 2 firms is relatively small, the input share of labor is relatively large, and the products are not so differentiated in comparison with other examples. From Figure 7, type 3 firms never emerge in the low-wage region in the case where the products are differentiated enough and the input share of labor is relatively small in comparison with other examples. From Figure 8, type 3 firms emerges when the transport costs of the goods produced by type 3 firms are large in the case where the products are differentiated and the input share of labor is small in comparison with other examples. From Figure 9, type 3 firms emerges when the transport costs of the goods produced by type 3 firms are small in the case where the products are not differentiated enough, the transport costs of the goods produced by type 2 firms are small, and the input share of labor is small in comparison with the other examples.

Figure 6: the emergence of firms in type 3: case 1



(Note) $s = 5,\ m_{32} = 0.1,\ m_{33} = 0.3,\ w_B = 0.1,\ t_2 = 3,\ c_{A1} = c_{A3} = c_{B3} = f_B = f_A = 1$
(Source) Author

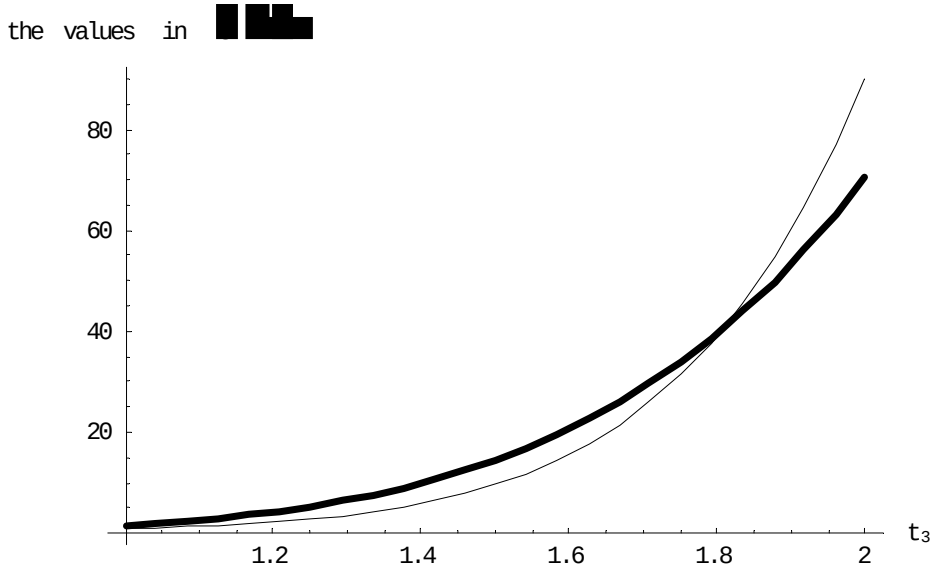
Figure 7: the emergence of firms in type 3: case 2



(Note) $s = 2,\ m_{32} = 0.6,\ m_{33} = 0.3,\ w_B = 0.1,\ t_2 = 3,\ c_{A1} = c_{A3} = c_{B3} = f_B = f_A = 1$

(Source) Author

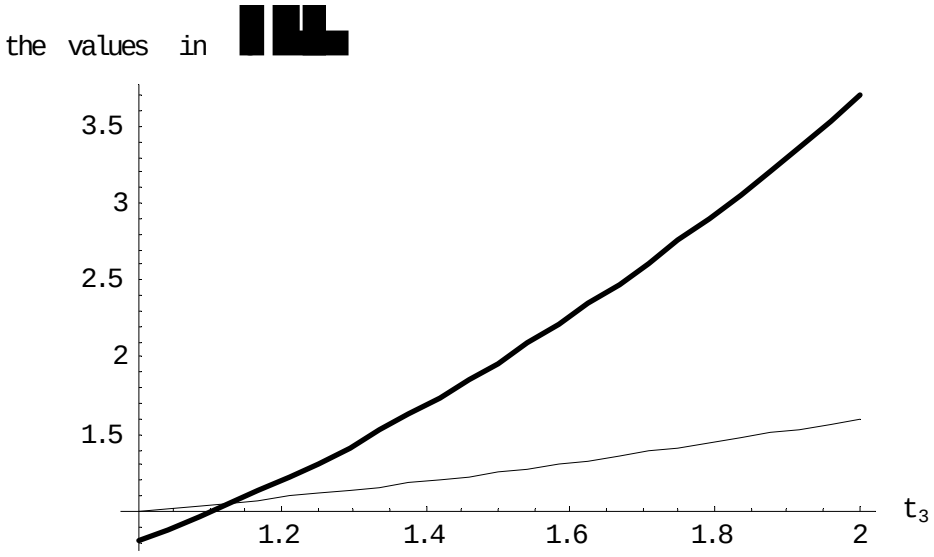
Figure 8: the emergence of firms in type 3: case 3



(Note) $s = 5,\ m_{32} = 0.5,\ m_{33} = 0.3,\ w_B = 0.1,\ t_2 = 3,\ c_{A1} = c_{A3} = c_{B3} = f_B = f_A = 1$

(Source) Author

Figure 9: the emergence of firms in type 3: case 4



(Note) $s = 2,\ m_{32} = 0.3,\ m_{33} = 0.6,\ w_B = 0.1,\ t_2 = 1.5,\ c_{A1} = c_{A3} = c_{B3} = f_B = f_A = 1$
(Source) Author

5. Conclusion

The results of model shows that firms tend to relocate from the region where firms agglomerated when transport costs become lower, but the results are ambiguous depending on the transport costs of inputs, the degree of product differentiation and the input share of inputs in the case where the demand of products are not only in a region. It is necessary to pay much attention about the location of final demand in the model used in the above to derive the results which fit the case on Guangzhou and Hanoi.

From the interview at Guangzhou and Hanoi, some policy measures to reduce transport costs seem to exist as follows:

(1) Roll-on/ roll-off ships transport trucks between Simonoseki, Japan and Busan, Korea. A tailor and the tractor of a truck were separated from the truck of trailer to change trucks. This operation saves costs and times and also cranes at ports are not necessary. Some Japanese logistics company's managers in Hanoi and Guangzhou hope to change tractors at the border between Vietnam and China on the route between Hanoi and Guangdong as the case between Simonoseki and Busan. By exchanging tractors, logistic companies avoid to reload their cargo, which save their time without the risk of wreck, rain and theft. Another suitable way is done at the border between Hong Kong and Guangdong where the truck has two number plates for Hong Kong and for Guangdong.

(2) Extending the hour to open custom offices is desirable because the time difference

exists between China and Vietnam. For example, when the trucks from Vietnam arrive at 15 o'clock at the border, the Chinese custom office at the border is closing at 16 o'clock, following Chinese local time. As a result, trucks must wait until next morning.

(3) The shortage of highway for running only by automotives in Vietnam is raised from Japanese multinational firms, although their focus is mainly on the routes between Guangdong and Hanoi and between Bangkok and Ho Chi Minh.

(4) Original documents are requested in Vietnamese customs instead of the copies of original documents. This cause the spread of offices to logistic firms to circulated documents among customs and owner of goods.

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