

Chapter 3

Does Regional Integration Agreement disperse or agglomerate multinational firms?

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1. Introduction

Multinational firms are considered to provide technologies, skills and accesses to foreign market and improve local firms' productivity through competition. As examined Blomstrom and Kokko (1998), these positive effects from foreign direct investment in host countries exist under the sufficient level of local capability and competition. In East Asia, the growth in FDI brings about significant progress in productivity. In fact, Marwah and Tavakoli (2004) estimate that the increase in FDI has provides about one-fifth to one-quarter of the improvement in productivity of the total capital stock in Thailand, Malaysia, Indonesia, and the Philippines. In China, the productivity of domestic firms tends to increase as the number of multinational firms locating near them increases (Zhou, Li and Tse 2000).

Given the positive effects of multinational firms, there are concerns. China has become one of the most attractive host countries for multinational firms. Thus ASEAN countries regard such attractiveness with some apprehension.

In this regard, this paper intends to examine when multinational firms shift their plants with a progress of economic integration. Economic integration expected to provide many gains. Jovanovic (2005, p 463) listed potential gains in regional integration as follows: (1) access to the market, (2) increased investment, (3) improved efficiency in the use of resources, (4) reduced cost of trade, (5) downward pressure on prices, (6) facilitation of exchange of technical information, (7) the pressure to implement new idea, (8) economy of scale, (9) potential for coordination of certain economic policy, (10) increased bargaining position to foreign partner, (11) stimulated research and innovation, (12) wider range of goods and services, (13) reduction in X-inefficiency. But our focus is related with only the first, the second, the forth, the fifth, the eighth and the twelfth. Integration is expressed by the reduction of transport costs in broad meaning.

There are many kinds of motives and many types in multinational firms as in Narula (2001). With regard to motivations, multinational firms seek resources, markets and/or

knowledge. Regarding operations, some subsidiaries are truncated miniature replicas of the parent firms, and the others are rationalized affiliates which are closely integrated into the MNE networks. In East Asian and South East Asian developing country scenario, there are single activity affiliates which are extremely truncated from truncated miniature replicas and are integrated in part of the MNE networks. Furthermore, foreign affiliates may upgrade or downgrade the role of subsidiaries depending on circumstances. But the focus is limited on a simple setting. In this chapter, multinational firms have HQs and plants. Subsidiaries are expressed as replicas without HQs.

The argument of this paper is organized in three sections after this introduction. Section 2 reviews the literature on two-country world setting. The setting makes clear the mechanism of multinational firms' location choice. Section 3 focuses on three-country world setting. The setting is helpful to examine the effects of regional integration as partial liberalization and the effects of the enlargement of the integration bloc. Finally, section 4 concludes.

2. The location choice of multinational firms in two-country world

2.1 The location for producing final products

Supposing the world with one home country and one foreign country, firms face trade-offs between the costs and benefit on becoming multinational. Navaretti and Venables (2004) explained the structure. The costs to becoming multinational are (i) the loss of scale economy and (ii) the costs of geographical dispersion. The loss of scale economy emerges when the production are duplicated in home country and foreign country. The costs of geographical dispersion emerge when plants are separated from headquarters geographically. From now, this cost is called communication costs. The benefit to become multinational is (i) factor cost saving and (ii) market access. The expenditure share of each factor in a firm is different among firms. Firms have an incentive to become multinational in the place where the production factor used heavily is not so expensive. Market access means that trade costs are saved by having plants foreign market. Resolving above trade-offs, firms decide the location of their plants.

Summing these costs and benefits, Fujita and Gokan (2005) examined the spread of plants. Firms produce differentiated final products under increasing returns to scale technology and imperfect competition. When firms have the second plants, additional fixed costs are incurred. Headquarters supposed to locate in home country by Marshallian externality. The costs of geographical dispersion between HQs and plants are expressed by

communication costs. The transportation costs are incurred when products are shipped. Under the setting, firms face three choices: (1) their plant is located in home country with HQs, (2) their plants are located in foreign country away from HQs, and (3) plants are located in home country and foreign country.

To examine the spread of firms, the relative cost advantage of foreign country over home country when serving to home country and the relative cost advantage of home country over foreign country when serving to foreign country is useful. These two ratios implicitly express four patterns of production: (i) the goods produced and sold in home country, (ii) the goods produced in foreign country and sold in home country, (iii) the goods produced and sold in foreign country and (iv) the goods produced in home country and sold in foreign country. The marginal cost of the first pattern corresponds to the marginal production cost (labor cost) in home market. That of the second pattern is composed with the sum of the marginal cost of producing a unit in foreign country, which is labor cost and communication cost, and transport cost to ship products to home country. That of the third pattern corresponds to the marginal production cost of producing a unit in foreign country. That of the fourth pattern is the marginal production cost of a unit in home country and transport cost to ship products to foreign country. The relative cost advantage of foreign country over home country when serving to home country is expressed by the ratio of the marginal cost of the first pattern over that of the second pattern. The large ratio means that firms have strong incentive to have plants in foreign country. Similarly, the relative cost advantage of home country over foreign country when serving to foreign country corresponds to the ratio of the marginal cost of the third pattern over that of the fourth pattern. The large ratio also means that firms have strong incentive to have plants in home country.

From the two ratios, it becomes clear that the effects of transport costs and communication costs on the location of plants are completely different. The ratio in terms of location advantage in foreign country decreases and the ratio in terms of location advantage in home country increase with a fall of communication costs. The fall is derived by the advance of information technology. Therefore, the advances in information technology provide the fragmentation of firms from home country to foreign country. Wage difference between home country and foreign country works on the location choice of plants as communication costs. On the other hand, a fall of transport costs, which implies the progress of regional integration, increases both ratios. That is, firms tend to have plants in home country with a decrease in transport costs when transport costs to home country is larger than that to foreign country, whereas production

activity tends to fragment with a decrease in transport costs when transport costs to foreign country is larger than that to home country. Under the weak scale economy at a plant level, multinational firms have plants in both regions when both ratios are small enough. This means that multinational firms avoid having plants in both regions with the progress of regional integration.

2.2 Linkages in manufacturing sector

When input-output structure is introduced the ratios on location advantage we mentioned in previous subsection are affected by the location of plants. That is, the shift of plants' location changes the ratio itself. These interactions among firms are examined in New Economic Geography (NEG). To introduce four effects affecting the distribution of firms in NEG is useful. The first three effects are in Baldwin et al. (2003). The first is market-access effect. Increases in firms which use varieties of manufactured product in foreign country expand sales in foreign country. Thus the country becomes more attractive for firms. The second is related with the price index. In a region where many suppliers locate, the price index of goods decreases. Prices of many varieties without transport costs become cheaper because many varieties of goods are produced locally. This effect also makes the country more attractive. The third is market crowding effects. A decrease in price index by concentrating firms makes the price of a product relatively expensive. Thus demands for the products decrease and firms lose incentive to locate in large market. Additionally, it is possible to add the forth effects which is related with labor cost. With three assumption that (1) traditional sector have decreasing-return-to-scale production technology, (2) that labor in traditional sector can move to manufacturing sector and (3) the total number of labor is fixed in the country, labor costs increase by a decrease in labor in traditional sector. Thus, increased labor costs affects negatively in the profit of firms. In short, the first and second effects are centripetal forces, and the third and the forth effects are centrifugal forces. Centripetal forces are related with demand and supply in vertical linkage.

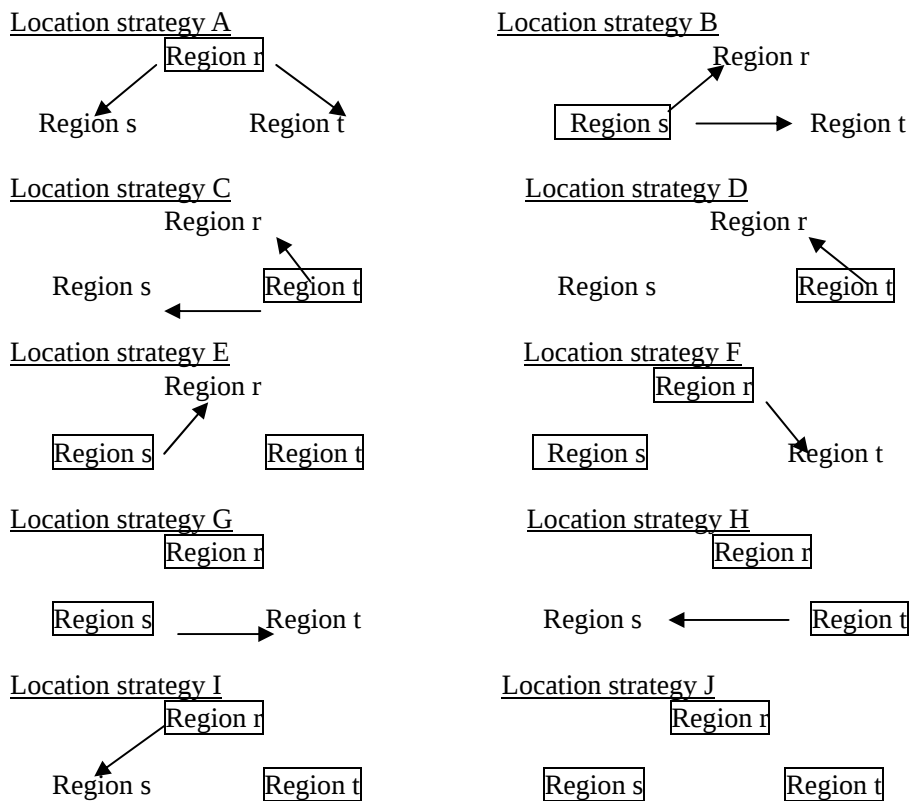
Summing these four effects, Robert-Nicoud (2008) showed the effect of transport cost reduction on the location choice of multinational firms. Headquarters (HQs) are expressed by the location of capital, and capital movements are allowed. Under the setting, HQs agglomerate in a region when transport costs are large enough or small enough, and disperse in two countries when transport costs are intermediate. When transport costs are large, the access to the other firms becomes more important, whereas the labor costs becomes more important when transport costs are small. With communication costs reduction, the range of transport costs

which enable HQs' agglomeration became wider, because HQs and plants are separated geographically.

3. The location choice of multinational firms in three-country world

In this section, we examine which subsidiaries are closed or move with a decrease in the progress of regional integration. We start from the case where plants are operated in all regions. Then, we focus on the case where plants are operated in a region.

Figure1 Potential location strategies



Source: Author

3.1 Regional integration as partial liberalization and the enlargement of the integration bloc

When two countries are integrated, other countries are discriminated. To examine such a case, three countries are required. In three-country world, we can also examine the effects of the enlargement of integration bloc. Three countries are called country r, s and t. We suppose that

HQs are only located in country r. Firms are allowed to have multiple plants with additional fixed costs for an additional plant. The skilled labor is used for fixed costs. Fixed costs are required in the region where HQs locate. The number of workers in plants and in traditional sectors is fixed in each country. The wage rates are decided under the decreasing returns to labor in traditional sector. The rest is vertical linkage NEG model as Krugman and Venables (1995).

Our focus is limited on location strategy J in Figure 1 in this subsection. That is every firms have plants in all regions. There are other 9 location strategies in Figure 1. In the figure, a firm has a plant in a boxed region and the direction of export from plants are expressed by arrows. We examine conditions where other location strategy emerges with a decrease in transport costs. For the purpose, profits are differentiated with transport costs, and then large derivatives are considered the probable location strategy. That is, the merits of regional integration for multinational firms in each location strategy are derived. When the effects of partial liberalization are examined, transport costs between region s and t are used. Whereas, when the effects of the enlargement of the integration bloc are examined, transport costs between region r and t and between region r and s are used. In the later case, transport costs between region r and t and between region r and s are supposed to be the same.

First, regional integration as partial liberalization is examined. The strategies in which transport costs between region s and t are not incurred are not affected by integration. The goods are transported from region s to region t in location strategy B and G., whereas from region t to region s in location strategy C and H. The derivative of profits in location strategy B and G with respect to transport costs between region r and s is as follows:

$$\frac{f}{H(1+2\alpha)} E_t \left(\frac{w_t}{w_s} \right)^{\sigma-1} \left(\frac{\phi_{Ht}}{\phi_{Hs}} \right)^{1-\gamma}$$

where the elasticity parameter is expressed as $\sigma > 1$ and the intermediate share in a Cobb-Douglas function of labor and intermediates $0 < \gamma < 1$. Communication costs between region r and t is expressed as ϕ_{Ht} . When communication costs are extremely large, the value of ϕ_{Ht} is the smallest and close to zero. The wage rates in region s and region t are respectively expressed as w_t and w_s . The derivative of profits in location strategy C and H with respect to transport costs between region r and region s is as follows:

$$\frac{f}{H(1+2\alpha)} E_s \left(\frac{w_s}{w_t} \right)^{\sigma-1} \left(\frac{\phi_{Hs}}{\phi_{Ht}} \right)^{1-\gamma}.$$

The first fractions in both expressions show the inverse of the number of multinational firms in location strategy J. This fraction is the same in the two derivatives, so the number of multinational firms does not affect the choice of location strategies. The manufacturing expenditures in region t and in region s are expressed as E_t and E_s . These expenditures include the consumption of manufactured goods as final consumptions and intermediate inputs. The fraction in the first parenthesis shows the wage difference and the fraction in the last parenthesis the difference of communication costs. Consequently, the two derivatives imply that, with a progress of regional integration as partial liberalization, there can be that plants are removed from a region such as (i) the large size of manufacturing expenditure, (ii) higher relative wage rate in comparison with the other integrated region, and (iii) higher relative communication cost in comparison with the other integrated region. Because the volume of trade to large market is larger, the merits from a decrease in transport costs to the market also become large.

At the next step, the enlargement of the integration bloc is examined. In terms of location strategy G and H, because transport costs incurred only between region s and t, the enlargement of integration bloc does not change the potential profits of firms in these strategies. The derivative of profits in location strategy A with respect to transport costs between region r and s and between region r and t is as follows:

$$\frac{f}{H(1+2\alpha)} \left(\left(\frac{w_s}{w_r} \right)^{\sigma-1} \frac{E_s}{\phi_{Hs}^{1/\gamma}} + \left(\frac{w_t}{w_r} \right)^{\sigma-1} \frac{E_t}{\phi_{Ht}^{1/\gamma}} \right).$$

This means that multinational firms in location strategy A tend to emerge by the enlargement of integration bloc when (i) both of communication costs between region r and s and between region r and t are large, (ii) manufacturing expenditure in region s and t are large, and (iii) wage rates in region s and region t are higher than those in region r. With regard to other location strategies, there are four cases. First, the derivative of profits in strategy B and E with respect to transport costs from region s to r is as follows:

$$\frac{f}{H(1+2\alpha)} E_r \left(\frac{w_r}{w_s} \right)^{\sigma-1} \phi_{Hs}^{1/\gamma}.$$

Second, the derivative of profits in location strategy C and D with respect to transport costs from region t to r is as follows:

$$\frac{f}{H(1+2\alpha)} E_r \left(\frac{w_r}{w_t} \right)^{\sigma-1} \phi_{Ht}^{1/\gamma}.$$

Third, the derivative of profits in location strategy F with respect to transport costs from region r to r is as follows:

$$\frac{f}{H(1+2\alpha)} E_t \left(\frac{w_t}{w_r} \right)^{\sigma-1} \phi_{Ht}^{-1/(1-\gamma)}.$$

The derivative of profits in location strategy I with respect to transport costs from region r to s is as follows:

$$\frac{f}{H(1+2\alpha)} E_s \left(\frac{w_s}{w_r} \right)^{\sigma-1} \phi_{Hs}^{-1/(1-\gamma)}.$$

Comparing with above four derivatives, the following location strategies tend to emerge: (1) the size of manufacturing expenditure in destination is large, (2) wage rates in region where manufactured goods are sent is smaller than those in destination, and (3) multinational firms have plants apart from HQs when communication costs between regions where manufactured goods are transported are small, whereas multinational firms have plants and HQs within a region when communication costs are large.

The derivatives in the last four cases differ from the results in partial liberalization in terms of communication costs. This is because partial liberalization is engaged between the region where HQs do not exist, whereas the enlargement of integration bloc are examined with the region where HQs locates.

In this subsection, we examined that where multinational firms abandon plants when a multinational firm has plants in all regions. From the explanation in section 2.1, plants of a multinational firm are located in all regions when scale economy at a plant level is weak and when transport costs are large.

3.2 The symmetric plants distribution in two countries

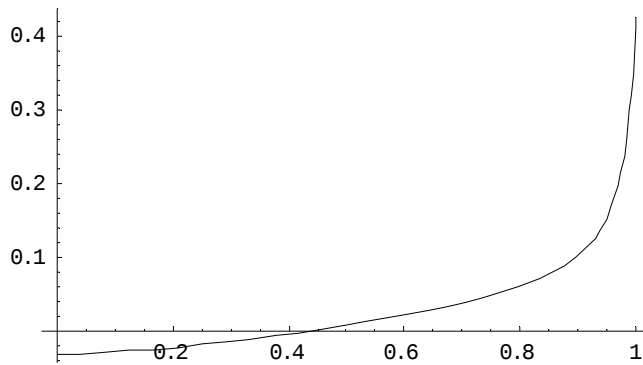
In this subsection, we focus on the case where scale economy at a plant level works enough. That is, multinational firms have a plant. The set up in this section is almost the same as in section 3.1. To have clear results, multinational firm's strategies are limited only two which is location strategy B and C in Figure 1. Half in total number of multinational firms takes location strategy B and the rest of half takes location strategy B. The choice of strategies is governed by the ad hoc equation:

$$\dot{\lambda} = (w_{H-B} - w_{H-C})\lambda(1-\lambda)$$

where λ is the share of multinational firms in location strategy B, w_{H_B} is the wage rate of labor in HQs which takes location strategy B, and w_{H_C} is the wage rate of labor in HQs which takes location strategy C. The equation implies that labor in HQs prefers strategies which make higher their wage rate. The number of workers in all HQs in region r, the number of workers in traditional sector and plants in each region, and the amount of agricultural specialized inputs are respectively set as 1. Therefore, region s and t are symmetric.

Our interest is whether such symmetric spread of plants is sustainable with a decrease in transport costs. We differentiate around the symmetric equilibrium, and then the response of wage rates in HQs with respect to small change of firm's location strategy are depicted in figure 2, 3 and 4. The vertical axis shows the differentiated wage difference between strategies with respect to small change of firm's location strategy, whereas the horizontal axis shows transport costs. The positive value in vertical axis means that more than half number of firms move to one location strategy. That is, the symmetric spread of location strategy is not sustainable. The smallest transport costs are expressed as the closest value to zero. The prohibitively high transport costs are close to one.

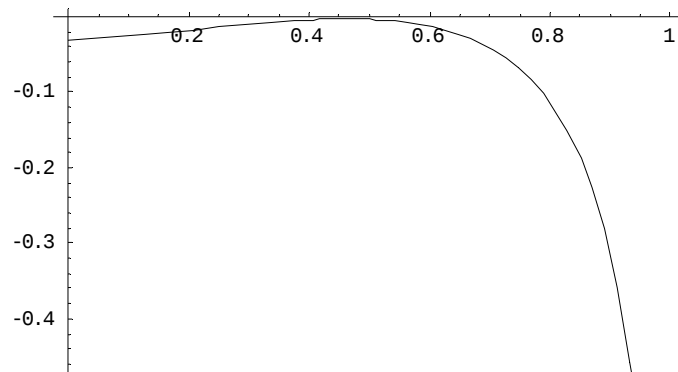
Figure 2 The sustainability of symmetric structure without input-output structure



Note: Labor share in Cobb-Douglas function in labor and agricultural specialized inputs are 0.5, intermediate share in Cobb-Douglas function in labor and intermediates is 0, and manufactured goods share in Cobb-Douglas function in a traditional good and a composite of manufactured goods is 0.1. The price elasticity of demand for every variety of manufactured goods is 3.

Source: Author

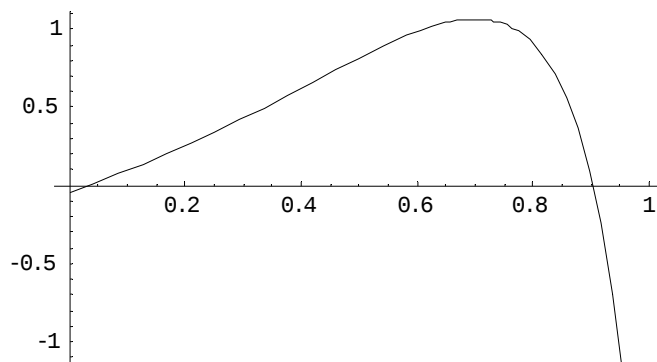
Figure 3 The sustainability of symmetric structure with weak input-output structure



Note: Labor share in Cobb-Douglas function in labor and agricultural specialized inputs are 0.5, intermediate share in Cobb-Douglas function in labor and intermediates is 0.1, and manufactured goods share in Cobb-Douglas function in a traditional good and a composite of manufactured goods is 0.1. The price elasticity of demand for every variety of manufactured goods is 3.

Source: Author

Figure 4 The sustainability of symmetric structure with strong input-output structure



Note: Labor share in Cobb-Douglas function in labor and agricultural specialized inputs are 0.5, intermediate share in Cobb-Douglas function in labor and intermediates is 0.7, and manufactured goods share in Cobb-Douglas function in a traditional good and a composite of manufactured goods is 0.1. The price elasticity of demand for every variety of manufactured goods is 3.

Source: Author

The difference of Figure 2, 3, and 4 is the value of intermediate share in Cobb-Douglas function in labor and intermediates. In Figure 2, the value is set as 0. Thus, input-output linkage does not exist. Thus, wage rate of labor in traditional sector and plants plays a role. When transport costs are large, the increased number of plants provide higher wage rate of these labor in the region. Thus, market expansion via an increase in the wage rate attracts more plants in the region. When transport costs are small, labor costs in total costs become relatively large. Thus, the symmetric structure becomes sustainable. In Figure 3, the value of intermediate share in Cobb-Douglas function in labor and intermediates is small. That is, input-output structure is weak. With input-output structure, the four effects explained in section 2.2 works. In this case, symmetric structure is stable independent from transport costs. In Figure 4, the value of intermediate share in Cobb-Douglas function in labor and intermediates is large. That is, input-output structure is strong. The four effects also work in this case. As a result, when transport costs are intermediate, symmetric distribution of plants are not stable. When transport costs are large, price index decreased by a shift of location strategy makes the price of manufactured goods for consumers relatively high. That means harsher price competition. When transport costs are small, the effect of increased labor costs keeps its size. Therefore, symmetric distribution of plants is sustained when transport costs are large or small.

4. Conclusion

This chapter summarizes the results of previous papers in the first half. A model related with Robert-Nicoud (2008) and Fujita and Goakn (2005) is used to examine the effects of a decrease in transport costs in the latter half.

When a multinational firm has plants in all regions, regional integration provides that the multinational firms close their plants in the large integrated market. Furthermore, we focus on the case where half of multinational firms have a plant in a region and the other half have a plant in the other region. We found that from numerical example that such a spread of plants are sustained (1) when transport costs are low and manufacturing firms do not have input-output linkage, (2) when manufacturing firms have weak input-output linkage, and (3) when transport costs are not moderate and manufacturing firms have strong input-output linkage.

The results show that the effects of regional integration on the location choice of multinational firms are different depending on the number of plants in a multinational firm.

This related with scale economy in a plant level. The existence of input-output structure and its degree provide different results. We need to take these factors into consideration to quantify the effects of regional integration. Finally, this chapter focuses on the case where HQs are located only in a region. Foreign direct investments among East Asian countries and South East Asian countries increased in reality. Thus, it would be better to consider these circumstances.

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